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North American Integrated Services Digital Network Users' Forum Agreements on ISDN

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North American ISDN Users' Forum
Agreements on ISDN

ABSTRACT

This document compiles the existing NIU-Forum agreements for an ISDN developed and approved in the NIU-Forum as of October 1991. These agreements cover: Layer 1 BRI at the U, and S/T reference points; Layer 1 PRI at the U/S/T reference points; Layer 2 BRI and PRI; Layer 3 BRI Basic Call Control for Class I equipment; Layer 3 PRI Basic Call Control for Class II equipment; and Generic Control procedures for Class I BRI Supplementary Services. In addition, this document references the Conformance tests which have been completed by the NIU-Forum. These include: Layer 1 BRI S/T interface; and Layer 2 BRI LAPD. Finally, this document contains the Application Profiles for: four of the Incoming Call Management applications; the Building Controls application; the Data Conferencing - Point-to-Point application; the ISDN Station Event Recording application; and three of the Voice Messaging System applications which have been submitted to the NIU-Forum.

KEY WORDS

application profile; basic call control; basic rate interface; conformance test; customer premises equipment; data link layer; implementation agreements; ISDN; LAPD; network layer; network termination; NIU-Forum; physical layer; primary rate interface; S/T interface; terminal adapter; terminal equipment; U Interface.

NOTICE OF DISCLAIMER

THIS DOCUMENT COMPILES NIU-FORUM VOLUNTARY AGREEMENTS AMONG PARTICIPATING EXPERT TECHNICAL PERSONNEL TO THE TEXTS OF ISDN STANDARDS, CONFIGURATIONS AND DESCRIPTIONS THAT ARE INTENDED TO PROMOTE INTEROPERABILITY AND EFFICIENCY. THESE AGREEMENTS WERE DEVELOPED AND APPROVED BY ORGANIZATIONS PARTICIPATING IN THE NORTH AMERICAN ISDN USERS' FORUM (NIUF) MEETINGS AS OF OCTOBER 1991. IN THE OCTOBER 1991 MEETING, PARTICIPANTS IN THE NIUF PLENARY AGREED TO PUBLISH ALL AGREEMENTS APPROVED AS OF THAT MEETING. NEITHER THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY NOR ANY OF THE PARTICIPANTS IN THE NIUF MAKE ANY REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED WITH RESPECT TO THE SUFFICIENCY, ACCURACY, OR USE OF ANY INFORMATION OR OPINION CONTAINED HEREIN. THE USE OF THIS INFORMATION OR OPINION IS AT THE RISK OF THE USER. UNDER NO CIRCUMSTANCES SHALL NIST, OR ANY PARTICIPANT IN THE NIUF BE LIABLE FOR ANY DAMAGE OR INJURY INCURRED BY ANY PERSON ARISING OUT OF THE SUFFICIENCY, ACCURACY, OR USE OF ANY INFORMATION OR OPINION CONTAINED HEREIN.

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TABLE OF CONTENTS

1 Introduction

The purpose of the Integrated Services Digital Network (ISDN) Agreements document, its organization and an overview of the North American ISDN Users' Forum (NIU-Forum) are described in the following subsections.

1.1 Purpose of this Document

Participants in the October 1991 NIU-Forum Plenary meeting, approved a motion to publish all agreements reached among the members as of October 1991. This document is a compilation of these NIU-Forum agreements for an ISDN.

1.2 Evolution of this Document

New versions of this document will be issued as progress is made in developing and approving implementation agreements, conformance tests, and application profiles within the NIU-Forum. It is the intent of the NIU-Forum, that each new version be compatible with previous versions. Therefore, each revision will supersede preceding versions, as each new version will include all of the unchanged agreements from previous versions, as well as errata pages for previously approved agreements.

1.3 Document Organization

The ISDN Agreements document is organized into specific sections as follows:

- Section 1
  Introduction — The purpose of this document, the document organization, and an overview of the structure and organization of the NIU-Forum.

- Section 2
  ISDN Versions — A specific interoperable subset of an ISDN which functions in a multi-vendor environment.

- Section 3
  Implementation Configurations — A categorization of the ISDN capabilities, based upon access and equipment class information.

- Section 4
  Implementation Agreements — The Implementation Agreements (IAs) are developed by both implementor and user representatives participating in the NIU-Forum Expert Working Groups. The IAs provided in this section allow for expeditious development of ISDN capabilities, and promote interoperability of ISDN communications equipments.

- Section 5
  ISDN Conformance Test Specifications — Conformance Test (CT) suites for an ISDN are detailed in this section of the agreements.

- Section 6

  Application Software Interface — The Application Software Interface (ASI) section will focus on the definition of a common application interface for accessing and administering ISDN services provided by Network Adapters.

- Section 7

  Application Profiles — The Application Profiles (APs) contain the recommended set of agreements and specifications for all layers and aspects of ISDN communication which must be present to support a particular user's application or set of applications (application family).

- Section 8

  References — The References section provides a listing of documents identified but not included in this publication.

1.4 NIU-Forum Overview

The following text introduces the NIU-Forum purpose and organization.

1.4.1 Purpose of the Forum

The Integrated Services Digital Network (ISDN) is defined in a group of international recommendations for a worldwide communications network for the exchange of all information (voice, data, and image) among all users, independent of any manufacturer, service provider, or implementation technology.

ISDN recommendations are being developed by the International Telephone and Telegraph Consultative Committee (CCITT). In North America, the ISDN standards are being developed by Committee T1, which is accredited by the American National Standards Institute (ANSI) and sponsored by the Exchange Carriers Standards Association (ECSA).

The result is one extensive standard with a tremendous variety of options and parameters. This is necessary to meet all the possible needs and technologies for which the standards could be used. However, to ensure interoperability and terminal portability within the ISDN network and its attendant terminals and other Customer Premises Equipment (CPE), a uniform subset of these options and parameters must be selected. Each application usually only requires a subset of functionality and in order for products to work together in a multi-vendor environment, common sets of options must be selected.

To cope with this proliferation of choices and to provide practical products and services which meet users' needs, the specification process must be extended to include Application Profiles, Implementation Agreements, and Conformance tests to promote interoperability.

1.4.2 NIU-Forum/NIST Relationship

The North American ISDN Users' Forum has created a user voice in the implementation of ISDN and ISDN applications and has helped to ensure that the emerging ISDN environment meets users' application needs. The NIU-Forum is sponsored by the National Institute of Standards and Technology (NIST). The precise relationship of the NIU-Forum, NIST, and other business

concerns is defined by the "Cooperative Research and Development Agreement: The Consortium on ISDN Based Systems."[1]

1.4.3 NIU-Forum Organization and Procedures

The actual work of the NIU-Forum is accomplished in two workshops; the ISDN Users' Workshop (IUW) and the ISDN Implementors' Workshop (IIW). These workshops, which consist of various working groups and special project teams, meet several times a year and develop the following products: Application Requirements, Application Analyses, Application Profiles, Implementation Agreements, Conformance Criteria, and an Applications Software Interface. The IUW produces Application Requirements which describe potential applications of ISDN and the features which may be required.

The IIW develops Application Analyses, Application Profiles, Implementation Agreements, Conformance Criteria, and an Applications Software Interface which provide the technical detail necessary to implement an Application Requirement in an interoperable manner.

The activities within the two workshops are coordinated by the NIU-Forum Executive Steering Committee. While specifics of the NIU-Forum organization follow, particulars relating to the procedures for the NIU-Forum are found in the "North American ISDN Users' Forum Practices Manual."[2]

1.4.3.1 ISDN Users' Workshop (IUW)

The IUW is responsible for identifying, defining, and prioritizing user requirements, as well as working with the IIW to define and approve agreements necessary to support the implementation of user requirements. Membership in the IUW is open to any organization. Users participating in the IUW are organized into seven Industry Groups: Manufacturing Industries, Process Industries, Service Industries, Small Business, Financial Services, Government, and Computing and Telecommunications Industries. The IUW organization emphasizes the synergy present when organizations from the same industry segment work together to define applications. Activities within the IUW are coordinated by the IUW Steering Committee.

The IUW work program is based on identifying potential user applications and structuring the IIW work to satisfy the user applications. Any user can request consideration for a particular ISDN application. The request should be for an application which could be used to support business related operations. It is important that ISDN solutions to business problems be based on business considerations which include:

- cost reductions
- productivity enhancements
- standard application interfaces
- and performance improvements.

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[1]For more information, contact the NIU-Forum Administrator (see sec. 1.5).

[2]Ibid.

For a detailed description of the "User Application" Processing within the ISDN Users' Workshop, please refer to "North American ISDN Users' Forum Practices Manual."[3]

1.4.3.2 ISDN Implementors' Workshop (IIW)

The IIW is responsible for developing Application Analyses, Application Profiles, Implementation Agreements, Conformance Criteria, and an Applications Software Interface in support of IUW defined Application Requirements. The IIW also provides technical advice and consultation to the IUW, sponsors multi-vendor demonstrations and trials, and provides formal liaisons with appropriate organizations such as the Corporation for Open Systems (COS), the Open Systems Interconnection (OSI) Implementors' Workshop (OIW), or the ANSI Accredited Standards Committee T1. Membership in the IIW is open to any organization.

The IIW Steering Committee is responsible for coordinating the activities of the IIW groups. The IIW is organized into the following groups:

- Applications Analysis Working Group (WG)
- Application Profile Teams
- Expert WGs
- ISDN Conformance Test (ICOT) WG.

The Applications Analysis WG develops an analysis of the user's application requirements, which serves as a basis for development of the Application Profile by the Applications Profile Teams. The Expert WGs produce the Implementation Agreements that are generally based on ANSI standards. In addition, there is an Expert WG defining an Applications Software Interface. The ICOT WG defines conformance requirements and develops abstract test suites for Implementation Agreements and Application Profiles.

1.4.4 ISDN Versions

A version defines and specifies ISDN as it exists at a certain point in time as derived from existing national and international standards and other consensus activities. Each version should be completely compatible with earlier versions. Manufacturers and service providers would be expected to develop ISDN offerings based on a particular version.

1.5 Point of Contact

Further information about the NIU-Forum, including information on specific groups or activities within the NIU-Forum can be obtained by contacting:

NIU-Forum Secretariat
National Institute of Standards and Technology
Building 223, Room B364
Gaithersburg, Maryland 20899
(301) 975-2937

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[3]Ibid.

2 Future ISDN Versions

Editor's Note: This section is reserved for future agreements on the definition and specification of ISDN Versions.

3 Implementation Configurations

The ISDN architecture is intended to interconnect all user and network equipments, in a ubiquitous fashion, to provide a common network encompassing all possible communication scenarios. Because of this broad scope, the national standards for the ISDN could not be universally applied to all the conceivable combinations of equipment types, access arrangements and applications. The concept of implementation configurations is introduced to allow specific ISDN capabilities (procedures) to be associated with a class of equipment, an access arrangement, or an application.

The use of the equipment class/access arrangement terminology permits clarification of the circumstances under which a certain capability should be available (i.e., when a particular equipment class is in use). It also permits a mechanism for indicating that a particular capability applies only to a subset of four possible configurations.

The implementation configurations, which were defined by the NIU-Forum Signalling Working Group (SWG), have been applied to the layer 3 circuit-switched signalling protocols only. Future work will evaluate the implementation configuration concept for applicability to all agreements emerging from the NIU-Forum.

The following text provides the current description of implementation configurations from the SWG:

The concept of equipment classes is introduced in this document to permit certain procedures to be associated with a particular application or class of equipment, e.g., station equipment versus Private Branch Exchange (PBX). Specifically, two classes of equipment are defined on the basis of two fundamental attributes.

The first attribute relates to the possibility of an exchange of signals occurring beyond the public network's point of contact with the interface (i.e., between the equipment directly connected to the public network and ISDN terminals or telephones connected to that equipment). For example, some user equipment may support subtending Basic Access digital subscriber loops and/or analog telephone loops. For Class I equipment, the network makes no provision for such an arrangement and assumes the Class I equipment constitutes the endpoint of the communication. Conversely, in the case of Class II equipment, the procedures at the network take into account that communication between Class II equipment (with which it communicates directly) and other equipment (with which the network does not have direct contact) may occur. As an example, Class II equipment may support digital and/or analog subscriber loops. Use of Class II equipment also involves the possibility of having interworking occur beyond the equipment with which the network has direct contact. Therefore, it is reasonable for Class II equipment to provide the network with an interworking notification, for both outgoing and incoming calls, when either the calling or called party respectively, is a non-ISDN user. Class II equipment may also send an interworking notification, if a private network exists beyond the Class II equipment and interworking to a non-ISDN facility within that network takes place. When an interface is associated with Class I equipment, it is assumed that multiple pieces of equipment may exist and communicate with the network over the D-channel. However, in this case, all equipment is assumed to be ISDN-capable and is considered as the endpoint of the communication. Therefore, interworking notification should not be accepted from Class I equipment.

The second attribute relates to the manner in which a SETUP message, the message which initiates an ISDN call, should be presented to the user equipment. When Class I equipment is applied on

a particular interface, the network should broadcast the SETUP message associated with each call that terminates on that interface, since interaction between the network and multiple pieces of user equipment should be supported. On the other hand, the network should not broadcast SETUP messages associated with terminating calls to an interface on which Class II equipment is being used. Here, a single piece of user equipment is assumed to be involved in all communication with the network.

To the extent possible, it is desirable to have one set of requirements for ISDN call control apply to all ISDN user configurations. However, in cases for which integrated procedures are not appropriate, the call control procedures associated with Equipment Class I will differ from those associated with Equipment Class II. Unless otherwise noted, the assumption should be that a particular procedure/capability should be provided for both classes of equipment on both basic and primary rate access. However, use of the equipment class terminology permits clarification of the circumstances under which a certain capability should be available (i.e., when a particular equipment class is in use). It also permits a mechanism for indicating that a particular capability applies only to a subset of four possible configurations which are labeled as follows.

Table 3-1. Implementation Configurations

	Class I	Class II
BRI	*IB*	*IIB*
PRI	*IP*	*IIP*

BRI: Basic Rate Interface
PRI: Primary Rate Interface

In other words, a capability that applies to Class I equipment may be provided on basic access interfaces (*IB*) and/or primary rate access interfaces (*IP*). Similarly, a capability that applies to Class II equipment may be provided on basic access interfaces (*IIB*) and/or primary rate access interfaces (*IIP*).

The notation shown in the table above is used within this implementation agreement to indicate when protocol or procedures are only expected to be supported for a particular class and/or are limited to a particular type of interface, i.e., basic or primary rate interface.

4 Implementation Agreements

The Implementation Agreements (IAs) generated by the NIU-Forum IIW provide the agreements for implementing the American National Standard (ANS) specifications for an ISDN. These IAs were developed and approved by both industry and user representatives participating in the Expert Working Groups, as well as the NIU-Forum Plenary. The IAs exist to expedite the development of ISDN capabilities, to promote interoperability of ISDN communications equipments, and to provide a universal, multi-vendor implementation. The following text details the IAs.[4]

4.1 ISDN Lower Layer Specifications

The ISDN lower layer specifications define the layer 1, 2, and 3 requirements of an ISDN. Network signalling, via the D-channel, is the focus of these agreements but, where appropriate, user data specifications of layers 1, 2, and 3 have been included. These IAs were developed in the Signalling Expert Working Group (SWG) of the IIW. These IAs provide a framework and a set of protocol procedures for accessing an ISDN, so that systems implemented according to these agreements can successfully interoperate. The following text details the ISDN lower layer IAs.

4.1.1 Layer 1 Basic Rate Interface (BRI)

The ISDN Basic Rate Interface (BRI) physical layer specifications are defined for their specific reference point of application. These reference points are S, T and U, providing the user and network interfaces for Terminal Equipment (TE) and Network Termination (NT) equipments. The following IAs are defined for the BRI physical layer.

4.1.1.1 U Reference Point

The IA *Basic Access Interface for Use on Metallic Loops for Application on the Network Side of the NT — Layer 1 Specification* (NIU 89-101) states: "The physical layer of the Basic Access Interface at the U reference point is specified in ANS T1.601-1988, *Integrated Services Digital Network — Basic Access Interface for Use on Metallic Loops for Application on the Network Side of the NT — Layer 1 Specification*, (Ref. [12]).

This IA adopts ANS T1.601-1988 (Ref. [12]) without exception."

4.1.1.2 S and T Reference Points

The IA *Basic Access Interface at S and T Reference Points — Layer 1 Specification*, (NIU 89-105) states: "The physical layer of the Basic Access Interface at the S and T reference points is specified in ANS T1.605-1989, *Integrated Services Digital Network — Basic Access Interface at S and T Reference Points — Layer 1 Specification*, (Ref. [16]).

This IA adopts ANS T1.605-1989 (Ref. [16]) without exception."

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[4]The NIU-Forum Plenary document numbers (e.g., NIU 89-101) are included for reference purposes only, as every numbered implementation agreement is included in the present document in its entirety.

4.1.2 Layer 1 Primary Rate Interface (PRI)

The ISDN Primary Rate Interface (PRI) physical layer specifications are defined for the S, T, and U reference points. These reference points provide the user and network interfaces for TE and NT equipments. The following IA is defined for the PRI physical layer.

4.1.2.1 S, T, and U Reference Points

The IA *Primary Rate Customer Installation Metallic Interfaces, Layer 1 Specification* (NIU 89-103R1) states: "The physical layer of the Primary Access Interface is specified by ANS T1.408-1990, *ISDN Primary Rate — Customer Installation Metallic Interfaces, Layer 1 Specification*, (Ref. [11]).

This IA applies to the Primary Rate S, T, and U reference points.

This IA adopts ANS T1.408-1990 (Ref. [11]) without exception."

NOTE: Previous revisions of this IA were based upon the ANS T1.403-1989 (Ref. [10]), (the DS1 specification) and can be found in NIST Special Publication 500-195, *North American ISDN Users Forum Agreements on ISDN* (Ref. [51]).

4.1.3 Layer 2 BRI and PRI

The ISDN Basic Rate Interface (BRI) and Primary Rate Interface (PRI) access arrangements specifies one common IA for the D-channel layer 2 data link.

The IA *Data Link Layer Signalling Specification for Application at the User-Network Interface* (NIU 89-210) states: "The data link layer of the D-channel is specified in ANS T1.602-1989, *ISDN Data Link Layer Signalling Specification for Application at the User-Network Interface*, (Ref. [13]).

This IA adopts ANS T1.602-1989 (Ref. [13]) with the following, additional clarifications:

1) Both automatic and non-automatic Terminal Endpoint Identifier (TEI) assignment terminals shall be allowed to connect to a passive bus. Automatic TEI assignments are preferred, since it would be the responsibility of the user to ensure that different TEIs are used by each different terminal for non-automatic TEI allocation equipment.

2) It is recommended that the data link monitor function be operated on at least one link associated with each TEI."

4.1.4 Layer 3 BRI and PRI

The ISDN BRI and PRI access arrangements will utilize the layer 3 Signalling protocol as defined by ANS T1.607-1990, ANS T1.608-1990 and ANS T1.610-1990 (Refs. [17, 18, 20]). These specifications apply to two distinct connection types: circuit-switched and packet-switched. The following text details the IAs for ISDN layer 3 signalling.

4.1.4.1 Circuit-Switched Call Control Procedures

The circuit-switched layer 3 signalling protocol shall be responsible for the establishment, maintenance and tear-down of basic signalling connections and supplementary service signalling connections which utilize circuit-switched access. The following text details the circuit-switched call control procedures.

4.1.4.1.1 Basic Call Control Procedures

The IAs (NIU 300 Series) for the ISDN Basic Call Control procedures state: the circuit-switched network layer protocol is specified in the ANS T1.607-1990, *Digital Subscriber Signalling System No. I (DSS1) — ISDN Layer 3 Signalling Specification for Circuit-Switched Bearer Service*, (Ref. [17]).

The IAs have adopted ANS T1.607-1990 (Ref. [17]), according to the implementation configurations, as follows:

- Class I BRI (*IB*)

The Class I BRI (*IB*) basic call control signalling IA *Layer 3 Signalling Specification for the Minimal Set of Circuit-Switched Bearer Services for the ISDN Basic Rate Interface/Class I* is included in Appendix A.

- Future Class I PRI (*IP*)

Editor's Note: This section is reserved for future agreements on Class I PRI (*IP*) basic call control signalling.

- Future Class II BRI (*IIB*)

Editor's Note: This section is reserved for future agreements on Class II BRI (*IIB*) basic call control signalling.

- Class II PRI (*IIP*)

The Class II PRI (*IIP*) basic call control signalling IA *Layer 3 Signalling Specification for the Minimal Set of Circuit-Switched Bearer Services for the ISDN Primary Rate Interface/Class II* is included in Appendix B.

4.1.4.1.2 Supplementary Services Control Procedures

The IAs (NIU 310 Series) for the ISDN Supplementary Services Control procedures are based upon ANS T1.610-1990, *Digital Subscriber Signalling System No. I (DSS1) — Generic Procedures for the Control of ISDN Supplementary Services*, (Ref. [20]). The following text details the IAs.

- Class I BRI (*IB*)

The IA (NIU 89-311) for the Class I BRI (*IB*) Supplementary Services Control procedures states: The generic procedures for the control of ISDN Supplementary Services for Class I equipment on a Basic Rate Interface (BRI) is specified in ANS T1.610-1990 (Ref. [20]).

The following changes shall apply to the ANS T1.610-1990 (Ref. [20]) specification:

1. In section 4, the Keypad protocol only applies during the establishment phase of a call;
2. In section 5.2.2.1, the option of using the dummy call reference for sending a call-associated feature request is removed.
3. In section 2.1.3, section 6, and Appendix I, the Common Information Element Category of the Functional Protocol is removed;
4. In section 7, the FACILITY and REGISTER messages are removed;
5. In section 8, the Facility information element is removed;
6. In Annex A, the Terminal Identification procedures for assignment of USID and TID at subscription time are removed;
7. In Annex B, section 2.1, the words "in the Called party number information element in one or more INFORMATION messages" should be changed to "in the Called party number information element in one INFORMATION message";
8. Remove Appendix III General Description of Component Encoding Rules.
9. The scope of this implementation agreements is applicable only to the ISDN Basic Access Rate as applied to Class I equipment.

- Future Class I PRI (*IP*)

Editor's Note: This section is reserved for future agreements on Class I PRI (*IP*) Supplementary Services Control procedures.

- Future Class II BRI (*IIB*)

Editor's Note: This section is reserved for future agreements on Class II BRI (*IIB*) Supplementary Services Control procedures.

- Future Class II PRI (*IIP*)

Editor's Note: This section is reserved for future agreements on Class II PRI (*IIP*) Supplementary Services Control procedures.

4.1.4.2 Packet-Switched Call Control Procedures

The Lower Layer Special Interest Group (LLSIG), of the OIW, has the responsibility of developing the IAs for packet-switched connections. Their work overlaps with the packet-switched services provided by an ISDN. Therefore, the SWG has the responsibility to review the LLSIG's IAs and provide to the LLSIG any additional information/clarification necessary to align these IAs with those defining the ISDN.

The packet-switched layer 3 signalling protocol shall be responsible for the establishment, maintenance and tear-down of basic signalling connections and supplementary service signalling connections which utilize packet-switched access. The following text details the packet-switched call control procedures.

The IA (NIU 89-320) for the ISDN Basic Call Control procedures states: the packet-switched network layer protocol is specified in the CCITT Recommendation Q.931-1988 (also designated CCITT Recommendation I.451-1988), *ISDN User-Network Interface Layer 3 Specification*,[5] (Ref. [26]).

The following agreements have been reached concerning the use of CCITT Recommendation Q.931-1988, (Ref. [26]):

1. On a BRI supporting the ISDN virtual circuit service, all of CCITT Recommendation Q.931-1988 (Ref. [26]) section 6, except for 6.1.1 and 6.2.1 (the sections covering the circuit-switched access case), shall apply. The following sections also apply; 3.2 (messages for packet-mode access connection control), 4-4.5 (section specifying general information element handling and encoding), 4.7 (information elements for packet communications).

2. On a PRI supporting the ISDN virtual circuit service all of Q.931-1988 (Ref. [26]) section 6, except for 6.1.1 and 6.2.1 (the sections covering the circuit-switched access case), 6.1.2.2, 6.2.2.2 and 6.4.2 (the sections specifying the D-channel ISDN virtual circuit service case), shall apply. The following sections also apply: 2.2 (packet-mode access connection states), 3.2 (messages for packet-mode access connection control), 4-4.5 (section specifying general information element handling and encoding), 4.7 (information elements for packet communications).

3. On a BRI or PRI supporting the Unrestricted 64 kbit/s circuit-mode service, CCITT Recommendation Q.931-1988 (Ref. [26]) sections 6.1.1, 6.2.1, 6.4.1 and 6.4.3 shall apply. The following sections also apply: 2.1 (circuit-mode connection states), 3.1 (messages for circuit-mode connection control), 4-4.5 (section specifying general information element handling and encoding).

4.2 Future Basic Bearer Services Specification

The ISDN basic bearer services specifications define the minimal set of bearer services provided by an ISDN. The specifications outline the set of essential bearer services, and their attributes, to be provided by an ISDN. The IAs developed for the bearer services will provide a specification outlining the required bearer services and their respective characteristics. The following text will detail the ISDN basic bearer services IAs.

4.2.1 Future Minimal Set of BRI Services

Editor's Note: This section is reserved for future agreements on the minimal set of ISDN Basic Rate Interface (BRI) bearer services (Refs. [15], [30, 31]).

4.2.2 Future Minimal Set of PRI Services

Editor's Note: This section is reserved for future agreements on the minimal set of ISDN Primary Rate Interface (PRI) bearer services (Refs. [14], [30, 31]).

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[5]This IA will be aligned with ANS T1.608-1990, *Digital Subscriber Signalling System No. 1 (DSS1) — Signalling Specification for X.25 Packet Switched Bearer Service* (Ref. [18]) when ANS T1.608-1990 is stable. Please refer to section 4.1.4.2 of the *North American ISDN Users' Forum (NIU-Forum) Working Agreements for the Integrated Services Digital Network (ISDN) — Publication 1* (Ref. [32]) for more information on this alignment.

4.3 Future Supplementary Services Specification

Editor's Note: This section is reserved for future agreements on the ISDN supplementary services specifications (Ref. [20]).

4.4 ISDN Terminal Adaptation Specification

The ISDN Terminal Adaptation specifications define the requirements for attaching a non-ISDN terminal to an ISDN. This attachment is performed across the R reference point, with the specification of the R reference point providing the necessary characteristics, attributes and functions such that successful interoperability between the non-ISDN and the ISDN is achieved. The IAs developed for terminal adaptation provide a specification of the R reference point requirements. The following text details the ISDN terminal adaptation IAs.

4.4.1 Future Circuit-Mode Data Terminal Adaptation

Editor's Note: This section is reserved for future agreements on circuit-mode data terminal adaptation which will define the R reference point requirements when circuit-switched connections are provided by an ISDN.

4.4.2 Packet-Mode Data Terminal Adaptation

The packet-mode data terminal adaptation IAs define the aspects of the packet-mode services to be used by the packet-mode Data Terminating Equipment (DTE), the access requirements, and the functions of the Terminal Adapter provided across the R reference point. These IAs were developed in the LLSIG of the OSI Implementors' Workshop. Refer to the NIST OSI Implementors' Workshop *Stable Implementation Agreements for OSI Protocols* (Ref. [52]), section 7.

4.5 ISDN Management Specification

The ISDN Management specifications provide the operations and maintenance requirements for the various access interfaces and protocol levels of the ISDN. The IAs are to be developed in the Network Management Expert Working Group (NMWG) of the IIW. The following text details the ISDN Management IAs.

4.5.1 Future Layer 1 BRI

Editor's Note: This section is reserved for future agreements on layer 1 ISDN management specification, for a Basic Rate Interface (BRI) (Ref. [7]).

4.5.2 Future Layer 1 PRI

Editor's Note: This section is reserved for future agreements on layer 1 ISDN management specification, for a Primary Rate Interface (PRI) (Ref. [8]).

4.5.3 Future Layer 2 and 3, BRI and PRI

Editor's Note: This section is reserved for future agreements on layer 2 and 3 ISDN management specification, for a Basic Rate Interface (BRI) and a Primary Rate Interface (PRI) (Ref. [9]).

4.6 Future Common Channel Signalling — Signalling System #7

Editor's Note: This section is reserved for future agreements on common channel signalling system, ANSI Signalling System #7 (Refs. [1, 2, 3, 4, 5, 6, 19].

5 ISDN Conformance Test Specifications

The NIU-Forum's Conformance Test (CT) specifications provide test suites to be used to verify the conformance of ISDN equipments to the designated specification. They are written in abstract form so that multiple test equipment vendors may provide implementations of the test suite. The ISDN Conformance test specifications are developed in the ISDN Conformance Test (ICOT) Working Group, and its subordinate Expert Working Groups: the Abstract Conformance Test Group for layer 1 (ACT1) and the Abstract Conformance Test Group for layers 2 and 3 (ACT23). The following text details the Conformance Tests for ISDN equipments.

5.1 Layer 1 BRI

The Basic Rate Interface (BRI) Layer 1 Conformance Test specifications provide the requirements for verifying equipment conformance at layer 1 of the ISDN BRI user-network interface. The following text details the Conformance Tests for layer 1 operation of a BRI.

- Future "U" Interface

Editor's Note: This section is reserved for future agreements on the layer 1 BRI conformance test abstract test suites, and conformance criteria to the ANS T1.601-1988 (Ref. [12]).

- The "S/T" Interface

The CT defining the conformance criteria and abstract test suites to verify equipment implementation conformance to the BRI S and T interface as specified in ANS T1.605-1989 (Ref. [16]) is defined by the NIU-Forum specification, NIU 90-002 (NIU-F/IIW/ICOT-90-040) *Integrated Services Digital Network (ISDN) Conformance Testing, Layer 1 Basic Rate S/T Interface, User Side*, (Ref. [33]).

5.2 Future Layer 1 PRI

Editor's Note: This section is reserved for future agreements on the layer 1 PRI conformance test abstract test suites, and conformance criteria to the ANS T1.408-1990 (Ref. [11]).

5.3 Layer 2 BRI

The layer 2 Conformance Test specifications, for the BRI and PRI access arrangements, provide the requirements for verifying equipment conformance at layer 2 of the ISDN BRI/PRI. The ISDN test suite development process is aligned with International Standards Organisation (ISO) 9646 (Ref. [54]), OSI Conformance Testing Methodology and Framework, Parts 1-3. The following text details the Conformance Tests for layer 2 operation of an ISDN.

The CT defining the abstract test suites to verify equipment implementation conformance to the layer 2 of an ISDN at the user-network interface is defined by the NIU-Forum specification, NIU 91-007[6] (NIU-Forum/IIW/ICOT/ACT-91/22.2 V1.2) *Integrated Services Digital Network (ISDN) Conformance Testing, Layer 2 Basic Rate Interface, Link Access Procedure, D-channel (LAPD), User Side*, (Ref. [34]). This conformance test suite is for the Link Access Procedure, D-channel

[6]In order to accurately represent the Layer 2 Conformance tests, the reference was changed from NIU 89-001 (NIU-Forum/IIW/ICOT/89-065.2) to the final, and NIU-Forum approved document NIU 91-007 (NIU-Forum/IIW/ICOT/ACT23-91-22.2 V1.2).

(LAPD) data link protocol and is described in Tree and Tabular Combined Notation (TTCN). Its use is for ISDN terminal equipments attaching to the user side of a Basic Access interface.

The CT defines the conformance criteria to the ANS T1.602-1989 (Ref. [13]) and to the CCITT Recommendation Q.921-1988 (Ref. [25]) (Note: These specifications are the same text). The purpose of the Abstract Test Suite is to provide the most complete protocol conformance test coverage as is possible, not to be completely exhaustive. The LAPD Test Suite has many additional test cases for TEI Management procedures and system related cases which are covered in the body of the CCITT Recommendation Q.921-1988 text (Ref. [25]) but not in the CCITT Recommendation Q.921-1988 state transition tables.

5.4 Future Layer 2 PRI

Editor's Note: This section is reserved for future agreements on the layer 1 PRI conformance test abstract test suites, and conformance criteria to the ANS T1.602-1989 (Ref. [13]).

5.5 Future Layer 3

Editor's Note: This section is reserved for future agreements on the layer 3 Conformance Test specifications, for BRI and PRI access arrangements.

6 Application Software Interface (ASI)

This section includes the introductory material for the specification for an Application Software Interface (ASI) defined by the NIUF. The complete ASI documents are published separately.

6.1 Introduction To The ASI

6.1.1 Overview

Part 1 of the ASI provides an initial specification intended to allow implementors to begin using the ASI for implementations of applications requiring a limited subset of ISDN services within a limited set of operating systems. The specification includes the following components:

- introduction to the ASI concepts,
- description of the ASI architecture,
- description of the ASI access functionality,
- ASI command messages to support a basic subset of ISDN services,
- and ASI data structures.

Future parts of the ASI specification will expand the above list to include:

- ASI access method for DOS, UNIX/POSIX, OS/2, Windows, etc.,
- additional ASI command messages to support additional ISDN services,
- formal specification of the ASI,
- expansion to include the full teleservices architecture,
- and conformance tests.

6.1.2 Charter

The Application Software Interface focuses on the definition of a common application interface for accessing and administering ISDN services provided by hardware commonly referred to in the vendor community as Network Adapters (NAs) and responds to the applications requirements generated by the ISDN Users' Workshop (IUW).

The characteristics of this Application Interface shall be:

- portable across the broadest range of system architectures,
- extensible,
- abstracted beyond ISDN to facilitate interworking,

- and defined in terms of services and facilities consistent with OSI layer interface standards.

6.1.3 Goals

The primary goal of the ASI is to provide a consistent set of application software interface services and application software interface implementation agreement(s) in order that an ISDN application may operate across a broad range of ISDN vendor products and platforms.

The application software interface implementation agreements will be referenced by (and tested against) the IUW generated applications. It is anticipated that the vendor companies involved in the development of these implementation agreements will build products for the ISDN user marketplace which conform to them.

ASI Implementation Agreements are likely to become a U.S. Government Federal Information Processing Standard (FIPS).

ASI specifications are expected to serve as a contribution for further North American or International standards activities.

6.1.4 Purpose

Today there exists an ever increasing number of ISDN Network Adapters (NAs) from different manufacturers, each with the same basic subset of features, plus additional features the manufacturers hope will differentiate them from the competition. This environment is illustrated in figure 6-1.

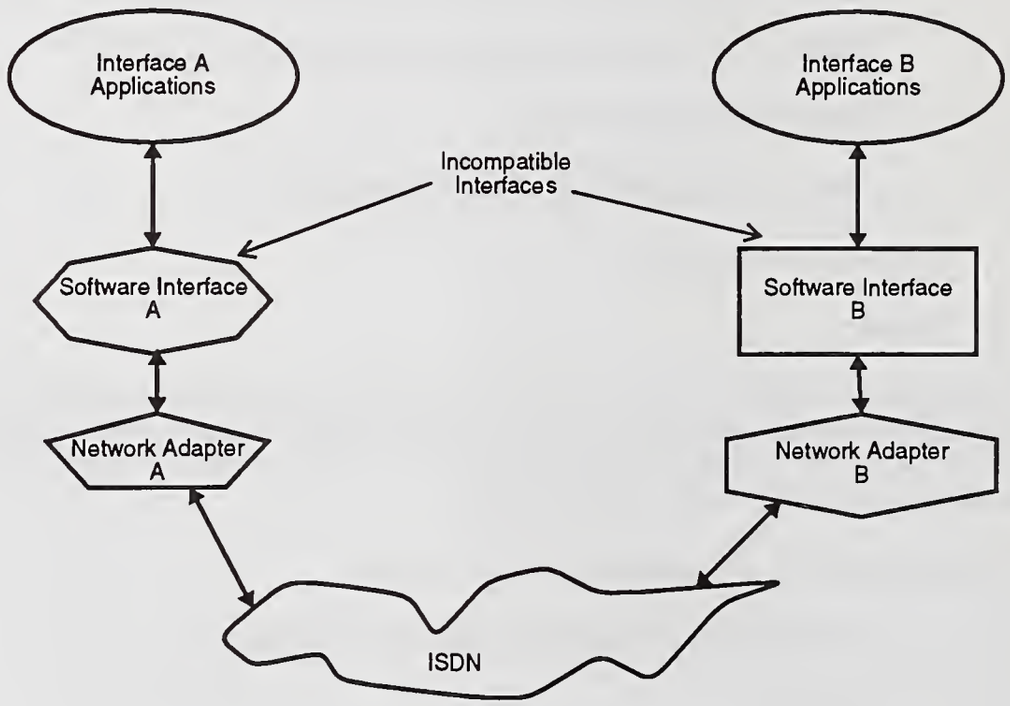

Figure 6-1. Typical Proprietary Interface Environment.

Currently, each NA vendor presents a different software interface to the ISDN application. This produces constant frustration to the ISDN applications developer. Each interface represents the efforts on the part of the vendor to provide access to all ISDN services provided by the NA; yet each, done in isolation, differs from the others. In developing an ISDN application, therefore, the developer is faced with the task of (a) binding with an initial NA (hopefully a popular one), and (b) once his application is fielded, working to enhance his application product to interface with other NAs as well. Exemplifying this process are products in the market today which advertise "currently works with Network Adapters A, B, and C; will support Network Adapters D and E in the near future."

6.1.5 Scope

Figure 6-2 conceptualizes a solution to the application interface incompatibility problem.

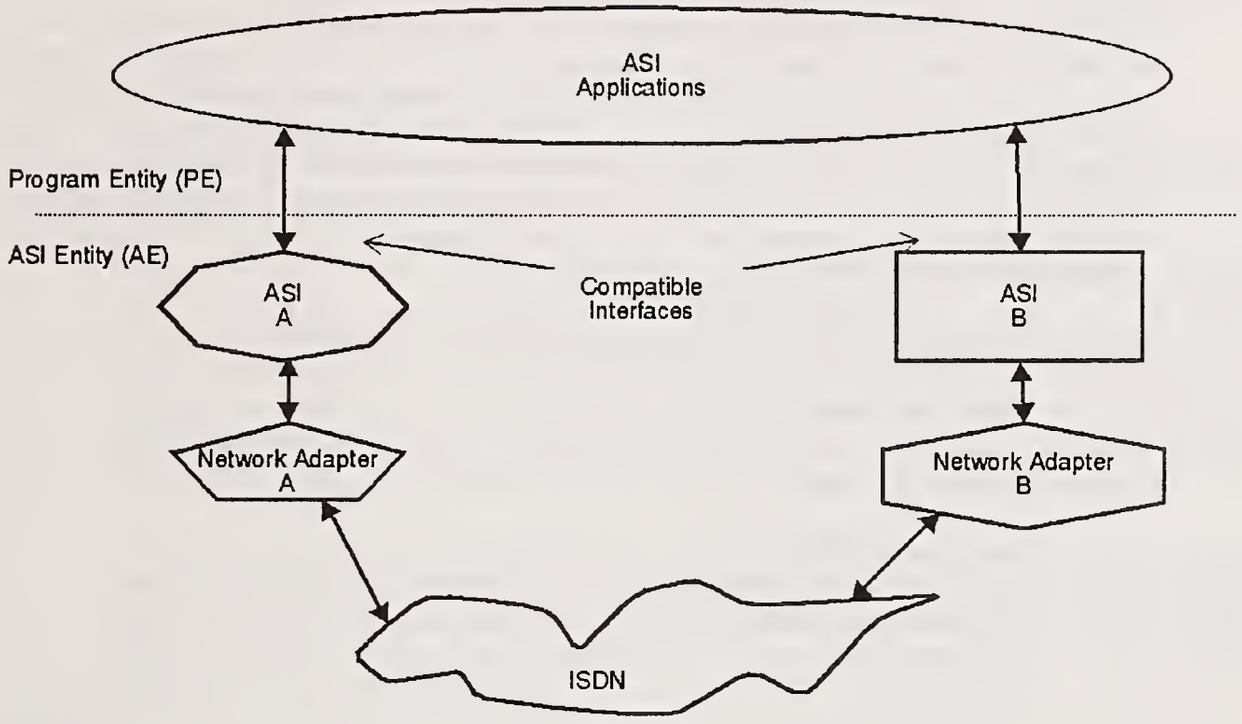

Figure 6-2. ASI Environment.

The ASI is a software interface between an application and a NA within an operating environment (the operating environment includes the operating system, hardware platform, bus, etc.). Elements on the network side of the interface are referred to as the **"ASI Entity (AE)."** Elements on the application side are referred to as the **"Program Entity (PE)."**

The ASI does not guarantee interoperability between the end to end applications that may use the ASI.

The ASI places emphasis on a common application interface as opposed to a common hardware device interface for two main reasons:

1. The most important user benefit is derived from a large selection of commercially available ISDN applications which can operate over a correspondingly large selection of NAs. The number of applications will be most influenced by the existence of a common application interface that allows the application provider to easily migrate applications to different NAs or operating system environments.

2. It is much more difficult to specify a standard hardware device interface. Vendors want to provide different NA hardware interfaces to appeal to different markets. For example, some NAs will be built for performance while others will be built for low cost. The market that a vendor desires to sell into, will determine the hardware device interface (i.e., memory mapped, polled I/O, interrupt driven, direct memory access (DMA) driven, shared memory, etc.). Vendors are accustomed to providing drivers or libraries which interface to their specific hardware implementation.

The conversion from the common ASI to the NA hardware device interface becomes the job of the adapter developer. The conversion function can, for instance, reside in a device driver which is provided by the adapter manufacturer. The application developer should have to do as little as possible to port an application written for one operating system to a different operating system (e.g., to re-compile or re-link is perceived as minimal effort). Also, within one operating system, the application developer should be able to design applications independently of the NA (e.g., the application should work the same and without modification on the variety of NAs available), assuming the NA provides equivalent services.

The conceptual objective of the ASI is to be as independent as possible of:

- Hardware Platform,
- Operating System,
- Data Protocol Type,
- Programming Language,
- and Compiler.

Although the ASI takes the approach of developing a common set of services which are applied across a broad range of environments, the access methods are environment dependent. This is true because of hardware restrictions within different operating environments, performance issues, and fundamental operating system differences.

As applicable ISDN standards evolve it is expected that the ASI will evolve to accommodate those applicable standards.

6.1.6 Assumptions

Several assumptions have gone into the development of the current ASI specification. These assumptions are described as follows:

- ISDN primary rate and basic rate access are assumed to be the network interface to the NA. This does not preclude application of this interface to NAs which interface to other ISDN access methods.

- The ASI provides a uniform software interface defined between the NA and the application. Throughout the ASI specification, the term "ASI entity" is used to refer to the ISDN service provider, and any associated hardware, network adapter card, or terminal equipment, while the term "Program Entity" is used to refer to the application which uses the ISDN service.

- This specification does not address peer-to-peer protocol or interoperability issues.

- The ASI interface is assumed to be at the OSI layer three to layer four boundary.

- ANSI Standards, NIUF Agreements, and CCITT Recommendations are the basis for this ASI specification.

- No default values for parameters are assumed by the interface. All parameter values necessary for a message must be supplied in the applicable data structures.

6.2 Technical Overview

This section presents an overview of the ASI architecture and the motivation underlying the chosen approach.

The goal of the ASI is to provide a portable, extensive, and layered software interface to ISDN hardware, call control, and services. Portability allows applications to be developed independent of any particular vendor's ISDN offering, and hence ties the success of the application to the penetration of ISDN rather than the future of a single vendor. Portability favors the application developer by making the application available for a wider audience. But widespread application availability will make it easier to use ISDN services, hastening deployment of ISDN lines, and thus ultimately benefitting the hardware (or ISDN capable computer platform) vendors as well.

ASI applications run on a computer platform employing ISDN interface hardware from different vendors without recompilation or linking. The same application is portable to a different computer platform (with the same operating system) by recompiling without changes to the source code. There may be some code changes required for a different operating system to accomodate differences in the access method.

A problem with designing application software interfaces to ISDN teleservices is the range of level of functionality such an interface could support. A high level interface would provide generic telephony interface functions, while a lower level would more closely match ISDN-specific message and event types. The ASI favors a layered approach, based on experience with the OSI model and numerous examples in distributed computing.

As such, the ASI incorporates a model with several reference points. A multi-tasking operating system will enable multiple processes to gain access to ISDN services through a server architecture which will provide a high level functional interface and event filtering to minimize ISDN-specific knowledge required of the application. This server, or the single application for a server-less or single threaded operating system, in turn communicates with ISDN call control over a lower level interface which more closely mirrors the ISDN protocol. The various reference points will be illustrated later in this section.

The current release of the ASI specification defines the core subset of the lower level reference point. It is to this reference point which vendors must supply ASI support, and, once written, early

applications can be developed immediately. No vendor-specific software need operate above this reference point, although a vendor may choose to provide higher level support for added value to an ISDN product.

The ASI defines a reference point and a message protocol across that reference point. ISDN call control and hardware specific interfaces will operate below the ASI and be provided by specific vendors. Vendors may also supply an application library, in some specific programming language, to compose messages in the ASI format.

The ASI specifies a complete interface composed of an operating system *dependent* access method, an operating system *independent* message set, and an operating system *independent* message encoding method. An operating system dependent access method allows the rest of the ASI to exist independent of the OS.

Because the message set and encoding method are identical between the various implementations of the ASI for different operating systems, application portability is greatly simplified.

The ASI message set and operating system specific access methods provide an asynchronous interface to ISDN call control. The application makes requests through the ASI, and the ISDN call control beneath the ASI transmits confirmation messages and event indication messages back through the ASI as appropriate. Any blocking or synchronous interface to the ASI should be provided as a library of function calls on the application side of the ASI.

For example, an application places a call by sending an Nb-CONNECT request. After issuing the request, the application can continue execution. Call control may generate various Nb-EVENT indication messages as the call proceeds through the network. When the call completes to the called party, an Nb-CONNECT confirmation message will be sent up through the ASI. To implement a blocking call request, the application would send the Nb-CONNECT request, and await the Nb-CONNECT confirmation.

6.2.1 Application Software Interface Definition

The Application Software Interface (ASI) is a common interface for accessing ISDN services provided by ISDN network adapters (NAs). The ASI is a way for an application and an ASI entity to communicate within an operating environment (the operating environment includes the operating system, hardware platform, bus, etc.). The translation of the ASI message set to and from the instructions needed to operate any hardware interfaces is accomplished by AE vendor supplied software. The conversion function, can, for instance, reside in a device driver provided with the AE.

The application developer should be able to design applications independent of the NA with which it might be used. Within a given operating environment (e.g., a PC running DOS), applications should be able to run on any ASI-compliant AE. Finally, the application developer should have to do as little as possible (e.g., recompile/relink) in order to move from one operating system to another. The ASI allows any ISDN application written against the ASI specification to communicate with any ASI-compliant ISDN network service provider.

6.2.2 OSI Reference Model Positioning

The ASI is positioned at the Service Access Point (SAP) between layers 3 and 4 in the OSI Reference Model. Conceptually, the ASI is an asynchronous message stream between the ISDN network services provider (layers 1 - 3) and the user (layers 4+) of those services.

If, for example, a non-empty transport layer protocol is positioned above the ASI, then that transport protocol, and not the higher layer application, is the actual user of the ISDN bearer services provided through the ASI. Likewise, the term "ASI entity" is meant to apply to any provider of ISDN network services that meets certain qualifying assumptions. The ASI is a local interface between layer 4 and layer 3 only; it is not, itself, a layer within the OSI Reference Model, nor is it an end-to-end protocol. Such features as interoperability or end-to-end integrity must be provided by protocols above the ASI, using ISDN network services accessed through the ASI.

6.2.3 Teleservices Architecture

The environment in which the ASI is expected to operate assumes an architecture including a generic teleservices server. Such a server may offer teleservices to applications on the local machine or on the local area network without requiring the applications to implement the details of ISDN, plain old telephone service (POTS)/public switched telephone network (PSTN), or other possible teleservices media.

It would be the responsibility of a server interface definition to allow for multiple client applications to access the services provided by a single interface adapter.

The teleservices architecture has been split into several layers. Issue 1 ASI is identified as the message stream at reference point "B" in this architecture.

The definition of the Reference Points is as follows, and is depicted in figure 6-3:

- In ASI Draft 1, the "A" reference point is not an exposed interface. It is defined to be the interface between the "standard" portions of Q.931 and the non-standard portions. Only the non-standard portions of ISDN need to be customized for each market.

- The "B" reference point is the interface between the ISDN signaling, management and user planes, and a server or dedicated application. Direct multi-client access is not allowed.

- The "C" reference point presents a generic teleservices interface to the server or dedicated application.

- The "D" reference point allows a server to provide a generic teleservices interface to multiple client applications. This interface also presents a simplified programming model to the application or toolkit developer.

- The "E" reference point is the programming interface provided by a high level library. This interface is the one most desired by typical applications developers.

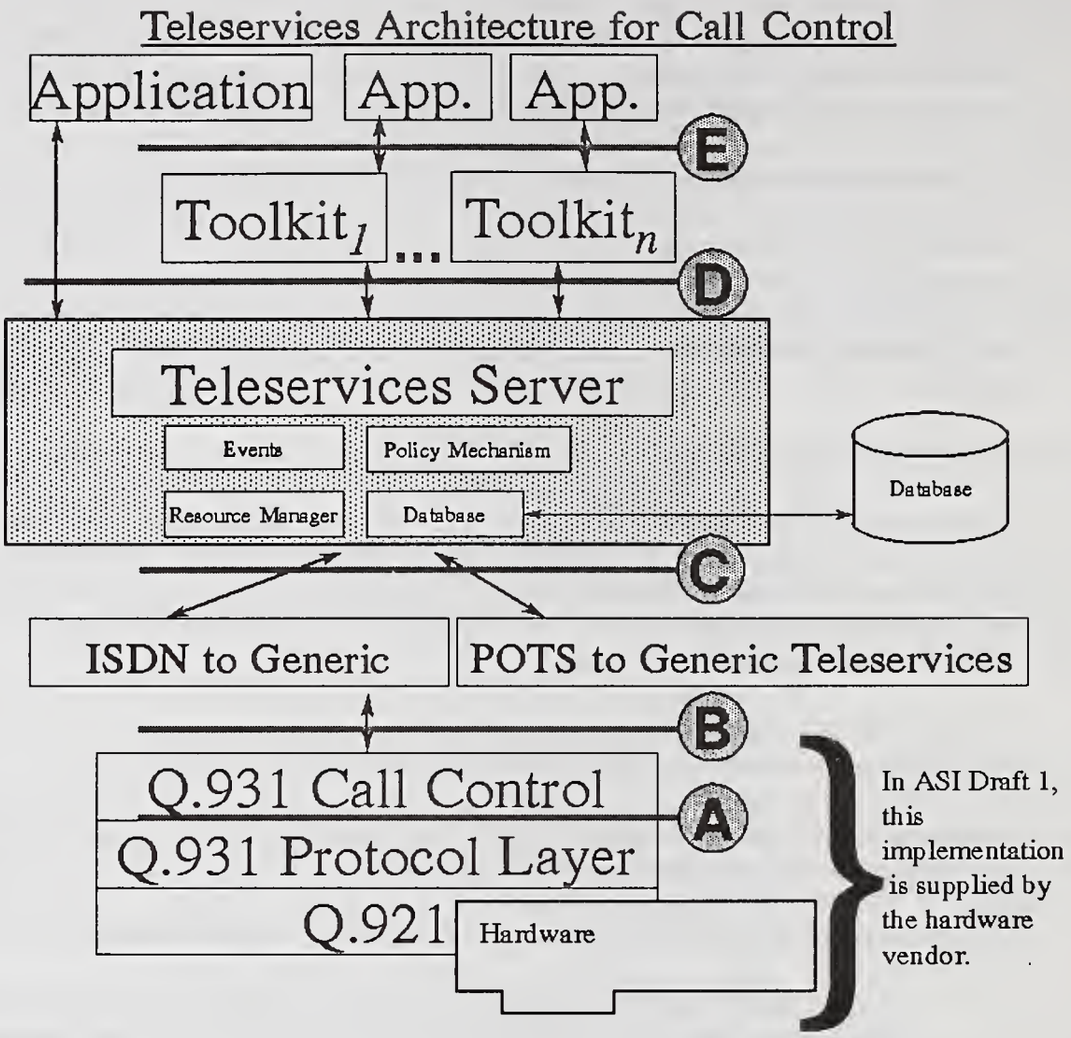

Figure 6-3. Teleservices Architecture for Call Control.

6.2.4 ASI Sessions

The Application Entity (AE) and Program Entity (PE) communicate across the ASI by reference to sessions. A session is a local virtual path between the PE and the AE which carries all requests and responses for a given instance of a service, e.g., a voice call. Once established, a session is referred to by a session ID.

Sessions are created dynamically by either the AE or the PE according to the rules defined by the ASI protocol. To allow for dynamic creation of sessions by either side, each side may create session IDs without consulting the other side. The AE's session ID is referred to as the AEI, while the PE's session ID is referred to as the PEI. Either side may refer to a session using the other's ID. An ID of all zeros indicates that the other side's ID is unknown or is not used.

Retiring and reuse of old IDs is carefully managed by the protocol.

6.2.5 ASI Components

The ASI, or any other interface in the architecture, must contain definitions for the following:

- access methods for each operating environment (DOS, Unix, etc.), for passing messages,
- a set of message types and associated parameters,
- precisely defined encodings for the above messages,
- and a formal description of the protocol semantics.

6.2.5.1 Access Methods

An access method, as defined by this document, is an operating system dependant set of procedures for passing messages between layers of software. The messages may contain control, management, or user plane information.

This architecture requires that any access method provides asynchronous message passing between software layers.

Access methods are described in the *Application Software Interface Part 1: Overview and Protocols* (Ref. [53]), section 4.

6.2.5.2 Messages

In order to meet the portability and network transparency requirements of the architecture, all messages are required to be self contained. Messages containing pointers, or other references, to external data structures are not legal.

Messages and their semantics are described in *Application Software Interface Part 1: Overview and Protocols* (Ref. [53]), section 5. Message parameters are described in *Application Software Interface Part 1: Overview and Protocols* (Ref. [53]), section 6.

6.2.5.3 Encoding

Message definition will be described using ASN.1.

Actual message encoding will be done using an ASI specific method. The method is chosen to promote ease of implementation and improve performance while providing for future expansion of the protocol.

7 Application Profiles

Since the inception of the NIU-Forum, the goal has been to provide an ISDN that users want and need, and to do so in a way that promotes application interoperability in a multi-vendor environment. Application profiles are the final step in the functional standardization process to achieve this goal.

7.1 NIU-Forum Application Profiles

An application profile provides an overall specification of the ISDN elements and the application elements necessary to provide a specific, interoperable application for an ISDN. A profile supports a particular application, or a set of applications, specifying the ISDN standards to use, the options to implement within each standard, the layered protocol configuration and the application's usage of the ISDN's attributes. Please refer to the *North American ISDN Users' Forum (NIU-Forum) Working Agreements for the Integrated Services Digital Network (ISDN) — Publication 1*, (Ref. [32]), section 7.1.1, for a description of the process for developing Application Profiles.

7.1.1 Application Profile Conformance

It is essential that the Application Profile teams identify criteria that the implementor must meet in order to claim compliance with the Application Profile. It is intended that a tester agency be established (e.g., the Corporation for Open Systems) which applies ICOT-derived conformance tests in order to verify a product's relative sufficiency of interoperability against a testbed which applies standardized testing methodologies (e.g., ISO 9646, Ref. [54]). Real multi-vendor interoperability is achieved in an interoperability testing environment which validates the Application Profile's compliance amongst participatory users and vendors.

7.1.2 Application Profile Families

The NIU-Forum ISDN applications have been categorized into one of six "application families." The families provide a means of assimilating applications based upon a commonality of usage.

Each family has been assigned its own Application Profile team to develop the Application Profiles for the family. The following Application Profile teams have been identified:

- ISDN Call Management
- ISDN CPE Compatibility/Capability
- ISDN Network Interconnectivity
- Messaging and Answering
- Bandwidth Negotiation
- Network Management/ISDN Administration

The following sections detail the Application Profile IAs.[7]

[7]The NIU-Forum Plenary document numbers (e.g., NIU 90-003) are included for reference purposes only, as every numbered application profile is included in the present document in its entirety.

7.2 ISDN Call Management

7.2.1 Incoming Call Management

The ISDN Call Management Profile team has completed an Application Profile, NIU 90-003, for incoming call management which covers all of the following applications:

Title	User Req't Document Number
• Database Information to Corporate Security	810005
• New Account Customer Inquiry Handling	840023
• Customer Service Call Handling	840024
• Automatic Callback for Financial Services	840025

7.2.1.1 Abstract

This application profile provides the User Descriptions, Alternative Architectures, Information Flows, and recommended Protocol Stacks for the Incoming Call Management Applications (User Application Requirements Data Form Numbers: 810005, 840023, 840024, 840025, Refs. [36, 37, 38, 39]). The Incoming Call Management Applications involve customer service agents who currently receive incoming calls, ask the caller for their member number, and input that data into a terminal connected to a host application. ISDN will be used to automate the transfer of the Caller's ID to the host. In addition, agents may transfer the call to an additional agent who should be able to continue the call without having to request the same information from the caller again. ISDN will be used to effect the call transfer and allow the second agent to bring up the right application screen without repeating questions. Finally, when all the agents are busy, the caller's number should be captured for later callback. ISDN will be used to capture the caller's number and allow callback later. ISDN can be used to connect the agent's terminal to the host.

7.2.1.2 User Description

Customer service agents currently receive incoming calls, ask the caller for their member number, and then input the member number into a terminal connected to a host application to obtain the customer information. Agents may transfer the customer to another agent to provide a different service. The second agent has to again ask for the member number and enter a transaction to receive the customer information. The second agent may access a different host application. In addition, when all agents are busy, the caller's number should be captured for later callback.

7.2.1.3 ISDN Application Breakdown

The user's proposed application and the breakdown of the application into service elements can be seen in figure 7-1.

- Call Transfer with Associated Data Service Element

  Agent 1 wishes to transfer a voice call from the Customer to agent 2. The voice call is transferred to agent 2. Certain information associated with the terminal session is transferred to the host to which agent 2 is attached, so that the appropriate screen can be delivered to agent 2.

• Call Delivery with Associated Data Service Element

The customer places a voice call in order to speak to an agent. The call arrives at a Central Office (Co) or Customer Premises switch (PBX). The switch delivers the voice

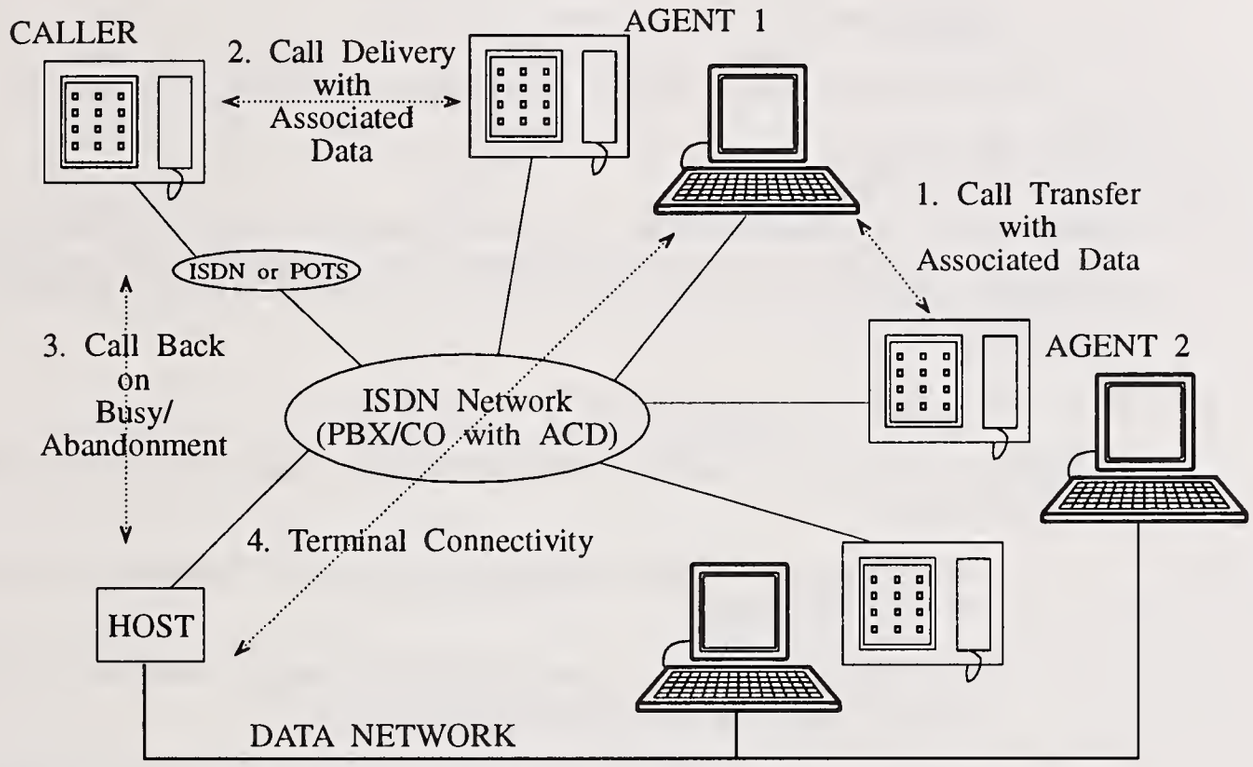

Figure 7-1. User Proposed Application Service Breakdown.

call to agent 1.[8] Certain information that is delivered to the switch with the voice call (probably the calling party's number) is delivered to a host application, so that the host application can deliver an appropriate screen to agent 1.

• Call Back on Busy/Abandonment Service Element

This service allows an available agent to place calls to customers who have received busy or abandoned the call prior to delivery to an agent.

• Terminal Connectivity Service Element

The agents data terminal is connected to the host via an ISDN link.

7.2.1.3.1 Service Logic

Figure 7-2 shows the sequence of services put together to provide Incoming Call Management Applications. The Terminal Connectivity Service Element may be optional and a Call coming in without the associated data (Calling Line Identification (CLID) may be available for Call Transfer with associated data.

7.2.1.4 Call Transfer with Associated Data Service Element

In this service a call is already active between agent 1 and the caller. Agent 1 could then perform any of the following:

1. Blind Transfer — Transfer the call to a second agent and disconnect before the second agent answers.

2. Transfer with Consulting — Transfer the call to a second agent, discuss the call with the second agent, then complete the transfer.

3. Consult — Agent 1 calls the second agent to discuss the call and then disconnects agent 2.

The components are shown in figure 7-3.

The sequence of events for each type is:

Blind Transfer

a. Agent 1 places the caller on hold.

b. Agent 1 places a call to agent 2 and invokes transfer.

c. Agent 1 hangs up.

d. Agent 2 is selected directly or by an intervening CO/PBX (Automatic Call Distributor (ACD) function).

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[8]The topic of how the switch decides to deliver the call to a particular agent has not been described as part of this application, but may have some bearing on implementation.

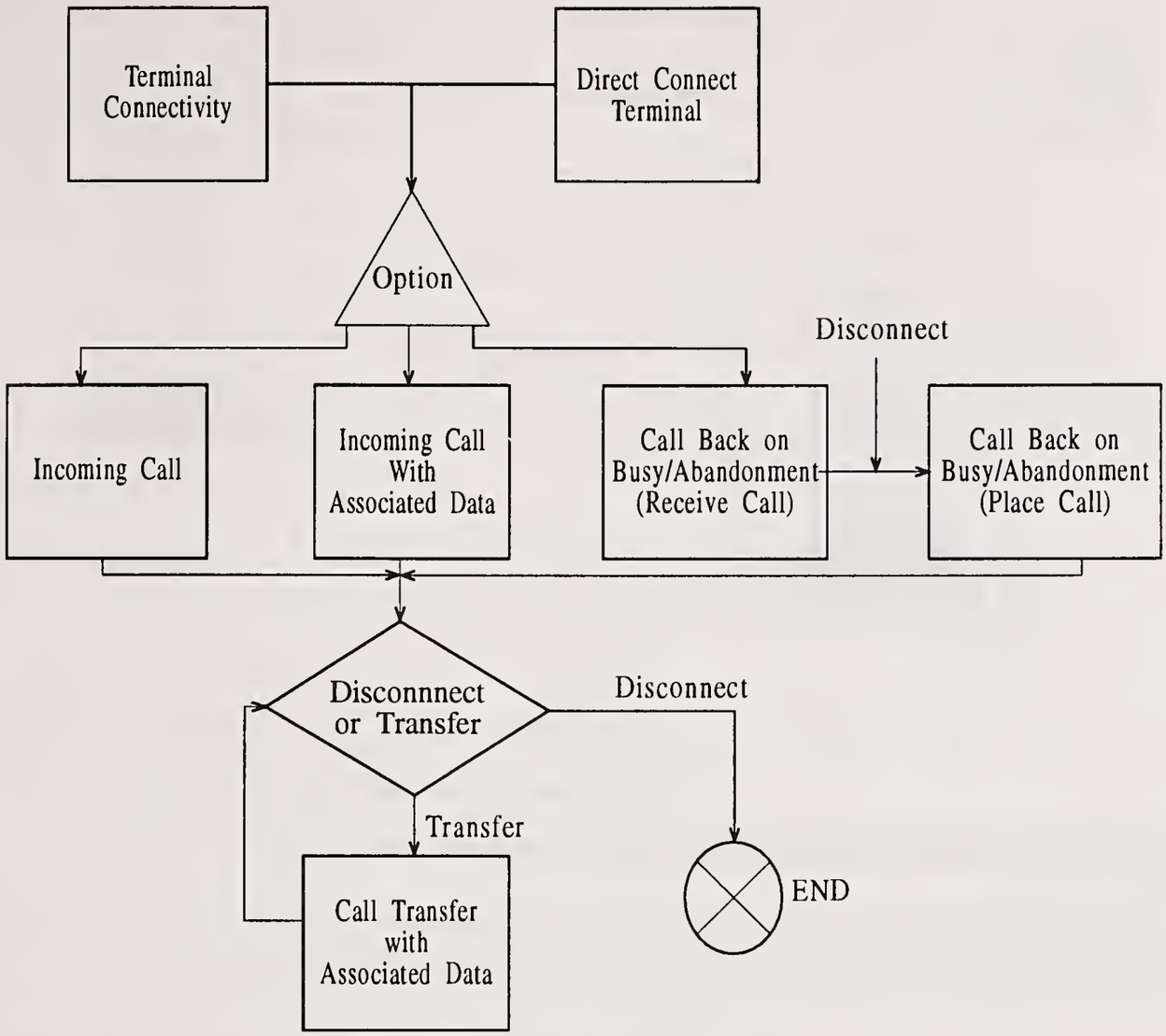

Figure 7-2. Incoming Call Management Application Logic Flow.

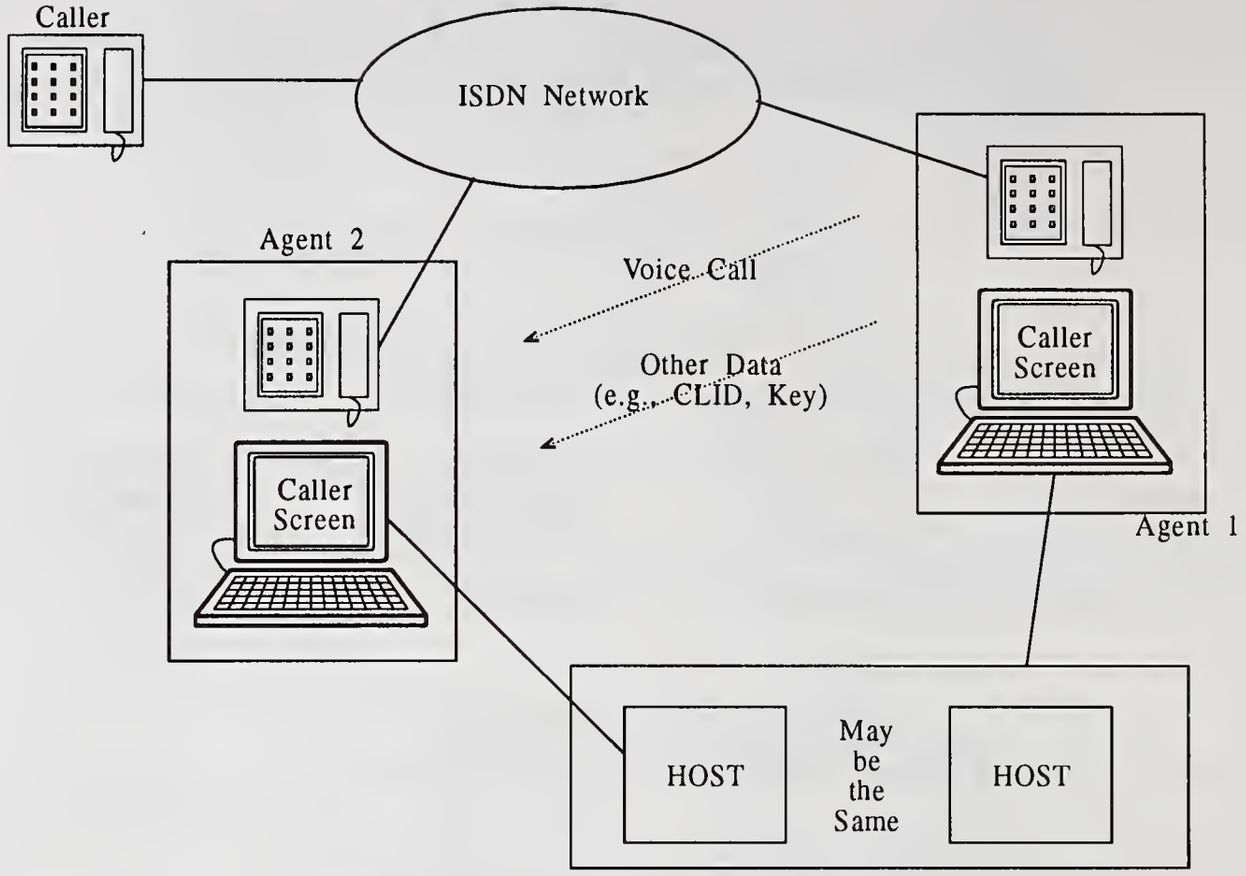

Figure 7-3. Call Transfer with Data Service Element Description.

e. Agent 2 receives the voice call, while concurrently a host[9] application brings up an appropriate screen based on some information delivered with the call to agent 2.

Transfer with Consulting

a. Agent 1 places the caller on hold.

b. Agent 1 places a call to agent 2.

c. Agent 2 is selected directly or by an intervening CO/PBX (ACD function).

d. Agent 2 receives the voice call, while concurrently a host application brings up an appropriate screen based on some information delivered with the call to agent 2.

e. Agent 1 talks with agent 2.

f. Agent 1 transfers the caller to agent 2 and disconnects.

Consulting

a. Agent 1 places the caller on hold.

b. Agent 1 places a call to agent 2.

c. Agent 2 is selected directly or by an intervening CO/PBX (ACD function).

d. Agent 2 receives the voice call, while concurrently a host application brings up an appropriate screen based on some information delivered with the call to agent 2.

e. Agent 1 talks with agent 2.

f. Agent 2 disconnects.

The information being passed along with the call will be called the Key. The Key may be any of the following:

- a database key used by the agent's application,
- the Calling Party Number,
- an Application or Screen ID,
- some other information used by the users application,
- or a combination of the above.

[9]The host that the application is running on may be the same for both agents or different.

7.2.1.4.1 User Environment

Some of the users' descriptions of the service have specified a hardware and software environment in which the service should work. At a minimum, the service should work in the following environment:

- IBM 3270† type terminals
- An IBM-compatible host
- SNA (Systems Network Architecture) host networks.

These are minimum requirements and the actual description of the service is more general in that it will work with other terminals, hosts, and networks.

7.2.1.4.2 Alternative Architectures

Two architectures for this application have been proposed and adopted (March 1989 and June 1989 NIU-Forum). The first architecture calls for the Call information to be delivered to the agent's station or terminal adapter (TA)[10] and then have that device transmit it to the host application (see fig. 7-4). If the agent's station is sufficiently intelligent (e.g., a personal computer), the station could run the application locally.

The second architecture calls for the Host to provide the central office or customer premises switch with the Key, and that Key is passed to agent 2's Host (see fig. 7-5). The call is delivered to the agent's station normally. The data terminal could be attached to the host directly or be attached using the **ISDN Terminal Connectivity Service Element** described in section 7.2.1.7.

7.2.1.4.3 Information Flow

The information flow diagrams show that data that must be sent between nodes necessary to provide the service described. Signalling messages that are normally present (i.e., confirmation messages, error messages, disconnect) are not shown for simplicity if they are not necessary to explain the working of the service.

The information flow for Architecture 1 — Smart Terminal/TA can be seen in figure 7-6.

Agent 1 places a call (Call Setup) which is delivered to agent 2's station with the Key (carried as User to User information). Agent 2's station could generate an appropriate screen using the Key

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†Trademark of IBM Corporation

[10]This requires intelligence not normally associated with a TA to satisfy the requirement that any 3270-like device were to be able to use this service. A separate functional entity, and Intelligence Unit (IU), will be described as providing the service of relaying Call information to the host. In effect this unit would upgrade the 3270 to an intelligent terminal with an attached voice terminal. The TA-intelligence unit will have to be able to have a separate session to the host running, so the data can be passed. Alternately, but more complex, the Intelligence Unit would have to be able to understand the screens being passed between the host and the terminal and insert information in the data stream.

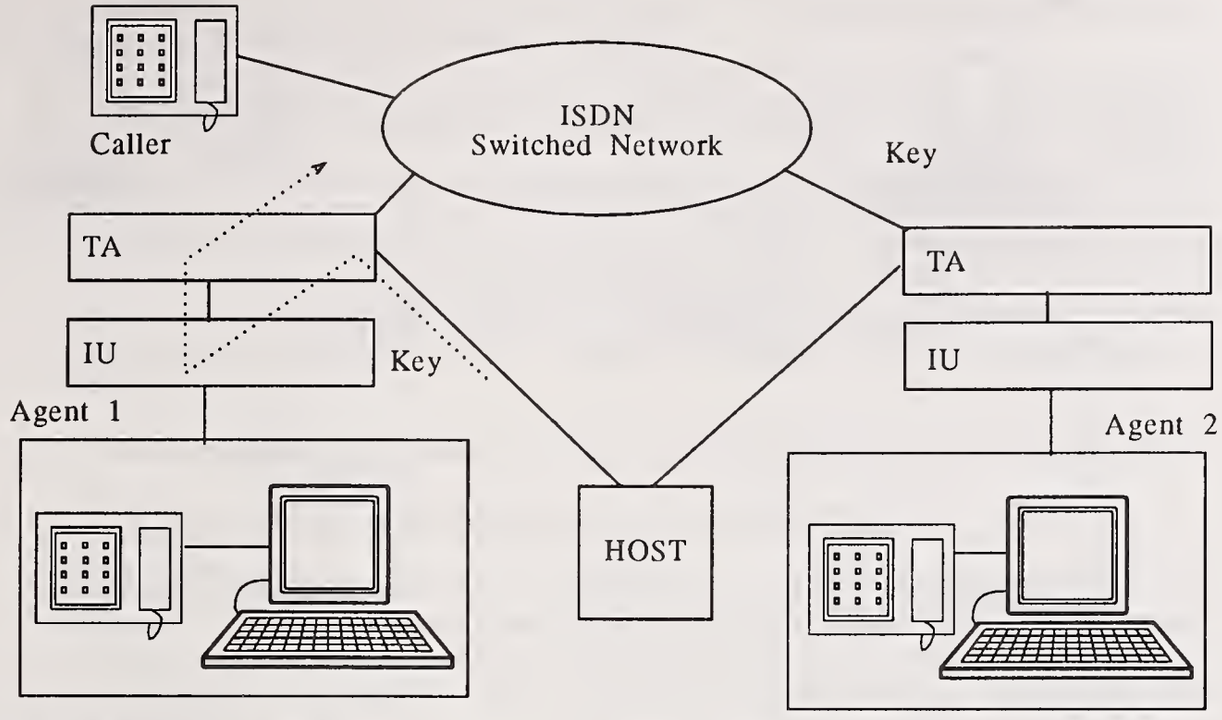

Figure 7-4. Call Transfer with Data Service Element Architecture 1 — Smart Terminal/TA.

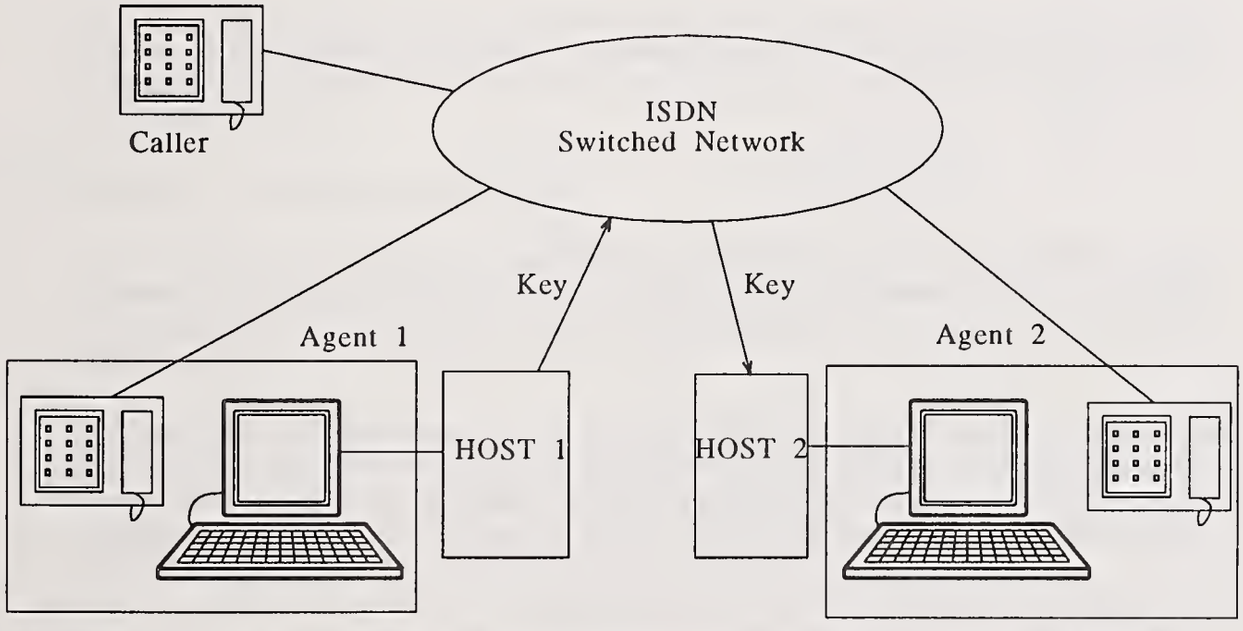

Figure 7-5. Call Transfer with Data Service Element Architecture 2 — Switch Host Interface.

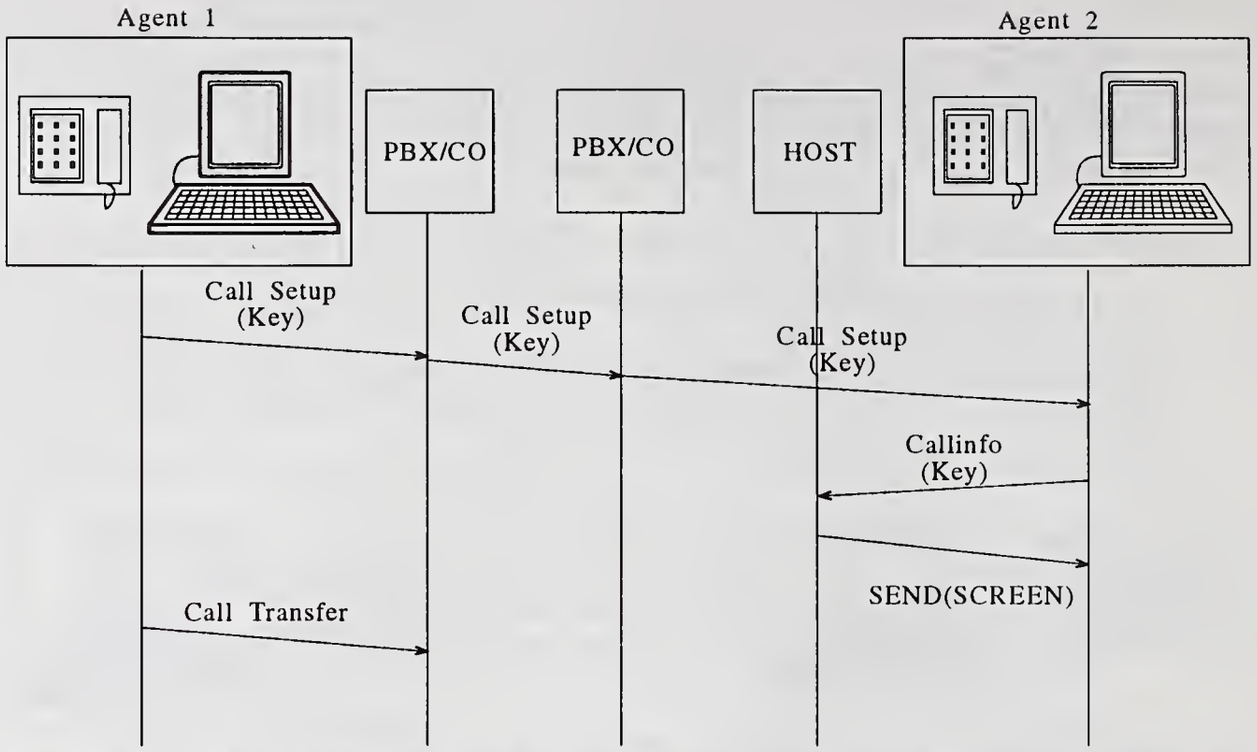

Figure 7-6. Call Transfer with Data Service Element Smart Terminal/TA — Information Flow Diagram.

or the station could then transfer the Key to the host. The host application would then select and transmit the appropriate screen to agent 2's terminal.

The information flow for Architecture 2 — Switch Host interface can be seen in figure 7-7.

The call would be initiated by agent 1 selecting to transfer via the terminal. The terminal would transfer this information to the host ("Init Call"). The host would then transmit this to the PBX/CO along with the Key as User to User information ("Init Call (Key)"). The PBX/CO the second agent is attached to would transmit the call setup information to agent 2's station. Simultaneously the PBX/CO would send the call setup information (including the user to user information containing the Key) to the host computer. The host selects and transmits the appropriate screen to agent 2's terminal.

In both flows, if consulting is desired instead of completing the transfer, agent 2 would disconnect.

7.2.1.4.4 Network Signalling Requirements — Protocol Identification

The network signalling requirements for providing this service with each architecture are shown in figures 7-8 and 7-9. Not shown is how the call was originally received, since it may have come in via ISDN or POTS. The requirement for this capability is that the end-points involved in the call transfer must be connected via end-to-end ISDN signalling so that user-to-user information can be exchanged.

In figures 7-8 and 7-9, any connection between two devices without a specific protocol marked may use any applicable protocol including a proprietary one.

7.2.1.4.5 Protocol Description

The messages and protocol elements described below are only those required by the service being described. Other messages and protocol elements are not discussed if they are not used by the application being described, even through they may be required for other reasons, such as routing of the call.

7.2.1.4.5.1 Call Setup User Information

The Key can be carried from the origination to destination terminal in the **SETUP** message described in NIU 90-301 (see Appendix A) and NIU 90-302 (see Appendix B). The **SETUP** Message described as sent to the network and by the network to the called user to initiate call establishment.

The information element used to carry the Key would be the **User-User** information element described as follows: "The purpose of the User-user information element is to convey information between ISDN users. This information is not interpreted by the network, but rather is carried transparently and delivered to the remote user(s). There are no restrictions on the content of the user information."

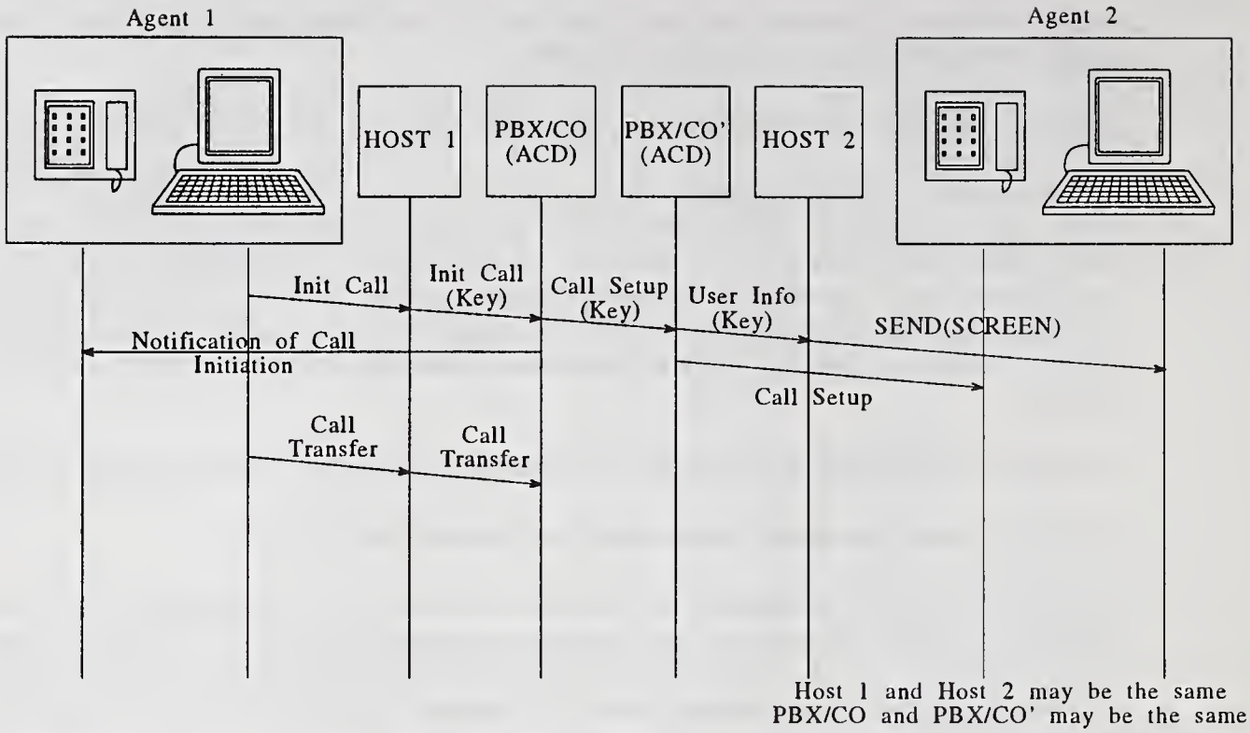

Figure 7-7. Call Transfer with Data Service Element Switch Host Interface — Information Flow Diagram.

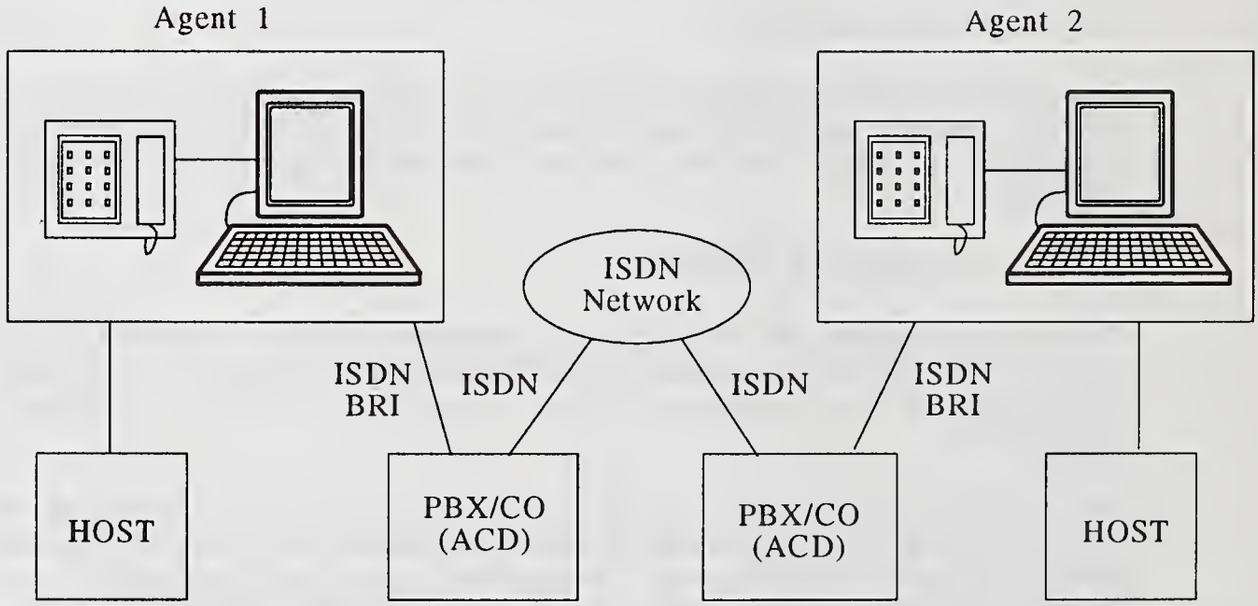

Figure 7-8. Call Transfer with Data Service Element Smart Terminal/TA — Network Signalling Requirements.

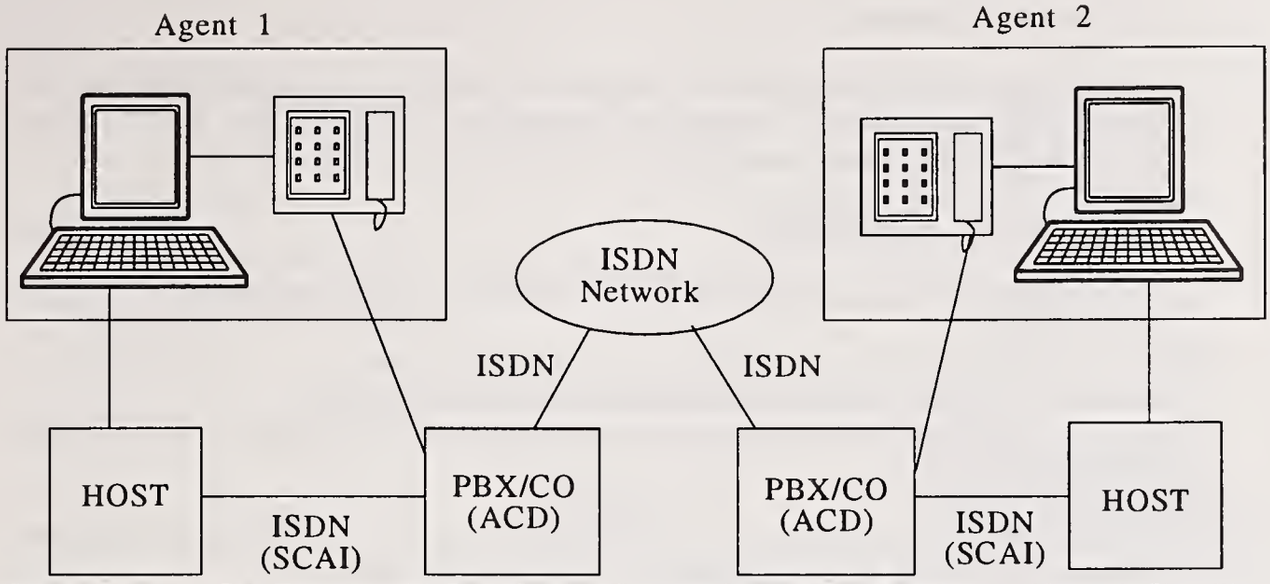

Figure 7-9. Call Transfer with Data Service Element Switch Host Interface — Network Signalling Requirements.

7.2.1.4.5.2 Call Transfer

Proposed baseline text for the Normal Call Transfer supplementary service exists within T1S1.2/91-309, *Supplementary Service — Normal Call Transfer Stage 1, 2, and 3*, (Ref. [22]).[11] There is no consensus on the protocol description for this service yet.

7.2.1.4.5.3 Host-Switch Messages

The functions that need to be provided to allow this service are the following:

- Send User-User information (Key) and initiate a call.
- Receive User-User information (Key) on an incoming call.
- Possibly initiate the call transfer operation, this could be done from the voice terminal directly.

The Host Computer messages are being described in the ANSI *Switch-Computer Applications Interface (SCAI) Draft Proposed Standard*, T1S1/92-629 (Ref. [23]).

7.2.1.5 Call Delivery with Associated Data Service Element

In this service an agent is available to receive an incoming call. When a customer's call is presented to the agent an appropriate screen is displayed on the agent's data terminal that relates to the caller or the application being provided by the agent (see fig. 7-10).

The sequence of events is as follows:

a. Caller places a call to the phone number of the "Call Delivery service user" (800 number in some user's application).

b. An agent is selected by the CO/PBX (ACD function).

c. The agent receives the voice call, while concurrently a host application brings up an appropriate screen (based upon the calling party's number).

7.2.1.5.1 User Environment

Some of the users' descriptions of the service have specified a hardware and software environment in which the service should work. At a minimum, the service should work in the following environment:

- IBM 3270 type terminals
- An IBM-compatible host
- SNA host networks.

These are minimum requirements and the actual description of the service is more general in that it will work with other terminals, hosts, and networks.

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[11]There is also ongoing work within ANSI to define Explicit Call Transfer and Single Step Call Transfer Supplementary Services.

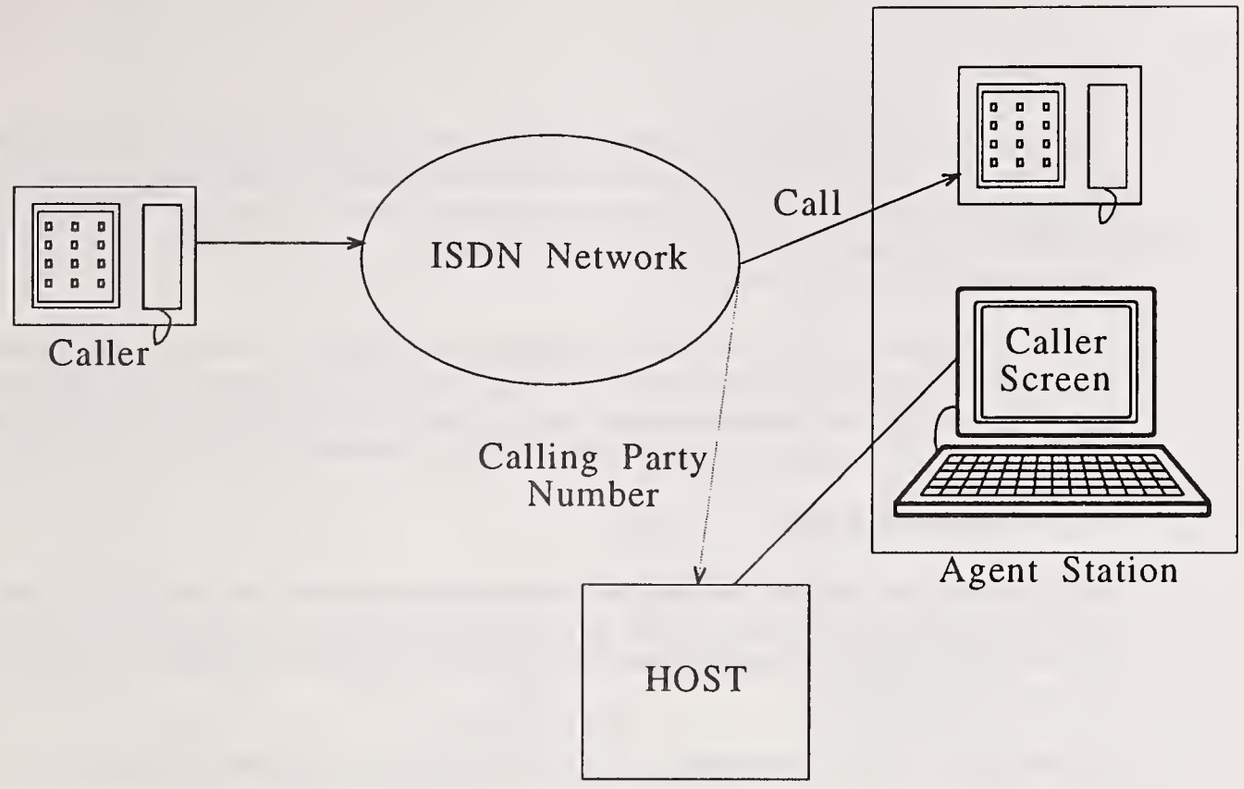

Figure 7-10. Call Delivery with Data Service Element Description.

7.2.1.5.2 Alternative Architectures

Two architectures for this application have been proposed and adopted (March 1989 and June 1989 NIU-Forum). The first architecture calls for the Call information to be delivered to the agent's station or terminal adapter (TA)[12] and then have that device transmit it to the host application (see fig. 7-11). If the agent's station is sufficiently intelligent (e.g., a personal computer), the station could run the application locally.

The second architecture calls for the Host to provide the central office or customer premises switch with the Key, and that Key is passed to agent 2's Host (see fig. 7-12). The call is delivered to the agent's station normally. The data terminal could be attached to the host directly or be attached using the **ISDN Terminal Connectivity Service Element** described in section 7.2.1.7.

7.2.1.5.3 Information Flow

The information flow diagrams show the data that must be sent between nodes necessary to provide the service described. Signalling messages that are normally present (i.e., confirmation messages, error messages, disconnect) are not shown for simplicity, if they are not necessary to explain the working of the service.

The information flow for Architecture 1 — Smart Terminal/TA can be seen in figure 7-13.

The call is delivered to the agent's station with the Calling Party Number (CPN). The station will generate an appropriate screen locally or by interacting with a host application.

The information flow for Architecture 2 — Switch Host interface can be seen in figure 7-14.

The Switch transmits the call setup information to the agent's station and the host computer simultaneously. The host selects and transmits the appropriate screen.

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[12]This requires intelligence not normally associated with a TA to satisfy the requirement that any 3270-like device were to be able to use this service. A separate functional entity, and Intelligence Unit (IU), will be described as providing the service of relaying Call information to the host. In effect this unit would upgrade the 3270 to an intelligent terminal with an attached voice terminal. The TA-intelligence unit will have to be able to have a separate session to the host running, so the data can be passed. Alternately, but more complex, the Intelligence Unit would have to be able to understand the screens being passed between the host and the terminal and insert information in the data stream.

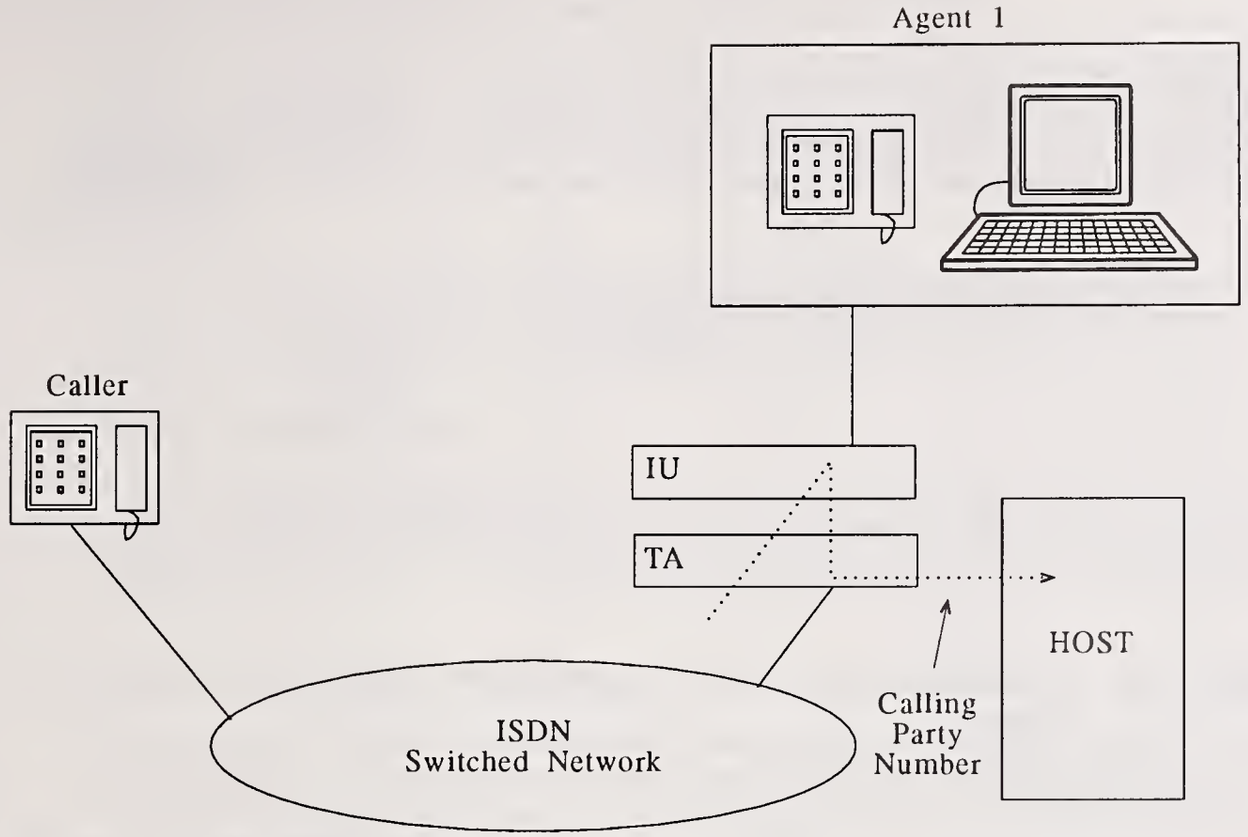


Figure 7-11. Call Delivery with Data Service Element Architecture 1 — Smart Terminal/TA.

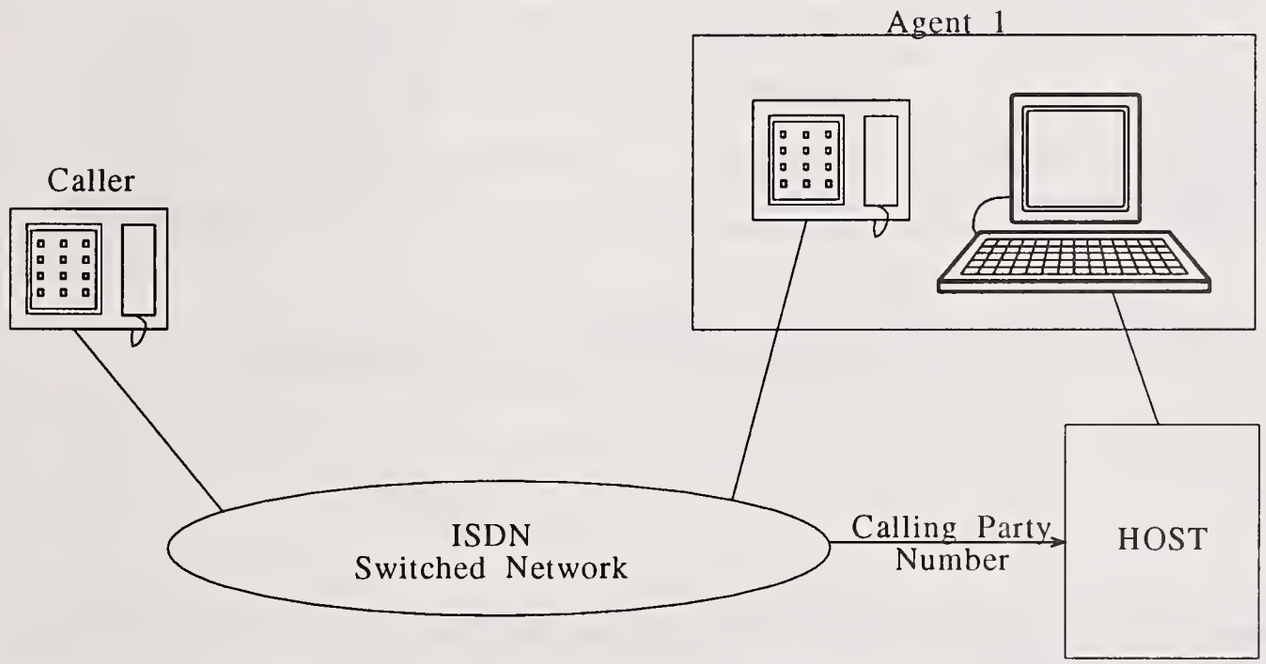


Figure 7-12. Call Delivery with Data Service Element Architecture 2 — Switch Host Interface.

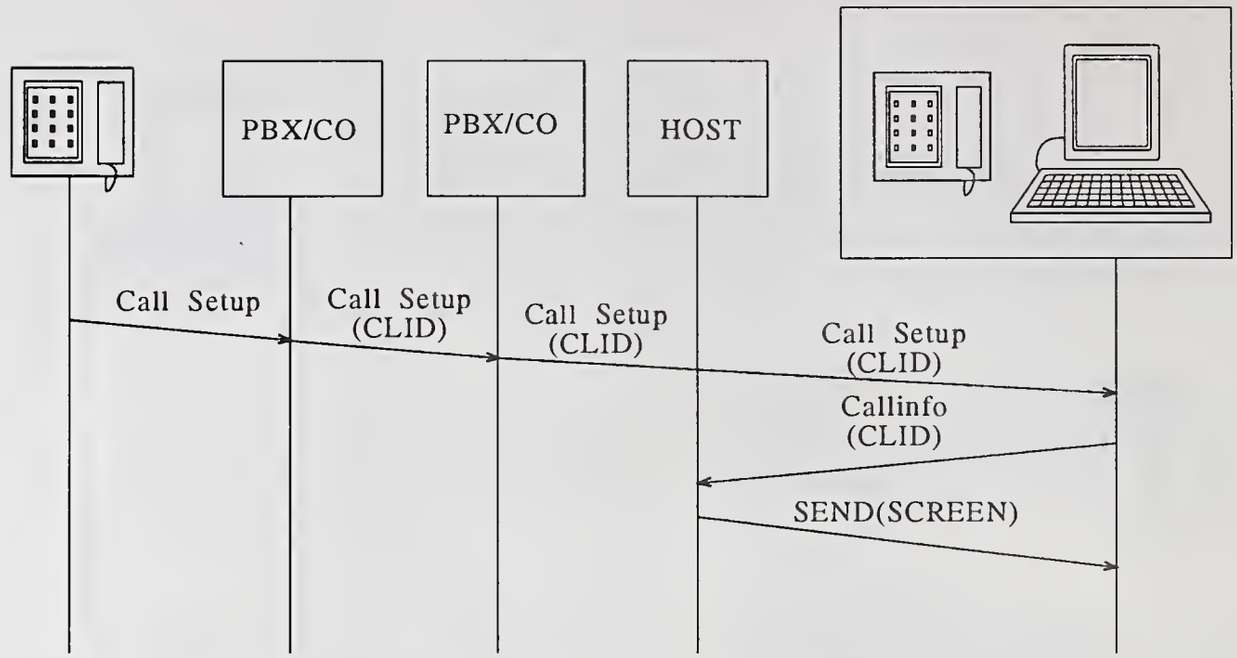


Figure 7-13. Call Delivery with Data Service Element Smart Terminal/TA — Information Flow Diagram.

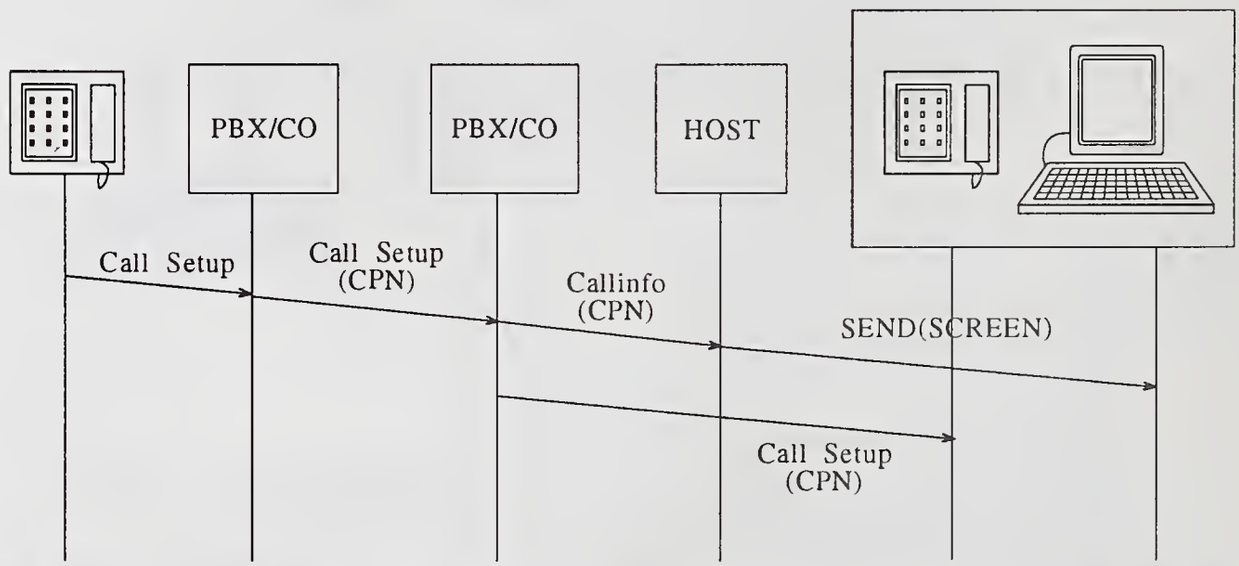


Figure 7-14. Call Delivery with Data Service Element Switch Host Interface — Information Flow Diagram.

7.2.1.5.4 Network Signalling Requirements — Protocol Identification

In order to implement this service, certain signalling capabilities are required in the user and carrier networks. Figures 7-15 and 7-16 identify what are the signalling requirements at each point in the network. As can be seen in the diagrams the requirements for signalling within the network are the same for the smart terminal and switch-host scenarios, but there are differences within the premises.

EAMF stands for Equal Access Multi-Frequency which can be used to pass the Calling Party Number. Any connection between two devices without a specific protocol marked may use any applicable protocol including a proprietary one.

7.2.1.5.5 Protocol Description

The messages and protocol elements described below are only those required by the service being described. Other messages and protocol elements are not discussed if they are not used by the application being described, even through they may be required for other reasons, such as routing of the call.

7.2.1.5.5.1 Call Setup User Information

The Calling Party Number can be carried from the origination to destination terminal in the **SETUP** message described in NIU 90-301 (see Appendix A) and NIU 90-302 (see Appendix B). The **SETUP** message is described as sent to the network and by the network toward the called user to initiate call establishment.

The Information needed to carry the Calling Party Number is described in a paragraph titled **Calling Party Number**. "The Purpose of the Calling party number information element is to identify the origin of the call." The information element may say that the number is not available, the application must be able to handle this situation appropriately.

7.2.1.5.5.2 Host-Switch Messages

The necessary function required by this service is the handling of the incoming Calling Party Number.

The Host Computer messages are being described in the ANSI *Switch-Computer Applications Interface (SCAI) Draft Proposed Standard*, T1S1/92-629 (Ref. [23]).

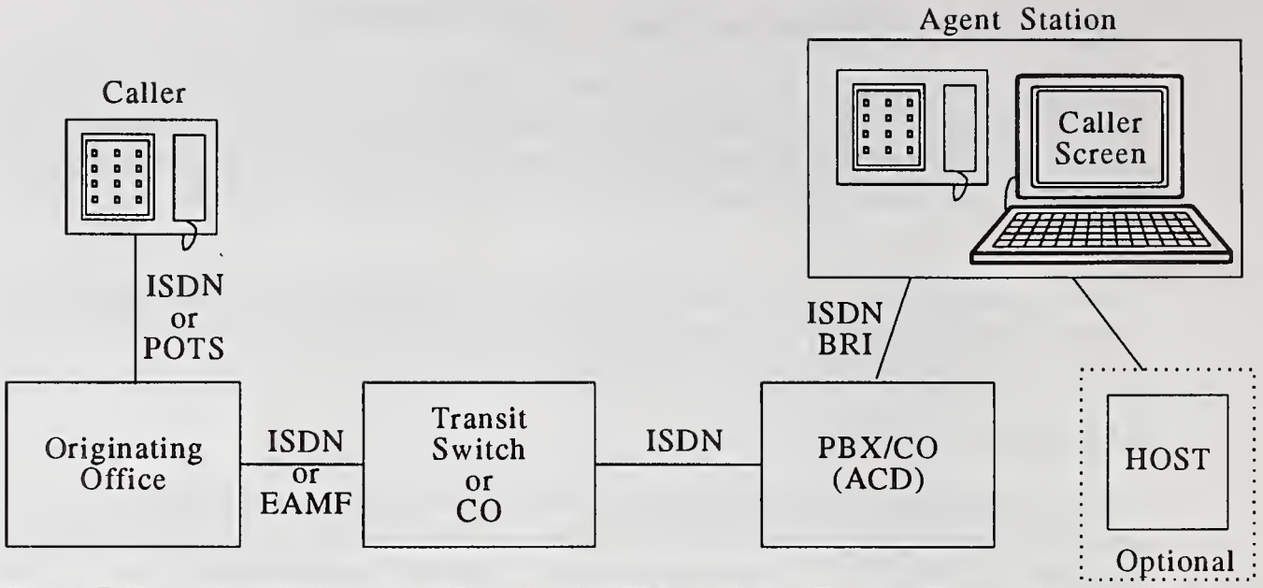


Figure 7-15. Call Delivery with Data Service Element Smart Terminal/TA — Network Signalling Requirements.

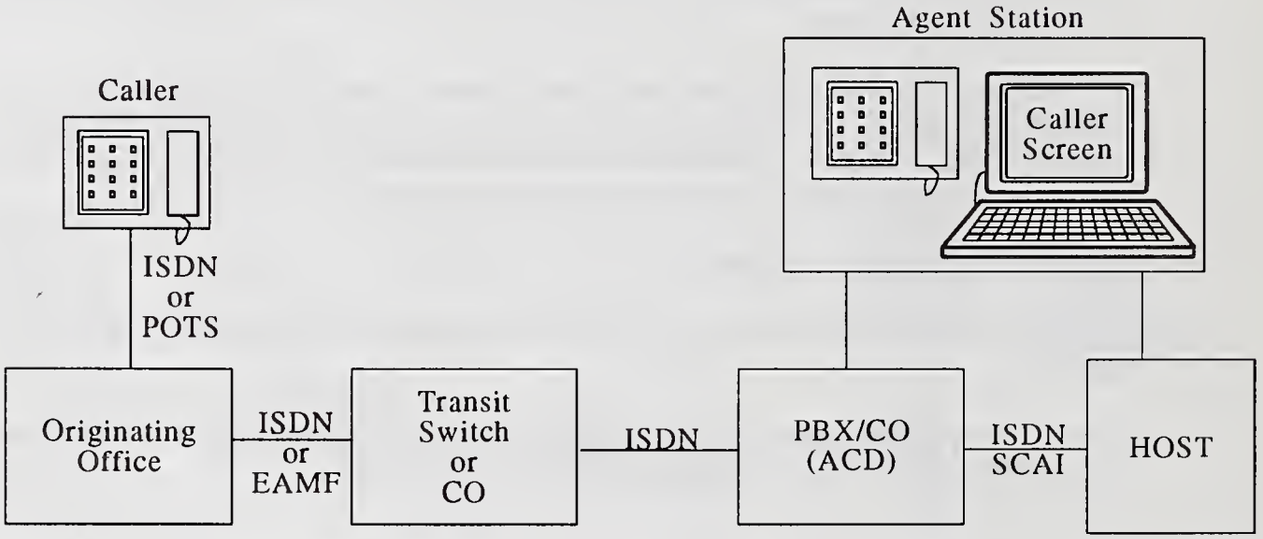


Figure 7-16. Call Delivery with Data Service Element Switch Host Interface — Network Signalling Requirements.

7.2.1.6 Call Back on Busy/Abandonment Service Element

In this service, no agents are available to receive an incoming call. The caller may do any of the following:

- receive Busy (possible reasons: all agents busy, maximum queue size),
- receive an Announcement (i.e., "All Lines are Busy, An agent will call you back when one becomes available") followed by disconnect,
- or be placed in a queue (possibly with an announcement "Wait for the next available agent, if you hangup, an agent will return your call") for the next available agent and then disconnect.

The caller's phone number will be recorded so that an agent can call back later (see fig. 7-17). This service cannot be invoked, unless the call is delivered to the final switch.

The sequence of events is as follows:

1. Caller places a call to the phone number of the "Call Delivery service user" (800 number in one user's application).
2. The calling line id is recorded by a host application.
3. The treatment may be busy, an announcement and disconnect, or being placed in a queue. If the caller was placed in a queue, they are subsequently disconnected.
4. Agent obtains the number from the application software and places a call.

7.2.1.6.1 User Environment

Some of the users' descriptions of the service have specified a hardware and software environment in which the service should work. At a minimum, the service should work in the following environment:

- IBM 3270 type terminals
- An IBM-compatible host
- SNA host networks

These are minimum requirements and the actual description of the service is more general in that it will work with other terminals, hosts, and networks.

7.2.1.6.2 Architecture

Two architectures for this application have been proposed and adopted (March 1989 and June 1989 NIU-Forum). The first architecture calls for the information to be delivered to the agent's terminal and the second to a host computer. Only the second architecture is considered here because there

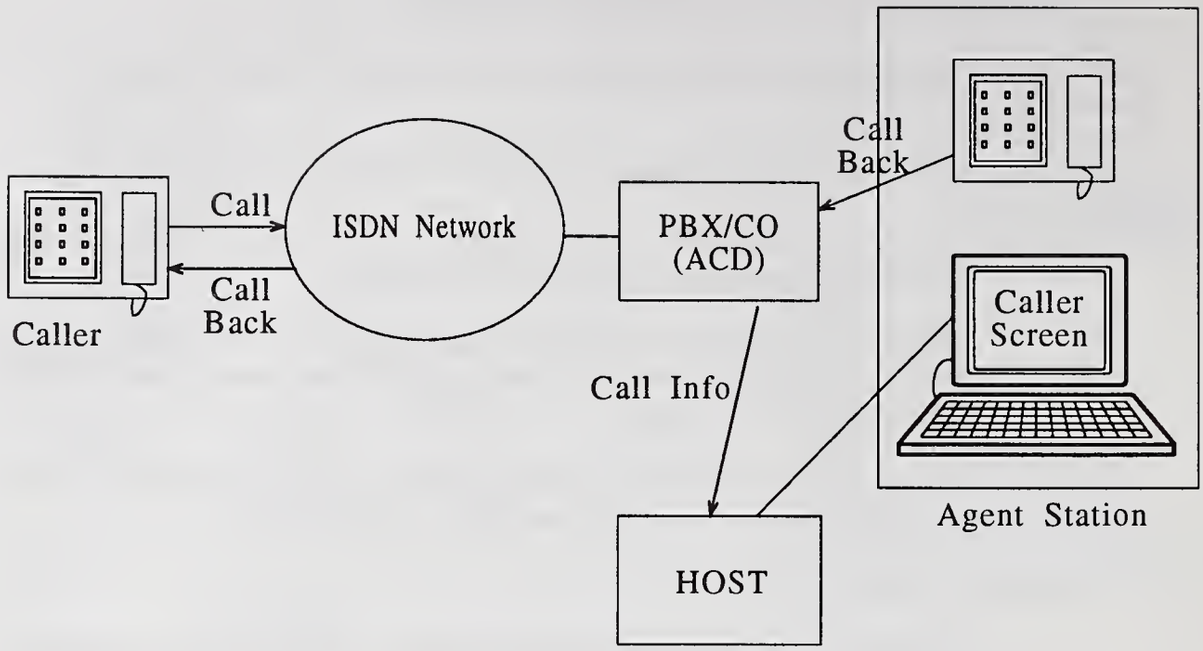


Figure 7-17. Call Back on Busy/Abandonment Service Element Description.

is no mechanism to pass information about calls that have never reached a station (i.e., Caller disconnects, PBX returns busy) to a station.

7.2.1.6.3 Information Flow

The flow diagrams show the general information flow necessary to provide the service described. Some messages that are normally present (i.e., confirmation messages, error messages, disconnect) are not shown if they are not necessary to explain the working of the service.

The flow diagram for call abandonment can be seen in figure 7-18. The call setup information, including Calling Party Number (CPN) goes across the network. The Switch transmits the call setup information (CPN) to the host computer. The caller then "Disconnects" and the host computer is informed, so it puts the number in a list for later callback. At a later time, the agent interacts with the host and selects a callback number. The agent can then either generate the call via the host or dial the number using the phone. Figure 7-19 is the flow diagram for the case where the caller receives busy or hears an announcement.

7.2.1.6.4 Network Signalling Requirements

The network signalling requirements for this service are the same as for Call Delivery using the Switch to Host interface (see fig. 7-16).

7.2.1.6.5 Protocol Description

The messages and protocol elements described below are only those required by the service being described. Other messages and protocol elements are not discussed if they are not used by the application being described, even through they may be required for other reasons, such as routing of the call.

7.2.1.6.5.1 Call Setup User Information

The Customer identifier can be carried from the origination to destination terminal in the **SETUP** message described in NIU 90-301 (see Appendix A) and NIU 90-302 (see Appendix B). The **SETUP** message is described as sent by the calling user to the network and by the network to the called user to initiate call establishment.

The Information needed to carry the Calling Party Number is found in the paragraph titled **Calling Party Number.** "The purpose of the Calling party number information element is to identify the origin of the call." The information element may say that the number is not available, the application must be able to handle this situation appropriately.

7.2.1.6.5.2 Host-Switch Messages

The necessary function required by this service is the handling of the incoming Calling Party Number.

The Host Computer messages are being described in the ANSI *Switch-Computer Applications Interface (SCAI) Draft Proposed Standard,* T1S1/92-629 (Ref. [23]).

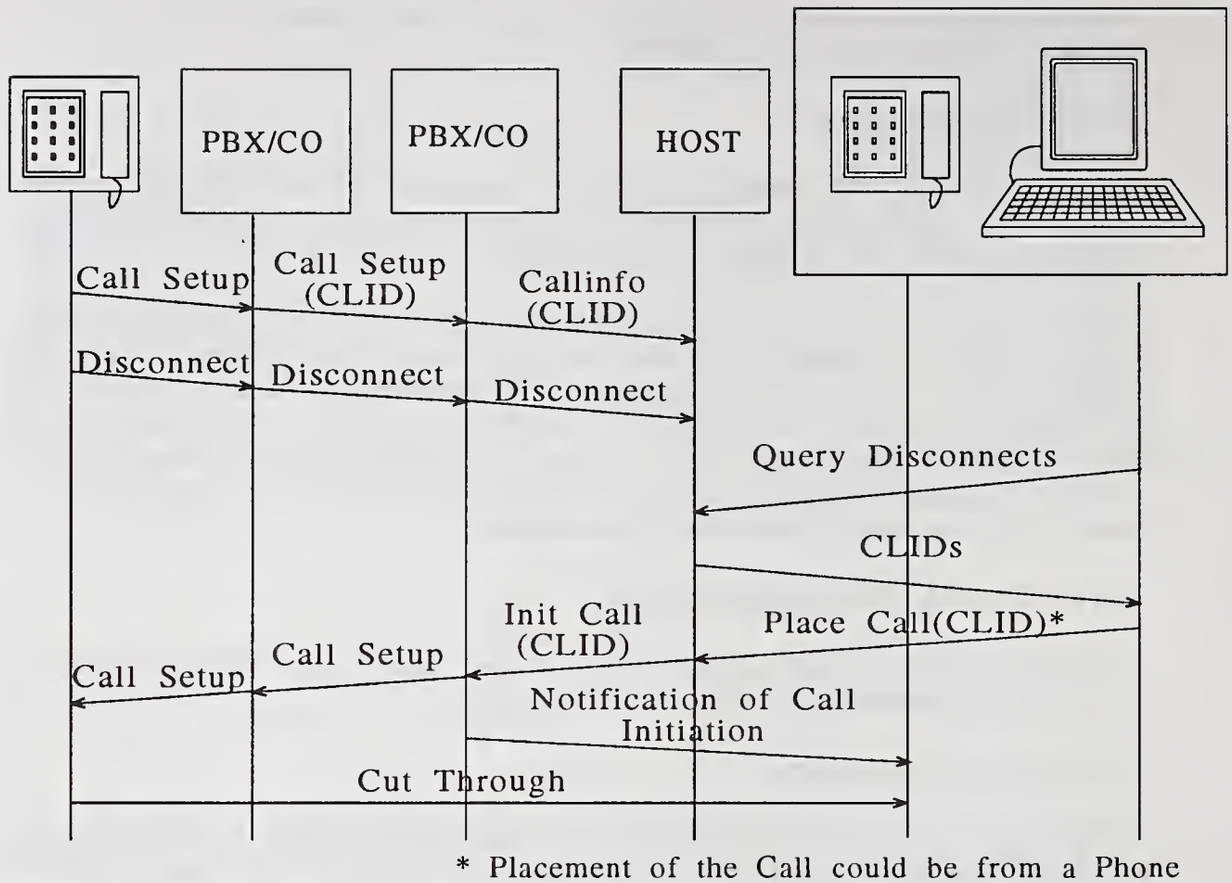
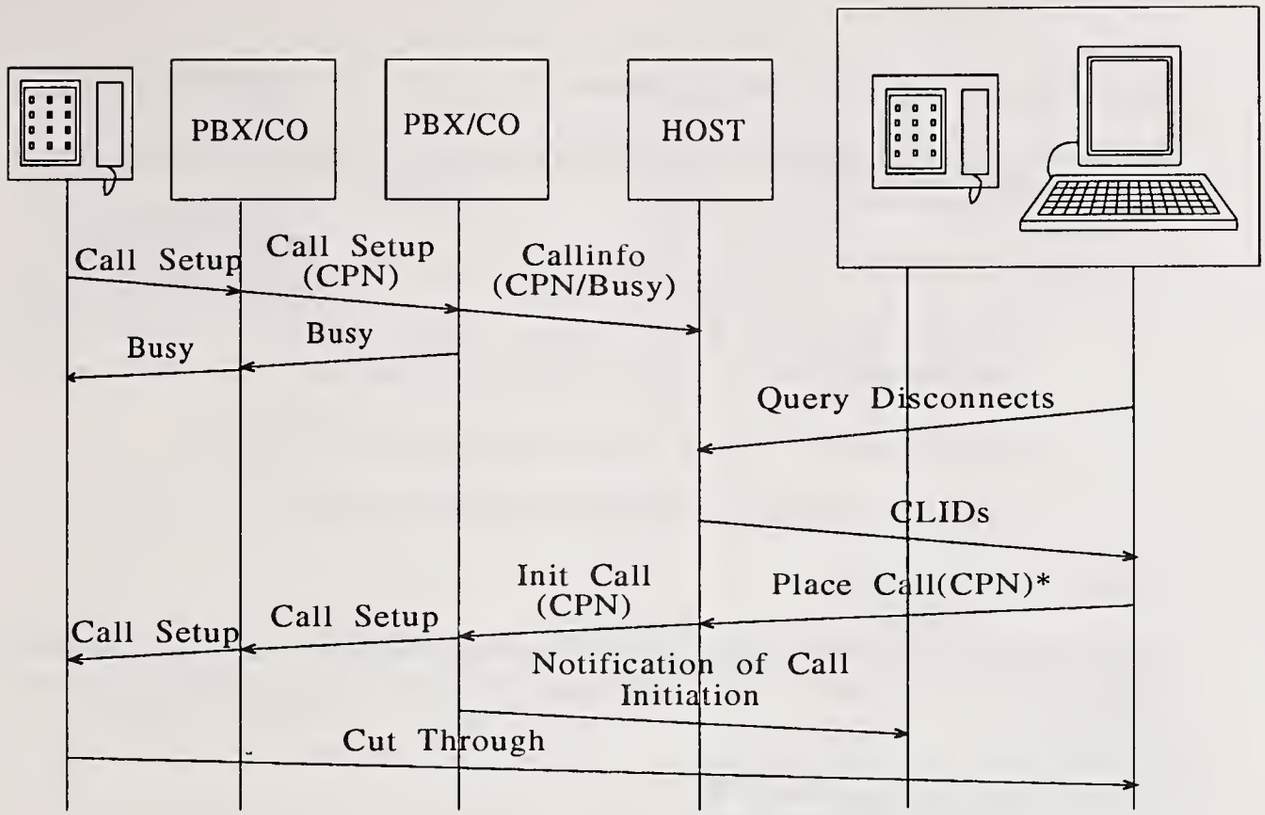


Figure 7-18. Call Back on Busy/Abandonment Service Element Information Flow Diagram — Abandonment.



* Placement of the Call could be from a Phone

Figure 7-19. Call Back on Busy/Abandonment Service Element Information Flow Diagram — Busy.

7.2.1.7 Terminal Connectivity Service Element

This service provides connectivity between a terminal and a host using an ISDN link. This is illustrated in figure 7-20.

The sequence of events is as follows:

a. The user causes a call to be placed from the terminal to a port on the host/controller.[13]

b. Upon connection of the call the data transport protocol is initiated.

c. When the data session is complete the call is disconnected.

7.2.1.7.1 User Environment

Some of the users' descriptions of the service have specified a hardware and software environment in which the service should work. At a minimum, the service should work in the following environment:

- IBM 3270 type terminals
- An IBM-compatible host
- SNA host networks.

These are minimum requirements and the actual description of the service is more general in that it will work with other terminals, hosts, and networks.

7.2.1.7.2 Information Flow

The information flow diagrams show the data that must be sent between nodes necessary to provide the service described. Signalling messages that are normally present (i.e., confirmation messages, error messages, disconnect) are shown for simplicity if they are not necessary to explain the working of the service.

The flow diagram in figure 7-21 shows the general information flow necessary to provide the described service.

[13]The use of some ISDN features for security (i.e., CLID) may be required, but are not part of the user application description (text or figures).

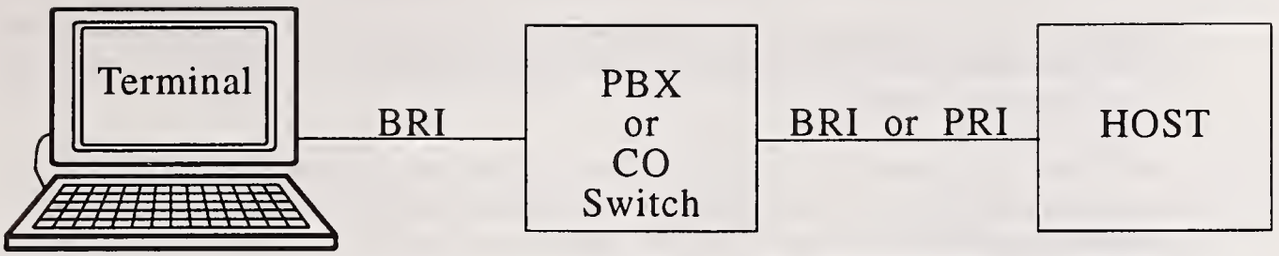


Figure 7-20. Terminal Connectivity Service Element — Description.

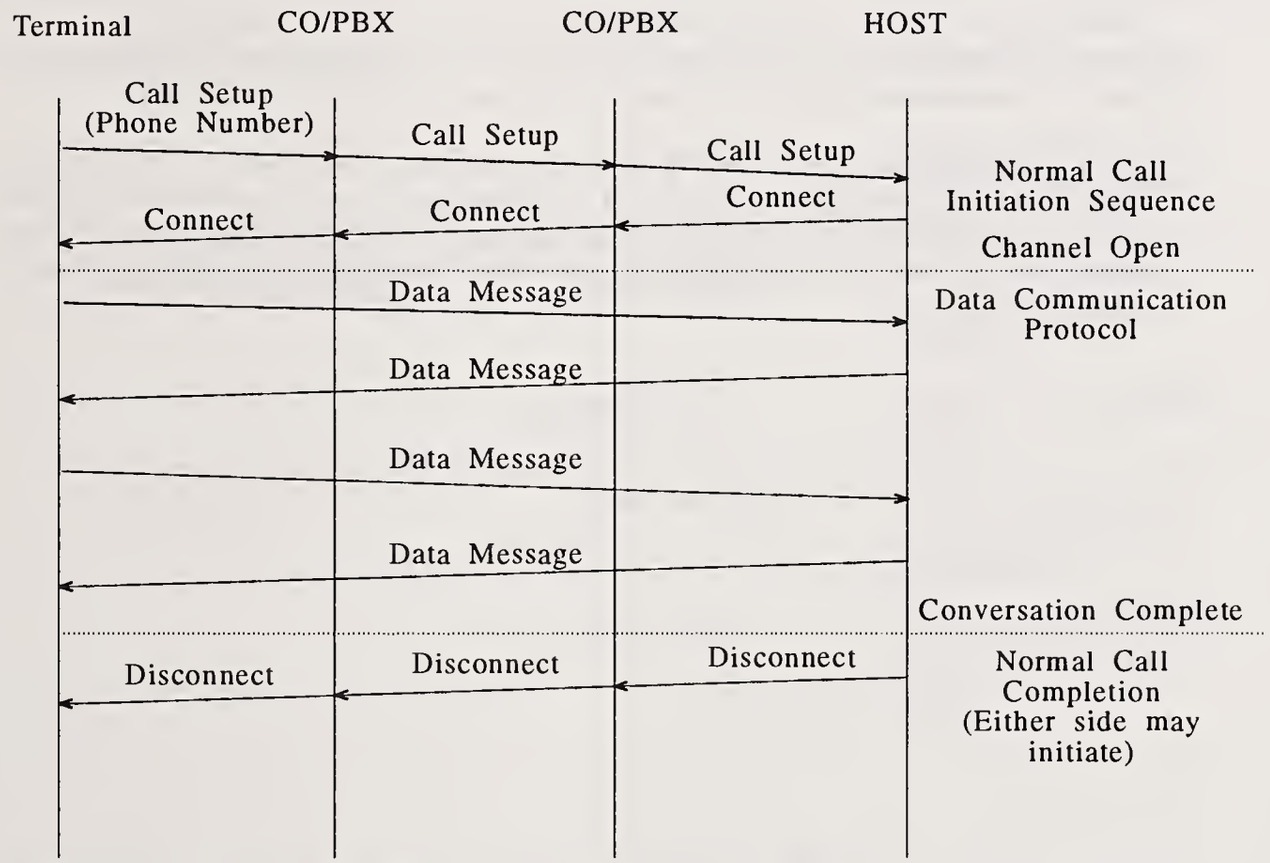


Figure 7-21. Terminal Connectivity Service Element Flow Diagram.

7.2.1.7.3 Network Protocol Requirements

The network protocol requirements for this service can be seen in figure 7-20. As shown in that figure, there needs to be ISDN connectivity between the terminal and the point where it is attached to the computer or controller.

The higher layer protocols for carrying the user data are not described here. The Network Interconnectivity Profile Team should provide the higher level protocol specification when completing Application Profiles for the User Application Requirements Data Forms numbered: 830008, 830009, 960009 (Refs. [40, 41, 42]).

7.2.1.7.4 Protocol Description

The messages and protocol elements described below are only those required by the service being described. Other messages and protocol elements are not discussed if they are not used by the application being described, even through they may be required for other reasons, such as routing of the call.

The protocol described in NIU 90-301 (see Appendix A) and NIU 90-302 (see Appendix B) can be used for the setup and breakdown of the call being made to carry the data protocol.

The only information element that may have a direct bearing on the service is in the **SETUP** message described as "sent by the calling user to the network and by the network to the called user to initiate call establishment." The information element is the Bearer Capability Information Element. The user can ask for the appropriate information transfer capability and transfer mode.

7.2.1.8 Protocol Summary and Status

The following is a summary of the protocol requirements of the Incoming Call Management Application.

Table **7-1**. Protocol Requirements for Incoming Call Management Application Profile

Application Service Element	Protocol Element	Document
Call Transfer With Associated Data	User—User	NIU 90—301 & NIU 90—302 Implementation Agreements
	Call Transfer	T1S1.2/92—185 (Ref. [22])
	Host—Switch	T1S1/92—629 SCAI Draft Proposed Standard, (Ref. [23])
Call Delivery With Associated Data	Calling Party Number	NIU 90—301 & NIU 90—302 Implementation Agreements
	Host—Switch	T1S1/92—629 SCAI Draft Proposed Standard, (Ref. [23])
Terminal Connectivity	Bearer Capability	NIU 90—301 & NIU 90—302 Implementation Agreements
	Higher Layer	Network Interconnectivity Family
Call Back	Calling Party Number	NIU 90—301 & NIU 90—302 Implementation Agreements
	Host—Switch	T1S1/92—629 SCAI Draft Proposed Standard, (Ref. [23])

7.3 ISDN CPE Compatibility/Capability

7.3.1 Building Controls

This application profile, NIU 91-002, provides User Descriptions, Terminal Adapter Functional Requirements and Application Architecture Analysis for the Building Controls Application 830013.0, (Ref. [43]).

7.3.1.1 User Description

The Building Controls application consists of a variety of control functions carried out with the objective of monitoring and managing a building and its facilities in a cost effective manner. Some of the representative functions are:

- Control of heating/ventilation and air conditioning equipment.
- Energy management.
- Comfort control.
- Fire monitoring and facility control in a fire situation.
- Security monitoring and control.
- Control of personnel access to restricted areas.

The application currently consists of the following components:

- Sensors that are attached to key metering equipment.
- The sensors are connected to control processors which either store information or initiate action based on the sensor readings. This connection is proprietary in nature and will not utilize ISDN services.
- Up to 31 control processors can be connected to a central processor in a multidropped, polled environment. The central processor stores, sorts and relays data received from its associated control processors. Additionally it provides an operator interface and transmits stored information to the end customer's host computer.

In the typical implementation in-house wiring is used to connect the central processor and its associated control processors. The interface used is RS-485 providing synchronous communication between 1200 and 9600 bps.

Control processors can also be connected remotely over private line facilities. The physical interface in this implementation is RS-232 providing synchronous or asynchronous communication between 1200 and 9600 bps. The asynchronous format is more common and utilizes either an 8 bit or 9 bit data format.

The link from the central processor to the customer's host utilizes an RS-232 interface which provides synchronous or asynchronous communication at 2400 bps.

This profile will focus on utilizing ISDN services for connections between 1) the control and central processors, and 2) the central processor and customer host computer.

7.3.1.2 Terminal Adapter Functional Requirements

Table 7-2 provides a summary of the basic functionality required for terminal adapters to operate in this application. This summary assumes the use of D-Channel permanent virtual circuits and B-Channel packet services between the central and control processors.

The link from the central processor to the host computer will utilize B-Channel circuit data services. The Application Architecture discussion in section 7.3.1.3 describes the ISDN data services to be used.

Table 7-2. Building Control Application Functional Requirements

Feature	Central Processor TA	Control Processor TA	Customer Host TA
RS-232 Async "R" Interface	Option	Yes	Yes
RS-232 Sync "R" Interface	Yes	Option	Yes
RS-485 Sync "R" Interface Proprietary Protocol	Option	Option	No
9 Bit Async Data	Option	Option	Option
8 Bit Async Data	Option	Yes	Yes

NOTES:

1) An answer of "Yes" means that support for this feature is required.

2) An answer of "Option" means that support for this feature appears desirable but may not be required.

3) An answer of "No" means that support for this feature is not required.

4) The round trip transit time for a poll and corresponding response through the network should not exceed 50 ms. This is exclusive of processing time at the Control Processor.

5) The data word formats used are 8 data bits + no parity and 8 data bits + 1 parity bit.

6) Currently the Central Processor can support up to 31 Control Processors. This number may be increased at a future date.

7.3.1.3 Application Architecture

The application architecture is based on the use of D-Channel permanent virtual circuits to each control processor. A nailed-up B-Channel packet service is used to connect the appropriate control processors to the central processor. This approach implies that the central processor will substitute X.25 for layers 1, 2 and 3 of the proprietary protocol that is currently used. The use of PVC's and nailed-up connections reasonably emulates the current multidropped environment and negates any requirement for the processor and terminal adapter to exchange commands for call setup or call clearing.

The central processor uses a file transfer facility to transmit information to the customer's host computer. Either D-Channel packet or B-Channel circuit switched data services could be used to support this requirement.

Figure 7-23 illustrates the topography of this application.

7.3.1.3.1 Layer 1 Architecture

The layer 1 architecture for this application is fully supported by T1.605 (Ref. [16]). Each control processor will function in a Point to Point environment; however, Point to Multipoint arrangements may be considered where distance limitations can be met.

7.3.1.3.2 Layer 2 Architecture

The layer 2 architecture for this application is fully supported by X.25 (Ref. [28]) LAPB procedures on the B-Channel and T1.602 (Ref. [13]) LAPD procedures on the D-Channel.

7.3.1.3.3 Layer 3 Architecture

The layer 3 architecture for this application is fully supported by T1.608 (Ref. [18]).

7.3.1.3.3.1 Central Processor Terminal Adapter Architecture

Terminal adapters attached to the central processor would utilize B-Channel packet services to allow the central processor to poll up to 31 control processors. This implementation requires that the central processor utilize X.25 for layers 1, 2 and 3 of the proprietary protocol and implies that the X.25 data will presented in a standard HDLC format.

The physical interface provided would be RS-232 and would support speeds up to 9600 bps. The requirement to support RS-485 is discussed in section 7.3.1.3.3.5 (Issues And Limitations).

The terminal adapter used for data transfer to the customer's host would utilize B-Channel circuit data services. The physical interface provided is RS-232 and it would support either asynchronous or synchronous data formats at speeds up to 9600 bps.

7.3.1.3.3.2 Control Processor Terminal Adapter Architecture

A terminal adapter attached to a control processor would utilize D-Channel PVC packet services. PVC's are required to support the following requirements:

- Round trip delay within network should not exceed 50 ms. The use of virtual circuits would not meet this requirement.

- Control processor must be able to transmit alarm information immediately to the central processor.

The terminal adapters utilizing D-Channel packet services would interface to control processors as follows:

- RS-232 interface
- Asynchronous data
- 8 bit word format
- Speeds up to 9600 bps

The following interface support is discussed in section 7.3.1.3.3.5 (Issues And Limitations):

- RS-485 interface
- Synchronous data
- 9 bit word format

7.3.1.3.3.3 Customer Host Terminal Adapter Architecture

The customer host terminal adapter would utilize B-Channel circuit data services to communicate with the central processor. D-Channel packet services could be considered, however, the terminal adapter could not currently support synchronous data.

The physical interface required is RS-232 and will support speeds up to 9600 bps. The data format can be either asynchronous or synchronous.

In the asynchronous mode the terminal adapter may have to provide a command interface to allow the establishment and clearing of calls. Alternatively an autodial mechanism may be provided which will dial a stored number when the DTE provides an appropriate signal e.g., Data Terminal Ready.

In the synchronous mode an autodial mechanism could also be considered.

7.3.1.3.3.4 Protocol Architecture Overview

The protocol stack shown below illustrates the peer to peer communications in the architecture described above.

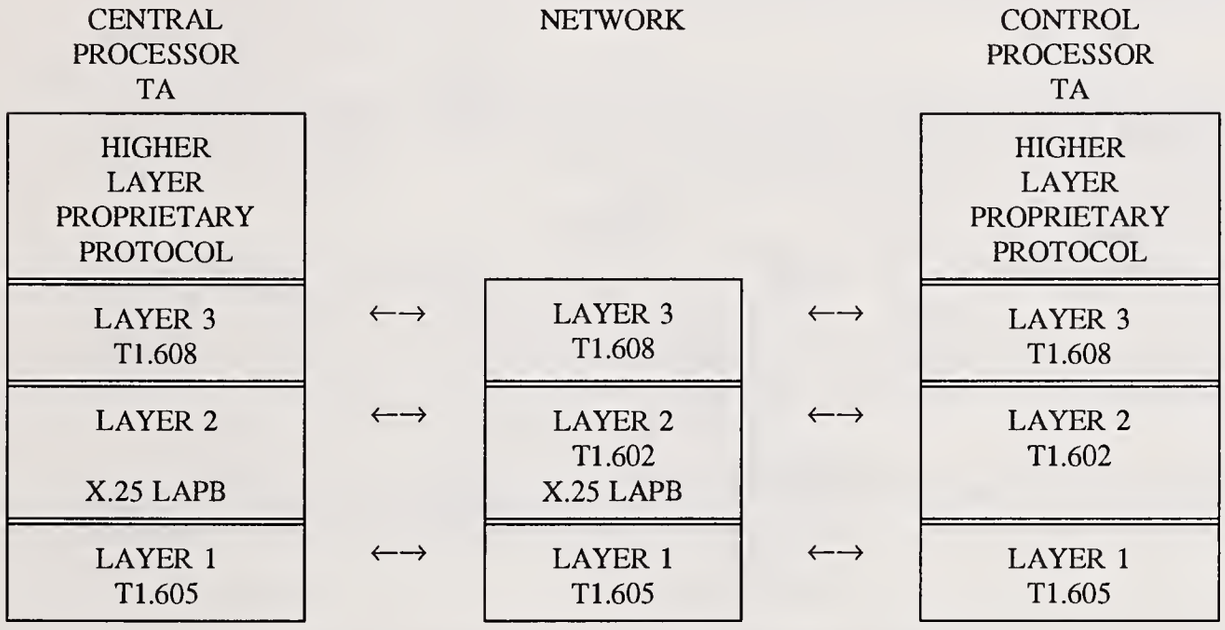


Figure 7-22. Building Controls Protocol Stack.

7.3.1.3.3.5 Issues And Limitations

The following issues are raised by this architecture:

1) There are currently no standards that define the interface between a synchronous DTE and X.25 packet assembler/disassembler (PAD).

2) There are currently no standards that support the use of 9 bit data from a start/stop DTE on an X.25 network. The requirement to octet align the data for transport on the network may require significant development.

3) The addition of RS-485 interfaces to terminal adapters will require significant development.

4) The requirement for a 50 ms round trip transit time for a poll and response may not be achievable in all cases.

The following limitations are imposed by this architecture:

1) The central processor will have to substitute X.25 for layers 1, 2 and 3 of the proprietary protocol.

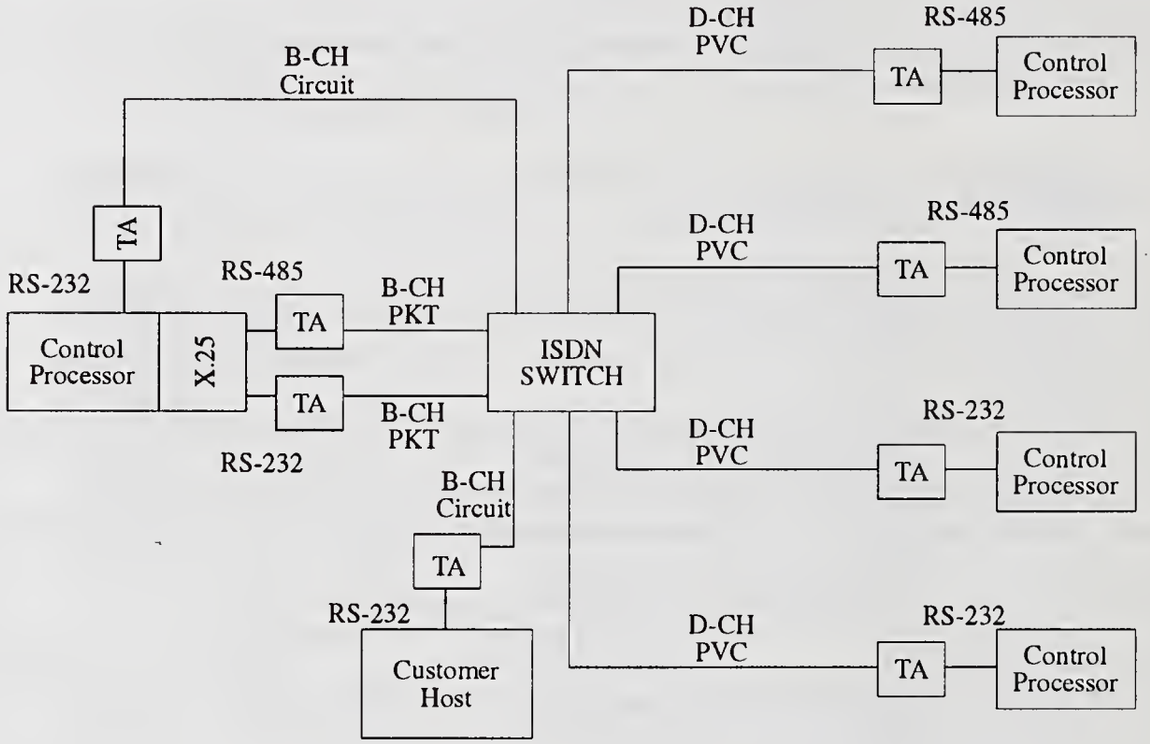


Figure 7-23. Building Controls Application Topography.

7.4 ISDN Network Interconnectivity

7.4.1 Data Conferencing (Point-to-Point)

This proposed Application Profile (pAP) for application 810004 (Ref. [35]) Data Conferencing (Point-to-Point) is distinguished from that of ISP application profiles for ISDN/OSI functional standards.

The Attachments are either tutorial in nature or provide information as to extensions for pAP 810004. When pAP is progressed through the IIW Expert Working Groups, it will then achieve a status of approved Application Profile (aAP). As contained herein, pAP 810004 is a first-order approach to identifying particular profiles that need to be expanded in the sense of Implementors' Conformance Statements (ICS), PICS, and Requirements List (RL) that encompass both the application environment and the ISDN/OSI environment.

7.4.1.1 Scope

The pAP 810004 delineates a set of profiles that identify the service/protocol specifications needed in order to comply with the ISDN functional standards (de jure) for aAP 810004.

pAP 810004 is point-to-point data conferencing. Multi-way (multi-peer) data conferencing is outside the scope of pAP 810004. pAP 810004 is limited to circuit-switched profiles. pAP 810004 logical or physical realizations are outside this scope, unless they are implicit in the cited reference model or standards for pAP 810004.

De facto aspects (NETbios) of pAP 810004 have been mandated by the IUW of the NIU-Forum. Circuit switched facilities are also stipulated by the IUW. OSI profiles are cited if they have been defined by other SPOs*.

7.4.1.2 Field Of Application

pAP 810004 in its future state (aAP 810004) coupled with NIU Forum implementation agreements will govern compliant product implementations (physical realizations) of point-to-point data conferencing over public or private wide-area ISDNs.

Customer premise environments have either BRA or PRA network termination and may involve LANs, PBXs or Private Switched Networks (PSN).

7.4.1.3 References

ISO DISP AFTnn-1: 1989 (E); Source: Standards Promotion and Application Group (SPAG).

COS Profile Selection (1989-1990) Final Draft Version 2.0, May 25, 1989.

ISPBX Networking by ECMA, TR/NTW, 2nd Draft, agreed, April 1988.

ISO XX: 1989 (E), *Information Processing Systems - XX - Common Upper Layer Requirements.*

NetBIOS Interface to ISO Transport Services and Name Service Protocol Specification 89-00-0001-TNS (MAP/TOP)

*Standards Promotion Organizations such as NIST, ETSI, INTAP, COS, MAP/TOP, et al.

ISO TR/10000, *Information Processing Systems - International Standardized Profiles, ISO/IEC JTC1/SGFS*

Part 1 - Taxonomy Framework N109, 1989-02-15

Part 2 - Taxonomy of Profiles N126, 1989-04-13

CCITT I.Series Bluebook

ISO 9646 *OSI Conformance Testing Methodology and Framework*

7.4.1.4 Definitions

Table 7-3. Definitions

Definitions	pAP - oriented
1. ICS*	Implementation Conformance Statement is a statement by the vendor (as constrained by the applicable profiles and PICS) regarding the implemented product's compliance with the base standard(s), profiles, PICS and the requisite conformance options.
2. ISPICS*	International Standardized Profiles Implementation Conformance Statement which aligns ISP features, functions or options in the sense of static conformance requirements. This alignment includes base standards, the profiles, and implementation choices.
3. pAP/ICS	is equivalent to a pAP/RL (which is provided for each profile in a pAP) but shows the general options of the profile (as a whole) coupled with a list of protocols selected and combined in the Profile as reflected in the PICS
4. PICS	protocol implementation conformance statement
5. Profile*	a profile makes explicit the relationships between a set of standards used together. A pAP/ICS is the equivalent of a PICS. The pAP/ICS emphasizes function, service options and features. The PICS concentrates on the protocol parameters, ranges, or characteristics.
6. Requirements List (RL)	it is the purpose of an RL to specify the NIU-Forum pAP/RL Profile's constraints on what may appear in the "Support" and "non-support" (values etc.) columns in the relevant pAP and PICS pro forma.

*adapted from DTR/10000-1

7.4.1.5 pAP 810004 Requirements List

Table 7-4. General Level Plus Scenario Level

Field of Application	(RL) 810004	
A.A	PUBLIC	Services
A.B	PRIVATE	Services
A.C	HYBRID	Services

User/Provider Feature Set	(RL) 810004
X.U	Peer User(s) Types
X.R	Server Types
X.D	Domain Types

Table 7-5. General Level plus Scenario Level plus Functional Level

Field of Application	(RL) 810004
A.A1	User's CPE - Public Service
A.A5	Peer User CPE - Public Service
A.B1	User's CPE - Private Service
A.B6	Peer User's CPE - Private Service
A.C1	User's CPE - HYBRID Service
A.C7	Peer User's CPE - HYBRID Service

User/provider Feature Set	(RL) 810004
X.1F	no peer user
X.2F	one (1) peer user
X.5F	server co-incident with user
X.6F	servers are symmetric
X.4F	one domain (multi-in-sessions)
X.8F	symmetric peer domains (multi-in-sessions)

Table 7-6. All 810004 "leafs"

Field of Application	(RL) 810004 leafs	branch
A.A11	TE1	PUBLIC
A.A12	TE2	PUBLIC
A.A13	NT2 (S/T)	PUBLIC
A.A14	PSN (S/T)	PUBLIC
A.A57	NT1 (T)	PUBLIC
A.A58	peer user LLF	PUBLIC
A.A59	peer user HLF	PUBLIC
A.B11	TE1	PRIVATE
A.B12	TE2	PRIVATE
A.B13	NT2 (S/T)	PRIVATE
A.B14	PSN (S/T)	PRIVATE
A.B67	NT1 (T)	PRIVATE
A.B68	peer user LLF	PRIVATE
A.B69	peer user HLF	PRIVATE
A.C11	TE1	HYBRID
A.C12	TE2	HYBRID
A.C13	NT2 (S/T)	HYBRID
A.C14	PSN (S/T)	HYBRID
A.C77	NT1 (T)	HYBRID
A.C78	peer user LLF	HYBRID
A.C79	peer user HLF	HYBRID

Table 7-7. Requirements List

User/provider Feature Set	(RL) 810004 leafs
X.15d	file transfer, NetBIOS (no peer)
X.25d	file transfer, NetBIOS (pt-to-pt)
X.55d	file transfer, NetBIOS (co-incident)
X.65d	file transfer, NetBIOS (symmetric)

7.4.1.6 pAP 810004 Conformance Requirements

See reference section 7.4.1.5 for details.

Table 7-8. Conformance Requirements

RL pAP 810004 features	pAProfiles Supported on CPE	pAProfiles Supported on ISDN	Conformance Option
A.A1	X, M, Q	I, M	m
A.A5	X, M, Q	I, M	m
A.B1	X, M, Q	I, M	o
A.B6	X, M, Q	I, M	o
A.C1 (ffs)	Q, V	I, M	o
A.C7 (ffs)	Q, V	I, M	o
X.2	X, M, Q	I, M	m
X.6	X, M, Q	I, M	m
X.8 (ffs)	X, M, Q	I, M	o
X.25d	X, M, Q	I, M	m
X.65d (ffs)	X, M, Q	I, M	o

M profiles are different at CPE than ISDN environments
m = mandatory conformance
o = optional conformance
ffs = for further study

7.4.1.7 pAP 810004 Configurator

Note: the following section contains all of the information from the 810004 application requirements and application analysis documents.

Figure 7-24, Figures 7-26 and 7-27, and Table 7-13 used in this section depict the basis for a pAP 810004 Configurator. The notion of a "configurator" enables functional (e.g., service overview--Table 7-13) and logical (figs. 7-24, 7-26 and 7-27) models to abstract the pAP 810004 application and connectivity details.

Table 7-9. Requirements Stipulated by the IUW as Augmented by the IIW/AAG

NIU-Forum/810004	must	want
interworking	public	private (PSN)
de facto industry LAN protocols	NETbios	PC/LAN
LAN-type access to databases		X
LAN-type ACCESS to data server		X
bearer service (ckt. switched)	64 kb/s	128 kb/s
bearer service	demand	BRA or PRA
file transfer & sharing	X	
image (graphics) flow		X
PCs and servers (IBM compat.)	X	
host		with TA
multi-peer		X
multi-sessions		X
voice		future
security	No	No
performance (128 kb/s synch'd)	ckt. switched	ffs
access arrangements	departmental	nationwide
application-independent	X	
PBX/CO-LAN/VPN/CCS #7/PSN		X
LAN media-independent		X
Addressing and/or signalling	I.Series	PSN

NOTE: ffs = for further study

Adapting the ISDN Reference Configuration, the pAP 810004 configurator is depicted in figure 7-24. This figure implies an end-to-end set of interworking (general-level) profiles based on the preceding values for the "must" requirements. This set of profiles is in Table 7-10.

Table 7-10. General-Level pAP 810004 Profiles

Source	Wide-Area	Destination
a) M (MAP/TOP NETBIOS)	I.Series	M (NETbios)
b) V (file xfr, file sharing)	I.Series	V (file xfr. ...)
c) Q = M = I = LLF	I.Series	Q (...)
d) X = (.U, .R, .D)	I.Series	X ...
e) A = PUBLIC	I.Series	A ...

NOTES:

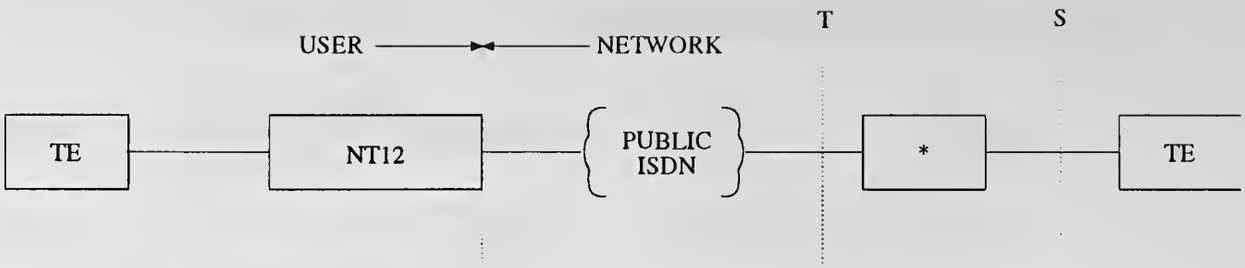
a) adopts the MAP/TOP NETbios Interface document and the Name Service Protocol functions.

b) enables high level functions (HLF) that denote file transfer and file sharing as utilized by application-independent means (e.g., elec. publishing, document sharing, screen sharing, etc.).

c) determines circuit switched bearer service of 1 or 2 transparent B channels on-demand.

d) addresses the user CPE as to access arrangements for types of users, types of servers, types of domains, etc.

e) isolates the field of application aligned with bearer, supplementary or teleservice functions.



Where network facilities are circuit switched

* - NT2 or NULL

Where TE may be a host (via TA&R reference point)

Where NT12 may be:
A) PSN of one or more ISxyz: Where xyz may be
B) Sub-network configuration of one or more of
I) ISLAN
II) ISPBX
III) Centrex/CO-LAN
IV) LAN G/W or IWU

Figure 7-24. pAP 810004 Reference Model.

Figure 7-26 further refines or simplifies figure 7-24 to the extent that the "basic" pAP 810004 products need only deal with symmetric CPE environments and interoperability, namely:

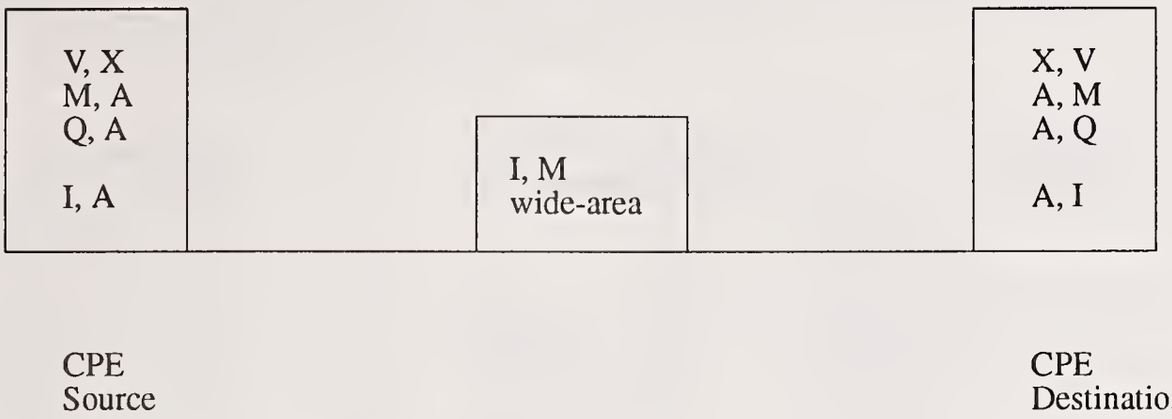


Figure 7-25. pAP Profile Stacks

This aligns the prior figure 7-24 discussion with the above stacks as follows:

b), d) = V, X

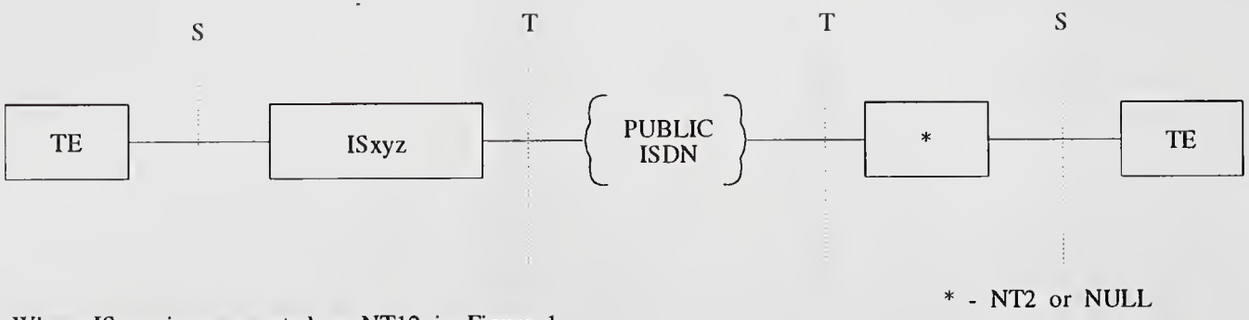
c), e) = Q, A

a), e) = M, A

e), (w/a) = I, A

See notes a-e after General-level Profile in this section.

This alignment reveals that wide-area (w/a) ISDN connectivity is based upon I.Series and SPO [M] profiles that are to evolve via NIST(NIUF), ETSI(EWOS), INTAP(AOW), etc. for provider services.



Where ISxyz is represented as NT12 in Figure 1.

NOTE: "Basic" means one sub-network type in CPE (Customer Premise Environment)

Figure 7-26. pAP 810004 Basic Configuration.

Figure 7-27 is the "extended" pAP 810004 configurator which is outside the scope of this pAP 810004 (point-to-point) "basic" configurator.

The purpose of including the pAP 810004 extended configurator is to encourage vendors to adopt general-purpose architectural criteria when setting out to meet pAP 810004 requirements.

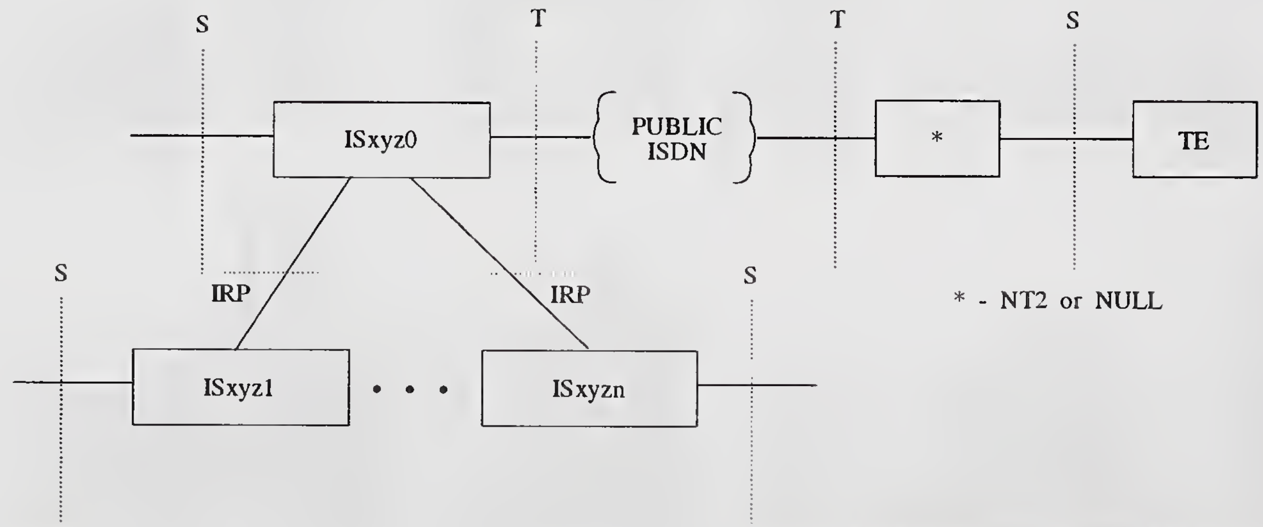
Table 7-11. Extended pAP 810004 Configurator*

ISDN customer premise end-point		Private Switched (NT12) network (ISDN)	ISDN carrier network
on-demand			on-demand
open	(B)	null	dial-up (P)
on-demand		on-demand	on-demand
open	(B)	(p) open availability	dial-up (P)
(p,P) shared-facility	(E)	+ exclusive-use (P)	dial-up
CUG	(E)	exclusive-use (P)	dial-up
(P) off-net	(E)	gateway (p/P)	dial-up
open	(B)	null	CO-LAN
CUG	(B)	null	PVN
dedicated end-point			dedicated (leased)
leased	(B)	(p) permanent	pure ckt. switched
leased	(E)		ckt. switched/ISDN signalling control
dedicated end-point		dedicated (leased)	dedicated (leased)
leased	(B)	(p) pure ckt. switched	pure ckt. switched
leased	(E)	(P) ckt. switched/ISDN signalling control	ckt. switched/ISDN signalling control
pre-established-channels (E)		null	permanent (P)
			ckt. switched/ISDN signalling
channel assoc. signalling			
pre-established-channels (E)		permanent (p)	
shared facility		channel assoc. signalling	ckt. switched/ISDN signalling
CUG		channel assoc. signalling	ckt. switched/ISDN signalling
off-net		channel assoc. signalling + gateway (p/P)	ckt. switched/ISDN signalling
		permanent (p)	permanent (P)
shared facility		intra-PSN	invisible
CUG		intra-PSN	invisible
off-net (ffs)		intra-PSN	invisible

P = public
p = private
intra-PSN = PVN

B = basic configurator
E = extended configurator

*deduced from ECMA ISPBX TR/XX



Where

0, 1, ..., n Are Circuit-Switched NT2
0, 1, ..., n Are Circuit-Switched Sub-networks
0, 1, ..., n Are Dedicated (NT2) Channels
e.g., PRI or PVN or PSN

NOTE: IRP-ISDN Reference Point (T, K* or N*)

Where
N* = ISDN To Another ISDN
K* = Dedicated Network to ISDN
AND * = IWF Inside/Outside Reference Configuration

Figure 7-27. pAP 810004 Extended Configuration.

Table 7-13 is the overall framework for the pAP 810004 configurator. It is also an overview of a service model. The properties of this framework are addressed in the Attachments.

The key aspects of the table 7-13 framework include:

• the notion that the carrier backbone network is augmented by a private network backbone in the sense of ISDN ISP profiles

• such augmentation is facilitated by profiles for Basic low layer functions (BLLF) that are aligned end-to-end across private and/or public sub-networks. Similarly, Additional LLFs are so aligned (ALLF). High-level functions may also be augmentations to both the (basic and additional) carrier and private backbones

• these Basic and Additional functions are provider-oriented in the sense of supporting the user's application environment. This notion of augmentation, when extended into the user's application environment, leads to further value-added application(s) augmentation as the following examples depict:

Table 7-12. pAP Configurator Descriptors (E) (examples only)

User/Provider Feature Set Aspects	user		provider	
	VLLF	VHLF	VLLF	VHLF
service	B		B, A	B, A
application	S	N	S	N
features	-		-	
interfaces	S		S	

• the substance of the above notions, augmentations and alignments, are administered via requirements list(s) at each plateau (carrier, private, CPE). The RLs are the fundamental application of the pAP taxonomy which is detailed in the Attachments. Viewed as a tree with trunk, branches and leaves, it enables each pAP/RL to denote work items or work-to-be-done in the sense of implementation agreements.

where V = value-added
S = supported
N = non-support
- = profile RLs

backbone-related descriptors
B = basic LLF or HLF
A = additional LLF or HLF

Table 7-13. pAP 810004 Service Overview

	pAP-810004		
	User/Provider Feature Set	810004 RL	Field of Application
Customer Premise Environment	AHLF ALLF	PSN RL	BHLF BLLF
Wide-Area Network	AHLF ALLF	ISDN RL	BHLF BLLF

RL - Requirements List
HLF - High Layer Function(s)
LLF - Low Layer Function(s)
PSN - Private Switched Network
B = Basic
A = Additional

NOTE: PSN and ISDN HLF and LLF May differ

7.4.1.8 Attachment 1 — Proposed Application Profile (pAP) Overview

The following pAP concerns are separate:

I. ISP Profiles per part 1, section 6 of TR/10000

- A. Standards
- B. Registration Mechanisms
- C. Conformance

II. IIW Profiles per the NIU-Forum

- A. Environment (Application)
  1. Application Requirements (IUW)
  2. Application Analysis (IIW)
- B. User/Provider Interaction
- C. Application Requirements List
- D. SPO Profile Selection
- E. I.Series Services
- F. NIU-Forum Conformance

The following pro forma outline of a pAP is based on the notion that a service-oriented model should convey a sufficient set of properties of a pAP which are aligned with standardized functions and options (in the sense of profiles) to enable implementors' to succeed in having their pAP derived products interoperate.

pAP products may be realized via application, product, service, or combinations thereof:

pAP pro forma

1. Scope
   - 1.1 Functional Model (Service-oriented)
   - 1.2 Objective Criteria
   - 1.3 Field of Application

2. Services
   - 2.1 Service Elements/Class
   - 2.2 Features/Functional Units
   - 2.3 Facilities/Interworking

3. Profiles
   - 3.1 Identify
   - 3.2 Requirements List - pAP
   - 3.3 Implementors' Conformance Statement (ICS) pAP

4. Conformance Requirements

The root structural identifier for a proposed Application Profile (pAP) is designated as

pAP xxxxxx

This identifier assumes the Application Environment definitions per the IUW treatment of xxxxxx which is the numeric IUW identifier for each ISDN-oriented application.

7.4.1.9 Attachment 2 — pAP Taxonomy Overview

The pAP identifier structure is extended for user/provider interplay and for user/network, or user/user signalling: The general form of the schema is

$\gamma.\Delta\chi\chi\chi$

where

γ = the major structural identifier for the general-level
Δ = the minor structural identifier for sub-levels of organization of the general-level
$\chi\chi\chi$ = the particular sub-levels as defined by Δ

if Δ = S it signifies the scenario-level of interaction within a particular general-level identifier

if Δ = s F it signifies the functional-level of interaction within the scenario-level identifier(s)

if Δ = s f P It signifies the protocol-level of interaction within the functional-level identifier which is within the scenario-level (s f)

finally, where Δ is

Physical-level	
.D	signalling channel
.B	basic rate access
.E	primary rate mux channel
.H	wide-band rate access

the schema shifts so that the physical-level identifier always occupies first position in the schema following the decimal point;

thus γ.xxxx is
.D s f p
.B s f p
.E s f p
.H s f p

The latter identifiers are the most subordinate in the pAP Taxonomy and are the "leaf" of the pAP Taxonomy "tree" of profiles. These leaf profiles may enable such details and options like attachment speeds and connectors to be registered by the pAP identifier. This specificity is for further study.

pAP Schema Overview

The pAP Application Environment resides within the Customer Premises Environment unless Enhanced Service Providers are part of the service interworking.

The root identifier [pAP xxxxxx] and related definition of the Application Context (signals from the environment) is linked to general-level profile identifiers such as:

X	user/provider feature set
R	requirement list
A	field of application
M	Standards Promotion Organizations (SPO) profile selection
I	ISDN I.Series base standards

NOTE: M profiles may encompass I profiles

When the general-level designator <M> is used in the sense of the I profiles, it extends the schema and profile descriptor's beyond the Application Environment designators <X>, <R>, and <A> to the standardized ISP realm of profiles.

When γ.Δ is M.Δ it depicts SPO general-level profiles

and if Δ is	it is general-level
2	I.200 Series
3	I.300 Series
4	I.400 Series
5	I.500 Series
6	I.600 Series

The pAP Application resides on customer premise sub-networks/equipment /environment. Such CPE may be as small as one sub-network or an extensive private switched network. The structural profile identifiers for the CPE/PSN backbone are

Q	Low Layer Compatibility Functions
V	High Layer Compatibility Functions

7.4.1.10 Attachment 3 — pAP 810004 Tutorial

Organization

The service framework depicted in table 7-13 [pAP 810004 Service Overview] is structured in a top-down manner. This structure incorporates two (2) independent stacks of profile factors; the field-of-application stack and the user/provider feature-set stack which are separated by Requirements List (RL) identifiers.

NOTE: The profile factors "stack" should not necessarily be interpreted as protocol stacks.

The structure depicted in table 7-13 is an integrated layered-view of the properties of the pAP 810004 taxonomy (based on Attachment 4), the pAP 810004 application and the pAP 810004 configurator (basic and extended -- pages 7-39 through 7-48).

The middle column of table 7-13 depicts pAP 810004, PSN and ISDN requirement lists (RL) which are descriptors that are dependent on the two (2) types of profile stacks mentioned in the first paragraph. This means that particular realizations of pAP 810004 will encompass RL selected profile factors, services, features and conformance requirements. These RLs are directly related to pAP 810004 profile attributes in contrast to generic properties of the taxonomy, configurator, application, service, conformance, or features.

NOTE: Attachment 1 is also an attempt to separate pAP 810004 intrinsic matters, e.g., services, from pAP 810004 extrinsic realization matters, e.g. profile ICSs.

Reference Model

Returning to table 7-13, the structure discussed in "1. ORGANIZATION" above displays the following dependencies whereby the application (pAP 810004), premises (CPE, PSN and provider support), and intervening networks (ISDN WAN) are unified in terms of services, application, function, features, reference configurations and everything short of particular de facto logic and implementation details.

The table 7-13 depiction suggests the "pAP 810004" top-most-level is the "umbrella" for all the subsidiary levels and profile stacks. It may also imply that this umbrella dictates the contextual requirements and context/scope for the underlying levels/sub-networks/networks.

The level below pAP 810004 is labelled "Customer Premise Environment" and this level has two (2) sub-levels. The major sub-level directly addresses pAP 810004 user/provider feature sets and services that are distinguished from underlying PSN provider functions, services, support and interworking. The PSN sub-level is an intervening sub-networking infrastructure which visibly (to the user sub-level) connects the various premise interfaces to the user/application service elements or functional groupings per the reference configurations.

The orientation of table 7-13 with A = additional -- at the left profile stack -- and B = basic -- at the right hand profile stack -- means that the BLLF and BHLF may be designated for either the ISDN WAN and/or PSN intervening networks whereas the ALLF and AHLF are considered user-premise extensions. In other words, "Basic" is a property of intervening provider facilities, and Basic facilities may only be overlaid by "Additional" user provisioned resources, albeit networked, which are not visible to intervening provider resources.

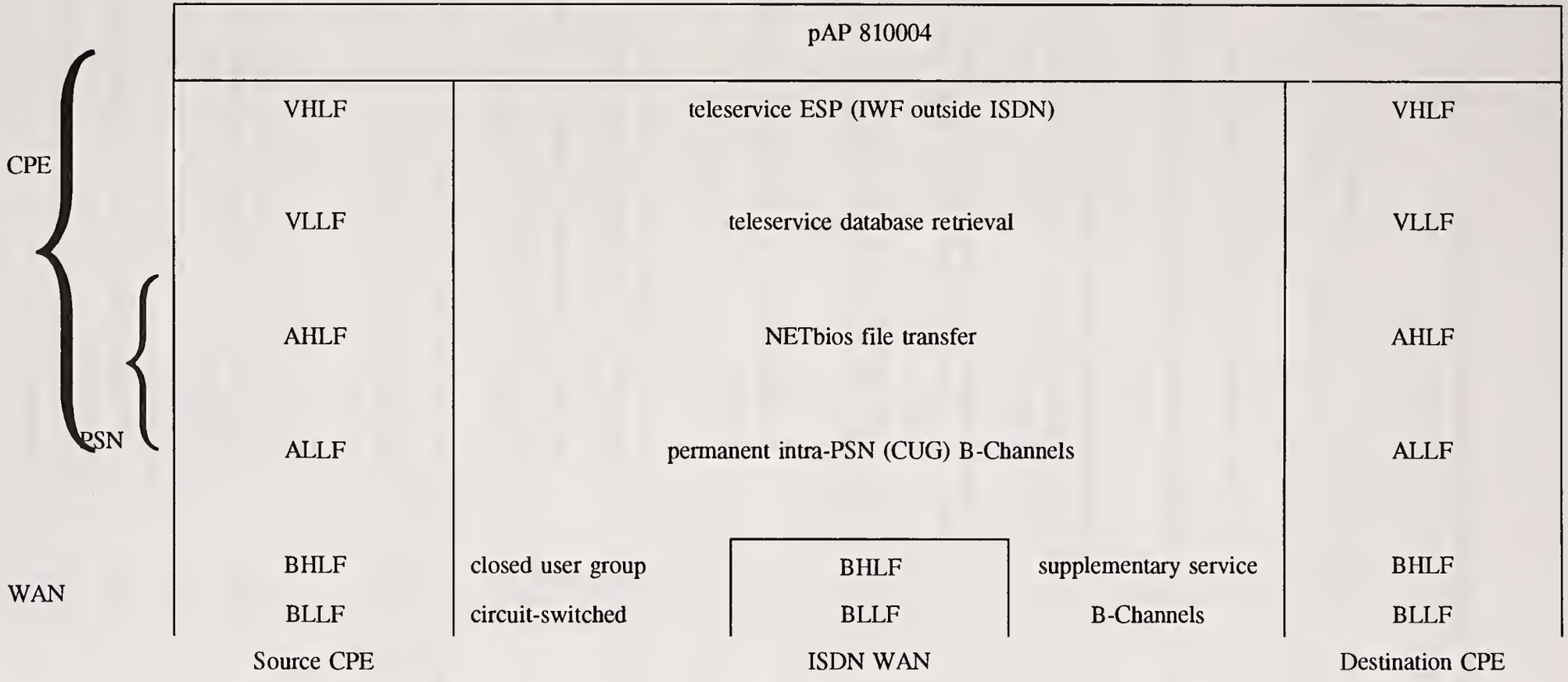
Table 7-14 (which follows) is an attempt to consolidate the foregoing pAP 810004 "tutorial" notions by recasting table 7-13 in order to depict a more traditional end-to-end topology for the

pAP 810004 application "umbrella." Table 7-13 was designed to stress the types of profile factors needed to adequately describe pAP 810004 in generic terms -- independent of source or destination realizations.

Table 7-14 stresses user/provider feature sets in the form of high-level (HLF) or low-level (LLF) functions "stacked" according to basic (B), additional (A) and value-added (V) service interworking across the ISDN WAN (the basic capability), the ISDN PSN (the additional capability), and the ISDN user functions (the value-added capability).

Using table 7-14 and beginning at p. 7-36 [section 7.4.1.5. pAP 81004 RL (General-plus scenario-level)], it should be discernable what might be the particular properties of a point-to-point pAP 810004 profile -- including configurator and conformance parameters.

Figure 7-14. pAP 810004 Distributed Networked Resources Example



7.4.1.11 Attachment 4 — Application Profile (pAP) Taxonomy

NOTE: See Attachment 2 for definitions and summary details.

When the general-level is distinguished using the schema and scenario-level, it enables "trees" to be structured which have their roots in the general-level identifiers, for example:

when		is		
	γ.Δ		A.S	it is the scenario-level of the field of application
and when		is		it signifies that this profile is based on PUBLIC services
	A.S		A.A	
and when		is		it signifies that this profile is keyed to PRIVATE services
	A.S		A.B	although public wide-area or transit networks may underlie the PRIVATE networks
and when		is		it signifies that the profile is a HYBRID of public/private
	A.S		A.C	services, e.g., a virtual private network (VPN) using public services

By extending the field of application tree <A> to the functional-level, it enables several "branches" which isolate the particular areas of the pAP 810004 Service Overview (depicted in table 7-13) as follows

when		is	it is	
	γ.Δx		A.Ax	the functional-level of the field of application for PUBLIC services
and when		is	it is	
	A.Ax		A.A1	the user's CPE profile that is being addressed
	A.Ax		A.A2	the provider's Low Layer service profile that is being addressed
	A.Ax		A.A3	the provider's High Layer service(s) profile
	A.Ax		A.A4	the provider's value-added (teleservices) that are distinguished
	A.Ax		A.A5	the profile for the peer user using PUBLIC services
	A.Ax		A.A6	the profile for multi-peer users using PUBLIC Services

NOTE: peer (recipient) user's of PUBLIC services are virtually the same as the originating user's profile.

when		is	it is	
	γ.Δx		A.Bx	the functional-level of the field of application for PRIVATE services
and when		is	it is	
	A.Bx		A.B1	the profile for the user's (originator) CPE
	A.Bx		A.B2	the profile for the user's (originator) PSN Low Layer Functions
	A.Bx		A.B3	the profile for the user's (originator) PSN High Layer Functions
	A.Bx		A.B4	the profile for the user's (originator) PSN value-added (teleservice)
	A.Bx		A.B5	the profile for the user's (originator) PSN value-added provider, i.e., ESP
	A.Bx		A.B6	the profile for the peer user (recipient) CPE
	A.Bx		A.B7	(same as A.B2) for the peer user PSN LLFs
	A.Bx		A.B8	(same as A.B3) for the peer user PSN HLFs

A.Bx	A.B9	(same as A.B4) for the peer user PSN VAFs
A.BX	A.B0	(same as A.B5) for the peer user PSN ESP

NOTE: A.B6 thru A.B9 & A.B0 apply to the recipient peer user

when	is	it is	
	γ.Δx	A.Cx	the functional-level of the field of application for HYBRID services.

and when	is	it is	
	A.Cx	A.C1	the profile for the user's (originator) CPE using HYBRID services
	A.Cx	A.C2	the profile signifies a user's (originator) PSN's use of HYBRID services
	A.Cx	A.C3	the profile for the user's VPN using PUBLIC service(s)
	A.Cx	A.C4	the profile for the user's VPN using PRIVATE service(s)
	A.Cx	A.C5	the profile for user's CENTREX/CO-LAN using PUBLIC services
	A.Cx	A.C6	the profile A.C5 but using PRIVATE services
	A.Cx	A.C7	the profile for the peer (recipient) user's CPE using HYBRID services
	A.Cx	A.C8	peer (recipient) user's PSN use of HYBRID services
	A.Cx	A.C9	peer (recipient) user's VPN using PRIVATE services
	A.Cx	A.C0	peer (recipient) user's CENTREX/CO-LAN using PRIVATE services

NOTE: peer (recipient) user's of PUBLIC services are virtually the same as the originating user's profile

when	is	it is	
	γ.Δxx	A.s f P	the protocol-level of the field of application

and when		it is	
		A.A f P	the protocol-level of the field of application for PUBLIC services

likewise		are	
		A.B f P	the protocol-levels of the field of application for PRIVATE and HYBRID and services respectively
		A.C f P	

when	is	it signifies the profile	
	A.s f P	A.s f 1	for TE1
	A.s f P	A.s f 2	for TE2
	A.s f P	A.s f 3	for NT2 (S/T)
	A.s f P	A.s f 4	for PSN (S/T)
	A.s f P	A.s f 5	for PSN (Nx)
	A.s f P	A.s f 7	for NT1 (T)
	A.s f P	A.s f 8	for peer user LLF
	A.s f P	A.s f 9	for peer user HLF
	A.s f P	A.s f a	for peer provider LLF
	A.s f P	A.s f b	for peer provider HLF
	A.s f P	A.s f c	for peer provider value-added (teleservice)

NOTE (1): when the above profiles have an f=1; it signifies the user's (originator) CPE use of visible PUBLIC services for the intervening ISDN WAN

NOTE (2): both "a" and "b" and "c" may associate with the N_x reference point to another ISDN

NOTE (3): for the above profiles, when s = A or B and f = 2, 3, or 4 respectively for the above profiles p = 7, 8, and 9

NOTE (4): A.s f 6 and A.s f d are reserved for future use

when	is	it signifies the profiles for:
A.s f P	A.s f k	peer provider LLF and IWF is inside ISDN
A.s f P	A.s f l	peer provider HLF and IWF is inside ISDN
A.s f P	A.s f m	peer provider value-added (teleservice) and IWF is inside ISDN
A.s f P	A.s f n	peer provider LLF and IWF is outside ISDN
A.s f P	A.s f o	peer provider HLF and IWF is outside ISDN
A.s f P	A.s f p	peer provider value-added (teleservice) and IWF is outside

When the functional-level (f=2) then P=k at the protocol-level and N (sub) x=IWF is (inside) ISDN

When the functional-level (f=3) then P=l at the protocol-level and N (sub) x=IWF is (inside) ISDN

When the functional-level (f=4) then P=m at the protocol-level and N (sub) x=IWF is (inside) ISDN

When the functional-level is f=2, 3, or 4 and P=n, o, or p respectively, then N (sub) x=IWF is (outside) ISDN in each case

when	is	it signifies the protocol-level functions for
γ.Δxx	A.A f P	PUBLIC Services
	A.B f P	PRIVATE Services
	A.C f P	HYBRID Services

and when	it designates the following protocol-function categories
P=H	Connection Handling
P=Z	Routing
P=R	Resources Handling
P=S	Supervision
P=M	Operation and Main
P=I	Interworking
P=C	Charging
P=P	L-2/-3 data unit handling (packet mode)

For the general-level user/provider feature set the specific structural identifiers for the scenario-level follow:

when	is	it is	
γ.Δ		X.S	the scenario-level of the user/provider feature set

and when	is		
X.S	X.U	the variable U signifies the number of conferencing users (peer-to-peer)	

so when			it signifies
	U=1		no peer user
	U=2		one peer user i.e., point-to-point
	U=3		multi-peer users

and when	is		
	X.S	X.R	the variable R signifies the number of independent server domains

so when		it signifies the
	R=5	server is co-incident with the user CPE
	R=6	servers are symmetric with peer users (point-to-point) or multi-peer users
	R=7	server(s) is asymmetric with peer users including being in a separate CPE from peer users or multi-peer users

and when	is		
	X.S	X.D	the variable D signifies the type of CPE domains that contain users and/or servers

so when		it signifies
	D=4	one domain which encompasses U=1 and R=5 but may have multiple users in-session with their respective servers
	D=8	symmetry of peer-to-peer domains and encompasses U=2 or 3 and R=6 but may signify multi-in-sessions between peer domains
	D=9	multi-peer domains which are symmetric as to users and servers U=3 and R=6 but may signify multi-in-sessions between multi-peer domains
	D=0	multi-peer domains which are asymmetric as to users and associated servers U=3 and R=7 but may also signify multi-in-sessions between multi-peer users and asymmetric server domains

when	is		it is
	$\gamma.\Delta x$	X.s F	the functional-level of the user/provider feature set

when	then	
		<u>Functional Components</u>
	F=i	Hold Invocation (disconnect & reservation)
	F=f	Retrieve (reestablish)
	F=n	Notify (inform, no response)
	F=e	Inquire
	F=t	Transfer
	F=j	Join (multiparty)
	F=a	Adjourn
	F=r	Reroute (to alternate address)
	F=m	Monitor (watch for Event)
	F=x	Restart
	F=s	Split (from a multipart connection)

7.4.1.11.1 Other Profile Taxonomy Matters

The capabilities of the user/provider feature set encompasses the Application/Service/User Program set, the Application Layer (7) Systems servicing the former set(s), the Upper Layer Architecture as regards directory services, Security and Network Management, and all Application Platforms whether software or hardware which form the infrastructure to support the former set(s).

The pAP Taxonomy reserves a number of structural identifiers for several types of service-independent/scenario profiles for user-type CPE/PSN environments, as follows:

Identifier	User Processing Environment
X.V	Application Programs
X.W	Communications Processes
X.Q	Application Platforms

The user/provider feature set may also address the classical OSI Reference Model application-layer.

when	is extended to	
	X.s F	the OSI Functional-level

and	is a	Provider Feature Set
	F=1	Directory
	F=2	Security
	F=3	Management
	F=4	(reserved)
	F=5	File Transfer
	F=6	Virtual Terminal
	F=7	Message Handling
	F=8	Transaction Processing
	F=9	Remote Database Access
	F=0	Job Transfer & Manipulation

This enables the functional-level designator to distinguish the particular protocol-level by the following extension

when	is extended to the Protocol-level
X.s f P	

and when	is	
X.s 5		file transfer

then	is	Protocol-identifier
X.s 5 a		FTAM (file transfer access and management)
X.s 5 b		FTP (file transfer protocol)
X.s 5 c		NFS (network file system)
X.s 5 d		NetBIOS
X.s 5 e		(reserved)

when	is	it is	
γ.Δ		2.S	the scenario-level for the CCITT I.200 series which identifies types of services

where	is the	
2		type of ISDN service described in the CCITT I.200 series
if		
Δ = Z,Y,X,...		types of CCITT I.200 bearer services, e.g., circuit-mode
if		
Δ = a,b,...,z		types of CCITT I.200 supplementary services of basic functional components
if		
Δ = A,B,C,...		types of CCITT I.200 signaling channel management services
if		
Δ = ...		types of CCITT I.200 management services

NOTE: .... = any unused alpha designator

when	is	then	
γ.Δ		2.S	CCITT I.200 services may be registered at the scenario-level

thus	is	<u>category</u>
2.X		circuit-mode
2.Y		packet-mode
2.Z		signaling-mode

or	is	<u>Supplementary Service function</u> (SS)
2.a		Number Identification
2.b		Call Offering
2.c		Call Completion
2.d		Multiparty
2.e		Community of Interest
2.f		Charging
2.g		Additional Information Transfer

when	signifies	<u>Supplementary Service</u>
2.a		Number Identification
then	is	
2.a 1		Direct Dialing In (DDI)
2.a 2		Multiple Subscriber No. (MSN)
2.a 3		Calling Line ID Presentation(CLIP)
2.a 4		Calling Line ID Restriction (CLIR)
2.a 5		Connected Line ID Presentation (COLP)
2.a 6		Connected Line ID Restriction (COLR)
2.a 7		Malicious Call Identification (MCI)
2.a 8		Sub-addressing (SUB)

when	signifies	<u>Supplementary Service</u>
2.b		Call Offering
then	is	
2.b 1		Call Transfer (CT)
2.b 2		Call Forwarding Busy (CFB)
2.b 3		Call Forwarding No Reply (CFNR)
2.b 4		Call Forwarding Unconditional (CFU)
2.b 5		Call Deflection (CD)
2.b 6		Line Hunting

when		signifies	Supplementary Service
	2.c		Call Completion
then		is	
	2.c 1		Call Waiting (CW)
	2.c 2		Call Hold (HOLD)
	2.c 3		Completion of calls to busy subscribers (CCBS)
when		signifies	Supplementary Service
	2.d		Multiparty SS
then		is	
	2.d 1		Conference Calling (CONF)
	2.d 2		Three Party Service (3PTY)
when		signifies	Supplementary Service
	2.e		Community of Interest SS
then		is	
	2.e 1		Closed User Group (CUG)
	2.e 2		Private Numbering Plan (PNP)
when		signifies	Supplementary Service
	2.f		Charging SS
then		is	
	2.f 1		Credit Card Calling (CRED)
	2.f 2		Advice of Charge (AOC)
	2.f 3		Reverse Charging (REV)
when		signifies	Supplementary Service
	2.g		Additional Information Transfer
then		is	
	2.g 1		User-to-User Signalling (UUS)
when			it is
	Δ = A,B,C...		types of CCITT I.200 signalling channel management services
then		signifies	category[14]
	2.A		Telephony (E)
	2.B		Telephony (A)
	2.C		Teletex (A)
	2.D		Telefax 4 (A)
	2.E		Mixed Mode (A)
	2.F		Videotex (A)
when		is	it is
	$\gamma.\Delta$		3.S the scenario-level of the CCITT I.300 Series
and when		is	
	S		ISDN reference points

[14]from I.230:

(E) an essential access arrangement or bearer service category
(A) an additional access arrangement or bearer service category

then	is		
	S=K		existing telephony n/w or dedicated
	S=M		specialized service provider
	S=N		another ISDN
	S=P		specialized n/w resource

when	is	it is	
	γ.Δ	4.S	the scenario-level of the I.400 Series

NOTE: previously, in these Appendices, the schema was extended to identify profiles encompassing channel types, B, D, E, and H by shifting the schema at the physical-level, e.g., B s f where "s" is also the scenario-level shifted right one character.

when	is	or	
	γ.Δ	4.S	4.Bs, 4.Ds, 4.Es, 4.Hs
then	may be		
	S(or s)	ISDN Reference Points	
such as			
	S=R		
	S=S		
	S=T		
	S=U		
	S=V		

when	is	or	
	γ.Δx 4.s	4.Bs, ..., 4.Hs	
then		signifies	
	S(or s)		scenario-level based upon types of service

when	is	scenario-types[15]
	4.B1	Dedicated (pre-established) systems connections
	4.B3	Permanent Public network connections
	4.B5	On-demand Public network connections

when	is	at	
	γ.Δxxx γ.ΔsF		the functional-level
then	signifies		
	F		an extension of the various types of scenario-level facilities with designations for category of connections

and when	it is	connection category[16]
	F=l	link
	F=t	transmission system
	F=p	purely circuit switched
	F=c	circuit switched/ISDN signalling
	F=k	circuit switched/packet

[15]adapted from ECMA ISPBX TR/NTW

[16]Ibid.

when		is	
	γ.Δs F		extended to the functional-level
and		is the	connection categories[17]
	F		*Dedicated*
	4.B 1 l		physical link
	4.B 1 t		transmission systems
			Permanent
	4.B 3 p		purely circuit switched
	4.B 3 c		circuit switched/ISDN signalling
	4.B 3 k		circuit switched/packet switched signalling
			On-Demand
	4.B 5 p		purely circuit switched
	4.B 5 c		circuit switched/ISDN signalling
	4.B 5 k		circuit switched/packet switched signalling
when		is	
	4.Δ s f P		extended to the protocol-level[18]
then			Dedicated Connections (s=l=physical link)
	4.B 1 l 1		link establishment
	4.B 1 l 2		synchronization
	4.B 1 l 3		thruput delay
	4.B 1 l 4		signalling transparency
	4.B 1 l 5		failure performance
and			
then		is	Dedicated Connections (s=t=transmission system)
	4.B 1 t 1		link establishment
	4.B 1 t 2		synchronization
	4.B 1 t 3		thruput delay
	4.B 1 t 4		signalling transparency
	4.B 1 t 5		failure performance

and so forth for

Permanent	and	On-Demand
4.B 3 p		4.B 5 p
4.B 3 c		4.B 5 c
4.B 3 k		4.B 5 k

[17]Ibid.

[18]Ibid.

NOTE: If H channels instead of B channels, then the 4.Hxxx schema is needed.

when		is	it is	
	γ.Δ		5.S	the scenario-level for the CCITT I.500 series
and when		**it signifies**		
	5.1		Layer 1 interworking (I.511)	
	5.3		Parameter Exchange (I.515)	
	5.5		ISDN-ISDN interworking	
	5.7		ISDN-Private Nets interworking	
when		**is**		
	5.s F		extended to the functional-level	
and		**signifies**	interworking functional requirements	
	5.5			
then		**is**		
	5.5 c		common channel signalling	
	5.5 x		X.75	
and when		**is**		
	5.s f P		extended to the protocol-level	
then		**is**		
	5.5 c k		signalling at K reference point	
	5.5 c n		signalling at N reference point	

7.4.1.12 Attachment 5 — ISDN RL Structure

Table 7-15. Circuit-mode bearer services, from I.335

#	xfr mode	xfr rate	xfr capab.	Estab. of conn.
1.1	ckt	64	unres}	demand
1.2	ckt	64	unres} (3)	reserved
1.3	ckt	64	unres}	permanent
5.1	ckt	2x64	unres	demand
5.2	ckt	2x64	unres	reserved
5.3	ckt	2x64	unres	permanent

(3) - during an interim period some networks may only offer restricted digital information transfer capability (i.e., an all-zero octet is not allowed)

Table 7-16. Unrestricted digital connection types, from I.335

#	xfr mode	xfr rate	xfr capab.	struc	Estab. of conn.
A.1	ckt	64	unres	8kHz	switched
A.2	ckt	64	unres	8kHz	semi-permanent
A.3	ckt	64	unres	8kHz	permanent
A.10	ckt	2x64	unres	8kHz}	switched
A.11	ckt	2x64	unres	8kHz} (2)	semi-permanent
A.12	ckt	2x64	unres	8kHz}	permanent

(2) - RDTD "Restricted differential time delay"

I.510 Definition Relied Upon For A pAP

from: I.510 section 4.2 Definitions Related to the General ISDN Interworking Configuration

"Interworking

Within the scope of the I.500 series of recommendations, the term interworking is used to express interactions between networks, between end systems, or between parts thereof, with the aim of providing a functional entity capable of supporting an end-to-end communication. The interactions required to provide a functional entity rely on functions and on the means to select these functions. These functions which include the conversion of physical and electrical states and the mapping of protocols, are referred to as interworking functions (IWFs). An IWF may be implemented in the ISDN, in the other network(s), at the user's premises, through a third-party service provider, or in some combination of these."

ISO/IEC ISP Taxonomy[19]

The following extracts[20] are a small portion of the referenced identifier structure

The ISDN subnetwork identifier structure for ISPs is

4	Integrated Services Digital Network
4 1	Circuit Switched bearer service at S or T
4 1 1	B Channel
4 1 1 1	Semi-permanent access
4 1 1 2	Demand Access

The LAN subnetwork identifier structure for ISPs is

5	Local Area Networks
5 1	CSMA/CD
5 2	Token Bus
5 3	Token Ring
5 4	FDDI

[19]extract from DTR/10000-1

[20]adapted from ECMA ISPBX TR/NTW

7.5 Messaging and Answering

7.5.1 Voice Messaging Systems

This application profile provides the descriptions necessary to meet the requirements of three NIU-Forum user applications: "Transparent Networking of Voice Messaging Systems" (860016.0) (Ref. [44]); "Interface to Voice Messaging Systems" (860018.0) (Ref. [45]); and "Interface to Centralized Voice Messaging System" (810034.0) (Ref. [46]).

7.5.1.1 User Description

Voice Messaging Systems (VMS) are becoming a fundamental component of corporate telecommunications networks. ISDN services and products must be capable of interfacing with these units while providing as good or better service than is available today. North American ISDN User's Forum "users" have submitted ISDN applications requiring an ISDN application that provides the capability for integrating VMS with ISDN service.

VMS allows automatic telephone coverage without the need for individual station equipment (i.e., answering machines) or full-time monitoring by other personnel (i.e., secretaries). VMS can also provide the functionality for voice mail where callers may leave voice messages for others without directly calling the others. A third function for VMS is call prompting which provides callers with additional information before selecting various options processed by the VMS. Call Prompting goes beyond the scope of this document.

Calls to VMS subscribers' telephones are redirected by the ISDN switch (Telco central offices or PBXs) to the VMS with sufficient information for the VMS to efficiently handle the call. Calls can be redirected several ways - the VMS subscriber can "call forward all calls" to the VMS (CFU - Call Forward Unconditional); calls with no answer can be call forwarded (CFNR - Call Forward No Reply); and calls to a busy telephone can be call forwarded (CFB - Call Forward Busy). In the case of voice mail, the VMS subscriber directly calls the VMS to leave messages rather than being call forwarded by the ISDN switch. Calling parties select options provided by call prompting (i.e., redirecting to another telephone by the ISDN switch, redirected to another VMS subscriber's mailbox by the VMS).

The VMS must be able to receive and store the message in the appropriate VMS subscriber's mailbox and in turn alert the VMS subscriber that a message is waiting by activating some type of message waiting indicator (MWI) (i.e., lamp, display, interrupted dial tone). Future functions may allow the VMS to include the calling I.D. or name, an urgent indication, etc., in the message waiting notification. The VMS should be capable of serving both ISDN and non-ISDN subscribers.

Figure 7-28 shows an overview of the user physical environment for voice messaging and answering applications. It includes one or more ISDN switches networked together, one or more VMSs networked together, non-VMS calling parties (analog, digital and ISDN) and VMS subscribers (analog, digital and ISDN). The BRI and PRI ISDN interfaces should support this VMS Application Profile.

This application profile provides the descriptions necessary to meet the requirements of three NIU-Forum user applications: "Transparent Networking of Voice Messaging Systems" (860016.0); "Interface to Voice Messaging Systems" (860018.0); and "Interface to Centralized Voice Messaging System" (810034.0). The profile also refers to "Secure Voice Mail" (050015.0) (Ref. [47]), "Secure E-Mail" (050014.0) (Ref. [48]) and "Secure Facsimile Transmission through ISDN" (050016.0) (Ref. [49]) although the security aspects are not included in this profile.

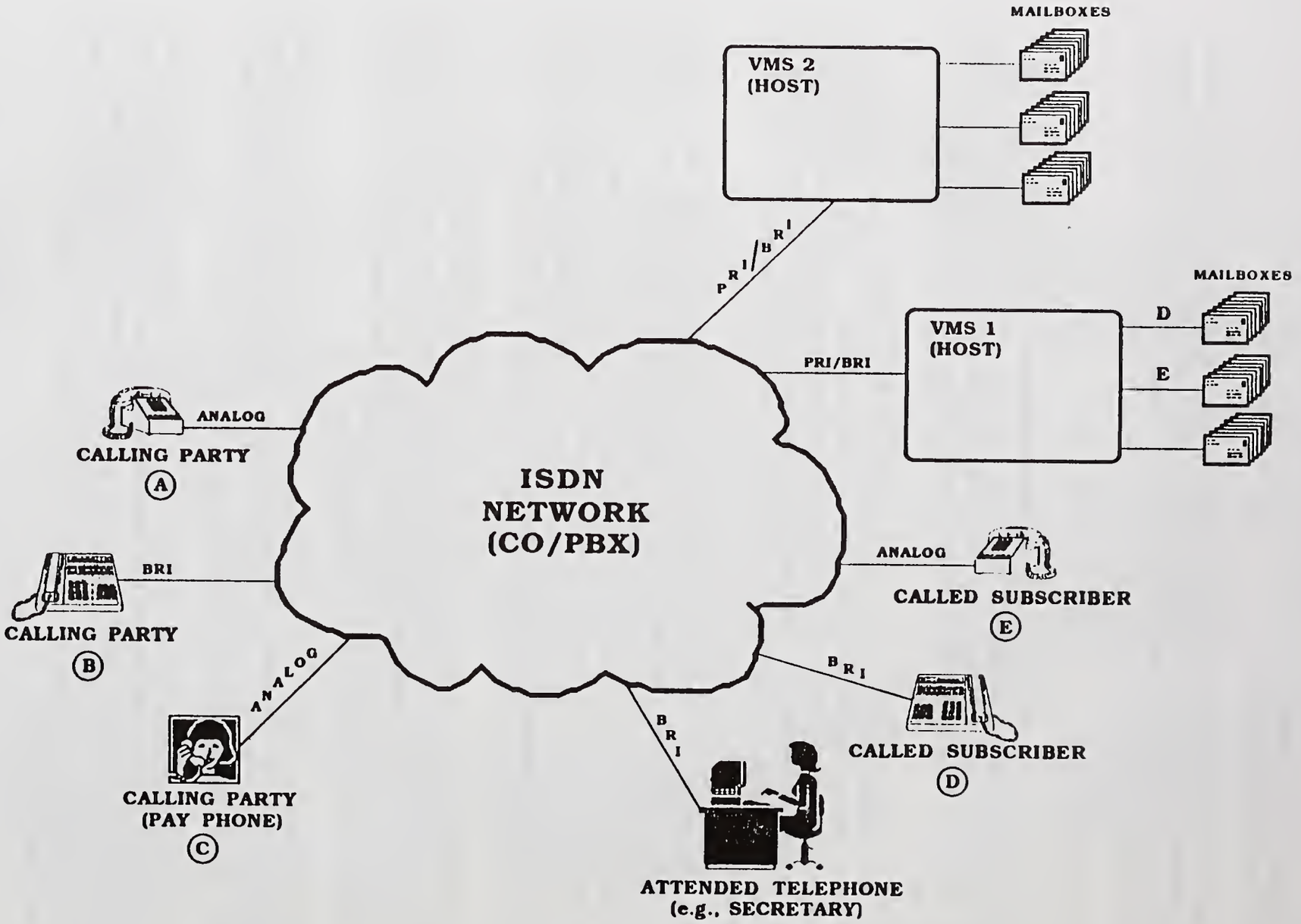


Figure 7-28. Overview of Physical Environment for Voice Messaging and Answering Applications.

7.5.1.2 ISDN Application Breakdown

The above user description is divided into three distinct cases based on different interactions between the ISDN switch and the VMS user. The three cases, Call Answering, Call Answering with Call Transfer to an Attendant, and Direct Access to Voice Mail are depicted in figure 7-29. The following describes the different interactions required between the ISDN switch, the VMS, the calling party and the called party.

7.5.1.2.1 Call Answering

The VMS function allows automatic telephone coverage without the need for individual station equipment (i.e., answering machines) or for full-time monitoring by other personnel. Calls to the VMS subscriber's telephone are redirected by the ISDN switch to the VMS with sufficient information for the VMS to handle the calls. The calls may be redirected several ways: call forward all calls to the VMS; call forward calls encountering a busy status; call forward no response calls. Calls may also be call transferred to a VMS subscriber mailbox by a third party such as a secretary or call attendant who received the initial call.

7.5.1.2.2 Call Answering With Call Transfer To An Attendant Or Pager Notification

This is similar to the above description when the initial call is call forwarded to the VMS. The VMS has the additional feature allowing the calling party the ability to transfer out of the VMS back to an attendant/secretary's telephone. The VMS may also allow the calling party the ability to page the desired person. These capabilities are used for urgent or emergency calls when a message is not sufficient or timely. The calling party may also transfer out of the VMS to make other calls.

7.5.1.2.3 Direct Access To Voice Mail

A VMS subscriber may call the VMS directly to leave messages for one or more VMS subscribers or other VMS subscribers if networked together with the initial subscriber's VMS. The voice mail functionalities are analogous to E-mail and include the ability to edit, broadcast, save, delete and retrieve messages, etc.

7.5.1.3 Service Logic

Voice Messaging and Answering Applications involve combinations of three different processes: VMS Subscriber Access, VMS Subscriber Notification and VMS Subscriber Message Retrieval. Section 7.5.1.4, Messaging and Answering Application Processes, describes each of these processes in more detail. In a single VMS system, the calling party accesses the VMS subscriber's mailbox and leaves a message. The subscriber is notified that a message is waiting and then retrieves the message. The VMS subscriber's notification is then canceled. This flow is shown in figure 7-30. The flow is basically the same in a multiple VMS environment, except that after the calling party leaves a message, the first VMS sends the message to the VMS subscriber's mailbox on the second VMS through message networking. The multiple VMS messaging and answering applications flow is shown in figure 7-31.

7.5.1.4 Messaging And Answering Application Process

The following describes the three basic Messaging and Answering application processes in more detail: Subscriber Access, Subscriber Notification, and Subscriber Message Retrieval.

7.5.1.4.1 Subscriber Access

Subscriber access is the first stage in Messaging and Answering application process.

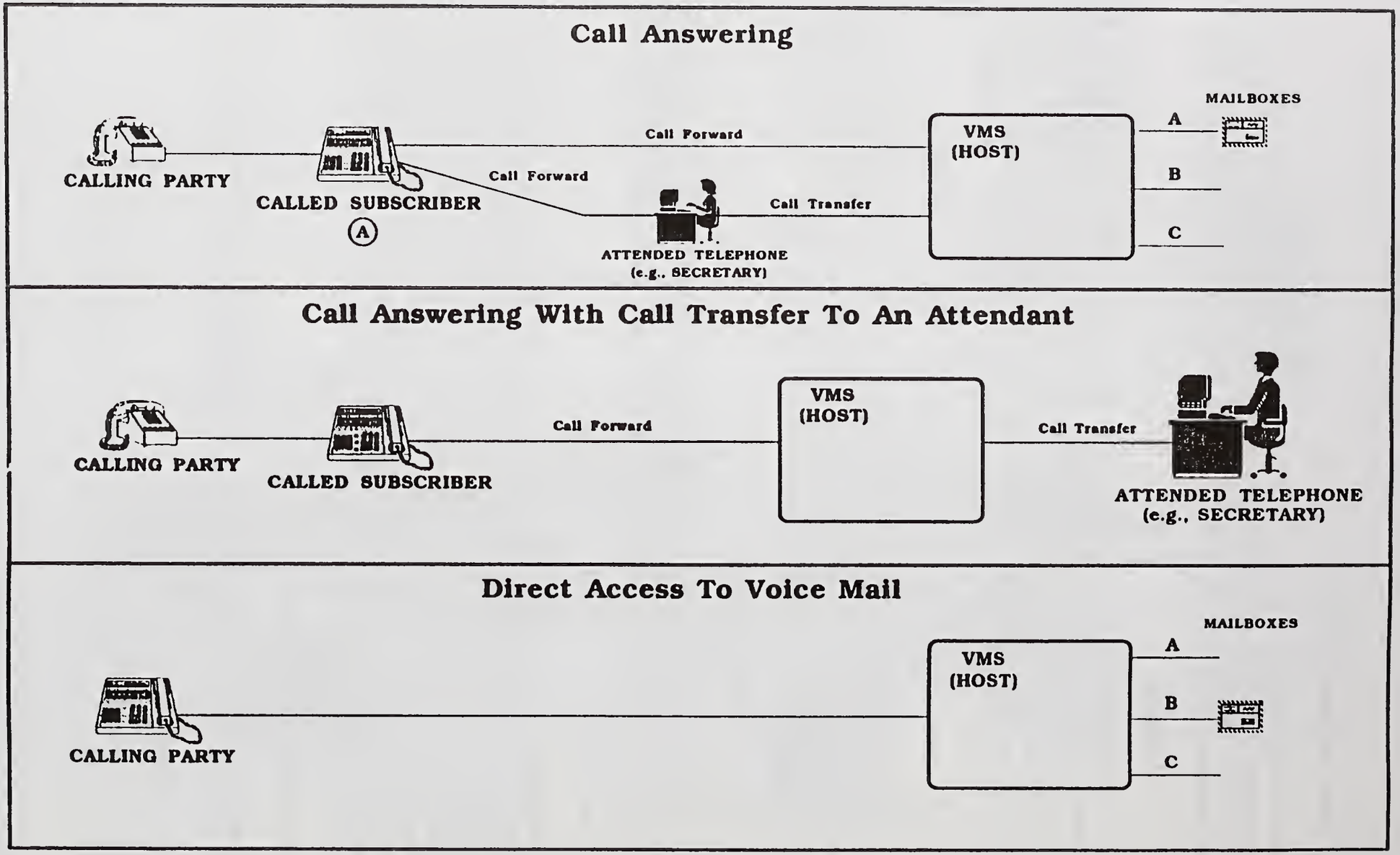


Figure 29. ISDN Messaging and Answering Application Cases.

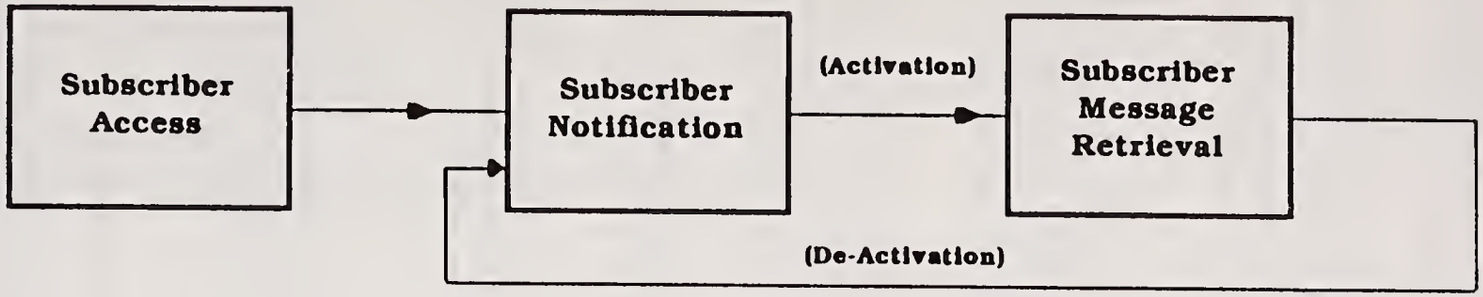


Figure 7-30. Single VMS Messaging and Answering Application Processes.

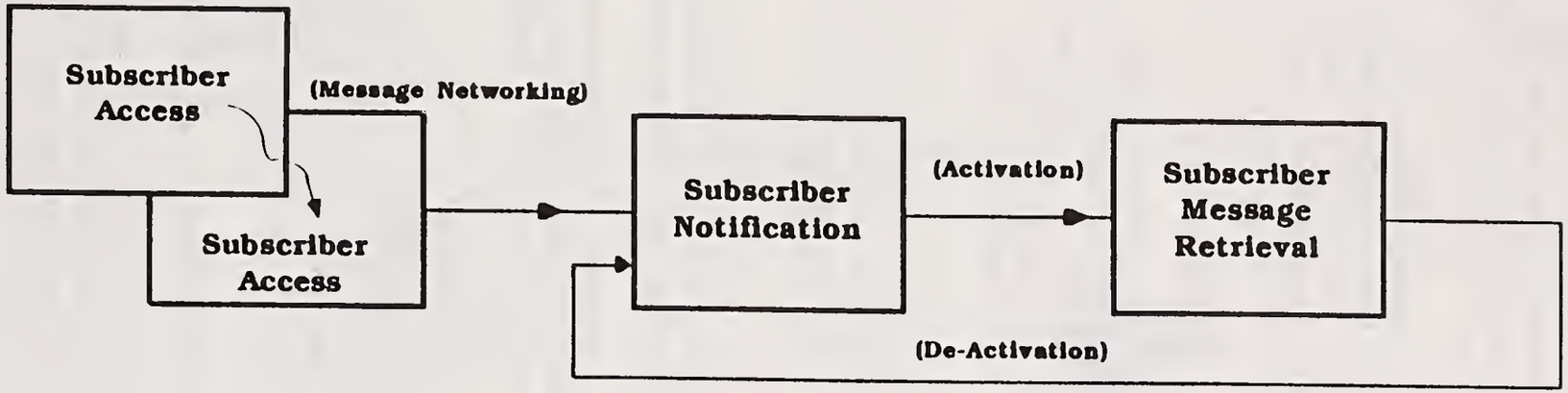


Figure 31. Multiple VMS Messaging and Answering Application Processes.

7.5.1.4.2 Application Process Description

Subscriber access includes the steps to connect the calling party to the VMS so that a message may be recorded and deposited in the called party's VMS subscriber mailbox. It allows the calling party to transfer out of the VMS when desired. This occurs when the calling party desires to speak to an attendant or secretary. When this happens, the calling party has left the Messaging and Answering applications process. Sometimes a secretary or attendant may transfer a calling party to the VMS to leave a recorded message for the called party. In this case, the process treats the call exactly as if the calling party called directly.

The Message Networking subprocess is optional and used only when multiple VMSs need to communicate with each other using the ISDN network. This situation occurs in campus environments with multiple VMSs and one ISDN switch or in inter-location environments with multiple VMSs and multiple ISDN switches. The networking communication occurs when one VMS needs to deliver messages to another VMS. The objective is that multiple VMSs should appear as one large VMS to the VMS subscribers.

7.5.1.4.2.1 Subscriber Access Process Alternative Architectures

A calling party may be forwarded or transferred to the VMS using one of several different service elements including Call Forwarding Busy (CFB), Call Forwarding Variable (CFV), or Call Forwarding No Answer (CVN). The particular service element used to establish connectivity is not critical to the Subscriber Access stage. What is critical is that the calling party is connected to the VMS with an opportunity to leave a voice message in the VMS subscriber's mailbox.

Figures 7-32, 7-35, 7-38, 7-41, and 7-43 show the specific physical environment for each of the three cases described in section 7.5.1.2. The various steps in each case are simplified to show typical interactions between the calling party and the VMS. In the real world this interaction might be more complicated. For example, a VMS subscriber might be the calling party wishing to leave another subscriber a message and retrieving a message on the single call.

In 7-32, 7-35, 7-38, and 7-41, Subscriber Access is defined so that all the VMS subscribers are connected to a single ISDN switch or PBX. In the real world, however, Messaging and Answering applications will also occur in multiple ISDN switched networks.

The Message Networking physical environment necessary to have one VMS communicate with a second VMS is shown in figure 7-43. This environment will require multiple VMSs (possible from different manufacturers) to forward voice mail over ISDN networks in a standard and uniform way.

7.5.1.4.2.2 Information Flow Diagrams

Information Flow Diagrams show the specific service elements necessary to complete the Messaging and Answering application process. For example, the Information Flow Diagram for Call Answering - No Answer is shown in figure 7-33. The Diagram for Call Forwarding - Busy or Variable is shown in figure 7-34. The remaining Diagrams for Subscriber Access are shown in figures 7-36, 7-37, 7-39, 7-40, 7-42 and 7-44.

7.5.1.4.2.3 Protocol Requirements and Application Service Element Description

The supplementary services, messages and protocol elements described below are only those required by this profile. Other messages and protocol elements are not discussed if they are not used by the application being described, even though they may be required for other reasons, such as routing of the call. See figures 7-32, 7-35, 7-38, 7-41, and 7-43. Please note that the required ANSI and NIUF documents will be supplied as they become available. NIU.xxx implies that the Messaging and Answering Profile team is requesting the Supplementary Services Working Group to create that particular document.

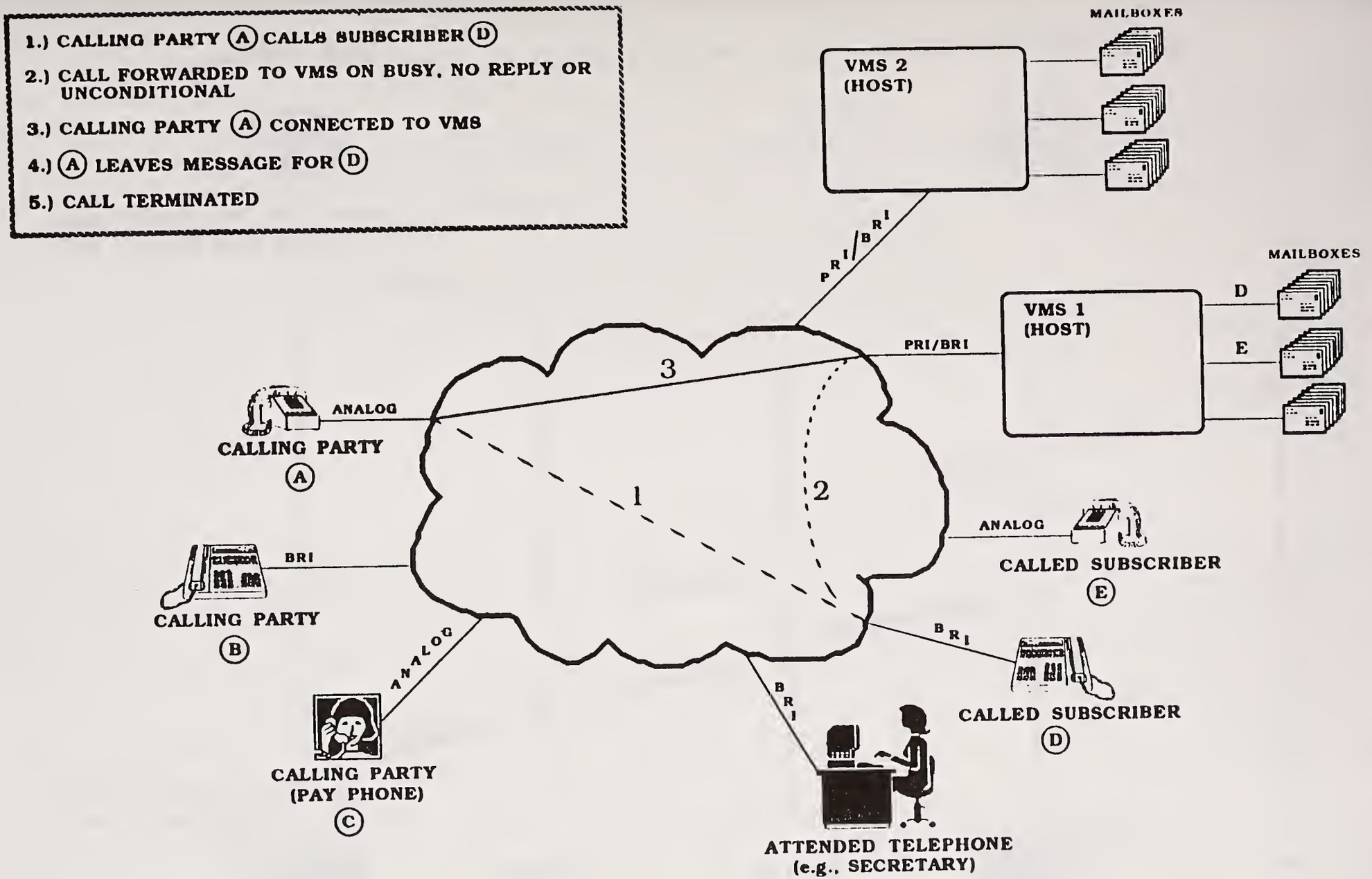
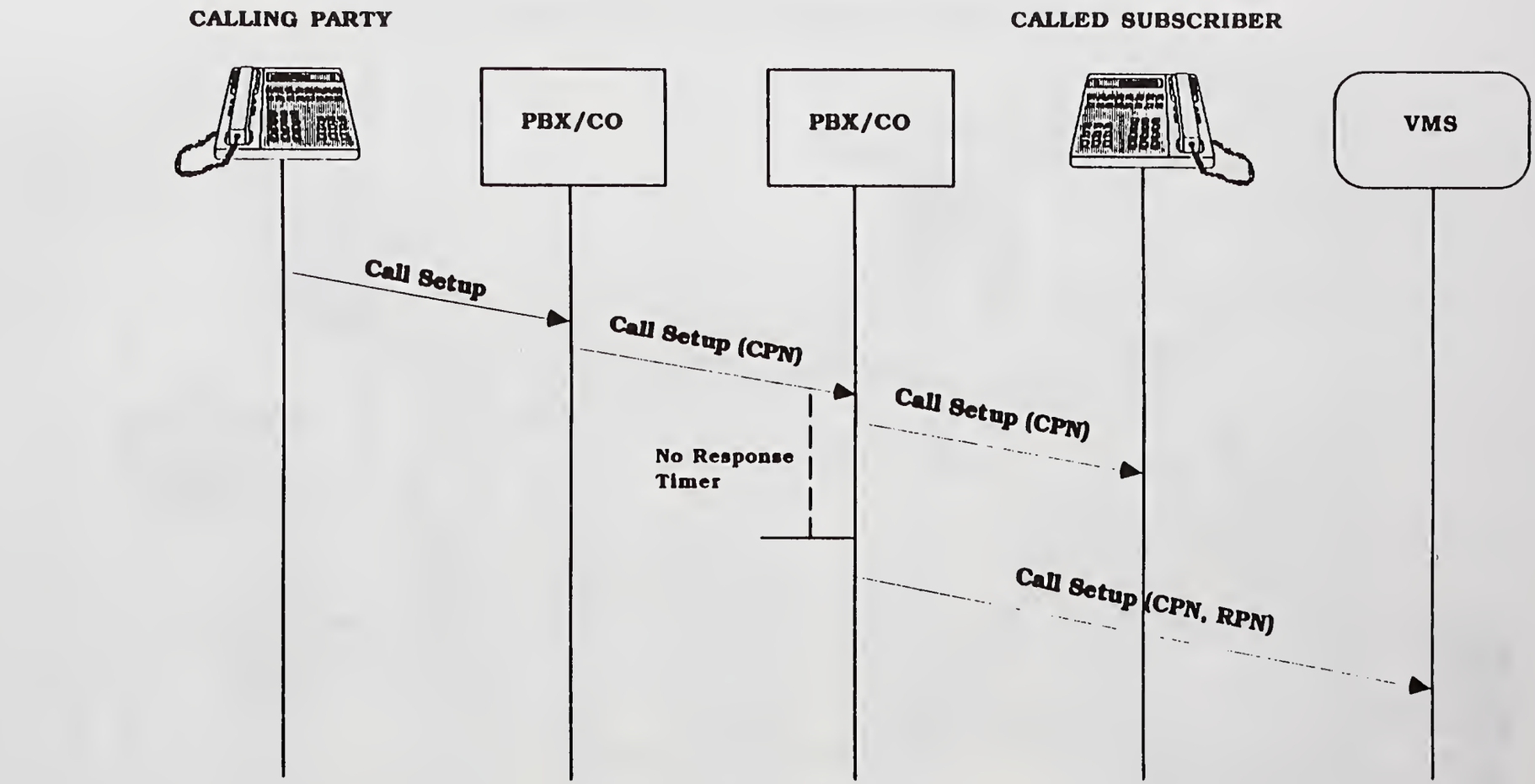


Figure 7-32. Suscriber Access--Call Answering (Call Forwarded to VMS).



CPN = Calling Party Number
RPN = Redirecting Party Number

Figure 7-33. Subscriber Access--Call Answering (Call Forwarded to VMS on No Reply)--Information Flow Diagram.

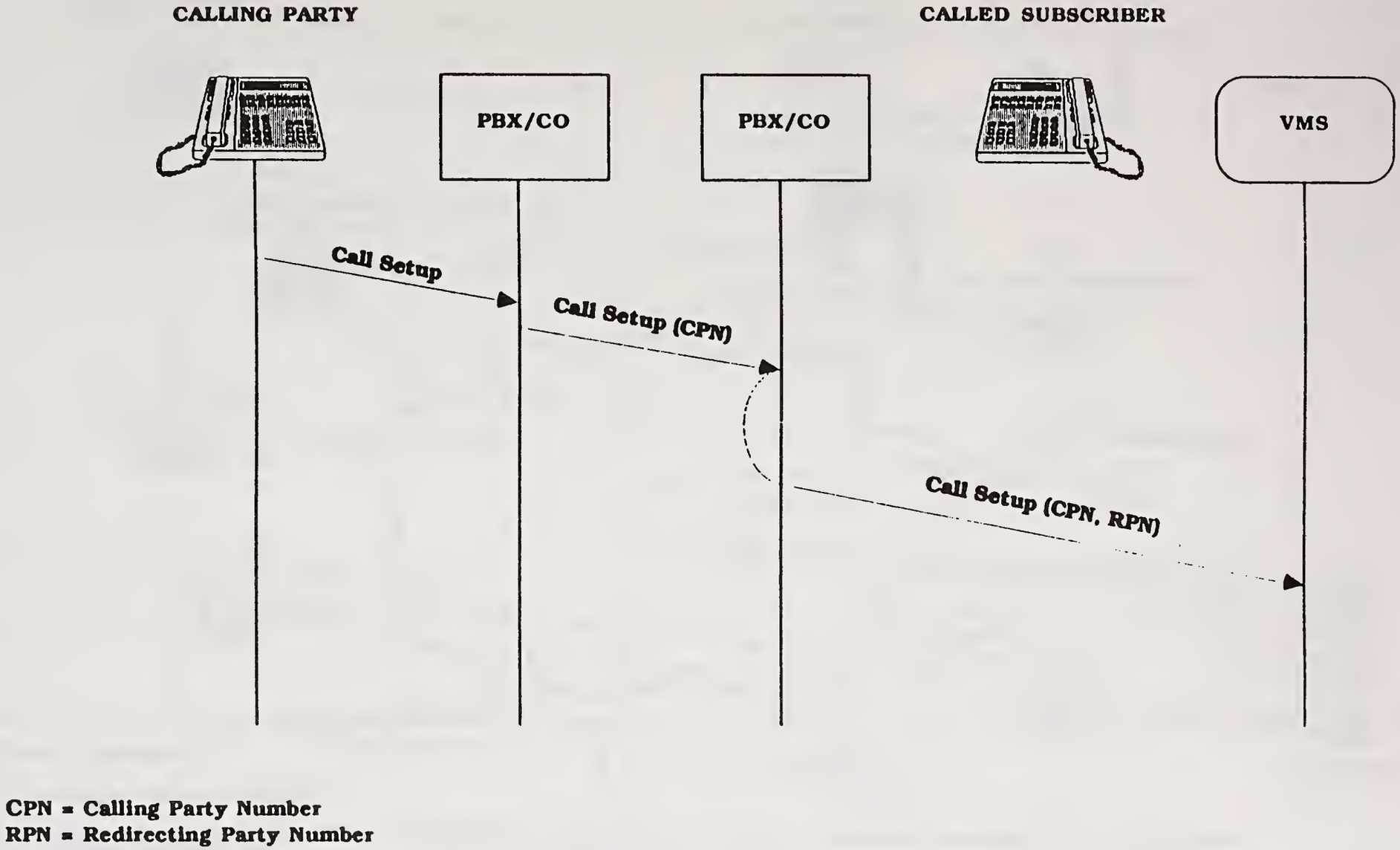


Figure 7-34. Subscriber Access--Call Answering (Call Forwarded to VMS on Busy/Unconditional)--Information Flow Diagram.

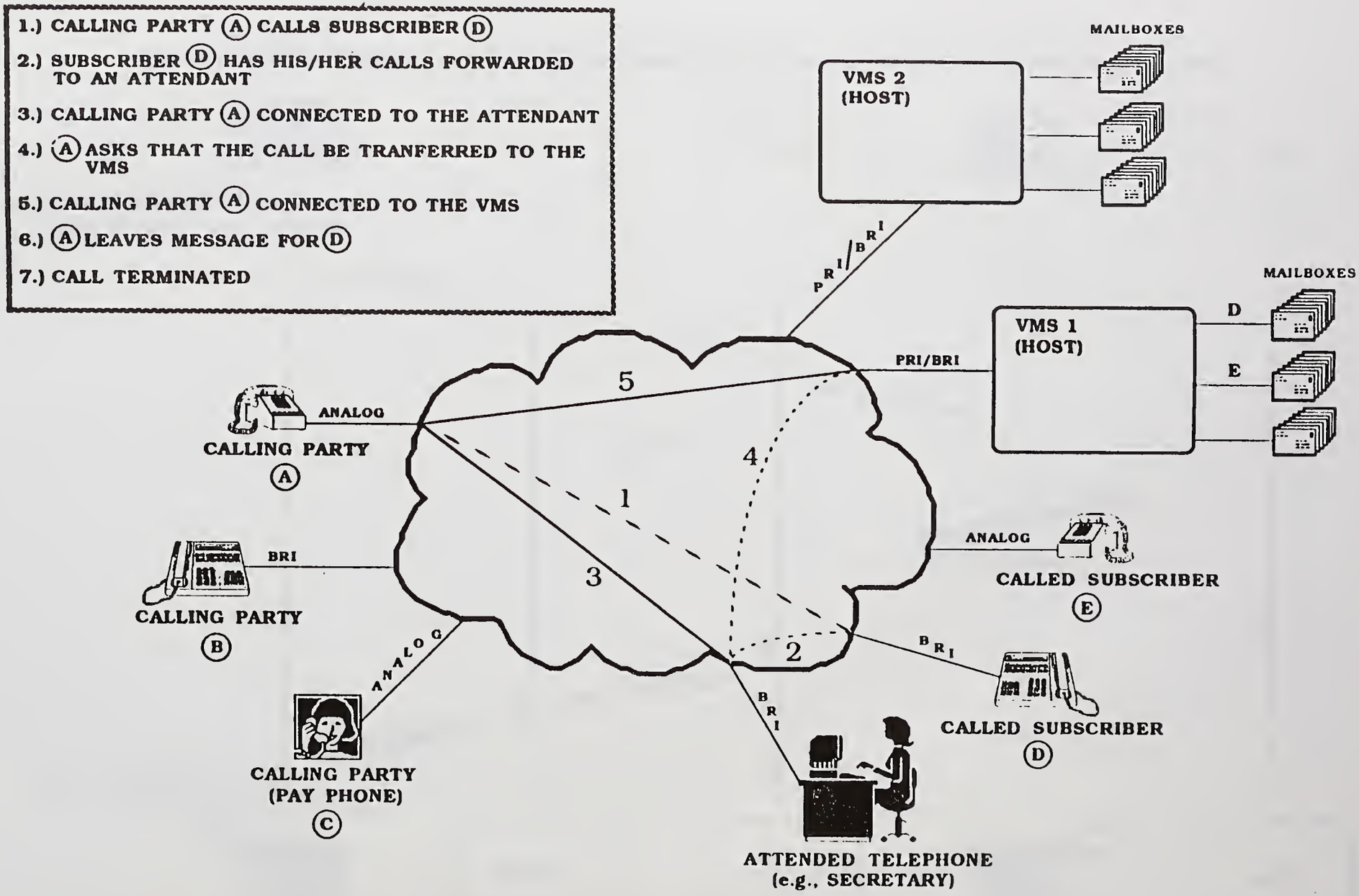


Figure 7-35. Subscriber Access--Call Answering (Call Forwarded to Attendant Who Transfers the Call to VMS).

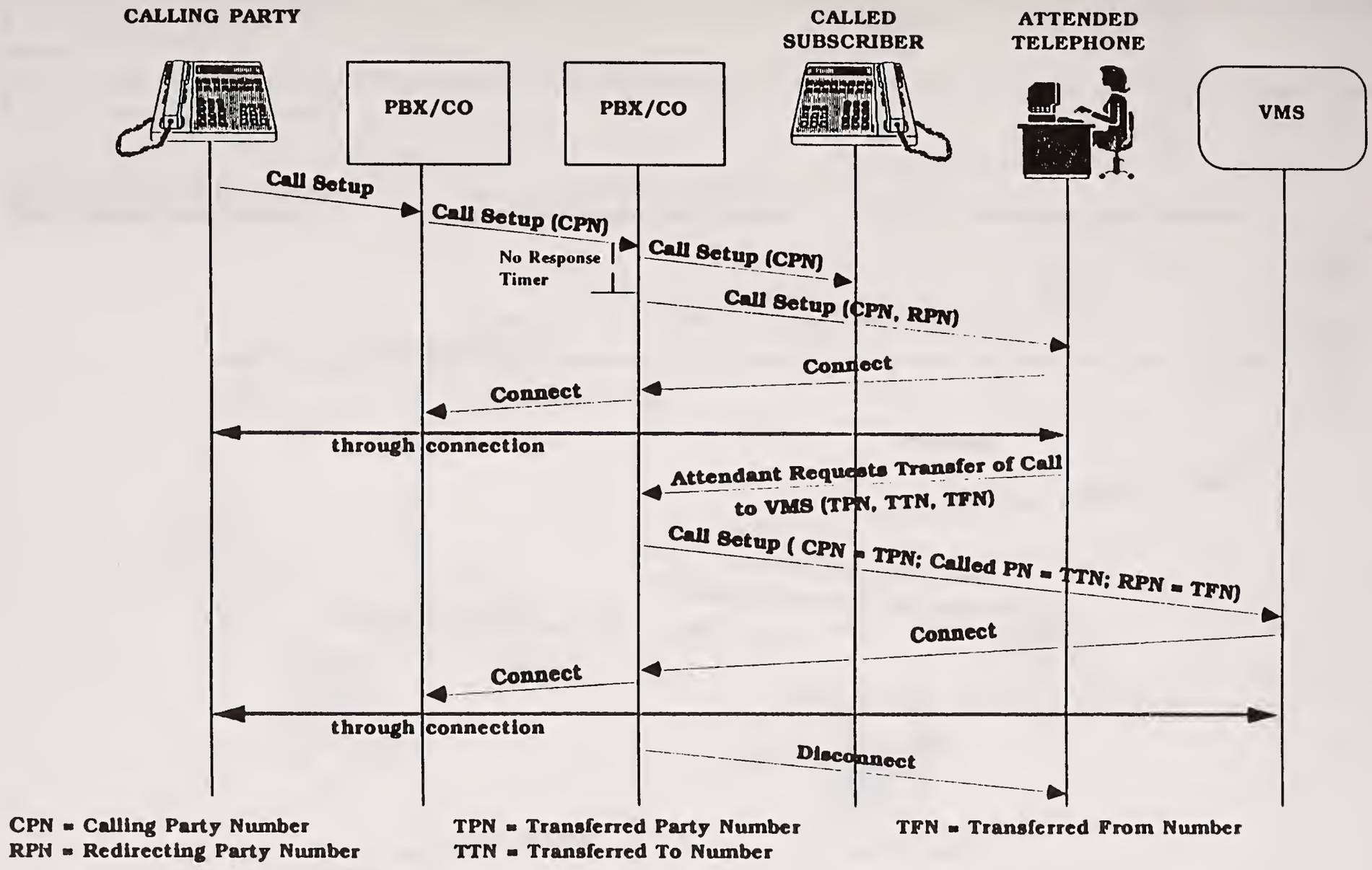


Figure 7-36. Subscriber Access--Call Answering (Call Forwarded on No Reply to Attendant Who Transfers the Call to the VMS)--Information Flow Diagram

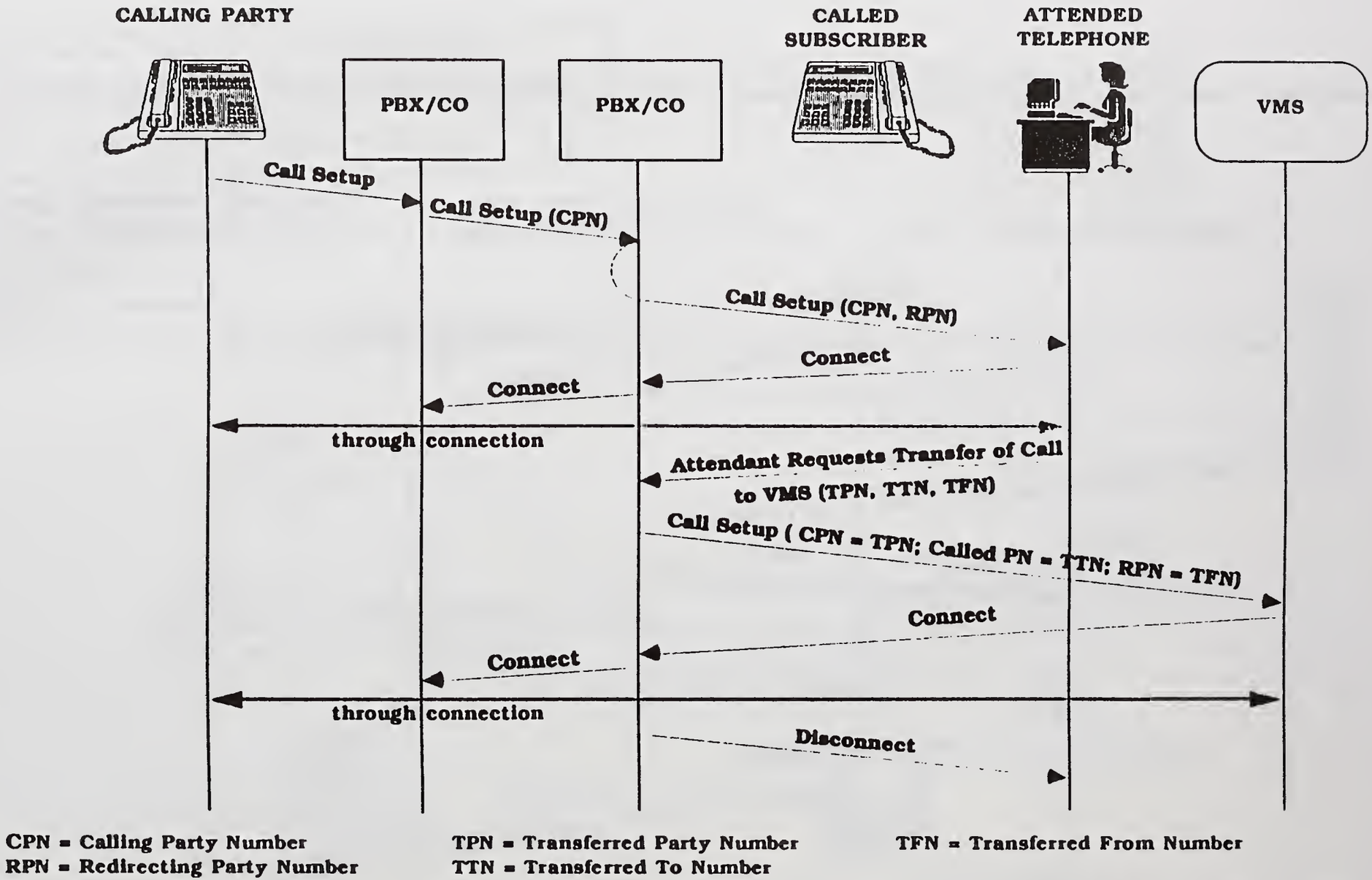


Figure 7-37. Subscriber Access--Call Answering (Call Forwarded on Busy/Unconditional to an Attendant Who Transfers the Call to the VMS)--Information Flow Diagram.

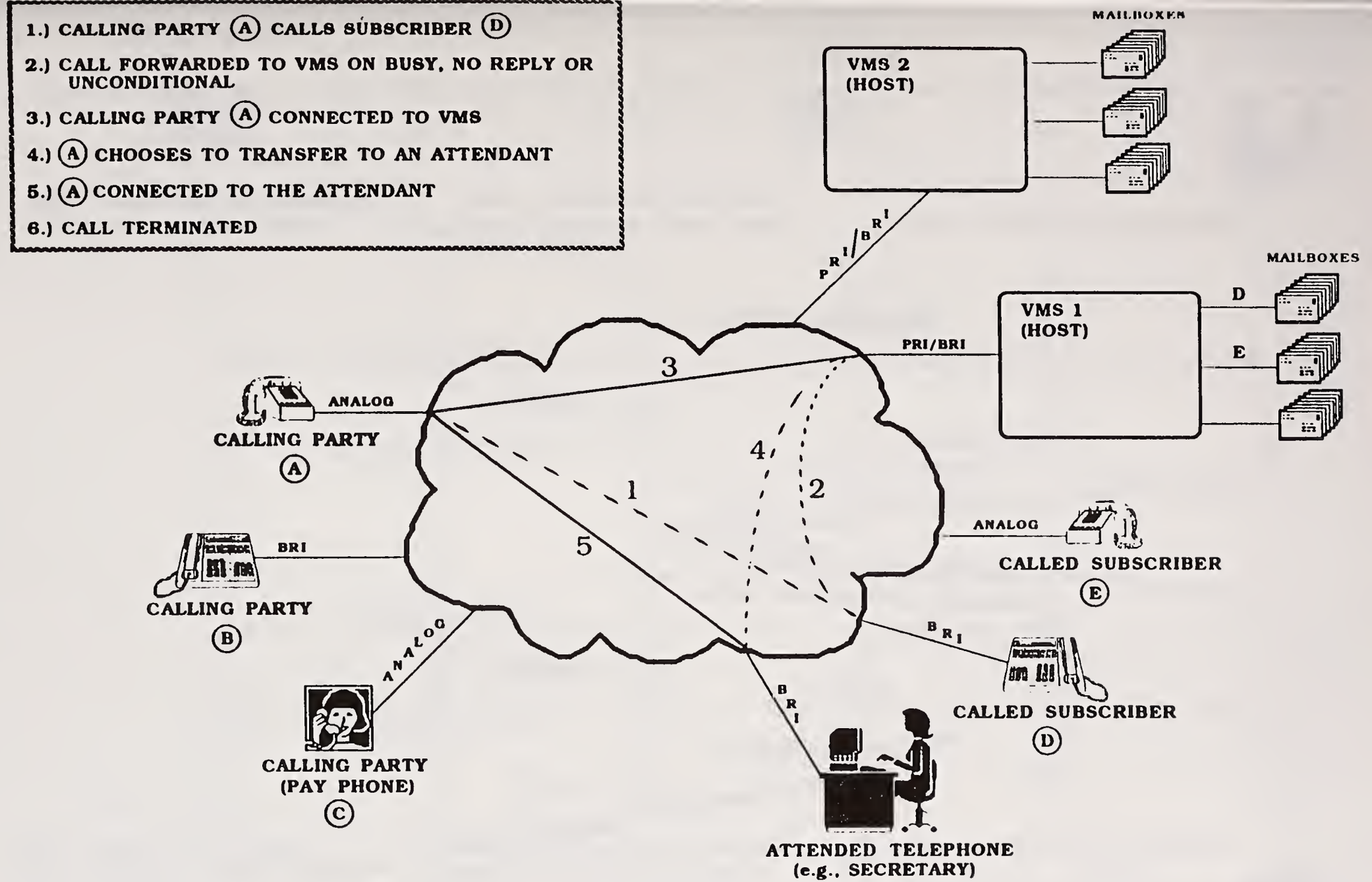


Figure 7-38. Subscriber Access--Call Answering with Call Transfer to an Attendant.

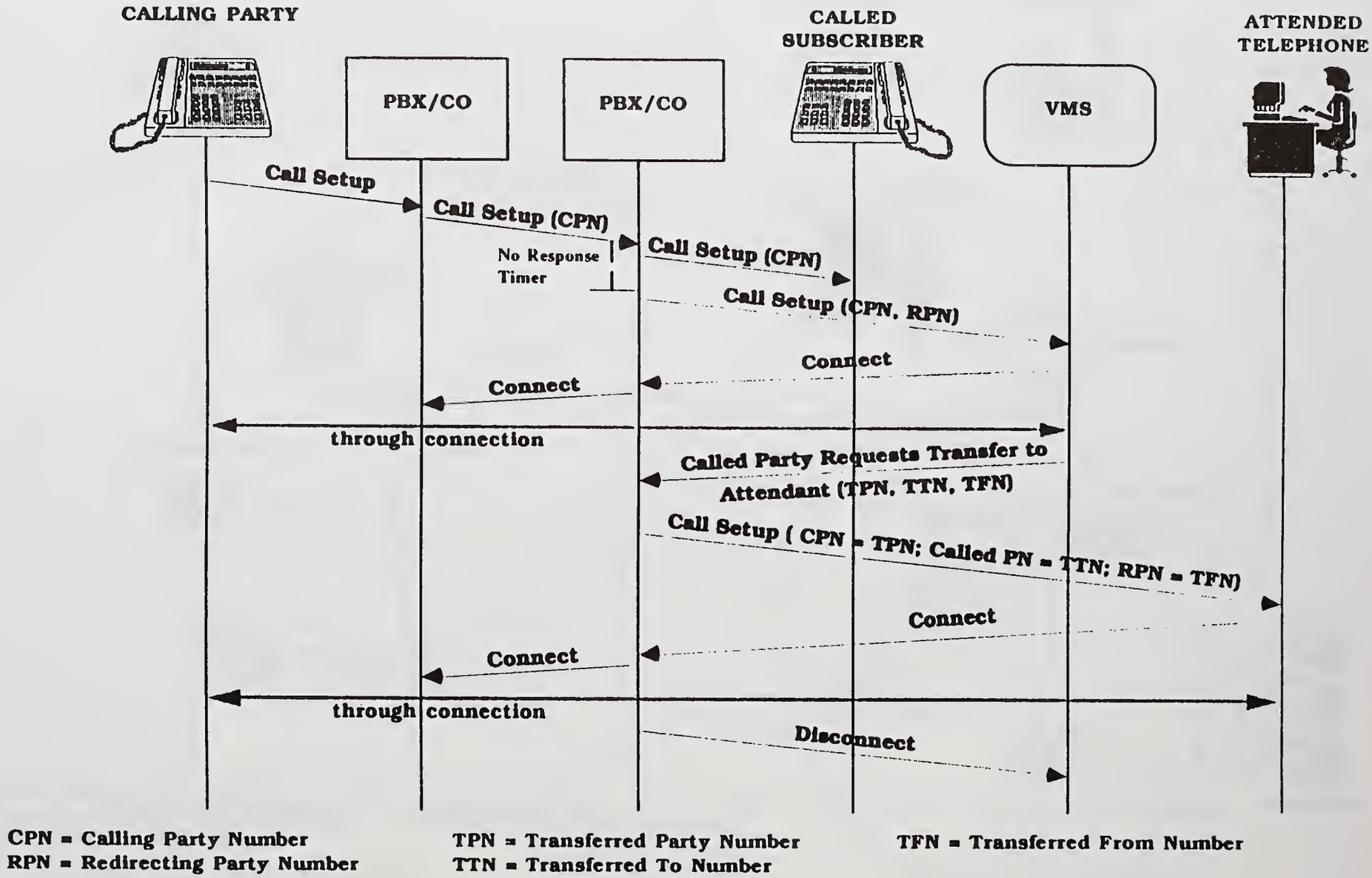


Figure 7-39. Subscriber Access--Call Answering (Call Forwarded to VMS on No Reply) With Call Transfer to an Attendant--Information Flow Diagram.

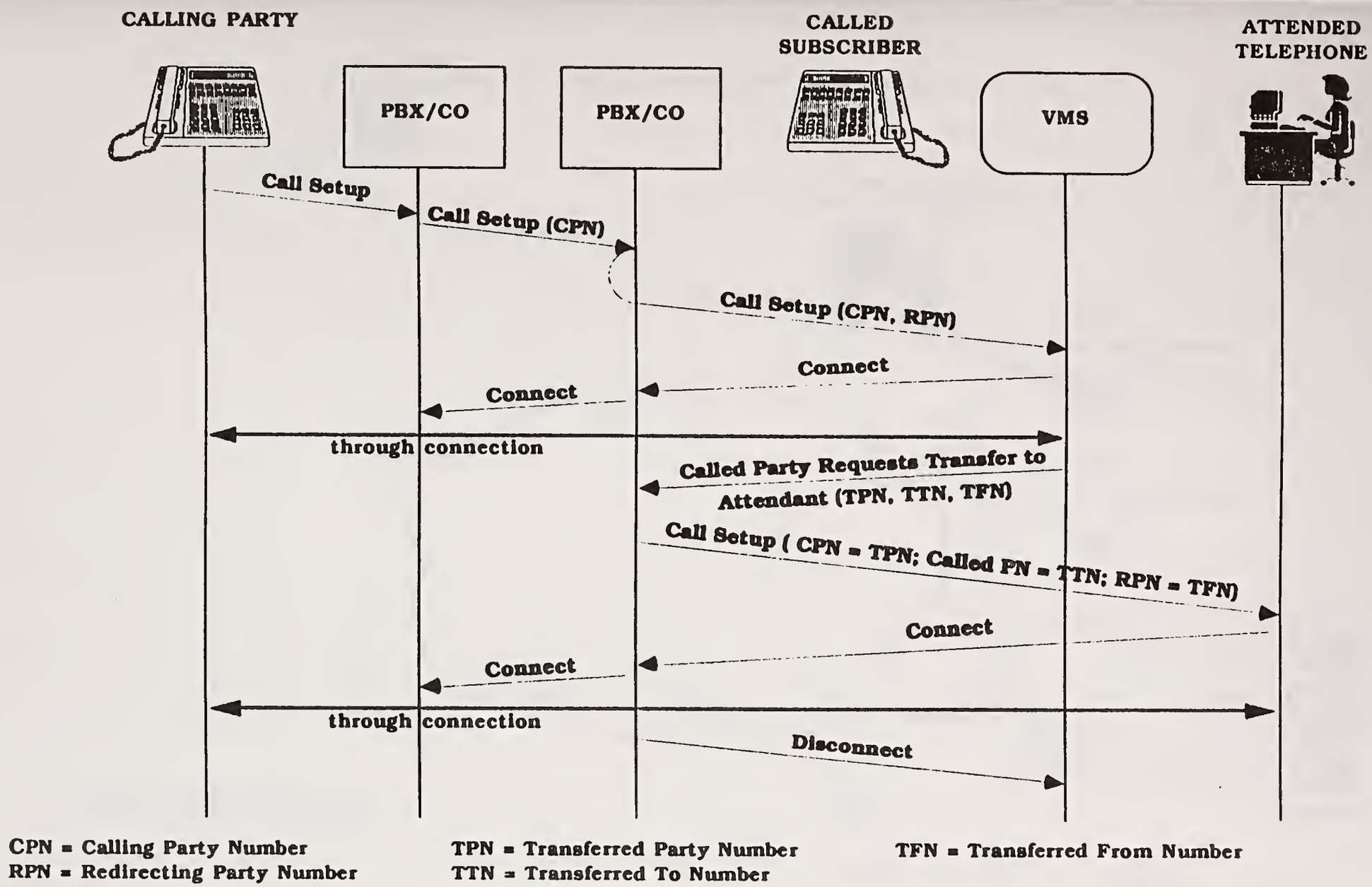


Figure 7-40. Subscriber Access--Call Answering (Call Forwarded to VMS on Busy/Unconditional) With Call Transfer to an Attendant--Information Flow Diagram.

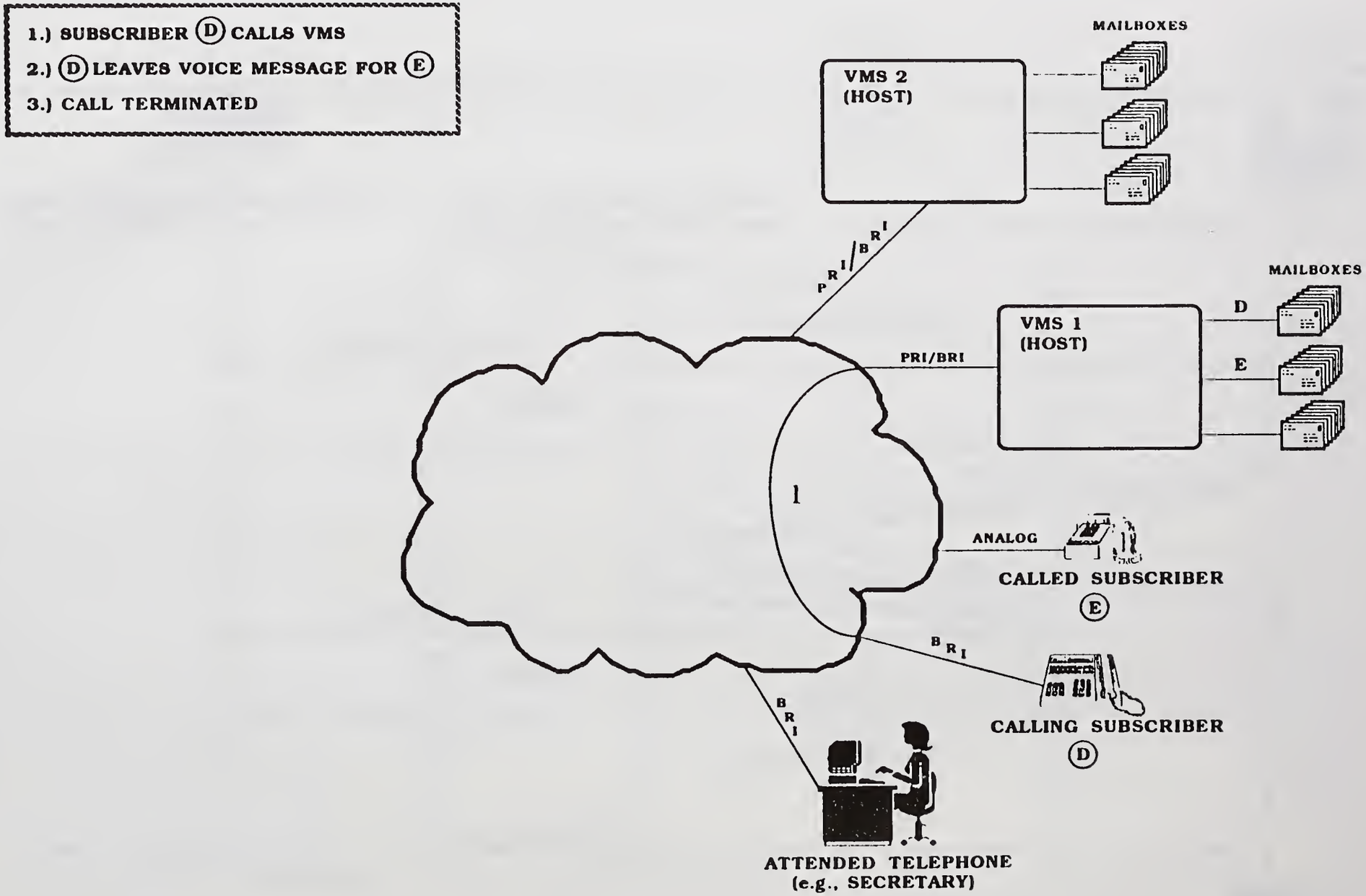
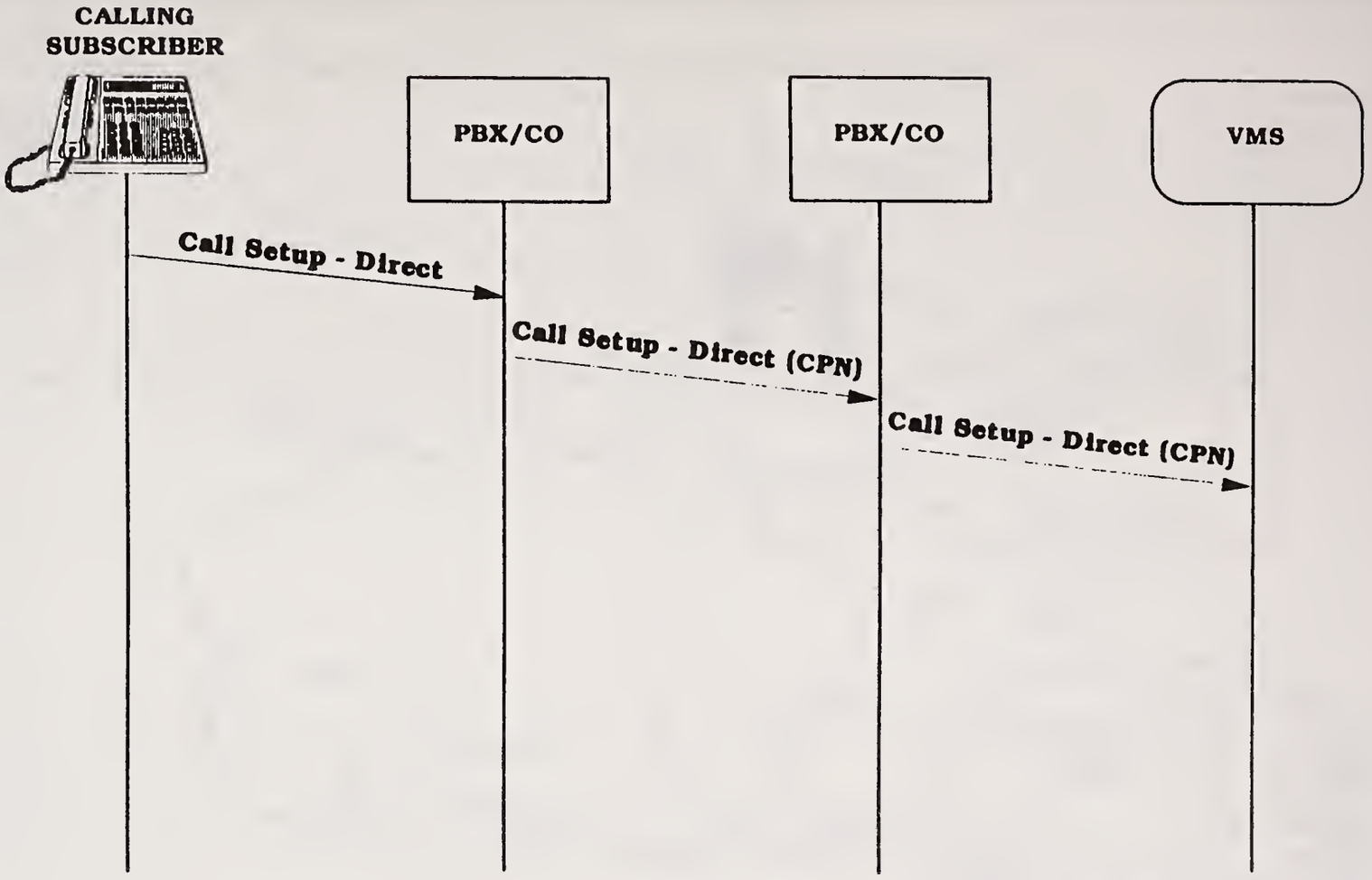


Figure 7-41. Subscriber Access--Direct Call to Voice Mail.



CPN = Calling Party Number

Figure 7-42. Subscriber Access--Direct Call to Voice Mail Information Flow Diagram.

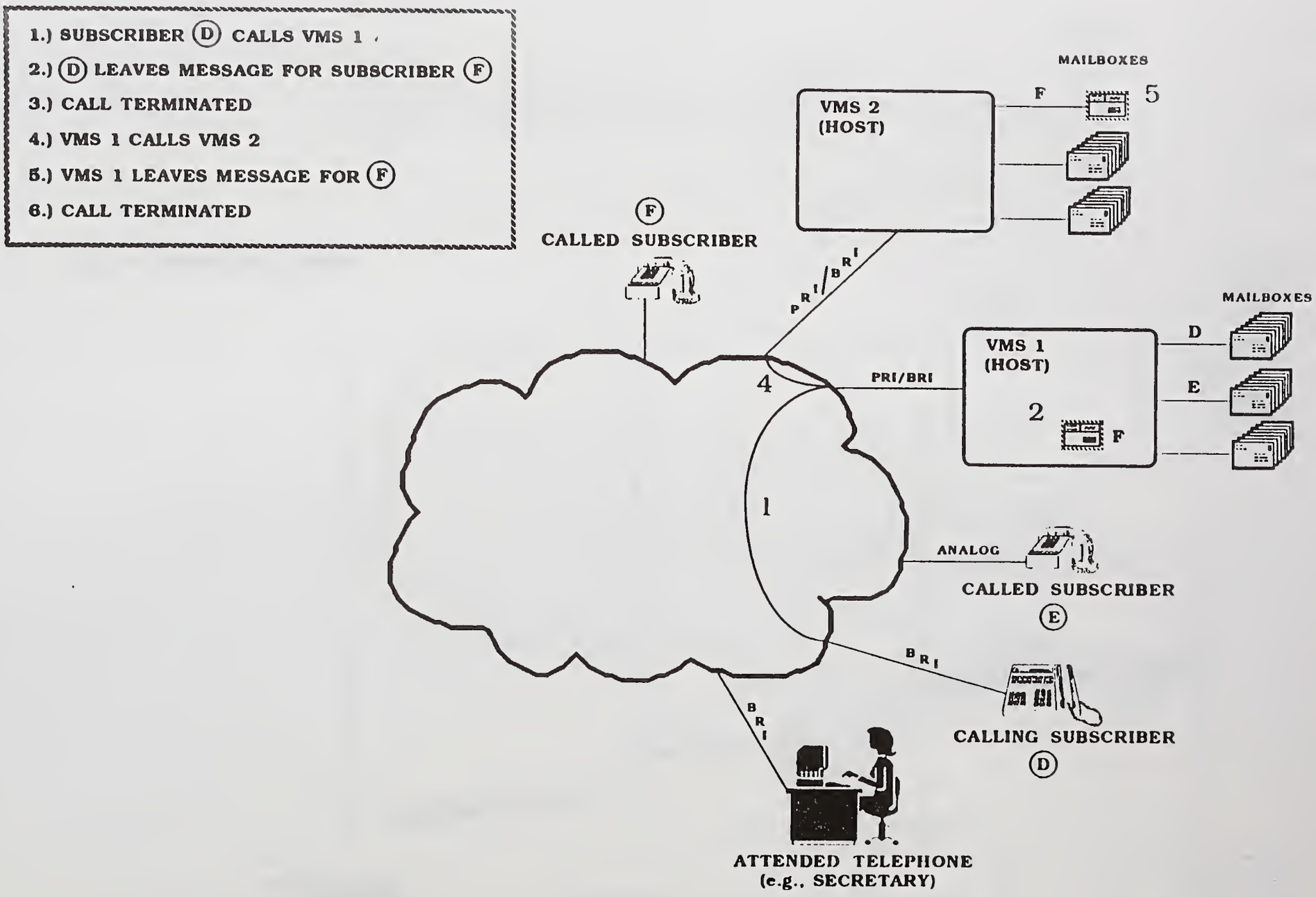


Figure 7-43. Subscriber Access--Direct Call to Voice Mail with Message Networking.

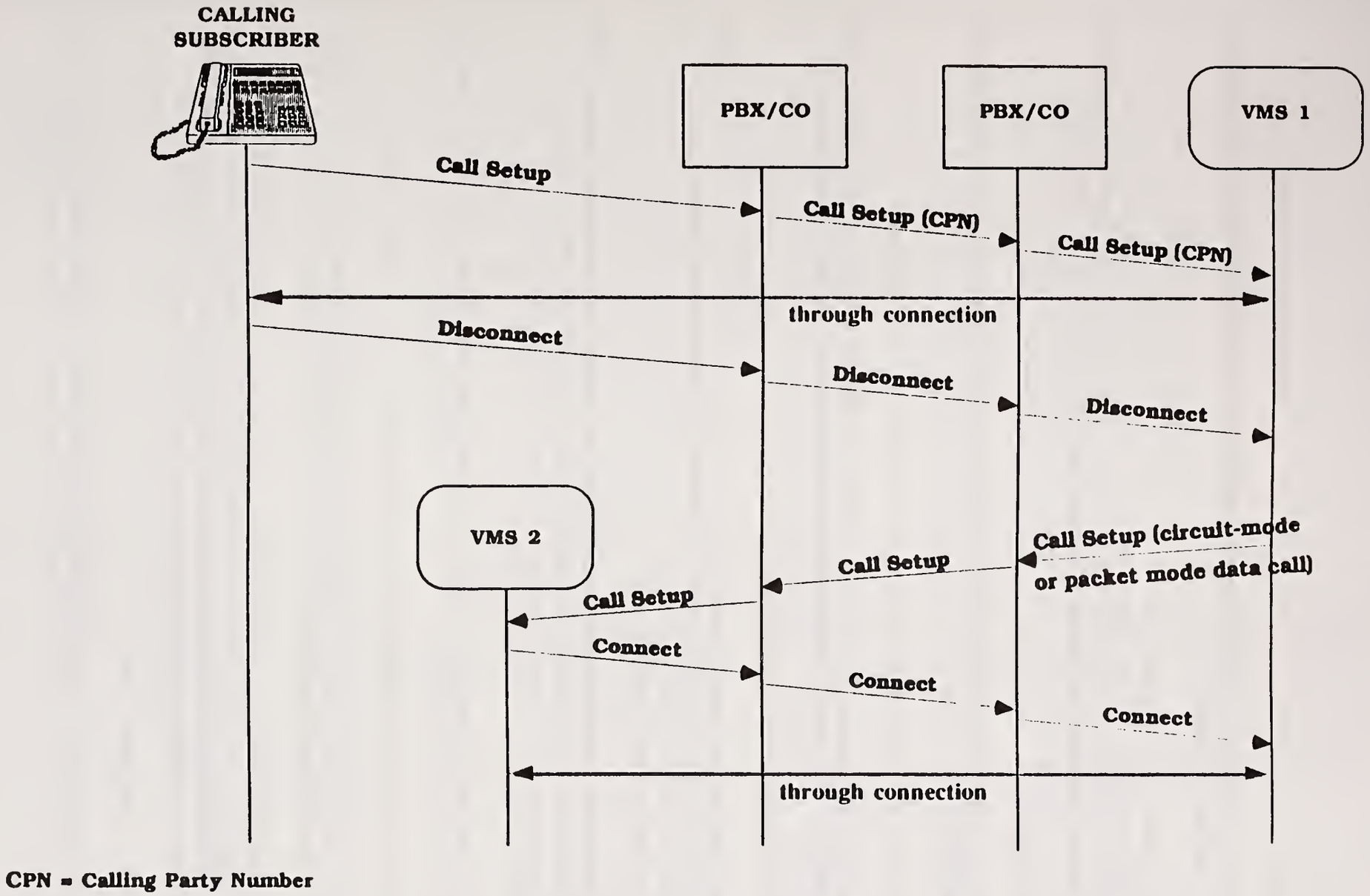


Figure 7-44. Subscriber Access--Direct Call to Voice Mail with Message Networking Information Flow Diagram.

Call Setup

The call setup process is described in NIU.301 (Appendix A) and NIU.302 (Appendix B). This process is used to establish the initial call.

Call Forwarding With Associated Data

The Call Forwarding supplementary service is defined in T1.xxx and NIU.xxx. This service supplies the VMS with the subscriber's DN which will be used to deposit the message in the proper mailbox.

Call Setup (direct)

The call setup process is described in NIU.301 and NIU.302. This process is used to setup a call directly to the VMS.

Call Delivery With Associated Data

The call (i.e., voice message) is delivered to the VMS using NIU.301 or NIU.302. These protocols supply the VMS with the subscriber's DN which will be used to deposit the message in the proper mailbox.

Connectivity to Called Subscriber's Mailbox

Current protocols exist to supply connectivity between the switch and the VMS; however, when connecting the VMS and the Switch via ISDN, the NIU.301 and NIU.302 documents are required.

Call Transfer With Associated Data

The Call Transfer supplementary service is defined in T1.xxx and NIU.xxx. These services supply the VMS with the subscriber's DN which will be used to deposit the message in the proper mailbox.

Call Termination

NIU.301 and NIU.302 describe the necessary terminating procedures required to release the connection between the VMS and the Switch.

Call Termination Outside VMS/Switch

NIU.301 and NIU.302 describe the necessary terminating procedures required to release the connection between the calling party and the Switch.

VMS Interoperability

The VMS Interoperability requirements are defined in T1.xxx and NIU.xxx. VMS Interoperability is critical in defining how VMSs communicate with one another.

7.5.1.4.2.4 Conformance Tests

The conformance tests to support this profile have not been written. This data will be supplied at a later date.

7.5.1.4.3 Subscriber Notification

The VMS Subscriber Notification is the second stage in the Message and Answering application process.

7.5.1.4.3.1 Application Process Description

The VMS has the capability to control the message waiting indicator (MWI) provided to the VMS subscriber via the ISDN switch. The MWI informs the VMS subscriber the status of recorded messages in the subscriber's mailbox. For an ISDN subscriber, the MWI may be a lamp, display or audible indication (e.g., interrupted dial-tone). For non-ISDN subscribers, the MWI should be in the form of an audible indication or visual indication supplied by the switch.

The MWI should be able to notify VMS subscribers when they have messages waiting and when there are no messages waiting. The terms activated and deactivated indicate which notification is being provided.

7.5.1.4.3.2 Subscriber Notification Process Alternative Architectures

VMS subscriber notification process is invoked whenever the VMS causes the ISDN network to "activate" or "deactivate" the VMS subscriber's message waiting indicator. Typically, the MWI is activated when a message is waiting and deactivated when no messages remain. However, the VMS may activate or deactivate the MWI at other times, such as during an error recovery process or if redundant MWI activation or deactivation messages are sent.

In typical existing implementations, all of the VMS's subscribers are connected to a single ISDN switch or PBX. The Messaging and Answering application physical environment for subscriber notification when the VMS subscribers and the VMS are connected to a single ISDN switch, is shown in figure 7-45. However, when a number of users in many locations subscribe to a single, centrally located VMS, then multiple ISDN switches are involved. The VMS first notifies the ISDN switch it is directly connected to tell the next switch (or the third, etc.) connected to the VMS subscriber to activate the VMS subscriber's MWI. This environment is shown in figure 7-47. The same steps occur in both environments when the VMS notifies the ISDN switch(s) to deactivate the subscriber's MWI. These environments are shown in figures 7-49 and 7-51.

7.5.1.4.3.3 Information Flow Diagrams

The Information Flow Diagrams for VMS subscriber notification are shown in figures 7-46, 7-48, 7-50 and 7-52.

7.5.1.4.3.4 Protocol Requirements and Application Service Element Description

The supplementary service, Message Waiting Indicator Control and Notification, will be the primary requirement specification to implement the following sub-sections. See figures 7-45 through 7-51. Please note that the required T1.xxx and NIU.xxx will be supplied as they become available. NIU.xxx implies that the Messaging and Answering Profile team is requesting the Supplementary Services Working Group to create the Message Waiting Indicator Control and Notification document.

Message Waiting Indicator Control Activation (VMS to Switch)

The requirements for MWI Control activation between the VMS and the Switch are in T1.xxx and NIU.XXX.

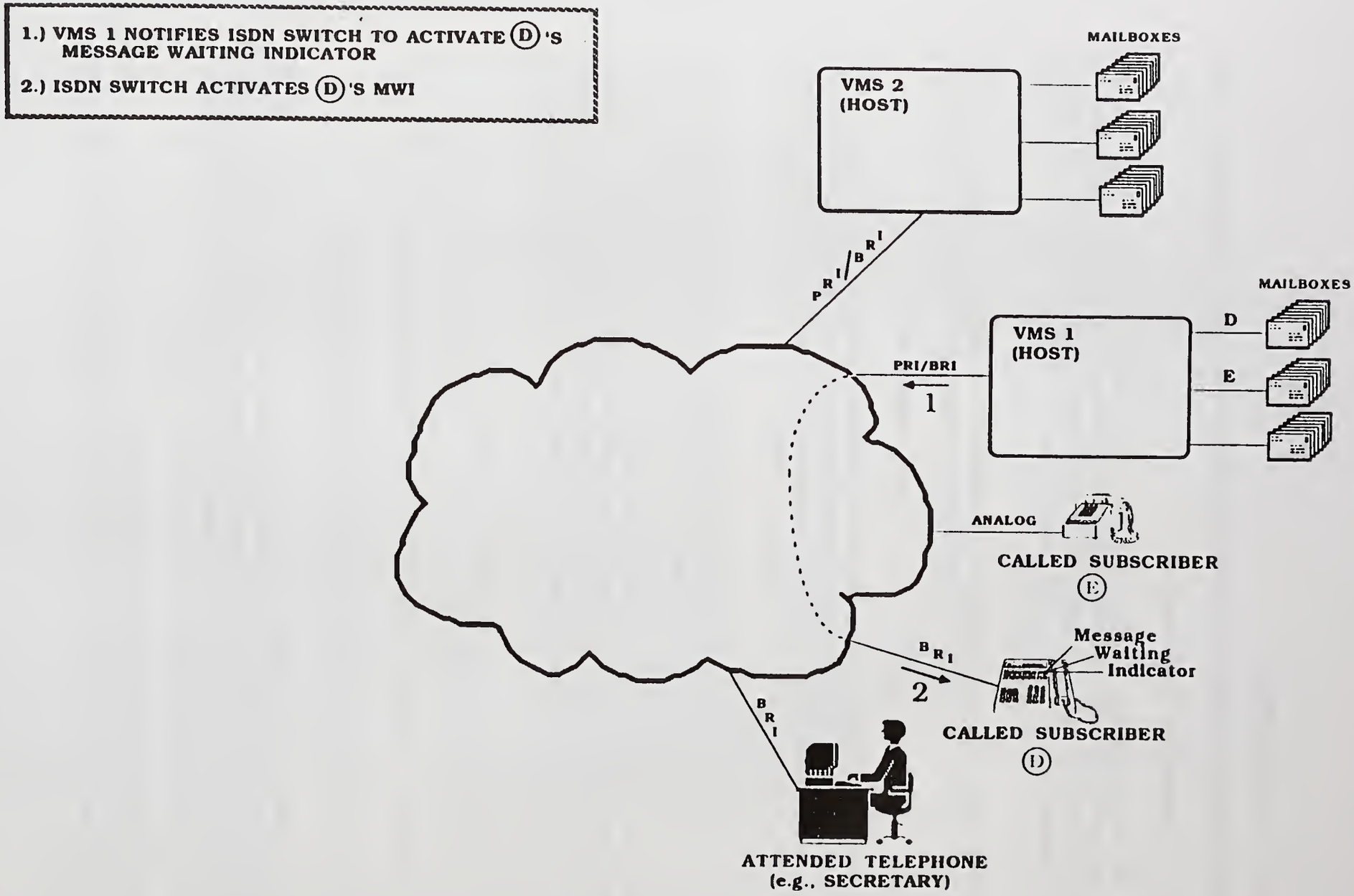


Figure 7-45. Subscriber Notification (MWI Activation)--VMS and Subscriber Off a Single ISDN Switch.

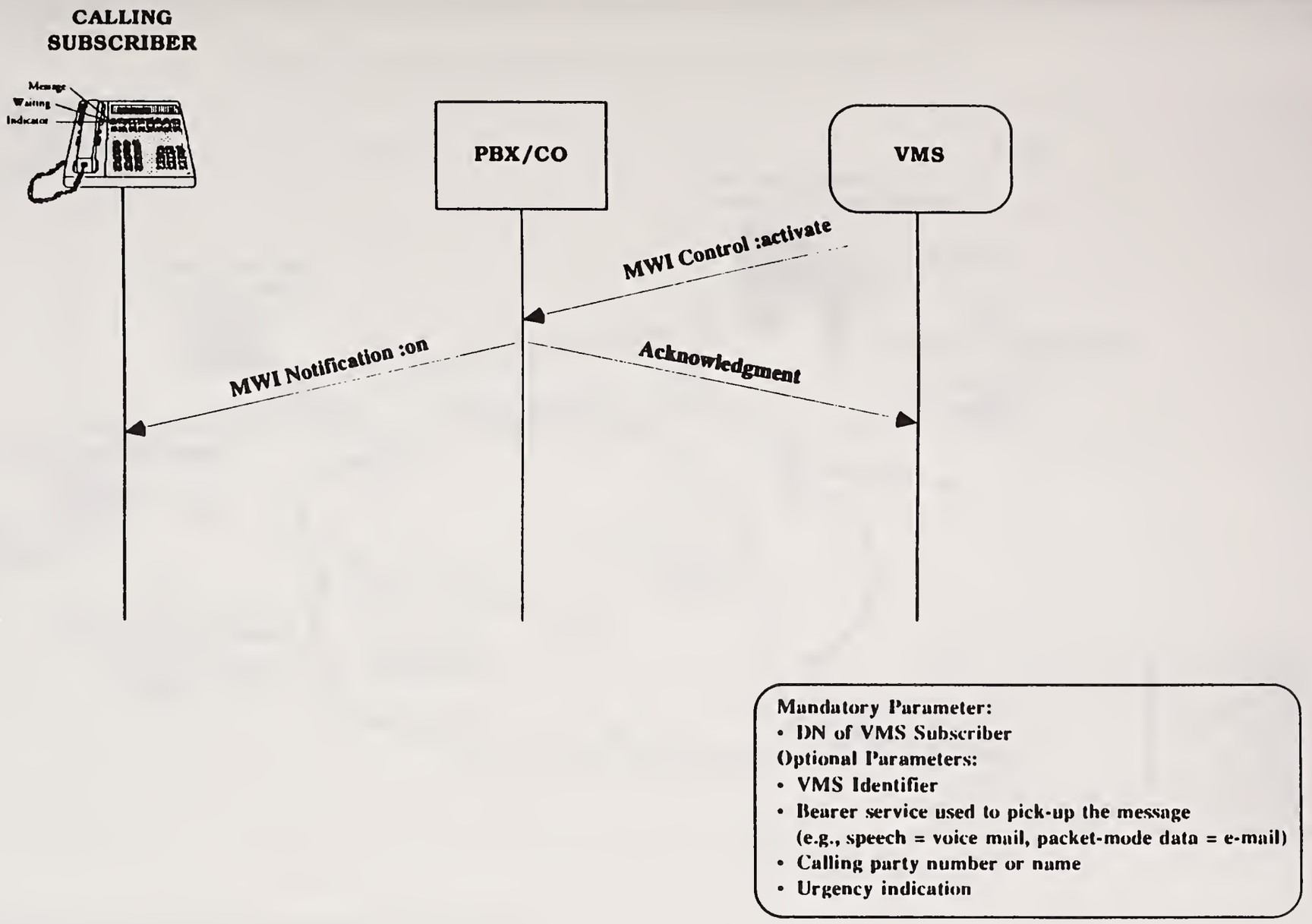


Figure 7-46. Subscriber Notification (MWI Activation--VMS and Subscriber Off a Single ISDN Switch) Information Flow Diagram.

1.) VMS 1 NOTIFIES ISDN SWITCH 1 TO ACTIVATE (B)'S MESSAGE WAITING INDICATOR

2.) SWITCH 1 NOTIFIES SWITCH 2 TO ACTIVATE (B)'S MWI

3.) SWITCH 2 ACTIVATES (B)'S MWI

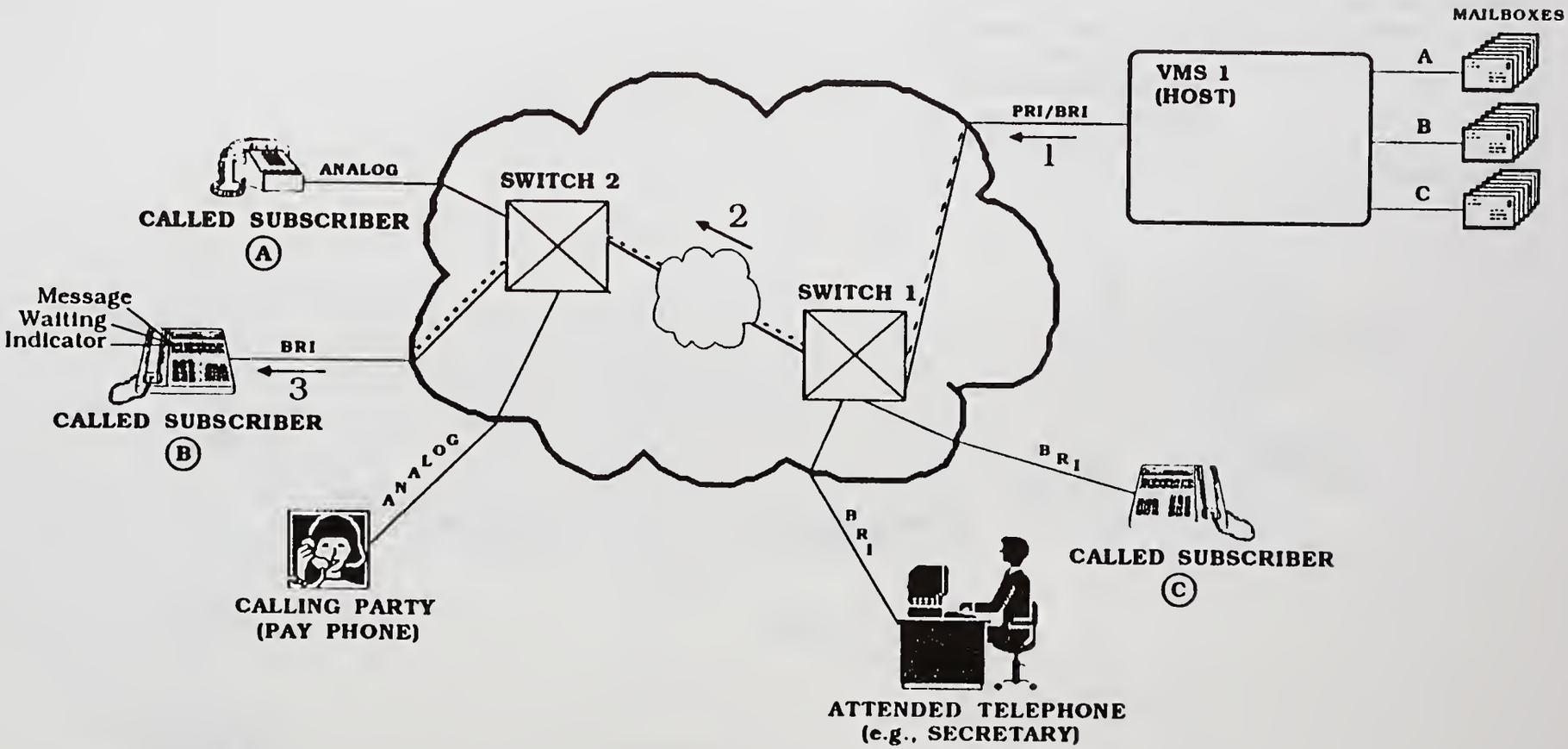


Figure 7-47. Subscriber Notification (MWI Activation) with Centralized VMS.

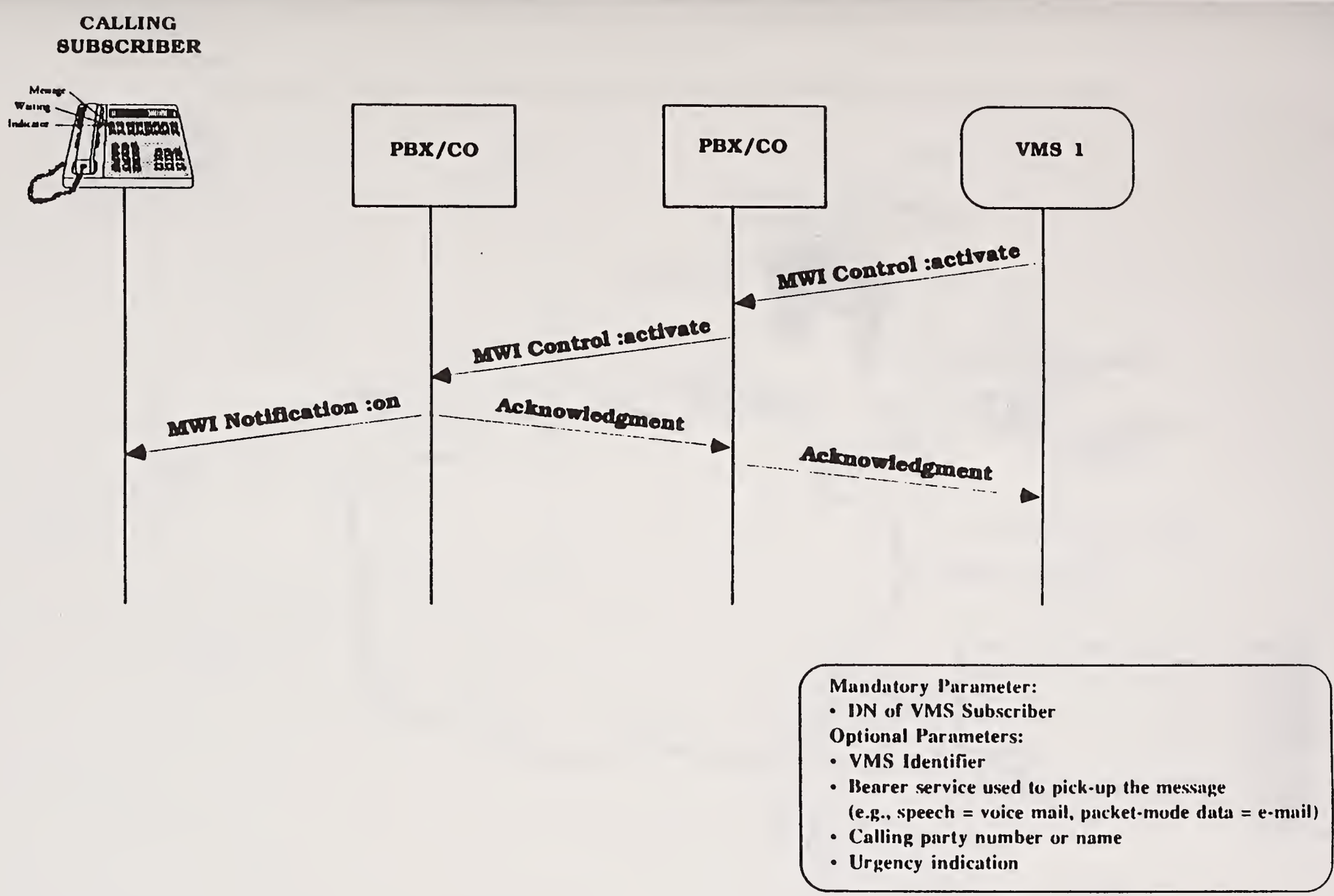


Figure 7-48. Subscriber Notification (MWI Activation) with Centralized VMS.

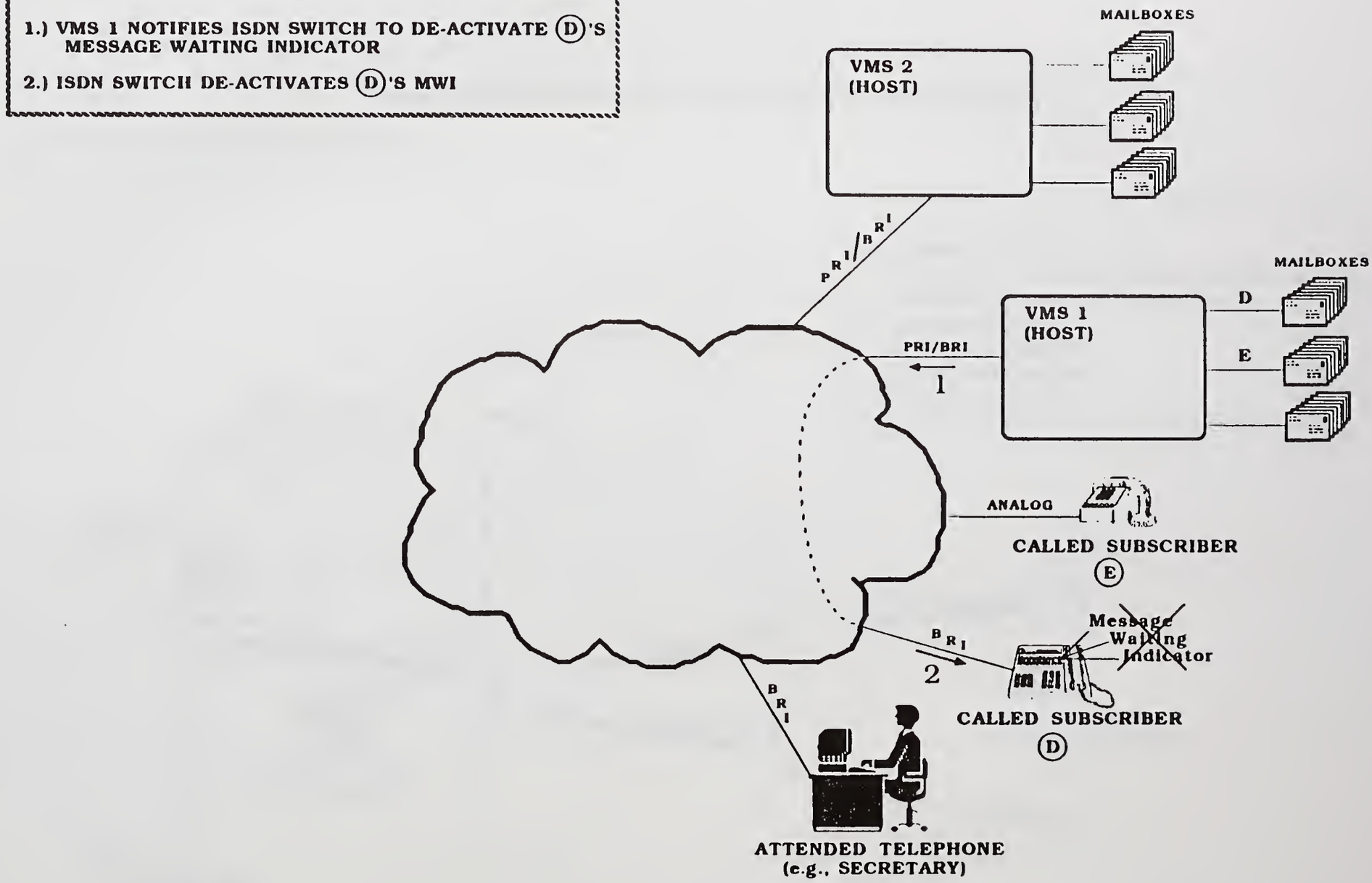
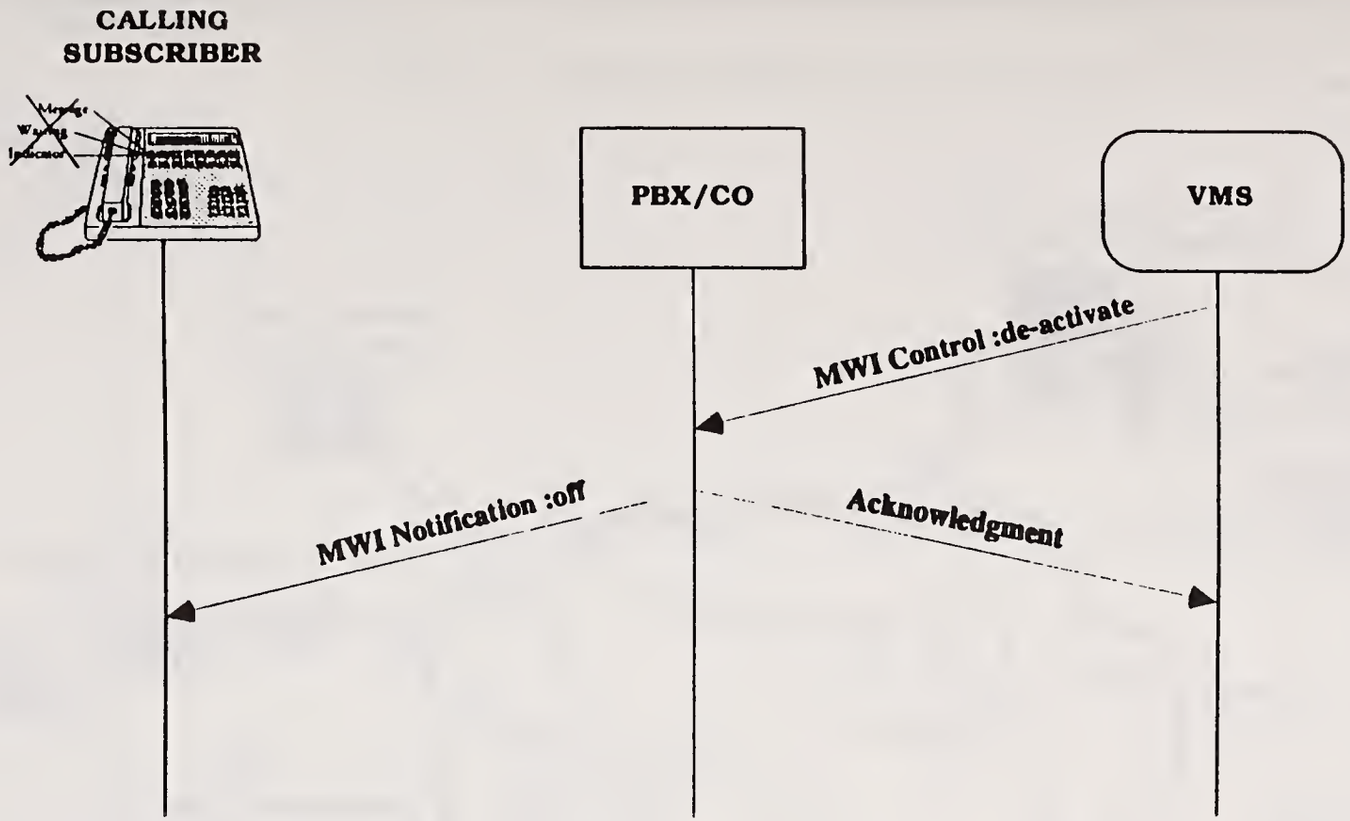


Figure 7-49. Subscriber Notification (MWI Deactivation)--VMS/Subscriber Off a Single ISDN Switch.



Mandatory Parameter:
- DN of VMS Subscriber

Optional Parameters:
- VMS Identifier
- Bearer service used to pick-up the message (e.g., speech = voice mail, packet-mode data = e-mail)
- Calling party number or name
- Urgency indication

Figure 7-50. Subscriber Notification (MWI Deactivation)--VMS and Subscriber Off a Single ISDN Switch--Information Flow Diagram.

1.) VMS 1 NOTIFIES ISDN SWITCH 1 TO DE-ACTIVATE (B)'S MESSAGE WAITING INDICATOR

2.) SWITCH 1 NOTIFIES SWITCH 2 TO DE-ACTIVATE (B)'S MWI

3.) SWITCH 2 DE-ACTIVATES (B)'S MWI

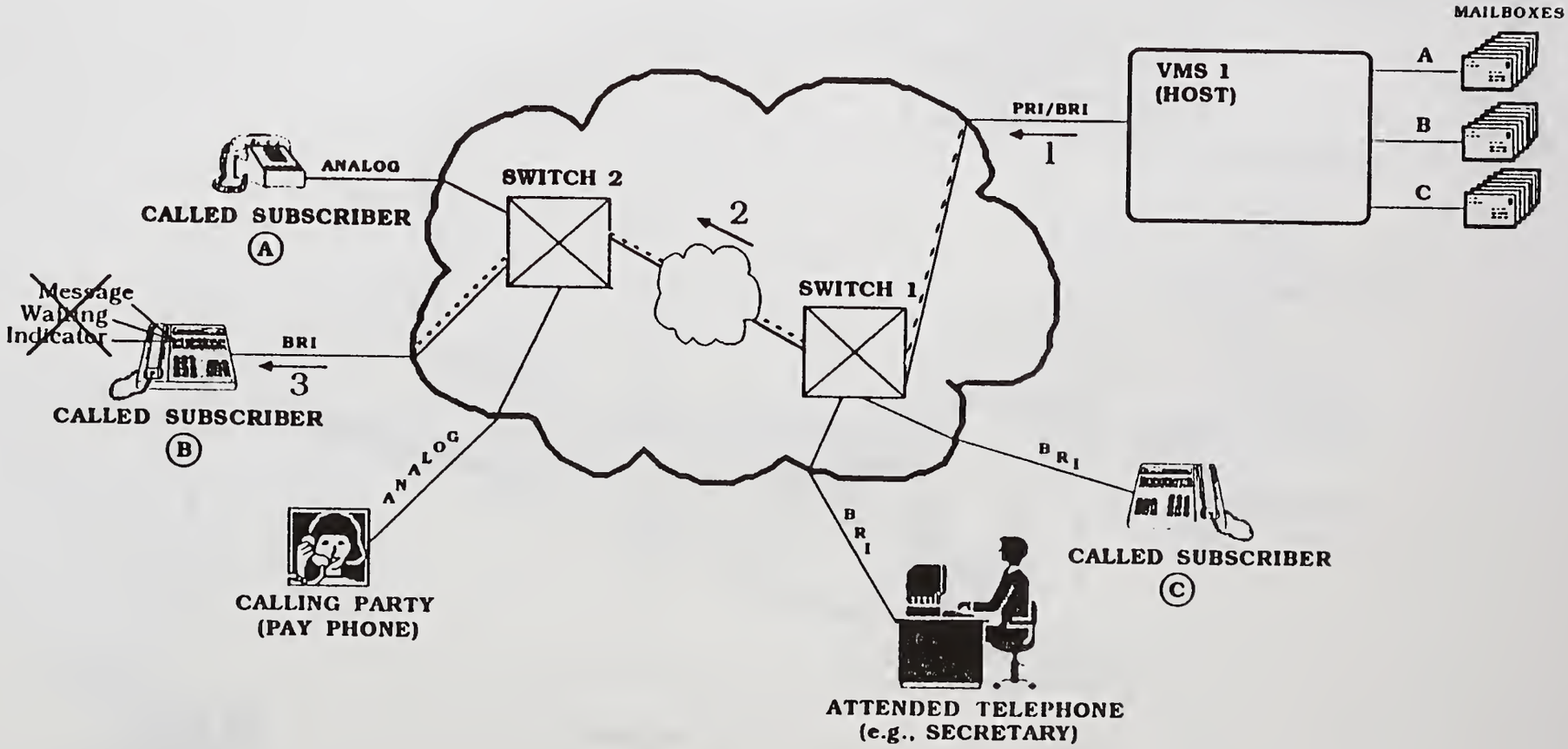


Figure 7-51. Subscriber Notification (MWI Deactivation) With Centralized VMS.

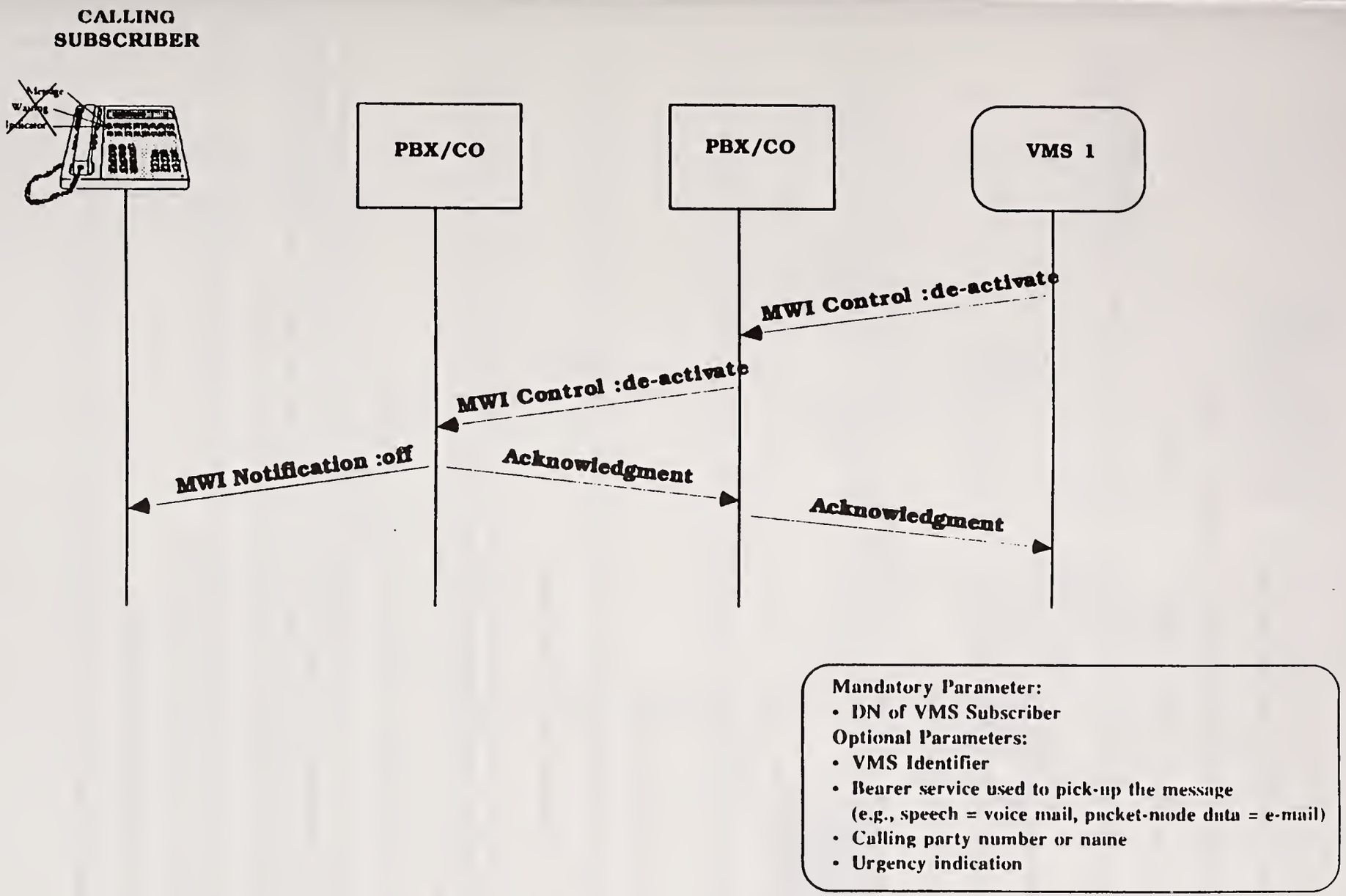


Figure 7-52. Subscriber Notification (MWI Deactivation) with Centralized VMS.

MWI Activation (Switch to Terminal Equipment)

The requirements for MWI activation are in T1.xxx and NIU.XXX.

MWI Control Deactivation (VMS to Switch)

The requirements for MWI Control deactivation between the VMS and the Switch are in T1.xxx and NIU.XXX.

MWI Deactivation (Switch to Terminal Equipment)

The requirements for MWI deactivation are in T1.xxx and NIU.XXX.

Network Signaling Requirements

The requirements for MWI Network signaling are in T1.xxx and NIU.XXX. These requirements are necessary for controlling the MWI for a centralized VMS. The TCAP messages are sent within the network to control the MWI.

7.5.1.4.3.5 Conformance Tests

The conformance tests to support this profile have not been written. This data will be supplied at a later date.

7.5.1.4.4 Subscriber Retrieval

The VMS Subscriber Retrieval process is the third stage in the Message and Answering application process.

7.5.1.4.4.1 Application Process Description

When the VMS subscribers message waiting indicators show waiting messages the VMS subscribers access the VMS directly to retrieve and process their voice messages. Once the retrieval stage is completed, the VMS must notify the ISDN switch to deactivate the MWI.

7.5.1.4.4.2 Called Subscriber Retrieval Alternative Architectures

A VMS subscriber may be connected to the VMS by several different service elements, such as Direct Call Set-up, Call Forwarding, Call Transfer, etc. The particular service element used to establish connectivity is not critical to the VMS subscriber retrieval stage. It is important that the VMS subscribers be connected to the VMS with an opportunity to retrieve the messages from their mailboxes.

The Message and Answering physical environments for when the VMS subscribers and VMS are connected to the same ISDN switch is shown in figure 7-53.

7.5.1.4.4.3 Information Flow Diagrams

The Information Flow from VMS subscriber access into a VMS is shown in figure 7-54.

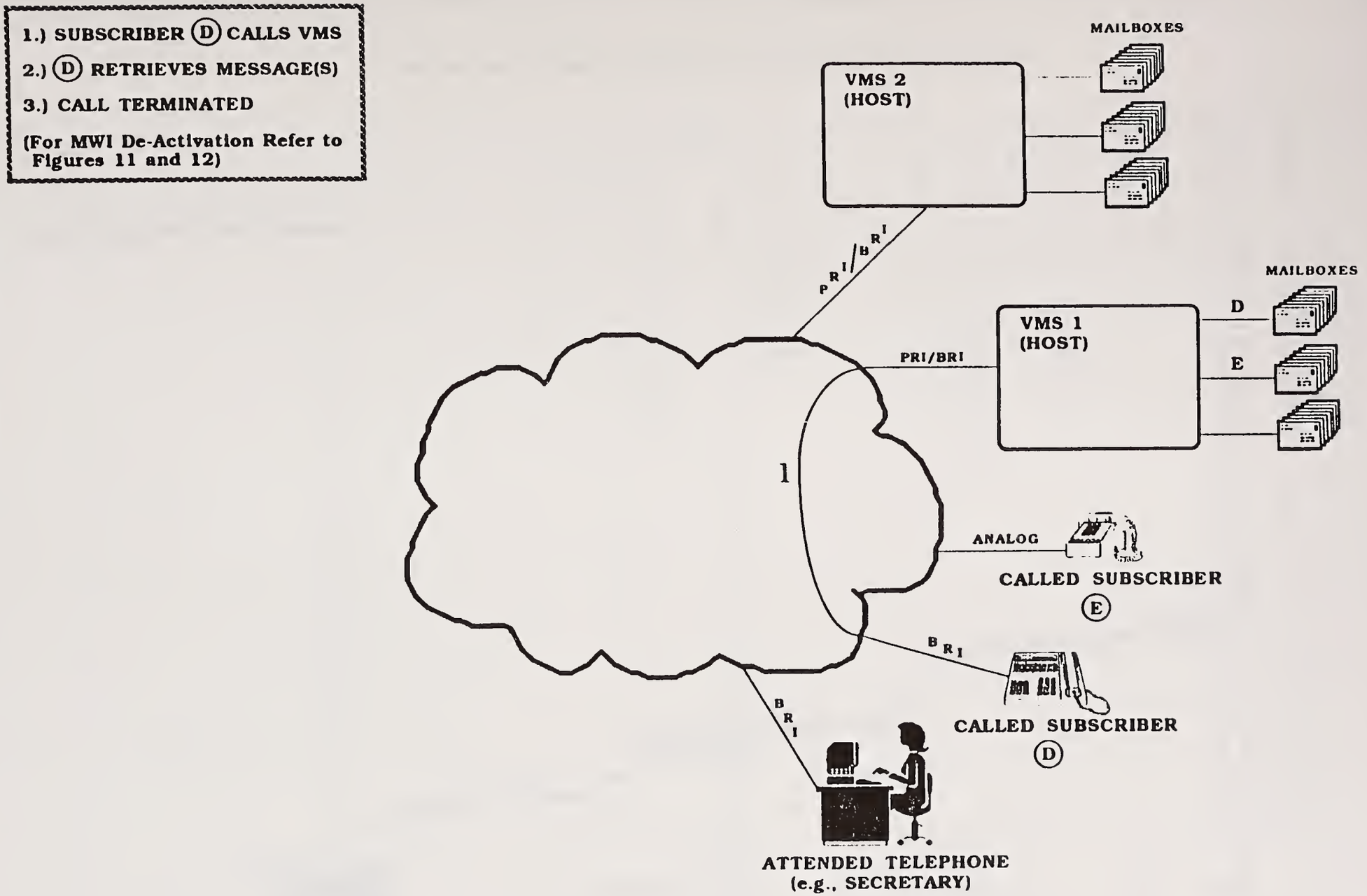
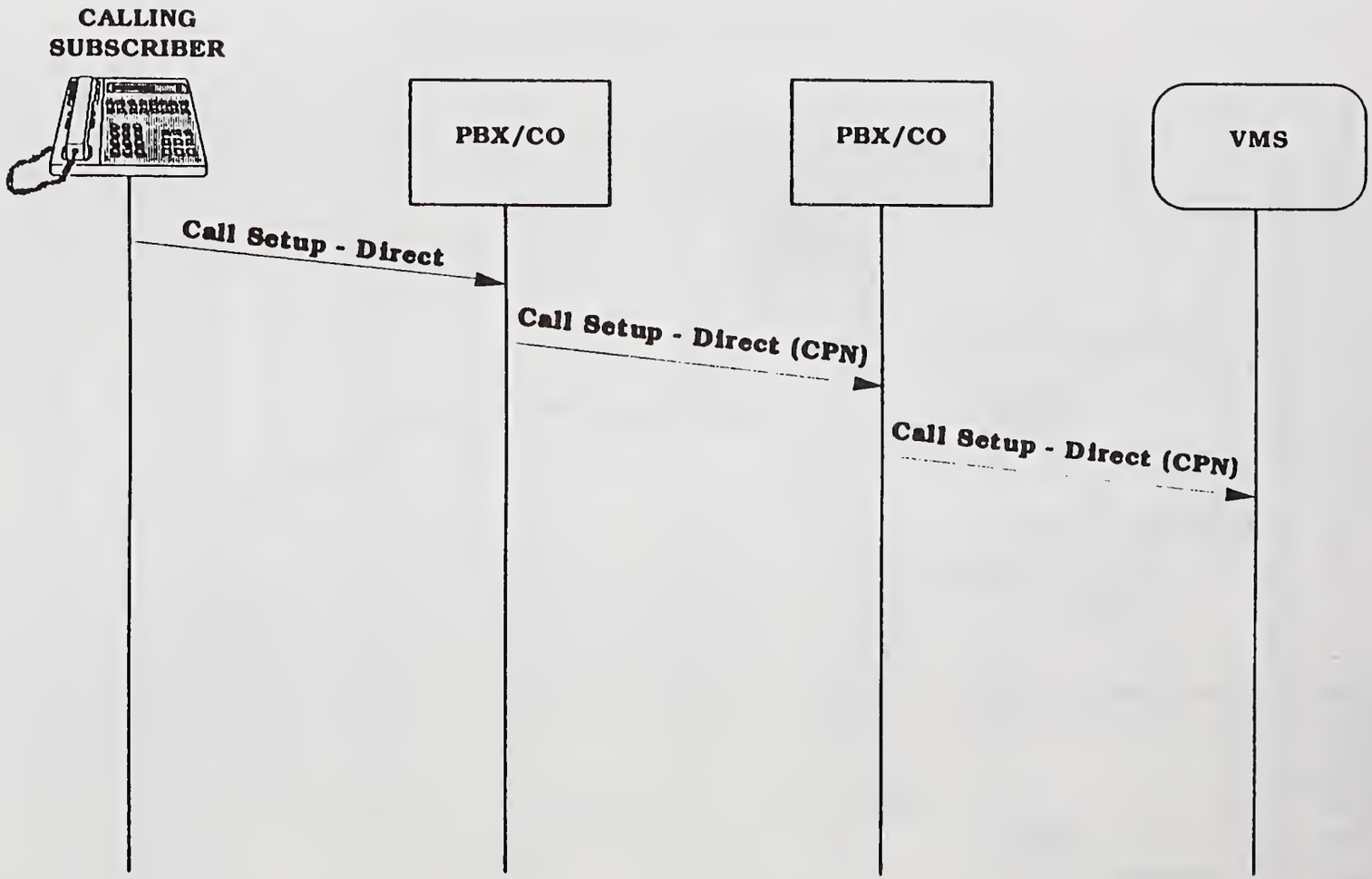


Figure 7-53. Subscriber Message Retrieval.



CPN = Calling Party Number

Figure 7-54. Subscriber Message Retrieval--Information Flow Diagram.

7.5.1.4.4.4 Protocol Requirements and Application Service Element Description

The protocol requirements and application service elements necessary for subscriber retrieval are a subset of those in section 7.5.1.4.2.3.

Call Setup (Direct)

See section 7.5.1.4.2.3.

Call Delivery With Associated Data

See section 7.5.1.4.2.3.

Connectivity to Called Subscriber's Mailbox

See section 7.5.1.4.2.3.

Call Termination

See section 7.5.1.4.2.3.

7.5.1.4.4.5 Conformance Tests

The conformance tests to support this profile have not been written. This data will be supplied at a later date.

7.5.1.4.5 Summary of MA processes

See Table 7-17.

Table 7-17. Voice Messaging and Answering Application Service Elements

PROCESSES / CASES	Subscriber Access		Subscriber Notification		Subscriber Message Retrieval
	Caller	Message Networking	Activation	De-Activation	
Call Answering	• Call Setup • Call Forward with Assoc. Data • Connectivity to Called Subscriber's Mailbox • Call Termination	NA	• MWI Control Activation • MWI Activation • Network Signalling Requirements	• MWI Control Deactivation • MWI Deactivation • Network Signalling Requirements	• Call Setup • Call Delivery with Associated Data • Connectivity to Called Subscriber's Mailbox • Call Termination
Call Answering With Call Transfer	• Call Setup • Call Forward with Assoc. Data • Connectivity to Called Subscriber's Mailbox (• Call Termination outside VMS/Switch)	NA	NA	NA	NA
Direct Access to VoiceMail	• Call Setup (direct) • Call Delivery with Assoc. Data • Connectivity to Called Subscriber's Mailbox • Call Termination	• Call Setup (direct) • Call Delivery with Assoc. Data • Connectivity to Called Subscriber's Mailbox • Call Termination • VMS Interoperability	• MWI Control Activation • MWI Activation • Network Signalling Requirements	• MWI Control Deactivation • MWI Deactivation • Network Signalling Requirements	•Call Setup •Call Delivery with Associated Data • Call Termination

7.6 Future Bandwidth Negotiation

Editor's Note: This section is reserved for future agreements on Bandwidth Negotiation.

7.7 Network Management/ISDN Administration

Editor's Note: This section is reserved for future agreements on Network Management/ISDN Administration.

7.7.1 ISDN Station Event Recording (ISER)

7.7.1.1 Basic Description

ISDN (and non-ISDN) users require detailed records of station events in a universal format independent of the switching element.

The expected benefits of this application are:

- Standard format for ISDN station event data
- Standard protocol for data transfer
- User-selectable interface
- Flexibility with regard to the data transferred
- Improved ability to process the data

This application (Ref. [50]) involves standardizing the information content and format of information provided to the user as well as providing a standard interface from which the user obtains the data. This interface is defined as "A" in figure 7-55.

The user has the ability to retrieve the data in a uniform manner. The retrieval method preserves the integrity and completeness of the data.

This application involves primarily the accounting management functional area of OSI network management.

The intention of this application is to be able to provide data for an event from its originating station to its terminating station including all intermediate switching nodes as required by the ISER user.

7.7.1.2 Functional Requirements

The ISDN Station Event Recording Module (ISERM), is a managed object for formatting, recording, and retrieving user data from the ISDN environment. The ISERM includes the following attributes:

- Standard Interface Protocol
- ISER Configuration Profile
- Standard ISER Data Delivery Format
  - Minimum Data Set for Event Recorded Information

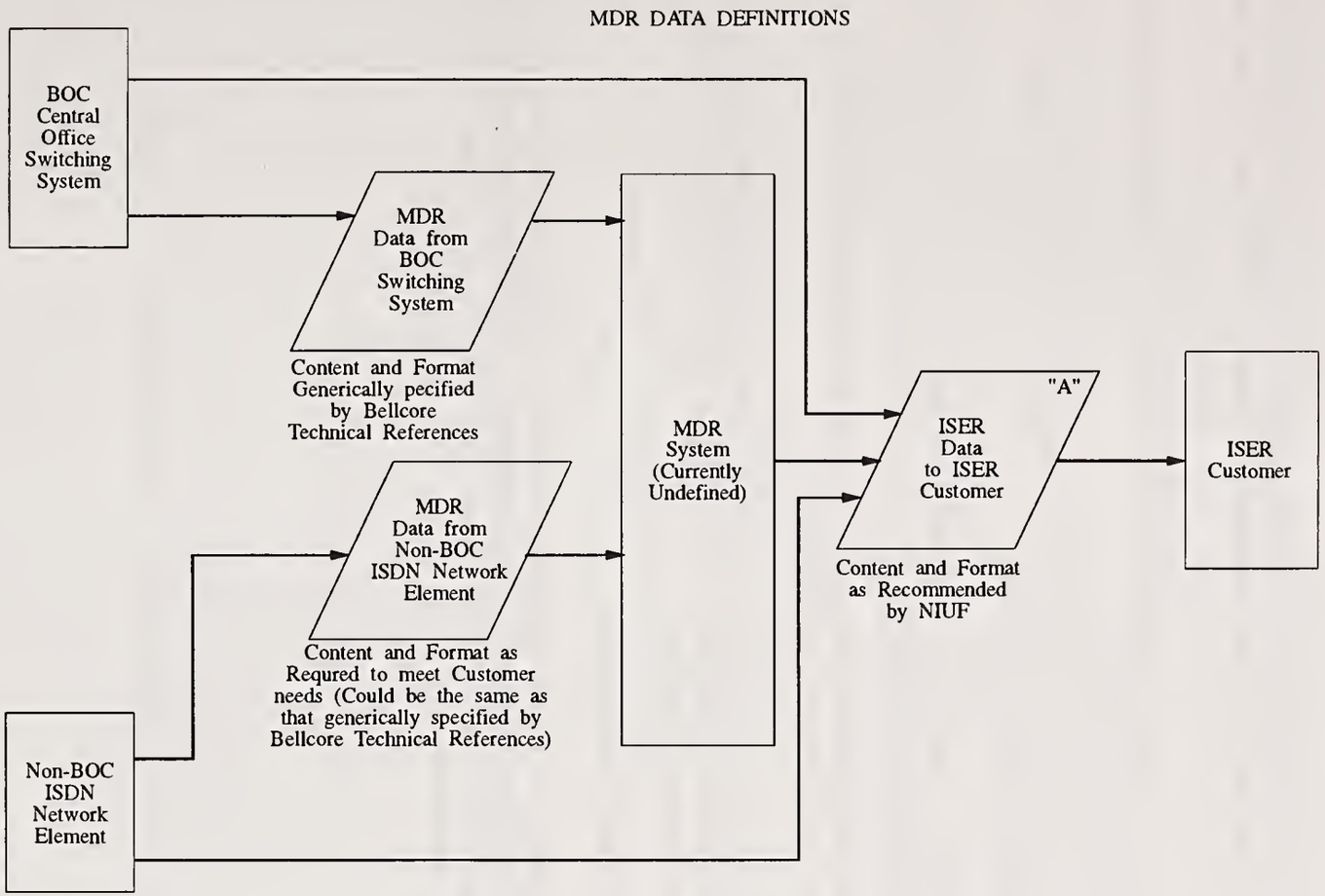


Figure 7-55. ISER Functional Schematic.

7.7.1.2.1 Standard Interface Protocol

A standard interface is provided to allow the user device (OSI agent) to establish a connection to the ISDN environment for ISER activities. Any such interface has the capability to establish a 2-way communications link (full duplex) between the user device and the ISDN environment using managed objects.

This connection uses a standard protocol which facilitates the orderly and efficient transfer of ISER data from the ISDN environment to the user's device(s). This protocol provides the following minimum capabilities:

- The ability to request the ISERM to perform the transfer of ISER data from the ISDN environment to user's devices.

- The ability to access an ISER Standard Configuration profile for the purpose of reviewing and changing its current information.

- The ability to establish and maintain a secure user environment for the purpose of restricting control and access to the ISERM.

In order to support this application, the protocol suites shown in figures 7-56 and 7-57 are to be considered as suggested implementation alternatives.

ISER implementation should not preclude future TP (Distributed Transaction Processing) protocol support for this application. See figures 7-58 and 7-59 for suggested implementation alternatives once TP has been made to accepted standard.

7.7.1.2.2 ISER Configuration Profile

A configuration profile will exist in the ISDN environment for each user for the purpose of controlling and downloading ISER data to the user's external device(s). This configuration profile is the minimum subset of the management data base for the managed object, ISERM, and its processes required to interact with the external device(s).

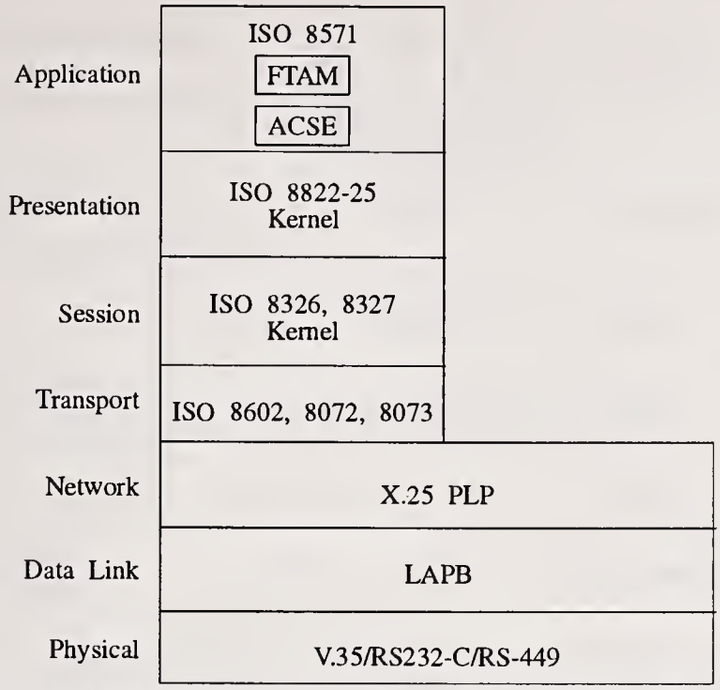


Figure 7-56. FTAM NON-ISDN Protocol Usage for Universal ISER Application.

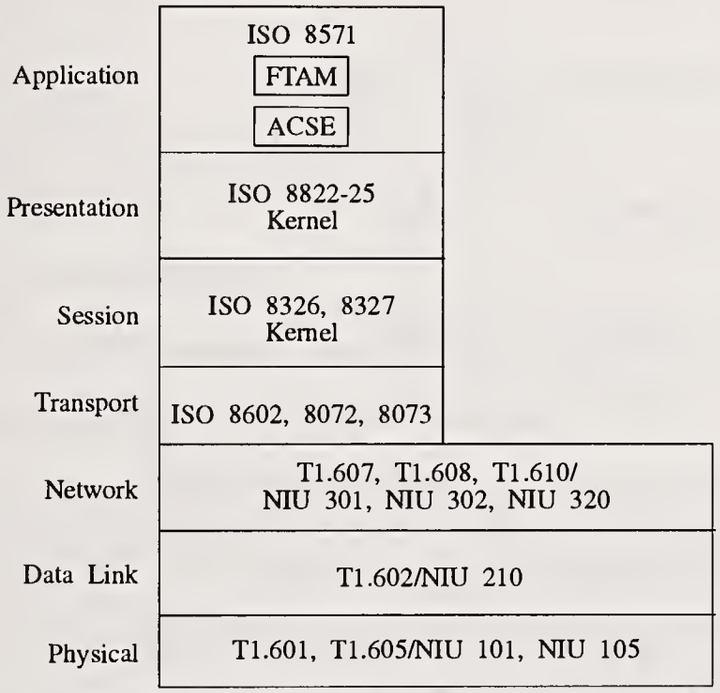


Figure 7-57. FTAM ISDN Protocol Usage for Universal ISER Application.

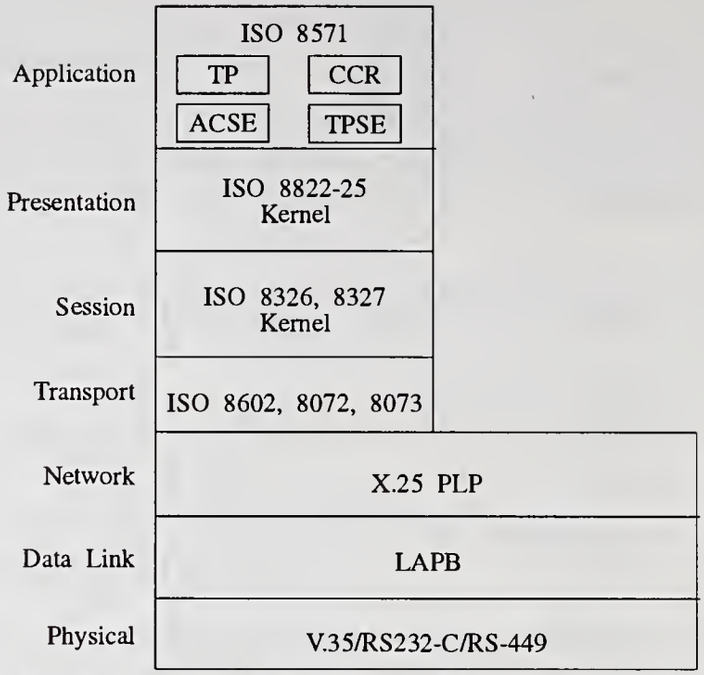


Figure 7-58. TP Non-ISDN Protocol Usage for Universal ISER Application.

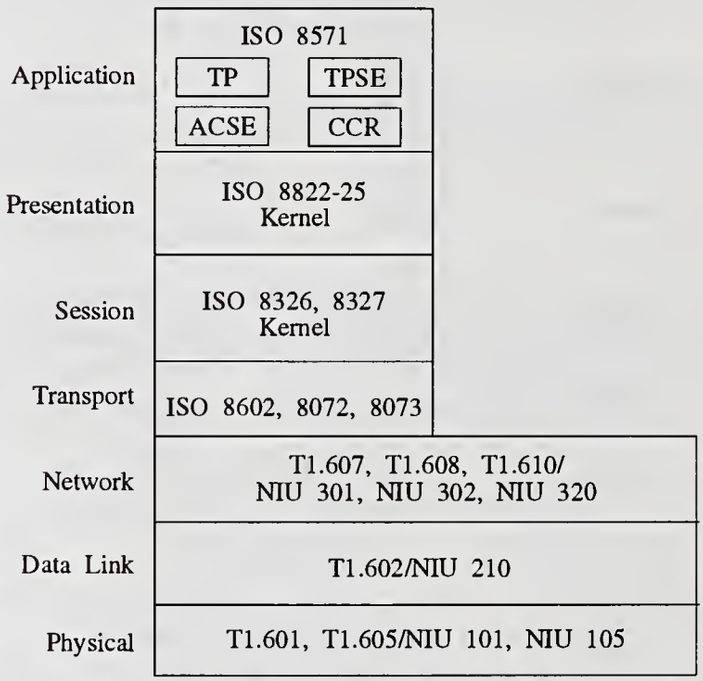


Figure 7-59. TP ISDN Protocol Usage for Universal ISER Application.

At a minimum, this profile allows:

7.7.1.2.2.1 Event record selection based on:

- Event classes
  - Station-to-station
  - Message network access
  - Private facility access
- Event types
  - All attempts
  - All completions
  - Answered only
- Event category
  - Originating
  - Terminating

7.7.1.2.2.2 Access control based on:

- Set of actions
  - Interface protocol
  - Interface speed
- Set of constraints
  - Authorized users
  - Numbers of simultaneous users
  - Restricted actions

7.7.1.2.2.3 User identification based on:

- Unique identification assigned to each ISER user (User Identifier in ISER record)

7.7.1.2.3 Standard ISER Data Delivery Format

A standard delivery format is established that allows the user to receive ISER data in a form that is consistent in format and content. An implementation agreement should be established for the specific contents of each data segment and the grouping of those segments into standard ISER records.

The following is the required minimum set of event data that should be included, as applicable, for an event.

Item	Description
Network Element Identifier	Switch Identification
User Identifier	User Identification
Group Identifier	Customer Identifier
Record Type	Identifies the Event Record Content and Format, e.g., Originating, Terminating, etc.

Item	Description
Service Identification Event Type Event Category Event Class	Type of Service Provided: Circuit-Switched Voice (CSV), Circuit-Switched Data (CSD), Packet-Switched Data (PSD)
Originating Number	Telephone Number plus Routing Digits (DNIC, etc.)
Route Information	ARS (Automatic Route Selection) Pattern Group
Originating Type	Station, Attendant, Trunk (Virtual and Physical), Offnet Line, Offnet Trunk, Foreign Exchange, other Onnet/Offnet, Shared Directory Number
Originating Trunk Group/Member	Private Trunk Group and Member Number
Call Complete Code	Answered, Unanswered, Busy, Abandoned, Attendant Extended
Facility Restriction Level	Privilege Class Level
Terminating Number	Telephone Number (DNIC, etc.)
SPID	Station Profile Identification
Terminating Type	Station, Attendant, Trunk, (Virtual and Physical), Offnet Line, Offnet Trunk, Foreign Exchange, other Onnet/Offnet, Shared Directory Number
Terminating Trunk Group/Member	Private Trunk Group and Member Number
Event Start Time (Time of Day)	Julian Date, Hours, Minutes, Seconds, and Tenths Answer Time if Answered, End of Dial Time if Unanswered
Call Duration	Usage Time in Seconds and Tenths
Digits Dialed	Digits actually Dialed by User
Digits Outpulsed	Digits actually Transmitted over the Network
Authorization Code	Used to Define Privilege Level
Account Code	Used to assign Charges to a particular Account
Volume of Packet Data Both In/Out	Number of octets Transferred
Network User Identification (NUI)	Identify Users for Billing Purposes
Billing Number	To cause Charging and Acceptance for Packet Calls, if Subscribed

Item	Description
Service Identification Event Type Event Category Event Class	Type of Service Provided: Circuit-Switched Voice (CSV), Circuit-Switched Data (CSD), Packet-Switched Data (PSD)
Originating Number	Telephone Number plus Routing Digits (DNIC, etc.)
Route Information	ARS (Automatic Route Selection) Pattern Group
Originating Type	Station, Attendant, Trunk (Virtual and Physical), Offnet Line, Offnet Trunk, Foreign Exchange, other Onnet/Offnet, Shared Directory Number
Originating Trunk Group/Member	Private Trunk Group and Member Number
Call Complete Code	Answered, Unanswered, Busy, Abandoned, Attendant Extended
Facility Restriction Level	Privilege Class Level
Terminating Number	Telephone Number (DNIC, etc.)
SPID	Station Profile Identification
Terminating Type	Station, Attendant, Trunk, (Virtual and Physical), Offnet Line, Offnet Trunk, Foreign Exchange, other Onnet/Offnet, Shared Directory Number
Terminating Trunk Group/Member	Private Trunk Group and Member Number
Event Start Time (Time of Day)	Julian Date, Hours, Minutes, Seconds, and Tenths Answer Time if Answered, End of Dial Time if Unanswered
Call Duration	Usage Time in Seconds and Tenths
Digits Dialed	Digits actually Dialed by User
Digits Outpulsed	Digits actually Transmitted over the Network
Authorization Code	Used to Define Privilege Level
Account Code	Used to assign Charges to a particular Account
Volume of Packet Data Both In/Out	Number of octets Transferred
Network User Identification (NUI)	Identify Users for Billing Purposes
Billing Number	To cause Charging and Acceptance for Packet Calls, if Subscribed

8 References

8.1 ANS documents

[1] ANS T1.111-1988, *Telecommunications — Signalling System Number 7 (SS7) — Message Transfer Part (MTP).*

[2] ANS T1.112-1988, *Telecommunications — Signalling System Number 7 (SS7) — Signalling Connection Control Part (SCCP).*

[3] ANS T1.113-1988, *Telecommunications — Signalling System Number 7 (SS7) — ISDN User Part (ISUP).*

[4] ANS T1.114-1988, *Telecommunications — Signalling System Number 7 (SS7) — Transactions Capability Application Part (TCAP).*

[5] ANS T1.115-1989, *Telecommunications — Signalling System Number 7 (SS7) — Monitoring and Measurements.*

[6] ANS T1.116-1989, *Telecommunications — Signalling System Number 7 (SS7) — Operations, Maintenance, Administration and Provisioning (OMAP).*

[7] ANS T1.216-1991, *ISDN Management — Basic Rate Physical Layer.*

[8] ANS T1.217-1991, *ISDN Management — Primary Rate Physical Layer.*

[9] ANS T1.218-1991, *ISDN Management — Data Link and Network Layers.*

[10] ANS T1.403-1989, *Telecommunications — Carrier to Customer Installation — DS1 Metallic Interface.*

[11] ANS T1.408-1990, *Telecommunications — Integrated Services Digital Network (ISDN) — Primary Rate — Customer Installation Metallic Interfaces — Layer 1 Specification.*

[12] ANS T1.601-1988, *Telecommunications — Integrated Services Digital Network (ISDN) — Basic Access Interface for Use on Metallic Loops for Application on the Network Side of the NT-Layer 1 Specification.*

[13] ANS T1.602-1989, *Telecommunications — Integrated Services Digital Network (ISDN) — Data-Link Layer Signalling Specification for Application at the User-Network Interface.*

[14] ANS T1.603-1990, *Telecommunications — Integrated Services Digital Network (ISDN) — Minimal Set of Bearer Services for the Primary Rate Interface.*

[15] ANS T1.604-1990, *Telecommunications — Integrated Services Digital Network (ISDN) — Minimal Set of Bearer Services for the Basic Rate Interface.*

[16] ANS T1.605-1989, *Telecommunications — Integrated Services Digital Network (ISDN) — Basic Access Interface at S and T Reference Points — Layer 1 Specification.*

[17] ANS T1.607-1990, *Telecommunications — Integrated Services Digital Network (ISDN) — Digital Subscriber Signalling System Number 1 (DSS1) — Layer 3 Signalling Specification for Circuit-Switched Bearer Service.*

[18] ANS T1.608-1990, *Telecommunications — Integrated Services Digital Network (ISDN) — Digital Subscriber Signalling System Number 1 (DSS1) — Signalling Specification for X.25 Packet-Switched Bearer Service.*

[19] ANS T1.609-1990, *Telecommunications — Integrated Services Digital Network (ISDN) — Interworking between the ISDN User-Network Interface Protocol and the Signalling System Number 7 (SS7) ISDN User Part.*

[20] ANS T1.610-1990, *Telecommunications — Integrated Services Digital Network (ISDN) — Digital Subscriber Signalling System Number 1 (DSS1) — Generic Procedures for the Control of ISDN Supplementary Services.*

[21] ANS T1.612-1990, *Telecommunications — Integrated Services Digital Network (ISDN) — Terminal Adaptation Using Statistical Multiplexing.*

[22] T1S1.2/92-185 (T1S1.2/90-030), *Supplementary Service — Normal Call Transfer Stage 1, 2 and 3.*

[23] T1S1/92-629 (TBA T1.626-1992), *Draft Proposed American National Standard - Switch-Computer Applications Interface (SCAI).*

8.2 CCITT Documents

[24] CCITT Recommendation I.431-1988, *ISDN Primary Rate User-Network Interface — Layer 1 Specification.*

[25] CCITT Recommendation Q.921-1988 (also designated CCITT Recommendation I.441-1988), *ISDN User-Network Data Link Layer Specification.*

[26] CCITT Recommendation Q.931-1988 (also designated CCITT Recommendation I.451-1988), *ISDN Primary Rate User-Network Interface — Layer 3 Specification.*

[27] CCITT Recommendation V.120-1988, *Support by an ISDN of Data Terminal Equipment with V-series Type Interfaces with Provision for Statistical Multiplexing.*

[28] CCITT Recommendation X.25-1984, *Interface between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode and Connected to Public Data Networks by Dedicated Circuit.*

[29] CCITT Recommendation X.31-1988, *Support of Packet Mode Terminal Equipment by an ISDN.*

[30] CCITT Recommendation I.231-1988, *Circuit-Mode Bearer Service Categories.*

[31] CCITT Recommendation I.232-1988, *Packet-Mode Bearer Services Categories.*

8.3 NIU-Forum Documents[21]

[32] NIU Publication 1, *North American ISDN Users' Forum (NIU-Forum) Working Agreements for the Integrated Services Digital Network (ISDN)*, 01 June 1990.

[33] NIU 90-002 (NIU/IIW/ICOT/90-40), *Integrated Services Digital Network (ISDN) Conformance Testing, Layer 1 Basic Rate S/T Interface, User Side*, 1990.

[34] NIU 91-007 (NIU/IIW/ICOT/ACT23/91-22.2 V1.2), *Integrated Services Digital Network (ISDN) Conformance Testing, Layer 2 Basic Rate Interface, Link Access Procedure, D-channel (LAPD), User side*, 1991.

[35] NIU-Forum User Application Requirements Data Form 810004, "Data Conferencing (Point to Point)."

[36] NIU-Forum User Application Requirements Data Form 810005, "Database Information to Corporate Security."

[37] NIU-Forum User Application Requirements Data Form 840023, "New Account Customer Inquiry Handling."

[38] NIU-Forum User Application Requirements Data Form 840024, "Customer Service Call Handling (Incoming Call Management)."

[39] NIU-Forum User Application Requirements Data Form 840025, "Automatic Callback for Financial Services."

[40] NIU-Forum User Application Requirements Data Form 830008, "Asynchronous to SNA/SDLC."

[41] NIU-Forum User Application Requirements Data Form 830009, "Synchronous Terminal to Controller."

[42] NIU-Forum User Application Requirements Data Form 960009, "Asynchronous Access to Host Computer."

[43] NIU-Forum User Application Requirements Data Form 830013, "Building Controls."

[44] NIU-Forum User Application Requirements Data Form 860016, "Transparent Networking of Voice Messaging Systems."

[45] NIU-Forum User Application Requirements Data Form 860018, "Interface to Voice Messaging Systems."

[46] NIU-Forum User Application Requirements Data Form 810034, "Interface to Centralized Voice Messaging System."

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[21]These documents are available by contacting the NIU-Forum Administrator, NIST, Building 223, Room B364, Gaithersburg, MD 20899.

[47] NIU-Forum User Application Requirements Data Form 050015, "Secure Voice Mail."

[48] NIU-Forum User Application Requirements Data Form 050014, "Secure E-Mail."

[49] NIU-Forum User Application Requirements Data Form 050016, "Secure Facsimile Transmission through ISDN."

[50] NIU-Forum User Application Requirements Data Form 960029, "ISDN Station Event Recording (ISER)."

8.4 Other Documents

[51] NIST Special Publication 500-195, *North American ISDN Users' Forum Agreements on Integrated Services Digital Network*, September 1991.

[52] NIST Special Publication 500-183, *Stable Implementation Agreements for Open Systems Interconnection Protocols*, Version 5, Edition 1, December 1991.

[53] NIST Special Publication, *Application Software Interface Part 1: Overview and Protocols*, September 1991.

[54] ISO 9646, *Information Processing Systems, OSI Conformance Testing Methodology and Framework*. Parts 1-5, 1989.

APPENDIX A.

NIU 90-301
Implementation Agreement
of the North American ISDN Users' Forum

Layer 3 Signalling Specification for the
Minimal Set of Circuit-Switched Bearer Services for
the ISDN Basic Rate Interface/Class I.

Baseline Text
American National Standard T1.607-1990:
Integrated Services Digital Network (ISDN) —
Layer 3 Signalling Specification for
Circuit-Switched Bearer Service for
Digital Subscriber Signalling System Number 1 (DSS1).

Base Standards
CCITT Recommendation Q.931 (1988):
ISDN User-Network Interface Layer 3 —
Specification For Basic Call Control.
ANSI T1.607-1990
ANSI T1.604*:
Integrated Services Digital Network (ISDN) —
Minimal Set of Bearer Services for
the Basic Rate Interface.

A.1 Abstract

This Implementation Agreement specifies procedures for establishing, maintaining, and clearing connections at the Integrated Services Digital Network (ISDN) user-network interfaces and are mandatory for the support of the minimal set of circuit-switched bearer services specified by ANSI T1.604-1990* *Integrated Services Digital Network (ISDN) — Minimal Set of Bearer Services for the Basic Rate Interface*, (Ref. [15]). Procedures for circuit-mode digital, circuit-mode speech and circuit-mode voiceband data bearer services are as specified in the baseline text ANS T1.607-1990, *Integrated Services Digital Network (ISDN) — Digital Subscriber Signalling System Number 1 (DSS1) — Layer 3 Signalling Specification for Circuit-Switched Bearer Service*, (Ref. [17]) as further resolved by this agreement. The packet-mode data service is included in this document as a bearer service. Procedures for the packet-mode bearer service will be detailed in another document.

*Subject to further discussion.

A.2 Introduction

The original implementation agreement (NIU 90-301) was reached by marking up the text of ANS T1.607-1990, (Ref. [17]) to reflect the clarifications of text and selection of options. This appendix translates the implementation agreement markup into a listing of these clarifications and selections, (i.e., this appendix lists the differences (the "delta") between the implementation agreement marked up ANS T1.607-1990, and the original text of ANS T1.607-1990).

A.3 NIU 90-301 Delta List**

The IA has adopted the ANS T1.607-1990*** (Ref. [17]) standard with the following clarifications of the text, and selection of options:

ANS T1.607-1990 SECTION/TABLE NUMBER/NAME	IMPLEMENTATION AGREEMENTS - CLARIFICATION OF TEXT AND SELECTION OF OPTIONS
Section 1 General	Delete "1. General" heading.
Section 1.1 Scope and Purpose	Replace this section with Attachment A of this document.
Section 2.2 States associated with the global reference call	Delete this section including subsections.
Section 3 Message functional definition and content Item (b), Subitem (2)	Delete last sentence from the Note: "Annex D contains a description of the information element usage for symmetric NT2-NT2 interfaces."
Section 3.1 Messages for circuit-mode connection control Table 1 — Messages for circuit-mode connection control	Change "NOTIFY 3.1.7" to "*NOTIFY".
Section 3.1 Messages for circuit-mode connection control Table 1 — Messages for circuit-mode connection control	Add the following footnote below table 1: "* See section 5.8.4 for treatment of this message."

**Note that this Delta List was developed in "good faith" by NIST as a simple equivalent representation of the actual agreements. It has been reviewed and approved by the editors of the Signalling Working Group as per recommendation of the Executive Steering Committee.

***This documents can be purchased from: American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

Section 3.1.1 ALERTING Table 2 — ALERTING message content	Change the "Call Reference/Length" cell from "2-*" to "2-3".
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Change the "Channel Identification/Direction" cell from "both (Note 1)" to "u -> n".
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Change the "Channel Identification/Length" cell from "2-*" to "2-3".
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Change the "Progress Indicator/Direction" cell from "both" to "n -> u".
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Change the "Progress Indicator/Length" cell from "2-4" to "2,4".
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Delete "Display" row.
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Delete Notes 1, 4, 5.
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Delete the last sentence from Note 3.
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Change Note "6 Included if the network optionally provides additional information describing tones." to "6 The network will always provide this IE."
Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Change the "Channel Identification/Length" cell from "2-*" to "2-3".
Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Delete reference to "Note 2" in the "Progress indicator/Type" cell.
Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Change the "Progress Indicator/Length" cell from "2-4" to "2, 4".
Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Delete "Display" row.

Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Delete Notes 2, 3, 4.
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Change the "Call Reference/Length" cell from "2-*" to "2-3".
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Change the "Channel Identification/Direction" cell from "both (Note 1)" to "u -> n (Note 1)".
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Change the "Channel Identification/Length" cell from "2-*" to "3".
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Change the "Progress indicator/Direction" cell from "both" to "n -> u".
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Change the "Progress Indicator/Length" cell from "2-4" to "2, 4".
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Delete the following rows: • "Display"; • "Connected number"; • "Connected subaddress"; • "Low Layer compatibility".
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Change Note 1 from "Included in the network-to-user direction for support of the procedures in Annex D." to "The coding of this IE should be always 'Exclusive B'."
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Delete the following from Note 3: "or in connection with the provision of in-band tones and patterns."
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Delete Notes 4, 5, 7, 8, 9.
Section 3.1.4 CONNECT ACKNOWLEDGE Table 5 — CONNECT ACKNOWLEDGE message content	Change the "Call Reference/Length" cell from "2-*" to "2-3".

Section 3.1.4 CONNECT ACKNOWLEDGE Table 5 — CONNECT ACKNOWLEDGE message content	Delete "Display" row.
Section 3.1.4 CONNECT ACKNOWLEDGE Table 5 — CONNECT ACKNOWLEDGE message content	Delete Notes 1, 2.
Section 3.1.4 CONNECT ACKNOWLEDGE Table 5 — CONNECT ACKNOWLEDGE message content	Change Note 3 from "Included if the network optionally provides additional information describing tones." to "Included if the network is required to turn Alerting off."
Section 3.1.5 DISCONNECT Table 6 — DISCONNECT message content	Change the "Call Reference/Length" cell from "2-*" to "2-3".
Section 3.1.5 DISCONNECT Table 6 — DISCONNECT message content	Change the "Cause/Length" cell from "4-32" to "4-10".
Section 3.1.5 DISCONNECT Table 6 — DISCONNECT message content	Delete the following rows: • "Display"; • "Connected Number"; • "Connected subaddress".
Section 3.1.5 DISCONNECT Table 6 — DISCONNECT message content	Delete Notes 1, 2, 4, 5.
Section 3.1.5 DISCONNECT Table 6 — DISCONNECT message content	Change Note 3 to: "Included if the network must turn tones on or off, or turn ALERTING off."
Section 3.1.6 INFORMATION Table 7 — INFORMATION message content	Change the "Call Reference/Length" cell from "2-*" to "2-3".
Section 3.1.6 INFORMATION Table 7 — INFORMATION message content	Delete "Display" row.
Section 3.1.6 INFORMATION Table 7 — INFORMATION message content	Change the "Keypad Facility/Length" cell from "2-34" to "3-34".
Section 3.1.6 INFORMATION Table 7 — INFORMATION message content	Delete Notes 2, 3.

Section 3.1.6 INFORMATION Table 7 — INFORMATION message content	Add the following to the end of Note 4 ("The Keypad facility information element..."): "When INFO is sent u -> n, this IE must be present."
Section 3.1.6 INFORMATION Table 7 — INFORMATION message content	Change Note 5 from "Included if the network optionally provides additional information describing tones." to "Included if the network is required to turn tones off."
Section 3.1.7 NOTIFY	Delete this section.
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Change "Direction" in table header from "both" to "n -> u".
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Change the "Direction" cell in the following rows from "both" to "n -> u": • "Protocol discriminator"; • "Call reference"; • "Message type"; • "Cause"; • "Progress Indicator".
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Change the "Cause/Length" cell from "2-32" to "2,4-10".
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Delete "Display" row.
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Delete Notes 2, 3.
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Change Note 4 from "Included if the network optionally provides additional information describing tones." to "Included when tones or some announcement are provided in-band."
Section 3.1.9 RELEASE Table 10 — RELEASE message content	Change the "Call reference/Length" cell from "2-*" to "2-3".

Section 3.1.9 RELEASE Table 10 — RELEASE message content	Change the "Cause/Length" cell from "2-32" to "2,4-10".
Section 3.1.9 RELEASE Table 10 — RELEASE message content	Delete the following rows: • "Display"; • "Connected number"; • "Connected subaddress".
Section 3.1.9 RELEASE Table 10 — RELEASE message content	Delete Notes 3, 4, 6, 7.
Section 3.1.9 RELEASE Table 10 — RELEASE message content	Change Note 5 from "Included if the network optionally provides additional information describing tones." to "Included if the network must turn tones or Alerting off."
Section 3.1.10 RELEASE COMPLETE Table 11 — RELEASE COMPLETE message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.10 RELEASE COMPLETE Table 11 — RELEASE COMPLETE message content	Change the "Cause/Length" cell from "2-32" to "2, 4-10".
Section 3.1.10 RELEASE COMPLETE Table 11 — RELEASE COMPLETE message content	Delete the following rows: • "Display"; • "Connected number" • "Connected subaddress".
Section 3.1.10 RELEASE COMPLETE Table 11 — RELEASE COMPLETE message content	Delete Notes 3, 4, 6, 7.
Section 3.1.10 RELEASE COMPLETE Table 11 — RELEASE COMPLETE message content	Change Note 5 from "Included if the network optionally provides additional information describing tones." to "Included if the network is required to turn tones on or off."
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Call Reference/Length" cell from "2-*" to "2-3".
Section 3.1.11 SETUP Table 12 — SETUP message content	Delete the following rows: • "Repeat Indicator"; • "Network-Specific Facilities"; • "Display".

Section 3.1.11 SETUP Table 12 — SETUP message content	Delete from the "Bearer Capability/Type" cell the reference to Note 2.
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Bearer Capability/Length" cell from "4-13" to "4-8".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Channel Identification/Length" cell from "2-*" to "2-3".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Progress Indicator/Direction" cell from "both" to "n -> u".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Progress Indicator/Length" cell from "2-4" to "2,4".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Calling party number/Length" cell from "2-*" to "2-19".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Called party address/Length" cell from "2-*" to "2-18".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Transit Network Selection/Length" cell from "2-*" to "2-7".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Higher Layer Compatibility/Length" cell from "2-4" to "2-5".
Section 3.1.11 SETUP Table 12 — SETUP message content	Delete Notes 1, 2, 5, 6, 7.
Section 3.1.11 SETUP Table 12 — SETUP message content	Add to the end of Note 8: "The digits in this IE are 0 to 9, *, and #."
Section 3.1.11 SETUP Table 12 — SETUP message content	Change Note 9 from "Included if the network optionally provides additional information describing tones." to "The network will always provide this IE."
Section 3.1.11 SETUP Table 12 — SETUP message content	Add to the end of Note 13: "The network should transport this IE transparently. This IE is optional on the user side."

Section 3.1.11 SETUP Table 12 — SETUP message content	Add to the end of Note 15: "The network should transport this IE transparently. This IE is optional on the user side. The total length is 2 to 16 octets."
Section 3.1.11 SETUP Table 12 — SETUP message content	Add to the end of Note 16: "The network should transport this IE transparently. This IE is optional on the user side."
Section 3.1.11 SETUP Table 12 — SETUP message content	Add to the end of Note 17: "The network will treat this IE on sending and receiving as described in the User-User supplementary service Implementation Agreement."
Section 3.1.11 SETUP Table 12 — SETUP message content	Delete "and 7kHz audio" from Note 20.
Section 3.1.12 SETUP ACKNOWLEDGE Table 13 — SETUP ACKNOWLEDGE message content	Change the "Call Reference/Length" cell from "2-*" to "2-3".
Section 3.1.12 SETUP ACKNOWLEDGE Table 13 — SETUP ACKNOWLEDGE message content	Change the "Channel Identification/Type" cell from "M" to "M*".
Section 3.1.12 SETUP ACKNOWLEDGE Table 13 — SETUP ACKNOWLEDGE message content	Add the following footnote before Note 1: "* The coding of the channel ID should always be 'Exclusive B'."
Section 3.1.12 SETUP ACKNOWLEDGE Table 13 — SETUP ACKNOWLEDGE message content	Change the "Channel Identification/Length" cell from "3-*" to "3".
Section 3.1.12 SETUP ACKNOWLEDGE Table 13 — SETUP ACKNOWLEDGE message content	Change the "Progress Indicator/Length" cell from "2-4" to "2,4".
Section 3.1.12 SETUP ACKNOWLEDGE Table 13 — SETUP ACKNOWLEDGE message content	Delete "Display" row.
Section 3.1.12 SETUP ACKNOWLEDGE Table 13 — SETUP ACKNOWLEDGE message content	Change Note 1 to: "The only valid value for progress indicator is 8 (refer to section 4.5.21 octet 4). Included in connection with the provision of in-band information/patterns."

Section 3.1.12 SETUP ACKNOWLEDGE Table 13 — SETUP ACKNOWLEDGE message content	Delete Notes 2, 3.
Section 3.1.12 SETUP ACKNOWLEDGE Table 13 — SETUP ACKNOWLEDGE message content	Change Note 4 from "Included if the network optionally provides additional information describing tones (e.g., activate dial tone)." to "Included if the network is required to turn on dial tone."
Section 3.1.13 STATUS	Change the first sentence from "This message is sent by the user or the network in response to a STATUS ENQUIRY message or at any time during a call to report certain error conditions as listed in 5.8." to "This message is sent by the user in response to a STATUS ENQUIRY message sent by the network, or by either the user or the network to report certain error conditions as listed in 5.8."
Section 3.1.13 STATUS Table 14 — STATUS message content	Change the "Call Reference/Length" cell "2-*" to "2-3".
Section 3.1.13 STATUS Table 14 — STATUS message content	Change the "Cause/Length" cell from "4-32" to "4-10".
Section 3.1.13 STATUS Table 14 — STATUS message content	Delete "Display" row.
Section 3.1.13 STATUS Table 14 — STATUS message content	Delete Notes 1, 2.
Section 3.1.14 STATUS ENQUIRY	Change "This message is sent by the user or the network at any time to solicit a STATUS message from the peer layer 3 entity." to "This message is sent by the network during the active state to solicit a STATUS message from the peer layer 3 entity."
Section 3.1.14 STATUS ENQUIRY Table 15 — STATUS ENQUIRY message content	Change "Direction" in the table header from "both" to "n -> u".
Section 3.1.14 STATUS ENQUIRY Table 15 — STATUS ENQUIRY message content	Change the "Direction" cell in the following rows from "both" to "n -> u": • "Protocol discriminator"; • "Call reference"; • "Message type".

Section 3.1.14 STATUS ENQUIRY Table 15 — STATUS ENQUIRY message content	Change "Call Reference/Length" cell from "2-*" to "2-3".
Section 3.1.14 STATUS ENQUIRY Table 15 — STATUS ENQUIRY message content	Delete "Display" row.
Section 3.1.14 STATUS ENQUIRY Table 15 — STATUS ENQUIRY message content	Delete Notes 1, 2.
Section 3.2 Messages used with the global call reference	Delete this section including subsections.
Section 4.2 Protocol Discriminator	Add the following paragraph after the second paragraph. "The only value supported for call control messages is described below, in Figure 2."
Section 4.2 Protocol Discriminator Figure 2 — Protocol Discriminator	Change "ANSI T1.607" to "Q.931".
Section 4.2 Protocol Discriminator Table 19 — Protocol Discriminator	Change "ANSI T1.607" to "Q.931" in the row labeled "0000 1000".
Section 4.3 Call Reference	Change the first sentence of the third paragraph from "... for a basic user-network interface, and a call reference value of two octets for a primary rate interface." to "and a maximum of 2. The network will send one octet call reference value (CRV) unless all 127 available codepoints are occupied."
Section 4.3 Call Reference	Delete the fourth paragraph "As a network option ... one or two octets."
Section 4.3 Call Reference	Add "The Dummy Call Reference and the Global Call Reference are not supported for BRI/Class 1 circuit-switched calls." after figure 5.
Section 4.3 Call Reference	Delete the last sentence from the eighth paragraph "The call reference ... (e.g., Restart procedures)."
Section 4.3 Call Reference	Delete Note 2 ("The numerical value ... defined in 3.2.").
Section 4.4 Message Type Table 20 — Message types	Add an asterisk (*) to the beginning of the "NOTIFY" row.

Section 4.4 Message Type Table 20 — Message Types	Add as a footnote "* See section 5.8.4 for treatment of this message type."
Section 4.5.1 Coding Rules	Delete the last 3 sentences of the fourth paragraph "Two types of ... octet elements."
Section 4.5.1 Coding Rules Figure 7 — Formats of information elements	Delete Figure 7 (b). Single octet information element format (type 2).
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Delete "Repeat Indicator" row.
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Delete reference to Note 6 in row "Bearer capability".
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Change the "Bearer capability/max length" cell from "13" to "8".
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Change the "Cause/max length" cell from "32" to "10".
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Change the "Cause/max. no. of occurrences" cell from "3" to "2".
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Change the "Channel identification/max length" cell from "(Note 4)" to "3".
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Delete the following rows: • "Network-specific facilities"; • "Notification indicator"; • "Display"; • "Connected number"; • "Connected subaddress".
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Change the "Calling Party Number/max length" cell from "(Note 4)" to "19".
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Change the "Called Party Number/max length" cell "(Note 4)" to "18".

Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Delete reference to Note 2 in the "Transit Network selection" row.
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Change the "Transit Network selection/max length" cell from "(Note 4)" to "7".
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Delete "4" from the "Transit Network Selection/max. no. of occurrences" cell.
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Delete the following rows: • "Restart indicator" and • "Escape for extension".
Section 4.5.1 Coding Rules Table 21 — Information element identifier coding	Delete Notes 3, 4, and 6.
Section 4.5.1 Coding Rules Figure 8 — Information element format using escape for extension	Delete this figure.
Section 4.5.2 Extensions of codesets	Change "T1.608" to "NIU 89-320" in the first bullet in the fourth paragraph.
Section 4.5.2 Extensions of codesets	Change the ninth paragraph to: "Codeset 7 information elements shall be handled according to the procedures for unrecognized information elements (see 5.8.7.1) by the first exchange."
Section 4.5.2 Extensions of codesets	Delete the tenth paragraph ("Codeset 6 ... bilateral agreements.").
Section 4.5.3 Locking shift procedure New codeset identification coding	Change "T1.608" to "NIU 89-320" in row "codeset 5".
Section 4.5.4 Non-locking shift procedures	Delete "(a) process the non-locking ... below." from the second paragraph.
Section 4.5.4 Non-locking shift procedures Temporary codeset identification coding	Change "T1.607" to "NIU 90-301" in row "codeset 0".
Section 4.5.4 Non-locking shift procedures Temporary codeset identification coding	Change "T1.608" to "NIU 89-320" in row "codeset 5".

Section 4.5.5 Bearer capability	In the second paragraph change "13 octets" to "8 octets".
Section 4.5.5 Bearer capability Figure 11 — Bearer capability information element	Change octet 4, bit 8 from "0/1" to "1".
Section 4.5.5 Bearer capability Figure 11 — Bearer capability information element	Delete octets • 4a*; • 4b*; • 5b* Note 2; • 5b* Note 3; • 5c*; • 5d*.
Section 4.5.5 Bearer capability Figure 11 — Bearer capability information element	Change octet 5a*, bit 8 from "0/1" to "1".
Section 4.5.5 Bearer capability Figure 11 — Bearer capability information element	Delete Notes 1, 2, and 3.
Section 4.5.5 Bearer capability Figure 11 — Bearer capability information element	Delete "or V.120" from the end of Note 4.
Section 4.5.5 Bearer capability	Add the following after Figure 11: "Octets 6 and 7 are included for information only and shall not be used for circuit-switched calls. The coding and application for these octets are included in another document."
Section 4.5.5 Bearer capability Information transfer capability (octet 3) coding	Delete row "10001 7 kHz audio".
Section 4.5.5 Bearer capability Information transfer rate (octets 4 and 4b) coding	Change the title to "Information transfer rate (octet 4)".
Section 4.5.5 Bearer capability Information transfer rate (octet 4) coding	Delete the following rows: • "10011 384 kbit/s"; • "10100 1472 kbit/s (see Note 2)"; • "10101 1536 kbit/s".
Section 4.5.5 Bearer capability Information transfer rate (octet 4) coding	Change Note 1 to: "The bearer capability is bidirectional symmetric at the information transfer rate specified in octet 4."

Section 4.5.5 Bearer capability Information transfer rate (octet 4) coding	Delete Note 2.
Section 4.5.5 Bearer capability	Delete the codings of octets 4a (structure, configuration, establishment) and 4b (symmetry).
Section 4.5.5 Bearer capability User information layer 1 protocol (octet 5) coding	Delete "and optionally octets 5b, 5c, and 5d as defined below." from row "00001".
Section 4.5.5 Bearer capability User information layer 1 protocol (octet 5) coding	Delete "and G.725 7 kHz audio" from row "00101".
Section 4.5.5 Bearer capability User information layer 1 protocol (octet 5) coding	Delete rows "00111" and "01000".
Section 4.5.5 Bearer capability User information layer 1 protocol (octet 5) coding	Delete Note 2.
Section 4.5.5 Bearer capability Synchronous/asynchronous (octet 5a) coding	Delete row "1 asynchronous".
Section 4.5.5 Bearer capability Synchronous/asynchronous (octet 5a) coding	Delete the second and third sentences from the Note.
Section 4.5.5 Bearer capability Negotiation (octet 5a) coding	Delete row "1 In-band negotiation possible".
Section 4.5.5 Bearer capability User rate (octet 5a) coding	Delete all code points except "01111 56 kbit/s CCITT Recommendation V.6."
Section 4.5.5 Bearer capability	Delete all text relating to octet 5b (i.e., sections labeled "Octet 5b for CCITT Recommendation V.100 or X.30 rate adaption" and "Octet 5b for CCITT Recommendation V.120 rate adaption").
Section 4.5.5 Bearer capability	Delete all tables and text referring to octets 5c (number of data bits excluding parity bit, parity information) and 5d (duplex mode, modem type).
Section 4.5.6 Call state Global interface state value (octet 3) coding	Delete this coding.

Section 4.5.7 Called party number	Change the second paragraph to: "The maximum length of this information element is 18 octets."
Section 4.5.7 Called party number Type of number (octet 3) coding	Delete the following rows: • "011 network specific number (see Note 4)" and • "111 reserved for extension".
Section 4.5.7 Called party number	Delete Note 4.
Section 4.5.7 Called party number Numbering plan identification (octet 3) coding	Delete the following rows: • "0011 Data numbering plan (CCITT Recommendation X.121)"; • "0100 Telex numbering plan (CCITT Recommendation F.69)"; • "1111 Reserved for extension".
Section 4.5.7 Called party number	Add Attachment B of this document after the following: "*Number digits (octets 4, etc.)* This field is coded with ASCII characters, according to the formats specified in the appropriate numbering and dialing plan."
Section 4.5.9 Calling party number	Change the second paragraph from: "The maximum length of this information element is network dependent." to "The maximum length of this information element is 19 octets."
Section 4.5.9 Calling party number Type of number (octet 3) coding	Delete the following rows: • "011 network specific number (see Note 4)" and • "111 reserved for extension".
Section 4.5.9 Calling party number Type of number (octet 3) coding	Delete Note 4.
Section 4.5.9 Calling party number Numbering plan identification (octet 3) coding	Delete the following rows: • "0100 Telex numbering plan (CCITT Recommendation F.69)" and • "1111 Reserved for extension".
Section 4.5.9 Calling party number	Add Attachment C of this document after the following: "*Number digits (octets 4, etc.)* This field is coded with ASCII characters, according to the formats specified in the appropriate numbering or dialing plan."

Section 4.5.10 Calling party subaddress	Add a new paragraph at the end of the section: "In the network to user direction (n —> u), the coding and delivery of this IE depends on the definition of the Calling Line ID service."
Section 4.5.11 Cause	Change the second sentence of the first paragraph from "The maximum length of this information element is 32 octets." to "The maximum length of this information element is 10 octets."
Section 4.5.11 Cause Figure 17 — Cause information element	Change octet 3, bit 8 from "0/1" to "1".
Section 4.5.11 Cause Figure 17 — Cause information element	Delete octet 3a*.
Section 4.5.11 Cause Figure 17 — Cause information element	Delete the Note.
Section 4.5.11 Cause Recommendation (octet 3a) coding	Delete this coding and its associated Notes 1 and 2.
Section 4.5.11 Cause	Add the following sentence to the end of the paragraph under "Diagnostics (octet 5)": "If more than one IE is identified in a diagnostic, they should be ordered as IE's normally appear in a message."
Section 4.5.11 Cause Cause table	Change the "diagnostics" cell of the first three code points to "Not used".
Section 4.5.11 Cause Cause table	Change the "Normal call clearing/diagnostics" cell from "(see Note 12)" to "Not used".
Section 4.5.11 Cause Cause table	Add to the "User busy/diagnostics" cell: "(see Note 10)"
Section 4.5.11 Cause Cause table	Change the "call rejected/diagnostics" cell from "(see Note 12, user supplied diagnostic) (see Note 4)" to "Not used".
Section 4.5.11 Cause Cause table	Delete row "Number changed".

Section 4.5.11 Cause Cause table	Add "(see Note 10)" to the "Network out of order/diagnostics" cell.
Section 4.5.11 Cause Cause table	Add "(see Note 10)" to the "Requested circuit or channel not available/diagnostics" cell.
Section 4.5.11 Cause Cause table	Delete row "Quality of service unavailable".
Section 4.5.11 Cause Cause table	Change the "Requested facility not subscribed/ diagnostics" cell from "Facility identification (see Note 1)" to "Not used".
Section 4.5.11 Cause Cause table	Change the "Bearer capability not authorized/ diagnostics" cell from "(see Note 3)" to "Not used".
Section 4.5.11 Cause Cause table	Delete row "Bearer capability not presently available".
Section 4.5.11 Cause Cause table	Delete row "Service or option not available, unspecified".
Section 4.5.11 Cause Cause table	Change the "Bearer capability not implemented/ diagnostics" cell from "(see Note 3)" to "Not used".
Section 4.5.11 Cause Cause table	Delete row "Channel type not implemented".
Section 4.5.11 Cause Cause table	Change the "requested facility no implemented/ diagnostics" cell from "Facility identification (see Note 1)" to "Not used".
Section 4.5.11 Cause Cause table	Delete rows "Only restricted digital information bearer capability is available" and "Service or option not implemented, unspecified".
Section 4.5.11 Cause Cause table	Delete row "Identified channel does not exist".
Section 4.5.11 Cause Cause table	Change the "incompatible destination/diagnostics" cell from "Incompatible parameter (see Note 2)" to "Not used".

Section 4.5.11 Cause Cause table	Delete row "Invalid message, unspecified".
Section 4.5.11 Cause Cause table	Change the "Recovery on timer expiry/diagnostics" cell from "Timer number (see Note 9)" to "Not used".
Section 4.5.11 Cause Cause table	Delete Notes 2, 3, 4, 5, 7, 9, 11, 12.
Section 4.5.11 Cause Figure 18 — Coding of the diagnostic field for causes 57, 58 and 65	Delete Figure 18 and text for octets 5, 5a, and 5b.
Section 4.5.12 Channel identification Figure 19 — Channel identification information element	Delete the octets 3.1, 3.2, and 3.3.
Section 4.5.12 Channel identification Figure 19 — Channel identification information element	Delete Notes 1, 2, 3, 4.
Section 4.5.12 Channel identification Interface identifier present (octet 3) coding	Delete row "1 Interface explicitly ... with octet 3.1."
Section 4.5.12 Channel identification Interface identifier present (octet 3) coding	Delete the Note and the reference to it in row "0 Interface implicitly identified".
Section 4.5.12 Channel identification Interface type (octet 3) coding	Delete row "1 other interface: ... (see Note)".
Section 4.5.12 Channel identification Interface type (octet 3) coding	Delete the Note.
Section 4.5.12 Channel identification Information channel selection (octet 3) coding	Add the following after Note 3: "4 The combination of 'Any Channel' (bits 1,2), and 'Exclusive' (bit 4) is invalid."
Section 4.5.12 Channel identification	Delete the text, codings, and figures relating to octets 3.1, 3.2, and 3.3.

Section 4.5.13 Connected Number	Delete this section.
Section 4.5.14 Connected subaddress	Delete this section.
Section 4.5.15 Display	Delete this section.
Section 4.5.16 High layer compatibility	Change the second paragraph from "The maximum length of this information element is four octets." to "The maximum length of this information element is five octets."
Section 4.5.18 Low layer compatibility	Delete the second paragraph.
Section 4.5.18 Low layer compatibility Negotiation indicator (octet 3a) coding	Delete row "1 Out-band negotiation possible".
Section 4.5.18 Low layer compatibility Negotiation indicator (octet 3a) coding	Delete Note 1.
Section 4.5.18 Low Layer compatibility User information layer 3 protocol (octet 7) coding	Change "ANSI T1.607" to "NIU 90-301" in row "00010".
Section 4.5.19 Network-specific facilities	Delete this section.
Section 4.5.20 Notification Indicator	Delete this section.
Section 4.5.21 Progress indicator Progress description (octet 4) coding	Delete row "000 0100 4 call has returned to the ISDN."
Section 4.5.21 Progress indicator Progress description (octet 4) coding	Add the following after Note 2: "3 In the SETUP message, n -> u, one of two values may be used: 1 or 3."
Section 4.5.22 Repeat indicator	Delete this section.
Section 4.5.23 Restart indicator	Delete this section.

Section 4.5.24 Signal Figure 32 — Signal information element	Add below the figure: "Note In the n -> u direction, and in the absence of supplementary services, the public network will offer signalling pattern 0 only."
Section 4.5.24 Signal Signal value (octet 3) coding	Delete the following rows: • "intercept tone on"; • "answer tone on"; • "off hook warning tone on"; • "ALERTING on — pattern 5"; • "ALERTING on — pattern 6"; • "ALERTING on — pattern 7".
Section 4.5.25 Transit network selection	Change the second sentence of the first paragraph to: "The transit network selection information element should not be repeated in a message (See Annex C)."
Section 4.5.25 Transit network selection	Change the second paragraph to: "The default maximum length of this information element is 7 octets."
Section 4.5.25 Transit network selection Type of network identification (octet 3) coding	Delete row "011 international network identification".
Section 4.5.25 Transit network selection Network identification plan (octet 3) coding	Delete row "0011 Data network identification code (CCITT Recommendation X.121)".
Section 4.5.26 User-user	Add the following sentence to the end of the Note (after the second paragraph): "This IE is included based on user-user supplementary service description and user application."
Section 4.5.26 User-user Protocol discriminator (octet 3) coding	Change "ANSI T1.607" to "NIU 90-301" in row "0000 1000".
Section 4.6.1 Operator system access type of access (octet 3) coding	Delete row "10 private/principal".
Section 5 Circuit-switched call control procedures	Delete the fourth paragraph ("As a general principle, ...").
Section 5 Circuit-switched call control procedures	Delete the last sentence of second Note ("Display information ... network to user.").
Section 5.1 Call establishment at the originating interface	Change "ANSI T1.602" to "NIU 89-210" in the last sentence of the first paragraph.

Section 5.1.3 Overlap sending	Add the following at the end of section 5.1.3: "However, as an option, the network can determine that a potentially complete code has been received following the receipt of address information, and the network could use critical interdigit timing (instead of T302) to determine whether additional digits are following. This timing could be 3-5 seconds. If implemented, when this timer expires, a complete address is assumed and the procedures in Sec. 5.1.5.2 shall be followed. In an INFORMATION message is received and the critical interdigit timing is running, it shall be stopped."
Section 5.1.4 Invalid call information	Delete the following line from the last paragraph: "22 'number changed'."
Section 5.1.4 Invalid call information	Add the following two paragraphs to the end of section 5.1.4: "The network should reject the call request if the SETUP message contains the keypad information element, and any of the following information elements: transit network selection, called party number, or operator system access. In this case, the network should send the calling user equipment a RELEASE COMPLETE message containing cause 28, 'invalid number format (location: public network serving the local user).'." "If the network receives a called party number information element containing more address digits than expected, as determined by the 'type of number and numbering plan identification' field, the network should discard the superfluous digits and route the call. Similarly, if the transit network selection information element contains more address digits than expected, as determined by the 'type of network identification' and 'network identification plan' fields, the network should discard the superfluous digits and route the call. If the network receives a keypad information element containing more address digits than required for completion of digit analysis, the network should discard the superfluous digits (according to the network dialing plan) and route the call. If any of these events occur, the local public network should send the calling user equipment a STATUS message containing National-specific cause 11, 'More digits received than allowed: call is proceeding (location: public network serving the local user' and the call state information element coded as call state 1, 'call initiated.' Private networks may support this procedure, optionally."

Section 5.1.5.1 Call proceeding, en-bloc sending	Delete causes "58 'bearer capability not presently available';" and "63 'service or option not available, unspecified';" from the second paragraph.
Section 5.1.5.1 Call proceeding, en-block sending	Add to the second paragraph after "57 ... authorized": "34 'no circuit or channel available';".
Section 5.1.5.2 Call proceeding, overlap sending	Delete "58 ...available" and "63 ... unspecified" from the first paragraph.
Section 5.1.5.2 Call proceeding, overlap sending	Add after "57 ... not authorized": "34 'no circuit or channel available';" in the first paragraph.
Section 5.1.5.2 Call proceeding, overlap sending	Add the following at the end of section 5.1.5.2: "*Other Misdialing Treatments* The Network should be capable of recognizing several types of misdialing. If network-provided tones and announcements do not apply, the network should initiate call clearing in response to a misdialing error. If en-bloc sending has been used, the network should send a RELEASE COMPLETE message to the calling user equipment. If overlap sending has been used, the network should send a DISCONNECT message to the calling user equipment. The initial clearing message should contain the appropriate cause information, as indicated below, and the signal information 'reorder tone on.' If tones and announcements apply, see section 5.3.4.1. — Vacant code: National-specific cause 4, 'vacant code.' — Prefix 0 dialed in error: National-specific cause 8, 'prefix 0 dialed in error.' — Prefix 1 dialed in error: National-specific cause 9 'prefix 1 dialed in error.' — Prefix 1 not dialed: National-specific cause 10, 'prefix 1 not dialed.'"
Section 5.1.6 Notification of interworking at the originating interface	Change (a) in the first paragraph to: "In an appropriate call control message when a state change is required (i.e., CONNECT); or,".
Section 5.1.6 Notification of interworking at the originating interface	Delete from the second paragraph the progress description value "4 'call has returned to the ISDN'. Call is now end-to-end and ISDN."

Section 5.1.7 Call confirmation indication	Change the last sentence of the first paragraph to: "When the user receives the ALERTING message, the user shall enter the Call Delivered state."
Section 5.2 Call establishment at the destination interface	Change "ANSI standard T1.602" to "NIU 89-210" in the first sentence of the first paragraph.
Section 5.2 Call establishment at the destination interface	Delete the third paragraph ("The SETUP message offered ... of the data link layer.").
Section 5.2.1 Incoming call	Delete "Display," from the second paragraph "(e.g., Display, Low layer compatibility)."
Section 5.2.1 Incoming call	Add the following to the end of second paragraph. "In general, a call terminating from a non-ISDN line or from a Public Switched Telephone Network (PSTN) trunk should be offered to the called user equipment with the 3.1. kHz audio bearer capability."
Section 5.2.1 Incoming call	Change "(e.g., for DDI)" to "(e.g., 7 digits)" in the second sentence of the third paragraph.
Section 5.2.1 Incoming call	Delete the third sentence from the third paragraph.
Section 5.2.2 Compatibility checking	Delete the third paragraph.
Section 5.2.3.1 SETUP message delivered by point-to-point data link	Delete this section.
Section 5.2.3.2 SETUP message delivered by broadcast data link	Combine the first and second sentences of the first paragraph to: "When the SETUP message is delivered by a broadcast data link, the network sends a SETUP message with the Channel identification information element indicating a specific channel with no alternative acceptable."
Section 5.2.5.1 Response to en-block SETUP	Delete "(see Note)" from the first sentence of the first paragraph.
Section 5.2.5.1 Response to en-block SETUP	Delete the Note after the first paragraph.
Section 5.2.5.1 Response to en-block SETUP	Delete the third paragraph ("When the SETUP message was delivered via a point-to-point data link ...").
Section 5.2.5.3 Called user clearing during incoming call establishment	Delete the first paragraph.

Section 5.2.5.3
Called user clearing during incoming call establishment

Change the second sentence of the second paragraph to: "If timer T303 expires (i.e., if no valid message such as CALL PROCEEDING, ALERTING, or CONNECT has been received), the network shall take action as follows:

a. If all clearing messages received from the called user equipment contain cause 88, 'incompatible destination,' the call should be cleared at the calling ISDN interface with cause 18, 'no user responding (location: public network serving the remote user)' and signal 'ring-back/audible ringing tone on.'

b. If one or more call clearing messages with cause 17, 'user busy,' have been received from the called user equipment, the call should be cleared at the calling ISDN interface with cause 17,'user busy (location: user).' The signal information should be coded as 'busy tone on' unless an audible ringing tone was indicated because timer T delay (if implemented) previously expired (see sec. 5.2.1). If audible ringing is being provided, the signal information should be coded as 'ring-back/audible ringing tone on.'

c. If no call clearing messages with cause 17 have been received from the called user equipment and at least one call clearing message with a cause other than 88 has been received, the call should be cleared at the calling ISDN interface with cause 21, 'call rejected (location: user),' and signal 'ring-back/audible ringing tone on.'."

Section 5.2.5.3
Called user clearing during incoming call establishment

Delete the last sentence from the second paragraph: "When multiple RELEASE COMPLETE ... sent to the originating user (see 5.3)."

Section 5.2.5.3.1
DISCONNECT received prior to expiry of T312

Change the second sentence in the second paragraph from "If an ALERTING message has been received, ... any other cause sent by a called user." to "If an ALERTING message has been received, the cause sent to the calling user shall be 21 'call rejected' (location: user)."

Section 5.2.5.3.1 DISCONNECT received prior to expiry of T312	Change the third sentence in the second paragraph from "In only CALL PROCEEDING ... sent by a called user." to "If only CALL PROCEEDING messages have been received from called users, the cause sent to the calling user shall be as in 5.2.5.3."
Section 5.2.5.3.2 DISCONNECT received after expiry of timer T312	Change the second sentence in the third paragraph from "If an ALERTING message has been received, ... any other cause sent by a called user." to "If an ALERTING message has been received, the cause sent to the calling user shall be 21 'call rejected' (location: user)."
Section 5.2.5.3.2 DISCONNECT received after to expiry of T312	Change the third sentence in the third paragraph from "If only CALL PROCEEDING ... by a called user" to "If only CALL PROCEEDING messages have been received, the cause sent to the calling user shall be as in 5.2.5.3."
Section 5.2.5.4 Call failure	Delete all occurrences of "(b) ..." (paragraphs 1, 3, 4) from this section.
Section 5.2.6 Notification of interworking at the terminating interface	Delete this section.
Section 5.2.7 Call accept	Add to the end of the second paragraph: "If the CONNECT message is the first response to the SETUP message, it shall contain the channel ID information element."
Section 5.2.8 Active indication	Delete the last paragraph of section 5.2.8 ("A user which has ... has been completed").

Section 5.3.2
Exception conditions

Add the following before the Note that appears at the end of this section.

"

— In the case of a SETUP message sent to the user via the broadcast data link, if a called user terminal sends a first response to the SETUP message after timer T303 has expired (the first expiration of T303 is the SETUP message should not be retransmitted, and the second expiration of T303 if the SETUP message should be retransmitted — note that the SETUP message is retransmitted only when no response is received prior to the first expiry of T303, e.g., the SETUP message should not be retransmitted when a call clearing message(s) is received prior to the first expiry of T303), but before timer T312 expires, the network should clear the call to that user by sending a RELEASE message. This message should contain cause 102, 'recovery on timer expiry' (location: public network serving the local user.).

— In the case of call offering via the broadcast data link, if either timer T310 or T301 expires at the called user interface, the network should initiate call clearing by sending a RELEASE message to all called user equipment responding to the SETUP message sent by the network. The RELEASE message(s) should contain cause 102, 'recovery on timer expiry' (location: public network serving the local user).

— If a call attempt is unsuccessful and a speech, 3.1 kHz audio call will not be immediately cleared because inband tones or announcements are being provided, the network should send the calling user a PROGRESS message containing progress message containing progress indicator 8, 'inband information or appropriate pattern now available.'."

Section 5.3.3
Clearing initiated by the user

Delete the last Note in this section.

Section 5.3.4.1 Clearing when tones or announcements provided	Add the following at the end of section 5.3.4.1: "To return an inband tone for an unsuccessful speech, 3.1. kHz audio the network should send a PROGRESS message and start a tone timer (value to be specified by network provider) in anticipation of the user initiating the clearing process. The PROGRESS message should contain the cause value indicated in the detailed procedures of Section 5.3, along with progress indicator 8, 'inband information or appropriate pattern now available.' If the tone timer expires, the network should initiate call clearing by sending the calling user a DISCONNECT message containing cause 102, 'recovery on timer expiry.' The network should then continue clearing the connection to the calling user equipment according to the procedures for sending a DISCONNECT message. The procedures described above also apply for returning an inband announcement for an unsuccessful speech, 3.1 kHz audio call, with the exception that the tone timer is not used. Inband announcements should not be timed; however, it is desirable that the network Delete an inband announcement after one or two message cycles, depending on the number specified by the network provider. In removing the inband announcement, the network should follow the above procedures for expiration of the tone timer."
Section 5.3.4.3 Completion of clearing	Delete the last Note at the end of section 5.3.4.3.
Section 5.5 Restart procedure	Delete this section including all subsections.
Section 5.8 Handling of error conditions	Change "T1.607" to "Q.931" in the first sentence of the first paragraph.
Section 5.8.1 Protocol discrimination error	Change "T1.607" to "Q.931" in the first sentence in the first paragraph.
Section 5.8.3.1 Invalid call reference format	Change the second paragraph to: "If the Call reference information element octet 1, bits 1 through 4 indicates a length greater than the maximum length supported by the receiving equipment (see 4.3), or the Null call reference, or the global call reference is used to identify a call, then the message shall be ignored."
Section 5.8.3.2 Call reference procedural errors	Delete item "(f) When any message ... shall be returned."

Section 5.8.4 Message type or message sequence errors	Add as a new paragraph "A NOTIFY message may also be ignored by the recipient." after the first paragraph (i.e., after the list of cause values).
Section 5.8.4 Message type or message sequence errors	Change the fourth sentence in the second paragraph to: "Whenever the network receives an unexpected RELEASE message, the network shall: disconnect and release the B-channel; clear the network connection and the call to the remote user with cause as specified in 5.2.5.3, or cause in the RELEASE message sent by the user. If no cause is included, cause 31 'normal, unspecified' or other causes as specified in 5.8.6.1; return a RELEASE COMPLETE message to the user; release the call reference; stop all timers; and enter the Null state."
Section 5.8.4 Message type or message sequence errors	Change the second sentence of the third paragraph to: "Whenever the network receives an unexpected RELEASE COMPLETE message, the network shall: disconnect and release the B-channel; clear the network connection and the call to the remote user with the cause indicated by the user or, if not included, cause 111 'protocol error, unspecified' or other causes as specified in 5.8.6.1; release the call reference; stop all timers; and enter the Null state."
Section 5.8.6.1 Mandatory information element missing	Change the beginning of the first sentence in the third paragraph to: "When a DISCONNECT message (first clearing message) is received with ...."
Section 5.8.6.1 Mandatory information element missing	Add the following as a new paragraph after the third paragraph: "As an option the network shall follow the following procedure. The DISCONNECT message sent to the network should contain cause information. If the network receives an initial clearing message without a cause information element, it should accept the message, disconnect the associated channel, and initiate procedures to clear the network connection and the call to the remote user. If the call is active or if the originating user cleared the call while in the setup phase, the network should send cause 16, 'normal clearing (location: user)' to the remote user. It should send cause 21, 'call rejected (location: user)' if the terminating user cleared the call while in the setup phase. The network should respond to the user initiating call clearing by sending a RELEASE message containing cause 96, 'mandatory information element is missing (location: public network serving the local user; diagnostic: cause information element identifier).'."

Section 5.8.6.2 Mandatory information element content error	Change the third paragraph to: "When a DISCONNECT message is received with invalid content of the Cause information element, the action taken shall be the same as if a DISCONNECT message with the cause missing was received with the exception that the RELEASE message sent on the local interface contains cause 100 'invalid information element contents'."
Section 5.8.7.1 Unrecognized information elements	Add the following to the Note after the first paragraph: "or not implemented by the receiver in a specific message."
Section 5.8.8 Data-link reset	Change "ANSI T1.607" to "NIU 90-301" in the first sentence of the first paragraph.
Section 5.8.9 Data-link failure	Change "ANSI T1.607" to "NIU 90-301" in the first sentence of the first paragraph.
Section 5.8.9 Data-link failure	Change both occurrences of "ANSI T1.607" in the first paragraph bullet b) to "NIU 90-301".
Section 5.8.9 Data-link failure	Change the first Note after the first paragraph to: "If the transfer mode of the call is circuit-mode, the NIU 90-301 entity may clear the calls."
Section 5.8.10 Status enquiry procedure	Delete the first paragraph.
Section 5.8.11 Receiving a STATUS message	Delete "As an option:" from the second sentence of the third paragraph ("The determination ...").
Section 5.8.11 Receiving a STATUS message	Change "a)" in the third paragraph to: "If a STATUS message indicating any call state except the Null state is received in the Null state, then the receiving entity shall send a RELEASE COMPLETE message with a cause 101 'message not compatible with call state' or cause 81 'Invalid Call reference value' and remain in the Null state. Otherwise, no action shall be taken on receipt of STATUS unless it is in response to STATUS ENQUIRY."
Section 5.8.11 Receiving a STATUS message	Delete "b) If a ..." and "c) If a STATUS message, indicating the Null ... into the Null state." after the third paragraph.
Section 5.8.11 Receiving a STATUS message	Delete the last three paragraphs and the last Note in this section.
Section 5.9 User notification procedure	Delete this section.

Section 6
Packet communication procedures

Change sentence to "See NIU 89-320".

Section 9.1
Timers in the network side
Table 22 — Timers in the network side

Change the "T302/Default time out value" cell from "10-15 s" to "16-24 s".

Section 9.1
Timers in the network side
Table 22 — Timers in the network side

Change the "T302/cause for start" cell from "SETUP ACKNOWLEDGE sent. Receipt of INFORMATION restarts T302." to "SETUP ACKNOWLEDGE sent. Receipt of INFORMATION not containing complete address information restarts T302."

Section 9.1
Timers in the network side
Table 22 — Timers in the network side

Change the "T302/NORMAL STOP" cell to: "With sending complete indication, or potentially complete address information received, as an option, the network can determine that a potentially complete code has been received following the receipt of address information, and the network could use critical interdigit timing (instead of T302) to determine whether additional digits are following. This timing could be 3-5 seconds. If implemented, when this timer expires, a complete address is assumed and the procedures in section 5.1.5.2 shall be followed. In an INFORMATION message is received and the critical interdigit timing is running, it shall be stopped."

Section 9.1
Timers in the network side
Table 22 — Timers in the network side

Add the following row entry for Timer "Tpot_comp" after row "T302":

TIMER NUMBER	DEFAULT TIME OUT VALUE	STATE OF CALL	CAUSES FOR START	NORMAL STOP	AT THE FIRST EXPIRY	AT THE SECOND EXPIRY	CROSS REFERENCE
Tpot_comp	3-5 s	Overlap Sending	Potentially complete address information received	INFORMATION received	Route call	Timer not restarted	*

* optional — as an option, the network can determine that a potentially complete code has been received following the receipt of address information, and the network could use critical interdigit timing (instead of T302) to determine whether additional digits are following. This timing could be 3-5 seconds. If implemented, when this timer expires, a complete address is assumed and the procedures in Section 5.1.5.2 shall be followed. In an INFORMATION message is received and the critical interdigit timing is running, it shall be stopped."

Section 9.1 Timers in the network side Table 22 — Timers in the network side	Change the "T303/DEFAULT TIME OUT VALUE" cell from "4s" to "2.5s".
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Change the "T303/NORMAL STOP" cell to "ALERT, CONNECT, or CALL PROCEEDING received."
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Change the "T303/AT THE FIRST EXPIRY" cell to "Retransmit SETUP; re-start T303."
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Delete "Note 7" from the "T308/AT SECOND EXPIRY" cell.
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Change "10s" to "5s" in the "T310/DEFAULT TIME OUT VALUE" cell.
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Delete "Note 6" from the "T310/DEFAULT TIME OUT VALUE" cell.
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Delete the following rows: "T316", "T317", "T321".
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Delete the following Notes: 3, 6, 7 at the end of Table 22.
Section 9.2 Timers in the user side Table 23 — Timers in the user side	Change the "T301/CROSS REFERENCE" cell to "Note 3".
Section 9.2 Timers in the user side Table 23 — Timers in the user side	Change the "T303/NORMAL STOP" cell to "SETUP ACKNOWLEDGE, CALL PROCEEDING or RELEASE COMPLETE received".
Section 9.2 Timers in the user side Table 23 — Timers in the user side	Delete "(annex D)" from the "T303/AT THE FIRST EXPIRY" cell.
Section 9.2 Timers in the user side Table 23 — Timers in the user side	Change the "T303/CROSS REFERENCE" cell to "optional".
Section 9.2 Timers in the user side Table 23 — Timers in the user side	Delete "Note 5" from the "T308/AT THE SECOND EXPIRY" cell.

Section 9.2 Timers in the user side Table 23 — Timers in the user side	Delete rows "T310", "T316", "T317", "T321".
Section 9.2 Timers in the user side Table 23 — Timers in the user side	Delete Notes 2 and 5 that appear at the end of table 7.
Annex A	Delete this section. NOTE: This section has not been addressed.
Annex B, Section B.3.1 Compatibility checking with addressing information	Change the second sentence under "a)" to: "In the case of a mismatch, the user shall either ignore or reject the call."
Annex B, Section B.3.2 Network to user compatibility	Change the last sentence in this section to: "If a mismatch is detected, then the user shall either ignore or reject the offered call using cause 88 'incompatible destination'."
Annex B, Section B.3.4 User action figures Figure B.1 — Bearer capability compatibility checking Figure B.2 — Low layer and high layer compatibility checking; compatibility assured Figure B.3 — Low layer and high layer compatibility checking; compatibility not assured	Delete the "point-to-point data link" columns.
Annex B, Section B.3.4 User action figures Figure B.1 — Bearer capability compatibility checking Figure B.2 — Low layer and high layer compatibility checking; compatibility assured	Change the "Incompatible/Broadcast data link" cell from "Reject" to "Ignore or Reject".
Annex B, Section B.3.4 User action figures Figure B.2 — Low layer and high layer compatibility checking; compatibility assured Figure B.3 — Low layer and high layer compatibility checking; compatibility not assured	Delete "Note 3" from the "Incompatible/broadcast data link" column.
Annex B, Section B.3.4 User action figures Figure B.1 — Bearer capability compatibility checking Figure B.2 — Low layer and high layer compatibility checking; compatibility assured Figure B.3 — Low layer and high layer compatibility checking; compatibility not assured	Delete the reference to "Note 1" from the last column.

Annex B, Section B.3.4 User action figures Figure B.3 — Low layer and high layer compatibility checking; compatibility not assured	Change "Accept or Reject" to "Accept, Ignore, or Reject" in the Broadcast Data Link column.
Annex B, Section B.3.4 User action figures Figure B.3 — Low layer and high layer compatibility checking; compatibility not assured	Delete Note 1 below figure B.3.
Annex B, Section B.3.4 User action figures Figure B.3 — Low layer and high layer compatibility checking; compatibility not assured	Change "will reject the call if incompatible" to "may reject the call if incompatible" in Note 2 below figure B.3.
Annex B, Section B.3.4 User action figures Figure B.3 — Low layer and high layer compatibility checking; compatibility not assured	Delete Note 3 ("Attempt low layer compatibility negotiation (see Annex M).") below Figure B.3.
Annex C, Section C.1 Introduction	Delete "optional" from the first paragraph.
Annex C, Section C.2 Selection not supported	Delete this section.
Annex C, Section C.3 Selection supported	Change the first sentence of the first paragraph to: "The user identifies the selected transit network in the SETUP message."
Annex C, Section C.3 Selection supported	Delete the second and third paragraphs.
Annex C, Section C.3 Selection supported	Delete the first sentence of the fourth paragraph.
Annex C, Section C.3 Selection supported	Delete the last sentence in the sixth paragraph.
Annex C, Section C.3 Selection supported	Delete the seventh, eighth, and ninth paragraphs.
Annex D Extension for symmetric call operation	Delete this section.
Annex E Network-specific facility selection	Delete this section.
Annex F D-channel backup procedure	Delete this section.

Annex G, Section G.1 Introduction	Add the following at the end of the first paragraph: "Section 4.5.11 identifies the causes supported in NIU 90-301."
Annex G Cause Definitions	Delete the following sections: • Section G.2.16 Cause 22 "number changed" • Section G.3.2 Cause 38 "network out of order" • Section G.3.7 Cause 45 "preemption" • Section G.3.8 Cause 46 "precedence call blocked" • Section G.3.9 Cause 47 "resource unavailable, unspecified" • Section G.4.1 Cause 49 "quality of service unavailable" • Section G.4.4 Cause 58 "bearer capability no presently available" • Section G.4.5 Cause 63 "service or option not available, unspecified" • Section G.5.2 Cause 66 "channel type not implemented" • Section G.5.4 Cause 70 "only restricted digital information bearer capability is available" • Section G.5.5 Cause 79 "service or option not implemented, unspecified" • Section G.6.2 Cause 82 "identified channel does not exist" • Section G.6.4 Cause 91 "invalid transit network selection" • Section G.6.5 Cause 95 "invalid message, unspecified"
Annex H Examples of Information elements coding	Change the status of this section from "informative" to "normative".
Annex H, Section H.1 Introduction	Replace the first and second paragraphs with the following: "These are the only recognized codings of the following Information Elements for circuit-mode services: — Bearer capability information element — Channel identification information element".
Annex H Examples of information elements coding	Delete the following figures and sections: • Figure "H.3 Coding for 7 kHz Audio" • Figure "H.6 Coding for synchronous 1472 kbit/s"; • sections H.3.2 (Figures H.9, H.10, H.11); • H.3.3 (Figures H.12 through H.17); • H.4 (Figures H.18 through H.21);
Annex H, Section H.3.1 Basic Interface, circuit mode, B-channel	Add Attachment D of this document.

Annex I Use of Progress Indicators	Change the status of this Annex from "Informative" to "Normative".
Annex I Use of progress indicators	Delete the fifth paragraph ("*Progress Indicator 4* ...").
Annex I Use of Progress Indicators	Delete "or primary" from the left side (between TE and ISDN) of Figure I.1.
Annex I Use of Progress Indicators	Delete "Basic or" from the right side (between ISDN and NT2) of Figure I.1
Annex J Examples of Cause Values and location for busy condition	Change "American National Standard T1.607" to "NIU 90-301" in the first sentence of the first paragraph.
Annex L low layer information coding principles	Change the first sentence of the first paragraph to: "This annex is part of NIU 90-301."
Annex M Low layer compatibility Negotiation	Delete this annex.
Annex N Procedures for establishment of bearer connection prior to call acceptance	Delete this annex.
Annex O Optional procedures for bearer service change	Delete this annex.
Annex P, Section P.1 Introduction	Delete "optional" from the first sentence.
Annex P, Section P.1 Introduction	Delete "or attendant system" from the end of the first sentence in the first paragraph.
Annex P, Section P.1 Introduction	Change the last sentence of the first paragraph to: "These procedures apply to the speech and 3.1 kHz audio bearer services."
Annex P, Section P.1 Introduction	Delete "or attendant system" from the first sentence in the second paragraph.
Annex P, Section P.2 Operator system access requested in keypad facility information element	Delete "or attendant system" from the first sentence of the first paragraph.
Annex P, Section P.2 Operator system access requested in keypad facility information element	Delete "or attendant system" from the last sentence of the first paragraph.

Annex P, Section P.3 Use of the operator system access information element	Delete "or attendant system" from the first sentence of the first paragraph.
Annex P, Section P.3 Use of the operator system access information element	Delete "c) Private/principal ... SETUP message." from the second paragraph.
Annex P, Section P.3 Use of the operator system access information element	Delete "or attendant system" from the third paragraph.
Annex P, Section P.3 Use of the operator system access information element	Delete the sixth paragraph.
Annex Q Responding address requirements of the OSI network layer service	Delete this annex.
Annex R Application of the Signal Information Element to Tones and Alerting Patterns	Change the status of this Annex from "informative" to "normative".
Annex R Application of the Signal Information Element to Tones and Alerting Patterns Table 21 — Tones	Delete the following rows: 2, 6, 8.
Annex S Comparison of CCITT Recommendation Q.931 to ANSI T1.607	Delete this annex.

Attachment A
(of Appendix A)

1. General

1.1 Scope and Purpose

This Implementation Agreement specifies a minimal subset of procedures and codepoints from the American National Standards T1.607-1990 (Ref. [17]) for the establishment, maintenance, and clearing of ISDN connections at the user-to-network interface. This signalling standard is used to support the circuit-switched bearer services specified in ANSI standards T1.603*.

Terminals are not required to support all services. Switches will support all of the mandatory protocols and codepoints in this implementation agreement. This does not preclude the support of additional services and procedures. However, equipment must be able to interoperate with equipment supporting only this minimal subset.

1.1.1 Definitions

The ANS T1.607-1990 (Ref. [17]) assumes that procedures apply generically to ISDN access interfaces, i.e., the document does not distinguish between basic and primary rates access interfaces. In addition, there are no references to specific applications in that document. The concept of equipment classes is introduced in this document to permit certain procedures to be associated with a particular application or class of equipment, e.g., station equipment versus PBX. Specifically, two classes of equipment are defined on the basis of two fundamental attributes.

The first attribute relates to the possibility of an exchange of signals occurring beyond the public network's point of contact with the interface (i.e., between the equipment directly connected to the public network and ISDN terminals or telephones connected to that equipment). For example, some user equipment may support subtending Basic Access digital subscriber loops and/or analog telephone loops. For Class I equipment, the network makes no provision for such an arrangement and assumes the Class I equipment constitutes the endpoint of the communication. Conversely, in the case of Class II equipment, the procedures at the network take into account that communication between Class II equipment (with which it communicates directly) and other equipment (with which the network does not have direct contact) may occur. As an example, Class II equipment may support digital and/or analog subscriber loops. Use of Class II equipment also involves the possibility of having interworking occur beyond the equipment with which the network has direct contact. Therefore, it is reasonable for Class II equipment to provide the network with an interworking notification, for both outgoing and incoming calls, when either the calling or called party respectively, is a non-ISDN user. Class II equipment may also send an interworking notification if a private network exists beyond the Class II equipment and interworking to a non-ISDN facility within that network takes place. When an interface is associated with Class I equipment, it is assumed the multiple pieces of equipment may exist and communicate with the network over the D-channel. However, in this case, all equipment is assumed to be ISDN-capable and is considered as the endpoint of the communication. Therefore, interworking notification should not be accepted from Class I equipment.

The second attribute relates to the manner in which a SETUP message should be presented to the user equipment. When Class I equipment is applied on a particular interfaces, the network should broadcast the SETUP message associated with each call that terminates on that interface, since interaction between the network and multiple pieces of user equipment should be supported. On the other hand, the network should not broadcast SETUP messages

*Subject to further discussion.

associated with terminating calls to an interface on which Class II equipment is being used. Here, a single piece of user equipment is assumed to be involved in all communication with the network.

To the extent possible, it is desirable to have one set of requirements for ISDN call control apply to all ISDN user configurations. However, in cases for which integrated procedures are not appropriate, the call control procedures associated with Equipment Class I will differ from those associated with Equipment Class II. Unless otherwise noted, the assumption should be that a particular procedure/capability should be provided for both classes of equipment on both basic and primary rate access. However, use of the equipment class terminology permits clarification of the circumstances under which a certain capability should be available (i.e., when a particular equipment class is in use). It also permits a mechanism for indicating that a particular capability applies only to a subset of four possible configurations which are labeled as follows.

	Class I	Class II
BRI	*IB*	*IIB*
PRI	*IP*	*IIP*

In other words, a capability that applies to Class I equipment may be provided on basic access interfaces (IB) and/or primary rate access interfaces (IP). Similarly, a capability that applies to Class II equipment may be provided on basic access interfaces (IIB) and/or primary rate access interfaces (IIP).

The notation shown in the table above is used within this implementation agreement to indicate when protocol or procedures are only expected to be supported for a particular equipment class and/or are limited to a particular type of interface, i.e., basic or primary rate interface.

Attachment B
(of Appendix A)

The various parts of the called party number information element should be coded as follows:

— Type of number and numbering plan (octet 3)

Bits 7 6 5 4 3 2 1	Meaning
0 0 0 0 0 0 0	Unknown
0 0 1 0 0 0 1	International number in ISDN numbering plan (Rec. E.164)
0 1 0 0 0 0 1	National number in ISDN numbering plan (Rec. E.164)
1 0 0 0 0 0 1	Local (directory) number in ISDN numbering plan (Rec. E.164)
1 1 0 1 0 0 1	Abbreviated Number in Private Numbering plan

All other values are reserved

— Digits (octet 4, etc.)

Bits 7 6 5 4 3 2 1	Meaning
0 1 1 0 0 0 0	0
0 1 1 0 0 0 1	1
0 1 1 0 0 1 0	2
0 1 1 0 0 1 1	3
0 1 1 0 1 0 0	4
0 1 1 0 1 0 1	5
0 1 1 0 1 1 0	6
0 1 1 0 1 1 1	7
0 1 1 1 0 0 0	8
0 1 1 1 0 0 1	9

All other values are reserved

Digits should be represented by IA5 characters whose encoding is shown above.

In the network to user direction (n -> u), this IE will be always signaled in the SETUP message, and public network interfaces will use only one codepoint: local number in ISDN. For private networks, this IE can contain the following codepoints: abbreviated type of number, and private numbering plan, and extra digits such A, B, C, and D (as per IA5).

Attachment C
(of Appendix A)

The various parts of the calling party number information element should be coded as described below. The numbering plans are as described in CCITT Recommendations E.164 or X.121.

— Type of number and numbering plan (octet 3) follows:

Bits 7 6 5 4 3 2 1	Meaning
0 0 0 0 0 0 0	Unknown
0 0 1 0 0 0 1	International number in ISDN numbering plan (Rec. E.164)
0 0 1 0 0 1 1	International number in data numbering plan (Rec. X.121)
0 1 0 0 0 0 1	National number in ISDN numbering plan (Rec. E.164)
1 0 0 0 0 0 1	Local (directory) number in ISDN numbering plan (Rec. E.164)
1 1 0 1 0 0 1	Abbreviated Number in Private Numbering plan

All other values are reserved

— Origin of number and presentation status (octet 3a) follows:

Bits 7 6 5 4 3 2 1	Meaning
0 0 0 0 0 0 0	Presentation allowed of user-provided number, number not screened
0 0 0 0 0 0 1	Presentation allowed of user-provided number, number passed network screening
0 0 0 0 0 1 0	Presentation allowed of user-provided number, number failed network screening
0 0 0 0 0 1 1	Presentation allowed of network-provided number
0 1 0 0 0 0 0	Presentation prohibited of user-provided number, number not screened
0 1 0 0 0 0 1	Presentation prohibited of user-provided number, number passed network screening
0 1 0 0 0 1 0	Presentation prohibited of user-provided number, number failed network screening
0 1 0 0 0 1 1	Presentation prohibited of network-provided number
1 0 0 0 0 1 1	Number not available

All other values are reserved

Notes

1—When octet 3a is omitted, the default value of Number Presentation parameter for the signaled DN value should be used, if it is available. If a value for this parameter is unavailable (i.e., the signaled DN value either fails screening or is not screened by the SPCS), the presentation parameter value of the default DN should be used.

2—Octet 3a, bits 7 and 6 are for the Presentation Indicator; bits 2 and 1 are for the Screening Indicator.

— Digits (octet 4, etc.)

Digits should be represented by IA5 characters whose encoding is shown below:

Bits 7 6 5 4 3 2 1	Meaning
0 1 1 0 0 0 0	0
0 1 1 0 0 0 1	1
0 1 1 0 0 1 0	2
0 1 1 0 0 1 1	3
0 1 1 0 1 0 0	4
0 1 1 0 1 0 1	5
0 1 1 0 1 1 0	6
0 1 1 0 1 1 1	7
0 1 1 1 0 0 0	8
0 1 1 1 0 0 1	9

All other values are reserved

Codings At Originating Party Interface

The calling party number information element should only be accepted when in the SETUP message. When the type of number and numbering plan indicator indicates "local number in the ISDN (E.164) numbering plan," the calling party number information element should contain a 7-digit local number. When the type of number and numbering plan indicator indicates "national number in the ISDN (E.164) numbering plan" the calling party number information element should contain a 10-digit national number.

In the network to user direction (n -> u), the coding and delivery of this IE depends on the definition of the Calling Line ID service. For private networks, this IE can contain the following codepoints: abbreviated type of number, and private numbering plan, and extra digits such as A, B, C, and D (as per IA5).

Attachment D
(of Appendix A)

- add the following figures to section H.3.1

8	7	6	5	4	3	2	1	octet
Channel identification								
0	0	0	1	1	0	0	0	1
Information element identifier								
0	0	0	0	0	0	0	1	2
Length of the channel identification contents								
1	0	0	0	1	0	0	1	3
	int id	int type		Pref/ Excl	D ch. id.	Ch. sel.		

Figure H.7-1. Channel B1 exclusive.

8	7	6	5	4	3	2	1	octet
Channel identification								
0	0	0	1	1	0	0	0	1
Information element identifier								
0	0	0	0	0	0	0	1	2
Length of the channel identification contents								
1	0	0	0	0	0	1	0	3
	int id	int type		Pref/ Excl	D ch. id.	Ch. sel.		

Figure H.7-2. Channel B2 preferred.

8	7	6	5	4	3	2	1	octet
Channel identification								
0	0	0	1	1	0	0	0	1
Information element identifier								
0	0	0	0	0	0	0	1	2
Length of the channel identification contents								
1	0	0	0	1	0	1	0	3
	int id	int type		Pref/ Excl	D ch. id.	Ch. sel.		

Figure H.7-3. Channel B2 exclusive.

8	7	6	5	4	3	2	1	octet
Channel identification								
0	0	0	1	1	0	0	0	1
Information element identifier								
0	0	0	0	0	0	0	1	2
Length of the channel identification contents								
1	0	0	0	0	0	1	1	3
	int id	int type		Pref/ Excl	D ch. id.	Ch. sel.		

Figure H.7-4. Any B-channel.

8	7	6	5	4	3	2	1	octet
Channel identification								
0	0	0	1	1	0	0	0	1
Information element identifier								
0	0	0	0	0	0	0	1	2
Length of the channel identification contents								
1	0	0	0	0	0	0	0	3
	int id	int type		Pref/ Excl	D ch. id.	Ch. sel.		

Figure H.7-5. No B-channel Indicated.

APPENDIX B.

NIU 90-302
Implementation Agreement
of the North American ISDN Users' Forum

Layer 3 Signalling Specification for the
Minimal Set of Circuit-Switched Bearer Services for
the ISDN Class II Primary Rate Interfaces.

Baseline Text
American National Standard T1.607-1990:
Integrated Services Digital Network (ISDN) —
Layer 3 Signalling Specification for
Circuit-Switched Bearer Service for
Digital Subscriber Signalling System Number 1 (DSS1).

Base Standards
CCITT Recommendation Q.931 (1988):
ISDN User-Network Interface Layer 3
Specification For Basic Call Control.
ANSI T1.607-1990
ANSI T1.603-1990*:
Integrated Services Digital Network (ISDN) —
Minimal Set of Bearer Services for
the Primary Rate Interface.

B.1 Abstract

This Implementation Agreement specifies procedures for establishing, maintaining, and clearing connections at the Integrated Services Digital Network (ISDN) user-network interfaces identified as Class II PRI, and are mandatory for the support of the minimal set of circuit-switched bearer services specified by ANSI T1.603-1990* *Integrated Services Digital Network (ISDN) — Minimal Set of Bearer Services for the Primary Rate Interface,* (Ref. [14]). Procedures for circuit-mode digital, circuit-mode speech and circuit-mode voiceband data bearer services are as specified in the baseline text ANS T1.607-1990, *Integrated Services Digital Network (ISDN) — Digital Subscriber Signalling System Number 1 (DSS1) — Layer 3 Signalling Specification for Circuit-Switched Bearer Service,* (Ref. [17]), as further resolved by this agreement. The packet-mode data service is included in this document as a bearer service. Procedures for the packet-mode bearer service will be detailed in another document.

*Subject to further discussion

B.2 Introduction

The original implementation agreement (NIU 90-302) was reached by marking up the text of ANS T1.607-1990, (Ref. [17]) to reflect the clarifications of text and selection of options. This appendix translates the implementation agreement markup into a listing of these clarifications and selections, (i.e., this appendix lists the differences (the "delta") between the implementation agreement marked up ANS T1.607-1990, and the original text of ANS T1.607-1990).

B.3 NIU 90-302 Delta List**

The IA has adopted the ANS T1.607-1990*** (Ref. [17]) standard with the following clarifications of the text, and selection of options:

ANS T1.607-1990 SECTION/TABLE NUMBER/NAME	IMPLEMENTATION AGREEMENTS - CLARIFICATION OF TEXT AND SELECTION OF OPTIONS
Section 1.1 Scope and Purpose	Replace this section with Attachment A of this document.
Section 2.1.1.3 Overlap Sending (U2)	Delete this section.
Section 2.1.2.3 Overlap Sending (N2)	Delete this section.
Section 2.1.2.14 Call Abort (N22)	Delete this section.
Section 3.1 Table 1 — Messages for circuit-mode connection control	Delete the following message and reference: "INFORMATION 3.1.6".
Section 3.1 Table 1 — Messages for circuit-mode connection control	Delete the following message and reference: "SETUP ACKNOWLEDGE 3.1.12".
Section 3.1 Table 1 — Messages for circuit-mode connection control	Change "NOTIFY 3.1.7" to "NOTIFY*".

**Note that this Delta List was developed in "good faith" by NIST as a simple equivalent representation of the actual agreements. It has been reviewed and approved by the editors of the Signalling Working Group as per recommendation of the Executive Steering Committee.

***These documents can be purchased from: American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

Section 3.1 Messages for circuit-mode connection control	Add the following footnote below Table 1 "* See section 5.8.4 for treatment of this message."
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Change the "Channel identification/Length" cell from "2-*" to "2, 5-6".
Section 3.1.1 ALERTING Table 2 - ALERTING message content	Delete the following rows: • "Display"; • "Signal".
Section 3.1.1 ALERTING Table 2 — ALERTING message content	Delete Notes 4, 5, 6.
Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Change the "Channel identification/Type" cell from "O(Note 1)" to "M".
Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Change the "Channel identification/Length" cell from "2-*" to "2, 5-6".
Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Delete rows • "Progress indicator"; • "Display".
Section 3.1.2 CALL PROCEEDING Table 3 — CALL PROCEEDING message content	Delete Notes 1, 2, 3, 4.
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Change the "Channel identification/Length" cell from "2-*" to "2, 5-6".

Section 3.1.3 CONNECT Table 4 — CONNECT message content	Delete the following rows: • "Display"; • "Signal"; • "Connected number"; • "Connected subaddress"; • "Low layer compatibility".
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Change Note 3 to: "Included in the event of interworking."
Section 3.1.3 CONNECT Table 4 — CONNECT message content	Delete Notes 4, 5, 6, 7, 8, 9.
Section 3.1.4 CONNECT ACKNOWLEDGE Table 5 — CONNECT ACKNOWLEDGE message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.4 CONNECT ACKNOWLEDGE Table 5 — CONNECT ACKNOWLEDGE message content	Delete the following rows: • "Display"; • "Signal".
Section 3.1.4 CONNECT ACKNOWLEDGE Table 5 — CONNECT ACKNOWLEDGE message content	Delete Notes 1, 2, 3.
Section 3.1.5 DISCONNECT Table 6 — DISCONNECT message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.5 DISCONNECT Table 6 — DISCONNECT message content	Change the "Cause/Length" from "4-32" to "4-10".
Section 3.1.5 DISCONNECT Table 6 — DISCONNECT message content	Delete the following rows: • "Display"; • "Signal"' • "Connected Number"; • "Connected subaddress".
Section 3.1.5 DISCONNECT Table 6 — DISCONNECT message content	Delete Notes 1, 2, 3, 4, and 5.
Section 3.1.6 INFORMATION	Delete this section.

Section 3.1.7 NOTIFY	Delete this section.
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Change the "Cause/Length" cell from "2-32" to "2, 4-10".
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Delete the following rows: • "Display"; • "Signal".
Section 3.1.8 PROGRESS Table 9 — PROGRESS message content	Delete Notes 2, 3, 4.
Section 3.1.9 RELEASE Table 10 — RELEASE message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.9 RELEASE Table 10 — RELEASE message content	Change the "Cause/Length" cell from "2-32" to "2, 4-10".
Section 3.1.9 RELEASE Table 10 — RELEASE message content	Delete the following rows: • "Display"; • "Signal"; • "Connected number"; • "Connected subaddress".
Section 3.1.9 RELEASE Table 10 — RELEASE message content	Delete Notes 3, 4, 5, 6, 7.
Section 3.1.10 RELEASE COMPLETE Table 11 — RELEASE COMPLETE message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.10 RELEASE COMPLETE Table 11 — RELEASE COMPLETE message content	Change the "Cause/Length" cell from "2-32" to "2, 4-10".

Section 3.1.10 RELEASE COMPLETE Table 11 — RELEASE COMPLETE message content	Delete the following rows: • "Display"; • "Signal"; • "Connected number"; • "Connected subaddress".
Section 3.1.10 RELEASE COMPLETE Table 11 — RELEASE COMPLETE message content	Delete Notes 3, 4, 5, 6, 7.
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.11 SETUP Table 12 — SETUP message content	Delete the following rows: • "Repeat indicator"; • "Display"; • "Keypad facility"; • "Signal".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Bearer capability/Type" cell from "M(Note 2)" to "M".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Bearer capability/Length" cell from "4-13" to "4-8".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Channel identification/Type" cell from "O(Note 3)" to "M".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Channel identification/Length" cell from "2-*" to "5-6".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Network specific facilities/Length" cell from "2-*" to "2-32".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Calling party number/Length" cell from "2-*" to "2-19".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Called party address/Length" cell from "2-*" to "2-18".

Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "Transit network selection/Length" cell from "2-*" to "2-7".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the "High layer capability/Length" cell from "2-4" to "2-5".
Section 3.1.11 SETUP Table 12 — SETUP message content	Delete Notes 1, 2, 3, 6, 7, 8, 9.
Section 3.1.11 SETUP Table 12 — SETUP message content	Change Note 4 to: "Included in the event of interworking."
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the first sentence of Note 12 to: "The called party number information element is included by the user ....".
Section 3.1.11 SETUP Table 12 — SETUP message content	Change the first sentence of Note 20 to: "This information applies to speech and 3.1 kHz audio bearer services."
Section 3.1.11 SETUP Table 12 — SETUP message content	Add the following to the end of Note 13: "The network should transport this IE transparently. This IE is optional on the user side."
Section 3.1.11 SETUP Table 12 — SETUP message content	Add the following to the end of Note 15: "The network should transport this IE transparently. This IE is optional on the user side. The total length is 2 to 16 octets."
Section 3.1.11 SETUP Table 12 — SETUP message content	Add the following to the end of Note 16: "The network should transport this IE transparently. This IE is optional on the user side."
Section 3.1.11 SETUP Table 12 — SETUP message content	Add the following to the end of Note 17: "The network will treat this IE on sending and receiving as described in the User-User supplementary service Implementation Agreement."
Section 3.1.12 SETUP ACKNOWLEDGE	Delete this section.
Section 3.1.13 STATUS Table 14 — STATUS message content	Change the "Call reference/Length" cell from "2-*" to "2-3".

Section 3.1.13 STATUS Table 14 — STATUS message content	Change the "Cause/Length" cell from "4-32" to "4-10".
Section 3.1.13 STATUS Table 14 — STATUS message content	Delete row "Display".
Section 3.1.13 STATUS Table 14 — STATUS message content	Delete Notes 1, 2.
Section 3.1.14 STATUS ENQUIRY	Change the first sentence to: "This message is sent by the user or the network during the active state to solicit a STATUS message from the peer layer 3 entity."
Section 3.1.14 STATUS ENQUIRY Table 15 — STATUS ENQUIRY message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.1.14 STATUS ENQUIRY Table 15 — STATUS ENQUIRY message content	Delete row "Display".
Section 3.1.14 STATUS ENQUIRY Table 15 — STATUS ENQUIRY message content	Delete Notes 1, 2.
Section 3.2.1 RESTART Table 17 — RESTART message content	Change the "Call reference/Length" cell from "2-*" to "2-3".
Section 3.2.1 RESTART Table 17 — RESTART message content	Change the "Channel identification/Length" cell from "2-*" to "2, 5-6".
Section 3.2.1 RESTART Table 17 — RESTART message content	Delete row "Display".
Section 3.2.1 RESTART Table 17 — RESTART message content	Delete Notes 3, 4.
Section 3.2.2 RESTART ACKNOWLEDGE Table 18 — RESTART ACKNOWLEDGE message content	Change the "Call reference/Length" cell from "2-*" to "2-3".

Section 3.2.2 RESTART ACKNOWLEDGE Table 18 — RESTART ACKNOWLEDGE message content	Change the "Channel identification/Length" cell from "2-*" to "2, 5-6".
Section 3.2.2 RESTART ACKNOWLEDGE Table 18 — RESTART ACKNOWLEDGE message content	Delete row "Display".
Section 3.2.2 RESTART ACKNOWLEDGE Table 18 — RESTART ACKNOWLEDGE message content	Delete Notes 3, 4.
Section 4.2 Protocol discriminator	Add the following sentence after the first sentence in the second paragraph: "The only value supported for call control messages is described below in Figure 2."
Section 4.2 Protocol discriminator Figure 2 — Protocol Discriminator	Change "ANSI T1.607" to "Q.931".
Section 4.2 Protocol discriminator Table 19 — Protocol Discriminator	Change "ANSI T1.607" to "Q.931" in row "0000 1000".
Section 4.3 Call reference	Change the third paragraph ("At a minimum ...") to: "At a minimum, all networks and users must be able to support a call reference value of one and two octets for a primary rate interface."
Section 4.3 Call reference	Delete the first sentence of the fourth paragraph "As a network ... also be supported."
Section 4.3 Call reference Figure 4 — Dummy call reference	Change "Figure 4. Dummy call reference" to "Figure 4. Dummy call reference *".
Section 4.3 Call reference	Add the following footnote after Figure 4: "*The dummy call reference is not supported for primary rate Class II circuit-switched calls."
Section 4.3 Call reference	Delete Note 1 ("The call reference ... ") at the end of the section.
Section 4.4 Message type Table 20 — Message types	Delete the following rows: • "SETUP ACKNOWLEDGE"; • "INFORMATION".

Section 4.4 Message type Table 20 — Message types	Add the following to the end of row "NOTIFY": "(see sec. 5.8.4 for treatment of this message type)."
Section 4.5.1 Coding rules	Delete the second, third, and fourth sentences from the fourth paragraph.
Section 4.5.1 Coding rules Figure 7 — Formats of information elements	Delete figure (b) Single octet information element format (type 2).
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Delete the following rows: • "Repeat indicator"; • "Notification indicator"; • "Display"; • "Keypad facility"; • "Signal"; • "Connected number"; • "Connected subaddress"; • "Escape for extension".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Delete reference to "(Note 6)" from "Bearer capability" row.
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "Bearer capability/Max length" cell from "13" to "8".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "Cause/Max length" cell from "32" to "10".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "Cause/Max no of occurrences" cell from "3" to "2".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "Channel identification/Max length" cell from "(Note 4)" to "6".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "Network-specific facilities/Max length" cell from "(Note 4)" to "32".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "Network-specific facilities/Max no. of occurrences" cell from "4" to "2".

Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "Calling party number/Max length" cell from "(Note 4)" to "19".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "Called party number/Max length" cell from "(Note 4)" to "18".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Delete reference to "(Note 2)" from "Transit network selection" row.
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "Transit network selection/Max length" cell from "(Note 4)" to "7".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Delete "4" from the "Transit network selection/Max no. of occurrences" cell.
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Change the "High layer compatibility/Max length" cell from "4" to "5".
Section 4.5.1 Coding rules Table 21 — Information element identifier coding	Delete Notes 3, 4, 6.
Section 4.5.1 Coding rules Figure 8 — Information element format using escape for extension	Delete this figure.
Section 4.5.2 Extensions of codesets	Change "T1.608" to "NIU 89-320" in the first bullet in the fourth paragraph.

Section 4.5.2 Extensions of codesets	Replace the tenth paragraph ("Codeset 6 ...") with the following: "Codeset 6 is reserved for information elements specific to the local network (either public or private). These information elements can appear in a call establishment (i.e., SETUP, ALERTING, or CONNECT) or first clearing message. As such, they do not have significance across a national or international boundary. For these two cases, codeset 6 information elements shall be handled according to the procedures for unrecognized information elements (see sec. 5.8.7.1) beyond the local network boundary. Inside a private local network recognized codeset 6 information elements shall be consumed, manipulated, or passed transparently according to the rule for that information element. Across the boundary between local networks (e.g., a public and a private network), recognized codeset 6 information elements shall be consumed and manipulated according to the rule for that information element. Inside a private local network, unrecognized codeset 6 information elements may be passed transparently. Across the boundary between a private local network and a public local network, unrecognized codeset 6 information elements shall be either treated as per section 5.8.7.1 or passed transparently if a bilateral agreement exists."
Section 4.5.3 Locking shift procedure New codeset identification table	Change "T1.608" to "NIU 89-320" for codeset 5.
Section 4.5.4 Non-locking shift procedures	Delete "a) process the nonblocking ... as described below" from the second paragraph.
Section 4.5.4 Non-locking shift procedures Temporary codeset identification table	Change "T1.607" to "NIU 90-302" for codeset 0.
Section 4.5.4 Non-locking shift procedures Temporary codeset identification table	Change "T1.608" to "NIU 89-320" for codeset 5.
Section 4.5.5 Bearer Capability	Change "13 octets" to "8 octets" in the second sentence ("The maximum length ...") of the second paragraph.
Section 4.5.5 Bearer Capability Figure 11 — Bearer capability information element	Change octet 4, bit 8 from "0/1" to "1".

Section 4.5.5 Bearer Capability Figure 11 — Bearer capability information element	Delete the following octets: • 4a; • 4b; • 5b (Note 2); • 5b (Note 3); • 5c; • 5d.
Section 4.5.5 Bearer Capability Figure 11 — Bearer capability information element	Change octet 5a, bit 8 from "0/1" to "1".
Section 4.5.5 Bearer Capability Figure 11 — Bearer capability information element	Delete Notes 1, 2, 3.
Section 4.5.5 Bearer Capability Figure 11 — Bearer capability information element	Add the following after Note 4: "5 Octets 6 and 7 are included for information only. The coding and application of these octets are included in another document."
Section 4.5.5 Bearer Capability Information transfer capability (octet 3) coding	Delete row "10001 7 kHz audio".
Section 4.5.5 Bearer Capability Information transfer rate (octets 4 and 4b) coding	Change the title to "Information transfer rate (octet 4)".
Section 4.5.5 Bearer Capability Information transfer rate (octets 4 and 4b) coding	Delete the following rows: "10011 384 kbit/s", "10100 1472 kbit/s (Note 2)", "10101 1526 kbit/s".
Section 4.5.5 Bearer Capability Information transfer rate (octets 4 and 4b) coding	Change Note 1 to: "The bearer capability is bidirectional symmetric at the information transfer rate specified in octet 4."
Section 4.5.5 Bearer Capability Information transfer rate (octets 4 and 4b) coding	Delete Note 2.
Section 4.5.5 Bearer Capability	Delete all codings and text referring to octet 4a (structure, configuration, establishment) and octet 4b (symmetry).
Section 4.5.5 Bearer Capability User information layer 1 protocol (octet 5) coding	Delete "and optionally octets 5b, 5c, and 5d as defined below." from row "00001".

Section 4.5.5 Bearer Capability User information layer 1 protocol (octet 5) coding	Delete "and G.725 7 kHz audio" from row "00101".
Section 4.5.5 Bearer Capability User information layer 1 protocol (octet 5) coding	Delete rows "00111" and "01000".
Section 4.5.5 Bearer Capability User information layer 1 protocol (octet 5) coding	Delete Note 2.
Section 4.5.5 Bearer Capability Synchronous/asynchronous (octet 5a) coding	Delete row "1 asynchronous".
Section 4.5.5 Bearer Capability Synchronous/asynchronous (octet 5a) coding	Delete the second and third sentences from the Note.
Section 4.5.5 Bearer Capability Negotiation (octet 5a) coding	Delete row "1 In-band negotiation possible".
Section 4.5.5 Bearer Capability User rate (octet 5a) coding	Delete all rows except row "01111 56 kbit/s CCITT Recommendation V.6".
Section 4.5.5 Bearer Capability	Delete all text relating to octet 5b (i.e., sections labeled "Octet 5b for CCITT Recommendation V.100 or X.30 rate adaption" and "Octet 5b for CCITT Recommendation V.120 rate adaption").
Section 4.5.5 Bearer Capability	Delete all codings and text referring to octets 5c (number of data bits excluding parity bit, parity information) and 5d (duplex mode, modem type).
Section 4.5.6 Call state Call state value (octet 3) coding	Delete row "000010 U2 — overlap sending".
Section 4.5.6 Call state Call state value (octet 3) coding	Add the following column to the right of the coding: Symmetric States* S0 — Null S1 — Call Initiated S3 — Outgoing Call Proceeding S4 — Call Delivered S6 — Call Present S7 — Call Received S8 — Connect Request S9 — Incoming Call Proceeding

	S10 — Active S11 — Disconnect Request S12 — Disconnect Indication S19 — Release Request
Section 4.5.6 Call state Call state value (octet 3) coding	Add the following after the coding: "*Note — For Symmetric states see Annex D."
Section 4.5.6 Call state Call state value (octet 3) coding	Delete "N22 — Call abort" from the "010110/ Network State" cell.
Section 4.5.7 Called party number	Change the second paragraph to: "The maximum length of this information element is 18 octets."
Section 4.5.7 Called party number Type of number (octet 3) coding	Delete the following rows: • "011 network specific number"; • "111 reserved for extension".
Section 4.5.7 Called party number Type of number (octet 3) coding	Change the end of Note 2 to: "this information element cannot be used in combination with Operator System Access or Transit Network Selection information elements."
Section 4.5.7 Called party number Type of number (octet 3) coding	Delete Note 4.
Section 4.5.7 Called party number Numbering Plan Identification (octet 3) coding	Delete the following rows: • "0011 data numbering plan"; • "0100 telex numbering plan"; • "1111 reserved for extension".
Section 4.5.7 Called party number Numbering plan identification (octet 3) coding	Change "c)" under the Note to: "this information element cannot be used in combination with Operator System Access or Transit Network Selection information elements."
Section 4.5.7 Called party number	Add Attachment B of this document after the following: "*Number digits (octets 4, etc.)* This field is coded with ASCII characters, according to the formats specified in the appropriate numbering/dialing plan."
Section 4.5.9 Calling party number	Change the second paragraph from "The maximum length of this information element is network dependent." to "The maximum length of this information element is 19 octets."

Section 4.5.9 Calling party number Type of number (octet 3) coding	Delete the following rows: • "011 network specific number"; • "111 reserved for extension".
Section 4.5.9 Calling party number Type of number (octet 3) coding	Delete Note 4.
Section 4.5.9 Calling party number Numbering Plan Identification (octet 3) coding	Delete the following rows: • "0100 telex numbering plan"; • "1111 reserved for extension".
Section 4.5.9 Calling party number	Add Attachment C of this document after the following: "*Number digits (octets 4, etc.)* This field is coded with ASCII characters, according to the formats specified in the appropriate numbering/dialing plan."
Section 4.5.11 Cause	Change the second sentence of the first paragraph to: "The maximum length of this information element is 10 octets."
Section 4.5.11 Cause Figure 17 — Cause information element	Change octet 3, bit 8 from "0/1" to "1".
Section 4.5.11 Cause Figure 17 — Cause information element	Delete octet 3a.
Section 4.5.11 Cause Figure 17 — Cause information element	Delete the Note under the figure.
Section 4.5.11 Cause Recommendation (octet 3a) coding	Delete this coding and Notes 1 and 2.
Section 4.5.11 Cause	Add the following sentence to the end of the paragraph following "*Diagnostics (octet 5)*": "If more than one IE is identified in a diagnostic, they should be ordered as IEs normally appear in a message."
Section 4.5.11 Cause Cause table	Change the "unallocated (unassigned) number/ diagnostics" cell to "Not used".
Section 4.5.11 Cause Cause table	Change the "no route to specified transit network/ diagnostics" cell to "Not used".

Section 4.5.11 Cause Cause table	Change the "no route to destination/diagnostics" cell to "Not used".
Section 4.5.11 Cause Cause table	Change "normal call clearing/diagnostics" cell to "Not used".
Section 4.5.11 Cause Cause table	Change the "user busy/diagnostics" cell to "(see Note 10)".
Section 4.5.11 Cause Cause table	Change the "call rejected/diagnostics" cell to "Not used".
Section 4.5.11 Cause Cause table	Delete the "number changed/diagnostics" cell.
Section 4.5.11 Cause Cause table	Delete the following rows: • "non-selected user clearing"; • "network out of order"; • "resource unavailable, unspecified"; • "quality of service unavailable"; • "only restricted digital information bearer capability is available"; • "service or option not implemented, unspecified"; • "invalid transit network selection"; • "invalid message, unspecified".
Section 4.5.11 Cause Cause table	Change the "No circuit/channel available/diagnostics" cell to "(see Note 10)".
Section 4.5.11 Cause Cause table	Delete reference to "(see Note 6)" in the "access information discarded/diagnostics" cell.
Section 4.5.11 Cause Cause table	Add "(see Note 10)" to the "requested circuit or channel not available/diagnostics" cell.
Section 4.5.11 Cause Cause table	Delete the corresponding cell in the "diagnostics" column for the following rows: • "requested facility not subscribed"; • "bearer capability not authorized"; • "bearer capability not presently available"; • "channel type not implemented"; • "requested facility not implemented".

Section 4.5.11 Cause Cause table	Change the "bearer capability not implemented/ diagnostics" cell to "Not used".
Section 4.5.11 Cause Cause table	Change the "identified channel does not exist/ diagnostics" cell to "Not used".
Section 4.5.11 Cause Cause table	Delete the "incompatible destination/diagnostics" cell.
Section 4.5.11 Cause Cause table	Delete the reference to "(see Note 6)" in the "mandatory information element is missing/ diagnostics" cell.
Section 4.5.11 Cause Cause table	Change the "information element non-existent or not implemented/diagnostics" cell to "Information element identifier(s) (see Note 8)".
Section 4.5.11 Cause Cause table	Change the "invalid information element contents/ diagnostics" cell to "Information element identifier(s)".
Section 4.5.11 Cause Cause table	Change the "recovery on timer expiry/diagnostics" cell to "Not used".
Section 4.5.11 Cause Cause table	Delete the following Notes: 2, 3, 4, 5, 6, 7, 9, 11, 12.
Section 4.5.11 Cause Figure 18 — Coding of the diagnostic field for causes 57, 58 and 65.	Delete this figure and Notes 1 and 2 appearing below it.
Section 4.5.11 Cause	Delete all text referring to octets 5 (attribute number), 5a (rejected attribute), and 5b (available attribute).
Section 4.5.12 Channel identification	Change the last sentence in the first paragraph to: "The default maximum length for this information element is 6 octets."
Section 4.5.12 Channel identification	Delete the second paragraph.

Section 4.5.12 Channel identification Figure 19 — Channel identification information element	Change octet 3.1, bit 8 from "0/1" to "1".
Section 4.5.12 Channel identification Figure 19 — Channel identification information element	Delete the reference to "Note 2" of octet 3.2.
Section 4.5.12 Channel identification Figure 19 — Channel identification information element	Delete the references to "(Note 2)" and "Note 4" in octet 3.3.
Section 4.5.12 Channel identification Figure 19 — Channel identification information element	Delete the last sentence of Note 1.
Section 4.5.12 Channel identification Figure 19 — Channel identification information element	Delete Notes 2 and 4.
Section 4.5.12 Channel identification Figure 19 — Channel identification information element	Add the following to the end of Note 3: "For completeness, a pointer to slot map is shown. It is not supported for this IA."
Section 4.5.12 Channel identification Interface identifier present (octet 3) coding	Change row the last row ("1") to: "1 Interface explicitly identified in octet 3.1."
Section 4.5.12 Channel identification Interface type (octet 3) coding	Delete the following row: "0 basic interface".
Section 4.5.12 Channel identification Information channel selection (octet 3) coding	Delete the column "basic interface".
Section 4.5.12 Channel identification Information channel selection (octet 3) coding	Delete the last two rows ("10" and "11").
Section 4.5.12 Channel identification Information channel selection (octet 3) coding	Delete Note 3.

Section 4.5.12 Channel identification Interface identifier (octet 3.1) coding	Delete the second sentence ("At subscription time ...").
Section 4.5.12 Channel identification Coding standard (octet 3.2) coding	Delete row " 1 0 National Standard ..."
Section 4.5.12 Channel identification Number/map (octet 3.2) coding	Delete the last row.
Section 4.5.12 Channel identification Channel type/map element type (octet 3.2) coding	Delete the last three rows.
Section 4.5.12 Channel identification Channel type/map element type (octet 3.2) coding	Delete the Note.
Section 4.5.12 Channel identification	Delete all text and Figure 20 referring to "Slot map (octet 3.3)".
Section 4.5.12 Channel identification	Add the following at the end of the section: "Note — In the network to user direction (n -> u), the terminating PRI will allow channel negotiation. The network will support offering calls with preferred B-channel and the user responds specifying the channel to be used for the call."
Section 4.5.13 Connected number	Delete this section.
Section 4.5.14 Connected subaddress	Delete this section.
Section 4.5.15 Display	Delete this section.
Section 4.5.16 High layer compatibility	Change the second paragraph to: "The maximum length of this information element is five octets."
Section 4.5.17 Keypad facility	Delete this section.
Section 4.5.18 Low layer compatibility	Delete the second paragraph.
Section 4.5.18 Low layer compatibility Negotiation indicator (octet 3a) coding	Delete the last row.

Section 4.5.18 Low layer compatibility Negotiation indicator (octet 3a) coding	Delete Note 1.
Section 4.5.18 Low layer compatibility User information layer 3 protocol (octet 7) coding	Change "ANSI T1.607" to "NIU 90-302" in the first row.
Section 4.5.19 Network-specific facilities	Change the second sentence of the first paragraph to: "No more than two Network-specific facilities information elements may be included in a single message."
Section 4.5.19 Network-specific facilities	Change the second paragraph to: "The maximum length of this information element is 32 octets."
Section 4.5.19 Network-specific facilities	Add Attachment D of this document to the end of this section.
Section 4.5.20 Notification indicator	Delete this section.
Section 4.5.21 Progress indicator Progress description (octet 4) coding	Delete row "000 0100 4 call has returned to the ISDN."
Section 4.5.21 Progress indicator	Add the following Note after Notes 1 and 2 following the "*Progress description (octet 4)*" coding: "3 In the SETUP message, in the user to network direction (u -> n) on PRI, one of two values may be used in the progress description field: 'call is not end-to-end ISDN' (1), or 'calling equipment is non-ISDN' (3). In the SETUP message, in the network to user direction (n -> u) on PRI, one of two values may be used in the progress description field: 'call is not end-to-end ISDN' (1), or 'calling equipment is non-ISDN' (3)."
Section 4.5.22 Repeat Indicator	Delete this section.
Section 4.5.24 Signal	Delete this section.
Section 4.5.25 Transit network selection	Change the first paragraph to: "The purpose of the Transit network selection information element is to identify one requested transit network (See Annex C)."

Section 4.5.25 Transit network selection	Change the second paragraph to: "The default maximum length of this information element is 7 octets."
Section 4.5.25 Transit network selection Type of network identification (octet 3) coding	Delete the last row ("011 ...").
Section 4.5.25 Transit network selection Network identification plan (octet 3) coding	Delete the last row ("0011 ...").
Section 4.5.26 User-user	Add the following to the end of the first paragraph: "This IE is to be included based on the User-to-user supplementary service description and user application."
Section 4.5.26 User-user Protocol discriminator (octet 3) coding	Change "ANSI T1.607" to "NIU 90-302" in the last row of the coding.
Section 5 Circuit-switched call control procedures	Change the third paragraph ("All messages ...") to: "All messages in this standard contain the functional type of information elements. Functional information elements are characterized as requiring a degree of intelligent processing by the Customer Premise Equipment (CPE) in either their generation or analysis."
Section 5 Circuit-switched call control procedures	Delete the fifth paragraph ("As a general ..."), the second Note of the section, and the seventh paragraphs ("In addition ...").
Section 5.1 Call establishment at the originating interface	Change "ANSI T1.602" to "NIU 89-210" in the last sentence.
Section 5.1.1 Call request	Change the last sentence of the first paragraph to: "The Bearer capability information element is mandatory in the SETUP message."
Section 5.1.1 Call request	Change the third paragraph to: "Furthermore, the SETUP message shall also contain all of the call information (i.e., address and facility requests) necessary for call establishment."
Section 5.1.1 Call request	Delete the following from the fourth paragraph: "b) the Keypad information ... other call information," and the Note ("All networks are ...").
Section 5.1.1 Call request	Delete the last paragraph ("For overlap ...").

Section 5.1.2 B-channel selection — originating	Delete the following from the first paragraph: "c) any channel ... alternative c) is assumed."
Section 5.1.2 B-channel selection — originating	Delete the last sentence from the third paragraph: "In case c), the ... with the D-channel."
Section 5.1.2 B-channel selection — originating	Change the end of the first sentence in the fourth paragraph from "(i.e., a SETUP ACKNOWLEDGE or CALL PROCEEDING message)." to "(i.e., a CALL PROCEEDING message)."
Section 5.1.2 B-channel selection — originating	Change the fifth paragraph to: "The user need not attach until receiving a: a) CALL PROCEEDING, b) ALERTING message with the progress indicator 8 'in-band information or appropriate pattern is now available' or c) a PROGRESS message with the progress indicator 1 'call is not end-to-end ISDN; further call progress information may be available in-band'. Prior to this time, the network cannot assume that the user has attached ... (if it has not already done so)."
Section 5.1.2 B-channel selection — originating	Change the first sentence of the last paragraph to: "In case a), if the specified channel is not available, and in case b) if not channel is available, a RELEASE COMPLETE message with a cause value of 44 'requested circuit/channel not available' or 34 'no circuit/channel available', respectively, is sent by the network as described in 5.3."
Section 5.1.3 Overlap sending	Delete this section.
Section 5.1.4 Invalid call information	Change the first sentence in the first paragraph to: "If, following the receipt of the SETUP message, the network determines ... cause such as the following:".
Section 5.1.4 Invalid call information	Add the following to the end of the first paragraph after "28 ...": "82 'identified channel does not exist'."
Section 5.1.5.1 Call proceeding, en-bloc sending	Add the following to the second paragraph after "58 ...": "34 'no circuit/channel available'."
Section 5.1.5.2 Call proceeding, overlap sending	Delete this section.
Section 5.1.6 Notification of interworking at the originating interface	Change "a) ..." in the first paragraph to: "a) in an appropriate call control message when a state change is required (CONNECT); or,".

Section 5.1.6 Notification of interworking at the originating interface	Add to the end of "1 ..." in the second paragraph "(i.e., in a PROGRESS message); or,".
Section 5.1.6 Notification of interworking at the originating interface	Change "2 ..." in the second paragraph to: "2 'destination address is non-ISDN' (i.e., in a CONNECT message);".
Section 5.1.6 Notification of interworking at the originating interface	Delete "4 ... end-to-end ISDN" from the second paragraph.
Section 5.1.6 Notification of interworking at the originating interface	Delete "or more" from the second part of the first sentence in the fourth paragraph.
Section 5.1.7 Call confirmation indication	Change the last sentence in the first paragraph to: "When the user receives the ALERTING message, the user shall enter the Call Delivered state."
Section 5.2 Call establishment at the destination interface	Delete the last sentence of the third paragraph ("No use ...").
Section 5.2.1 Incoming call	Delete the last two sentences of the first paragraph.
Section 5.2.1 Incoming call	Change the last part of the second paragraph from "(e.g., Display, Low layer compatibility)." to "(e.g., Low layer compatibility.)".
Section 5.2.1 Incoming call	Add the following to the end of the second paragraph: "In general, a call terminating from a non-ISDN line or from a Public Switched Telephone Network (PSTN) trunk should be offered to the called user equipment with the 3.1 kHz audio bearer capability."
Section 5.2.1 Incoming call	Delete the first and second sentences of the third paragraph. Delete "However, if ... the interface" from the third sentence. The third paragraph will now read: "A point-to-point data link shall be used to carry the SETUP message. After sending the SETUP message, the network starts timer T303."
Section 5.2.1 Incoming call	Delete the fifth paragraph and the Note following this paragraph.
Section 5.2.1 Incoming call	Change the second part of the last sentence in the seventh paragraph from "timers T303 and T312 are restarted." to "timer 303 is restarted."

Section 5.2.2 Compatibility checking	Delete the second paragraph ("When the SETUP message ...").
Section 5.2.3.1 SETUP message delivered by point-to-point data link	Delete the following from the first paragraph under "a) ...": "3) any channel is acceptable."
Section 5.2.3.1 SETUP message delivered by point-to-point data link	Delete the paragraph under "b) ...." that reads "In case 3), ..."
Section 5.2.3.1 SETUP message delivered by point-to-point data link	Change the first sentence in the third paragraph under "b)" to: "If in case 1) the B-channel indicated in the first response message is not the channel offered by the network, or in case 2) the B-channel indicated in the first response message is unacceptable to the network, it will clear the call by sending a RELEASE message with cause 6 'channel unacceptable' (see 5.3.2 d)."
Section 5.2.3.1 SETUP message delivered by point-to-point data link	Change the first part of "e) ..." to: "e) In case 1) if the indicated B-channel is not available, or in case 2) if no B-channel is available ...."
Section 5.2.3.2 SETUP message delivered by broadcast data link	Delete this section.
Section 5.2.5.1 Response to en-bloc SETUP	Change the first sentence of the Note to: "A Progress indicator information element may be included in a CONNECT message (e.g., when an analogue terminal is connected to an NT2 functional grouping)."
Section 5.2.5.1 Response to en-bloc SETUP	Delete the second paragraph ("When the SETUP message was delivered via a broadcast ...").
Section 5.2.5.2 Receipt of CALL PROCEEDING and ALERTING	Delete the first paragraph ("When the SETUP message is delivered on a broadcast ...").
Section 5.2.5.2 Receipt of CALL PROCEEDING and ALERTING	Change the second paragraph to: "Upon receipt of the first CALL PROCEEDING message from a user, the network shall: stop timer T303; start time T310; and enter the incoming Call Proceeding state."
Section 5.2.5.2 Receipt of CALL PROCEEDING and ALERTING	Delete the fourth paragraph ("When the SETUP message was delivered via a broadcast ...").

Section 5.2.5.2 Receipt of CALL PROCEEDING and ALERTING	Change the fifth paragraph to: "Upon receipt of the ALERTING message from a user, the network shall: stop timers T303 or T310 (if running) and TDEL (if running); start optional timer T301 (unless another internal alerting supervision timer function exists; w.g. incorporated in call control); enter the Call Received state; and send a corresponding ALERTING message to the calling user."
Section 5.2.5.2 Receipt of CALL PROCEEDING and ALERTING	Delete the sixth paragraph ("When a SETUP message has been delivered on a broadcast link ...").
Section 5.2.5.3 Called user clearing during Incoming call establishment	Change the first part of the first paragraph to: "If the RELEASE COMPLETE or DISCONNECT message is received ...."
Section 5.2.5.3 Called user clearing during Incoming call establishment	Delete the second and third paragraphs.
Section 5.2.5.3.1 DISCONNECT received prior to expiry of T312	Delete this section.
Section 5.2.5.3.2 DISCONNECT received after expiry of timer T312	Delete this section.
Section 5.2.5.4 Call failure	Delete the following from the first paragraph: "a) If the SETUP message ... Call Abort state;"
Section 5.2.5.4 Call failure	Change "b)" in the first paragraph to: "b) The network shall also initiate clearing procedures toward the called user in accordance with 5.3.4, using cause 102 'recovery on timer expiry'."
Section 5.2.5.4 Call failure	Delete the second paragraph ("If the network receives ...").
Section 5.2.5.4 Call failure	Delete the following from the third paragraph: "a) If the SETUP ... shall be sent."
Section 5.2.5.4 Call failure	Change "b)" in the third paragraph to: "b) The called user shall be cleared in accordance with 5.3.4, using cause 102 'recovery on timer expiry'."
Section 5.2.5.4 Call failure	Change the beginning of the first sentence in the fourth paragraph to: "If the network supports timer T301 and has received a ALERTING message, ..."
Section 5.2.5.4 Call failure	Delete from the fourth paragraph: "a) If the SETUP message was ... shall be sent."

Section 5.2.5.4 Call failure	Change "b)" in the fourth paragraph to: "b) The called user shall be cleared in accordance with 5.3.4, using cause 102 'recovery on timer expiry'."
Section 5.2.6 Notification of interworking at the terminating interface	Change the first item in the list in the second paragraph from: "— in an appropriate ..." to: "— in an appropriate call control message when a state change is required (CONNECT); or,".
Section 5.2.6 Notification of interworking at the termination interface	Delete the third item from the list in the third paragraph: "4 Call has ...'".
Section 5.2.7 Call accept	Add the following to the end of the last paragraph: "If the CONNECT message is the first response to the SETUP message, it shall contain the channel identification information element."
Section 5.2.8 Active indication	Delete the fourth paragraph ("A user that has received the SETUP via the broadcast data link ...").
Section 5.2.9 Non-selected user clearing	Delete this section.
Section 5.3.2 Exception conditions	Change in the first paragraph "a)" to: "a) In response to a SETUP message, the user or network can reject a call (e.g., because of the unavailability of a suitable B-channel) by: responding with a RELEASE COMPLETE message provided no other response has previously been sent releasing; the call reference and entering the Null state."
Section 5.3.2 Exception conditions	Delete from the first paragraph: "b) In the case ... user clearing".
Section 5.3.2 Exception conditions	Delete from the first paragraph e)1) and e)2) and the Note at the end of the section.
Section 5.4 In-band tones and announcements	Change the title of this section to "In-band audible ringing tone and announcements".

Section 5.4 In-band tones and announcements	Change the first paragraph to: "It is assumed that the originating Class II device will provide a busy tone and a reorder tone to the calling user for speech and 3.1 kHz calls. The network will not provide in-band busy or reorder tone. When in-band audible ringing tone/announcements not associated with a call state change are to be provided by the network before reaching the Active state, a PROGRESS message is returned simultaneously with the application of the in-band audible ringing tone/announcement. The PROGRESS message contains the progress indicator 8 'in-band information or appropriate pattern is now available'."
Section 5.4 in-band tones and announcements	Change the second paragraph to: "When an audible ringing tone has to be provided together with a ... is sent simultaneously with the application of the inband audible ringing tone."
Section 5.4 in-band tones and announcements	Delete Note 1.
Section 5.4 in-band tones and announcements	Change Note 2 to: "When the PROGRESS message is used, the user may initiate call clearing as a result of the applied in-band audible ringing tone/ announcement, according to procedures specified in 5.3.3."
Section 5.5 Restart procedure	Delete from the second paragraph "b) the interface is a ... exists; or,".
Section 5.5.2 Receipt of RESTART	Change in Note 2 the reference to "ANSI T1.602" to "NIU 89-210".
Section 5.5.2 Receipt of RESTART	Change in Note 2 "b)" to: "b) that correspond to the specified channel or interface."
Section 5.7 Call collisions	Delete the Note at the end of the section.
Section 5.8.2 Message too short	Change this paragraph to: "When a message is received that is too short (less than 4 octets) to contain a complete message type information element, that message shall be ignored."
Section 5.8.4 Message type or message sequence errors	Add the following after the first paragraph: "The NOTIFY message may be ignored by the recipient."
Section 5.8.7.2 Non-mandatory information element content error	Delete the last sentence of the second paragraph ("However, in some ...").

Section 5.8.8 Data link reset	Delete from the first paragraph: "a) For calls in the Overlap ... procedures of 5.3".
Section 5.8.9 Data link failure	Delete from the first paragraph the first sentence of "a) ..." ("The calls in the ... internally.").
Section 5.8.9 Data link failure	Delete the second sentence of the Note following the first paragraph ("Note — If the transfer mode ....").
Section 5.9 User notification procedure	Delete this section.
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Delete row "T302".
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Delete the second sentence in the "T310/NORMAL STOP" cell ("If DISCONNECT ...").
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Delete rows "T312" and "T321".
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Delete Notes 4 and 5.
Section 9.1 Timers in the network side Table 22 — Timers in the network side	Add the following to the end of Note 6: "(see Annex D)".
Section 9.2 Timers in the user side Table 23 — Timers in the user side	Delete the following rows: • "T301"; • "T304".
Section 9.2 Timers in the user side Table 23 — Timers in the user side	Delete "SETUP ACKNOWLEDGE" from the "T303/ NORMAL STOP" cell.
Section 9.2 Timers in the user side Table 23 — Timers in the user side	Delete the reference to "Note 4" in the "T310/TIMER NUMBER" cell.
Section 9.2 Timers in the user side Table 23 — Timers in the user side (Part 2)	Delete Notes 3 and 4.
Annex A — SDL diagrams	Delete this section. NOTE: This section has not been addressed.

Section B.3.1 Compatibility checking with addressing information	Delete Note 2 ("If an incoming call, ... or subaddress.").
Section B.3.4 User action figures Figure B.1 — Bearer capability compatibility checking Figure B.2 — Low layer and high layer compatibility checking; compatibility assured	Delete the reference to "(Note 1)" from the cell in the first row of the second column.
Section B.3.4 User action figures Figure B.1 — Bearer capability compatibility checking Figure B.2 — Low layer and high layer compatibility checking; compatibility assured	Delete the "broadcast data link" column.
Section B.3.4 User action figures Figure B.3 — Low layer and high layer compatibility checking; compatibility not assured	Delete the reference for "(Note 1)" in the cells in the first row of the second and third columns.
Section B.3.4 User action figures	Delete Notes 1 and 3 (ed. note: Note 3 is still referenced in the figures).
Annex C, Section C.1 Introduction	Delete "optional" from the first paragraph.
Annex C, Section C.2 Selection Not Supported	Delete this section.
Annex C, Section C.3 Selection Supported	Change the first paragraph to: "The user identifies the selected transit network in the SETUP message. One Transit network selection information element is used to convey a single network identification."
Annex C, Section C.3 Selection Supported	Delete the second ("The user may ..."), third ("As the call ..."), and fourth ("No more than ...") paragraphs.
Annex C, Section C.3 Selection Supported	Delete the last sentence of the sixth paragraph ("The diagnostic ...").
Annex C, Section C.3 Selection Supported	Delete the seventh ("A network may ...") and eighth ("If the transit ...") paragraphs.
Annex D Extensions for Symmetric Call Operation	Delete Annex D and replace with Attachment E of this document.

Annex E, Section E.3 Routing Not Supported	Add the following paragraph before at the end of this section: "When the requested facility can not be provided an indication shall be returned in the first clearing message with cause 29 'facility rejected'."
Annex E, Section E.4 Routing Supported	Change the first sentence in the fourth paragraph to: "No more than two Network-specific facilities information elements may be used in a SETUP message."
Annex E, Section E.4 Routing Supported	Delete the last sentence of the fifth paragraph ("The diagnostic ...").
Annex F D-channel Backup Procedure	Delete this Annex.
Annex G, Section G.1 Introduction	Add the following to the end of the first paragraph: "Section 4.5.11 identifies the causes supported in NIU 90-302."
Annex G, Section G.3.8 Cause 46 "precedence call blocked"	Change "precedence circuits" to "preemptable circuits".
Annex H, Section H.1 Introduction	Change the first paragraph to: "These are the only recognized codings of the following information elements."
Annex H, Section H.1 Introduction	Delete the last two bullet items from the second paragraph.
Annex H Examples of Information Elements Coding	Delete the following figures and sections: • Figure "H.3 Coding for 7kHz Audio"; • Figure "H.6 Coding for synchronous 1472 kbit/s"; • Section H.3 Channel identification information element; • Section H.4 Called and Calling party subaddress information element.
Annex I Use of Progress indicators	Delete the fifth paragraph ("*Progress indicator 4 ...*").
Annex I Use of Progress indicators	Delete "or basic" from the left side of Figure I.1 (between the TE and ISDN).
Annex I Use of Progress indicators	Delete "or basic" from the right side of Figure I.1 (between ISDN and NT2).
Annex M Low Layer Compatibility Negotiation	Delete this Annex.

Annex N Procedures for Establishment of Bearer Connection Prior to Call Acceptance	Delete this Annex and replace with Attachment F of this document.
Annex O Optional Procedures for Bearer Service Change	Delete this Annex.
Annex P, Section P.1 Introduction	Delete "optional" from the first sentence in the first paragraph.
Annex P, Section P.1 Introduction	Change the last sentence of the first paragraph to: "These procedures apply to the speech, and 3.1 kHz and audio bearer services."
Annex P, Section P.1 Introduction	Change the second paragraph to: "The user may indicate a request for access to an operator or attendant system using the Operator system access information element."
Annex P, Section P.2 Operator system access requested in Keypad facility information	Delete this section.
Section P.4 invalid request	Delete this section.
Annex Q Responding address requirements of the OSI network layer service	Delete this Annex.

Attachment A
(of Appendix B)

1. General

1.1 Scope and Purpose

This Implementation Agreement specifies a minimal subset of procedures and codepoints from the American National Standards T1.607-1990 (Ref. [17]) for the establishment, maintenance, and clearing of ISDN connections at the user-to-network interface. This signalling standard is used to support the circuit-switched bearer services specified in ANS T1.604-1990*.

Terminals are not required to support all services. Switches will support all of the mandatory protocols and codepoints in this implementation agreement. This does not preclude the support of additional services and procedures. However, equipment must be able to interoperate with equipment supporting only this minimal subset.

1.1.1 Definitions

The ANS T1.607-1990 (Ref. [17]) assumes that procedures apply generically to ISDN access interfaces, i.e., the document does not distinguish between basic and primary rates access interfaces. In addition, there are no references to specific applications in that document. The concept of equipment classes is introduced in this document to permit certain procedures to be associated with a particular application or class of equipment, e.g., station equipment versus PBX. Specifically, two classes of equipment are defined on the basis of two fundamental attributes.

The first attribute relates to the possibility of an exchange of signals occurring beyond the public network's point of contact with the interface (i.e., between the equipment directly connected to the public network and ISDN terminals or telephones connected to that equipment). For example, some user equipment may support subtending Basic Access digital subscriber loops and/or analog telephone loops. For Class I equipment, the network makes no provision for such an arrangement and assumes the Class I equipment constitutes the endpoint of the communication. Conversely, in the case of Class II equipment, the procedures at the network take into account that communication between Class II equipment (with which it communicates directly) and other equipment (with which the network does not have direct contact) may occur. As an example, Class II equipment may support digital and/or analog subscriber loops. Use of Class II equipment also involves the possibility of having interworking occur beyond the equipment with which the network has direct contact. Therefore, it is reasonable for Class II equipment to provide the network with an interworking notification, for both outgoing and incoming calls, when either the calling or called party respectively, is a non-ISDN user. Class II equipment may also send an interworking notification if a private network exists beyond the Class II equipment and interworking to a non-ISDN facility within that network takes place. When an interface is associated with Class I equipment, it is assumed the multiple pieces of equipment may exist and communicate with the network over the D-channel. However, in this case, all equipment is assumed to be ISDN-capable and is considered as the endpoint of the communication. Therefore, interworking notification should not be accepted from Class I equipment.

The second attribute relates to the manner in which a SETUP message should be presented to the user equipment. When Class I equipment is applied on a particular interfaces, the network should broadcast the SETUP message associated with each call that terminates on that interface, since interaction between the network and multiple pieces of user equipment should be supported. On the other hand, the network should not broadcast SETUP messages associated with terminating calls to an interface on which Class II equipment is being used. Here, a single piece of user equipment is assumed to be involved in all communication with the network.

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*Subject to further discussion.

To the extent possible, it is desirable to have one set of requirements for ISDN call control apply to all ISDN user configurations. However, in cases for which integrated procedures are not appropriate, the call control procedures associated with Equipment Class I will differ from those associated with Equipment Class II. Unless otherwise noted, the assumption should be that a particular procedure/capability should be provided for both classes of equipment on both basic and primary rate access. However, use of the equipment class terminology permits clarification of the circumstances under which a certain capability should be available (i.e., when a particular equipment class is in use). It also permits a mechanism for indicating that a particular capability applies only to a subset of four possible configurations which are labeled as follows.

	Class I	Class II
BRI	*IB*	*IIB*
PRI	*IP*	*IIP*

In other words, a capability that applies to Class I equipment may be provided on basic access interfaces (IB) and/or primary rate access interfaces (IP). Similarly, a capability that applies to Class II equipment may be provided on basic access interfaces (IIB) and/or primary rate access interfaces (IIP).

The notation shown in the table above is used within this implementation agreement to indicate when protocol or procedures are only expected to be supported for a particular equipment class and/or are limited to a particular type of interface, i.e., basic or primary rate interface.

Attachment B
(of Appendix B)

The various parts of the called party number information element should be coded as follows:

— Type of number and numbering plan (octet 3)

Bits 7 6 5 4 3 2 1	Meaning
0 0 0 0 0 0 0	Unknown
0 0 1 0 0 0 1	International number in ISDN numbering plan (Rec. E.164)
0 1 0 0 0 0 1	National number in ISDN numbering plan (Rec. E.164)
1 0 0 0 0 0 1	Local (directory) number in ISDN numbering plan (Rec. E.164)

All other values are reserved

— Digits (octet 4, etc.)

Bits 7 6 5 4 3 2 1	Meaning
0 1 1 0 0 0 0	0
0 1 1 0 0 0 1	1
0 1 1 0 0 1 0	2
0 1 1 0 0 1 1	3
0 1 1 0 1 0 0	4
0 1 1 0 1 0 1	5
0 1 1 0 1 1 0	6
0 1 1 0 1 1 1	7
0 1 1 1 0 0 0	8
0 1 1 1 0 0 1	9

All other values are reserved

Digits should be represented by IA5 characters whose encoding is shown above.

In the network to user direction (n -> u), this IE will be always signaled in the SETUP message, and public network interfaces will use only one codepoint: local number in ISDN. For private networks, this IE can contain the following codepoints: abbreviated type of number, and private numbering plan, and extra digits such A, B, C, and D (as per IA5).

Attachment C
(of Appendix B)

The various parts of the calling party number information element should be coded as described below.

— Type of number and numbering plan (octet 3) follows:

Bits 7 6 5 4 3 2 1	Meaning
0 0 0 0 0 0 0	Unknown
0 0 1 0 0 0 1	International number in ISDN numbering plan (Rec. E.164)
0 0 1 0 0 1 1	International number in data numbering plan (Rec. X.121)
0 1 0 0 0 0 1	National number in ISDN numbering plan (Rec. E.164)
1 0 0 0 0 0 1	Local (directory) number in ISDN numbering plan (Rec. E.164)
1 1 0 1 0 0 1	Abbreviated Number in Private Numbering plan
	All other values are reserved

— Origin of number and presentation status (octet 3a) follows:

Bits 7 6 5 4 3 2 1	Meaning
0 0 0 0 0 0 0	Presentation allowed of user-provided number, number not screened
0 0 0 0 0 0 1	Presentation allowed of user-provided number, number passed network screening
0 0 0 0 0 1 0	Presentation allowed of user-provided number, number failed network screening
0 0 0 0 0 1 1	Presentation allowed of network-provided number
0 1 0 0 0 0 0	Presentation prohibited of user-provided number, number not screened
0 1 0 0 0 0 1	Presentation prohibited of user-provided number, number passed network screening
0 1 0 0 0 1 0	Presentation prohibited of user-provided number, number failed network screening
0 1 0 0 0 1 1	Presentation prohibited of network-provided number
1 0 0 0 0 1 1	Number not available
	All other values are reserved

Note 1 — When octet 3a is omitted, the default value of the Number Presentation parameter for the signaled DN value should be used, if it is available. If a value for this parameter is unavailable (i.e., the signaled DN value either fails screening or is not screened by the SPCS), the presentation parameter value of the default DN should be used.

Note 2 — Octet 3a, bits 7 & 6, are for the Presentation indicator; bits 2 & 1 are for the screening indicator.

— Digits (octet 4, etc.)

Digits should be represented by IA5 characters whose encoding is shown below:

Bits 7 6 5 4 3 2 1	Meaning
0 1 1 0 0 0 0	0
0 1 1 0 0 0 1	1
0 1 1 0 0 1 0	2
0 1 1 0 0 1 1	3
0 1 1 0 1 0 0	4
0 1 1 0 1 0 1	5
0 1 1 0 1 1 0	6
0 1 1 0 1 1 1	7
0 1 1 1 0 0 0	8
0 1 1 1 0 0 1	9

All other values reserved

Codings At Originating Party Interface

The calling party number information element should only be accepted when in the SETUP message. When the type of number and numbering plan indicator indicates "local number in the ISDN (E.164) numbering plan," the calling party number information element should contain a 7-digit local number. When the type of number and numbering plan indicator indicates "national number in the ISDN (E.164) numbering plan" the calling party number information element should contain a 10-digit national number.

In the network to user direction (n -> u). the coding and delivery of this IE depends on the definition of the Calling Line ID service. For private networks, this IE can contain the following codepoints: abbreviated type of number, and private numbering plan, and extra digits such as A, B, C, and D. (as per IE5)

Attachment D
(of Appendix B)

Network — Specific facilities Information Element Examples

One recommended use for the Network Specific Facilities information element is to indicate which type of network facilities are being invoked at the specified network. In this arrangement, many different facility types are allowed to share a single Primary Rate Interface. Examples of the different DS-1 facility types allowed are:

Private Lines
Inwats Circuits
Outwats Circuits
Foreign Exchange (FX)
Tie Trunks

Attachment E
(of Appendix B)

(editor's note: the sections contained in the parentheses are unchanged from the original Annex D)

*Annex D — Extensions for symmetric **(peer-to-peer)** call operation*

This annex is part of NIU 90-302.

Symmetric call operation, or peer-to-peer call operation, shall be applied to the switches within a private network where all switches, such as PBXs and central office switches serving business group users are considered as peers. For example, PBX-to-PBX, PBX-to-Centrex, Centrex-to-Centrex.

D.1 Additional message handling

(In symmetric applications, the SETUP message will contain a Channel Identification information element indicating a particular B-channel to be used for the call. A point-to-point data link shall be used to carry the SETUP message.)

The following procedures shall be followed for symmetrical operation. The call control states followed should be the symmetric states defined in section D.6.

D.1.1 Call Request

The initiator of the call shall follow the network side procedures described in section 5.2.1.

D.1.2 B-channel Selection — symmetric interface

(Only B-channels controlled by the same D-channel will be the subject of the selection procedure. The selection procedure is as follows:

a) The SETUP message will indicate one of the following:

   1) channel is indicated, no acceptable alternative, or

   2) channel is indicated, any alternative is acceptable.

b) In cases 1) and 2), if the indicated channel is acceptable and available, the recipient of the SETUP message reserves it for the call. In case 2), if the recipient of the SETUP message cannot grant the indicated channel, it reserves any other available B-channel associated with the D-channel.)

c) The recipient of the SETUP message indicates the selected B-channel in a CALL PROCEEDING, message transferred across the interface and enters the Incoming Call Proceeding state. If an ALERTING or a CONNECT message is received in response to a SETUP message, the call should continue to be processed, if the channel indicated is acceptable to the initiator of the call, in accordance with sections D.1.5.1 and D.1.8, respectively. Although these are acceptable responses, a CALL PROCEEDING message is the recommended response to a SETUP message.

d)

e) In case 1) if the indicated B-channel is not available, or in case 2) if no B-channel is available, a RELEASE COMPLETE message with a cause value of No. 44 "requested circuit/channel not

available" or No. 34 "no circuit/channel available" respectively is returned to the initiator of the call. The sender of this message remains in the Null state.

f) If the channel indicated in the CALL PROCEEDING, message is unacceptable to the initiator of the call, it clears the call in accordance with section 5.3. If an ALERTING or a CONNECT message is received in response to a SETUP message and the channel indicated is unacceptable to the initiator of the call, it clears the call in accordance with section 5.3. Although these are acceptable responses, a CALL PROCEEDING message is the recommended response to a SETUP message.

D.1.3 Invalid Call Information

The recipient of a SETUP message shall follow the network side procedures described in section 5.1.4.

D.1.4 Compatibility Checking

The recipient of a SETUP message shall follow the user side procedures described in section 5.2.2.

D.1.5 Call Confirmation

Upon receipt of a SETUP message, the equipment enters the Call Present state. Valid responses to the SETUP message are a CALL PROCEEDING, or a RELEASE COMPLETE message. If an ALERTING or a CONNECT message is received in response to a SETUP message, the call should continue to be processed, if the channel indicated is acceptable to the initiator of the call, in accordance with sections D.1.5.1. and D.1.8, respectively. Although these are acceptable responses, a CALL PROCEEDING message is the recommended response to a SETUP message.

If the indicated channel is acceptable to the initiator of the call, the initiator shall attach to the indicated B-channel according to the procedures in Annex N.

D.1.5.1 Receipt of CALL PROCEEDING and ALERTING

The Initiator of a call shall follow the network side procedures in section 5.2.5.2.

D.1.5.2 Clearing during incoming call establishment

The initiator of a call shall follow the network side procedures in section 5.2.5.3.

D.1.5.3 Call Failure

The initiator of a call shall follow the network side procedures in section 5.2.5.4.

D.1.6 Clearing by the called user employing user-provided tones/announcements

When tones or announcements are provided in conjunction with call clearing, the party providing the in-band treatment shall send a PROGRESS message.

D.1.7 Call Accept

The recipient of the call shall follow the user side procedures in section 5.2.7.

D.1.8 Active indication

Upon receipt of a CONNECT message, the initiator of the call shall respond with a CONNECT ACKNOWLEDGE message and enter the Active State (see sec. 5.2.8 network side procedures).

D.1.9 Call Clearing

D.1.9.1 Normal Call Clearing

Then sender of the DISCONNECT message shall follow the user side procedures in section 5.3.3. The recipient of the DISCONNECT message shall follow the network side procedures in section 5.3.3.

D.2 Timers for call establishment

The timers described in section 9 table 7 shall be implemented along with the corresponding procedures for action's taken upon expiration of these timers. The default of T310 should be extended to 20 seconds. In addition, timer T309 shall be mandatory.

D.3 Call collisions

In symmetric arrangements, call collisions can occur when both sides simultaneously transfer a SETUP message indicating the same channel. In the absence of administrative procedures for assignment of channels to each side of the interface, the following procedure is employed.

First, one side of the interface will be designated the **"controlling function"** and the other side of the interface will be designated the **"responding function."** This can be accomplished by administering the Layer 2 Command/ Response bit. The controlling function is assigned **"command"** and has control of all the channels on the interface. The responding function is assigned **"response."** Second, for the three possible scenarios where the same channel is indicated by combinations of preferred and exclusive from the responding function and controlling function, the following procedure is used:

a) **"controlling function"** preferred, **"responding function"** preferred:

The **"controlling function"** preferred channel is awarded and an alternate channel is indicated in the first response to the **"responding function"** SETUP message.

b) **"controlling function"** exclusive, **"responding function"** exclusive:

The **"controlling function"** exclusive channel is awarded and the **"responding function"** SETUP message is cleared with a RELEASE COMPLETE message with cause No. 34 "no circuit/channel available".

c) **"controlling function"** preferred, **"responding function"** exclusive; or **"controlling function"** exclusive, **"responding function"** preferred:

The side of the interface with an exclusive indicator in a SETUP message is awarded the channel and an alternate channel is indicated in the first response to the side using a preferred indicator in the SETUP message.

Channel identification is allowed in both directions for ALERTING and CONNECT.

D.4 Restart Procedures

See section 5.5.

D.5 Handling of Error Codes

See section 5.8.

D.6 Call control states for symmetric call operation

The state below are used in association with call references other than the global call reference, and apply to symmetric interfaces. The Outgoing side is the side of the symmetric interface that transmits the SETUP message, while the incoming side is the recipient of the SETUP message.

D.6.1 Null State (S0)

No call exists.

D.6.2 Call Initiated (S1)

This state exists for an outgoing call when the Outgoing Side has sent a request for call establishment to the Incoming Side but has not yet received a response.

D.6.3 Outgoing Call Proceeding (S3)

This state exists for an outgoing call when the Outgoing Side has received acknowledgment that the Incoming Side has received all call information necessary to effect call establishment.

D.6.4 Call Delivered (S4)

This state exists for an outgoing call when the Outgoing Side has received from the Incoming Side an indication that the called user is being alerted.

D.6.5 Call Present (S6)

This state exists for an incoming call when the Incoming Side has not yet responded to the request from the Outgoing Side for call establishment.

D.6.6 Call Received (S7)

This state exists for an incoming call when the Incoming Side has indicated to the Outgoing Side that the called user is being alerted.

D.6.7 Connect Request (S8)

This state exists for an incoming call when the Incoming Side has indicated to the Outgoing Side that the called user has answered the call.

D.6.8 Incoming Call Proceeding (S9)

This state exists for an incoming call when the Incoming Site has sent to the Outgoing Side acknowledgment that it has received all call information necessary to effect call establishment.

D.6.9 Active (S10)

This state exists for an incoming call when the Incoming Side has received from the Outgoing Side an acknowledgment of the indication that the called user has answered the call. This state exists for an outgoing call when the Outgoing Side has received from the Incoming Side an indication that the called user has answered the call.

D.6.10 Disconnect Request (S11)

This state exists when a Side has sent to the other Side a request to disconnect the user information connection and is waiting for a response.

D.6.11 Disconnect Indication (S12)

This state exists when a Side has received from the other Side a request to disconnect the user information connection and has not yet responded.

D.6.12 Release Request (S19)

This state exists when a Side has sent to the other Side a request to release the call and has not yet received a response.

Attachment F
(of Appendix B)

Annex N — Procedures for Establishment of Bearer Connection Prior to Call Acceptance

This annex is part of NIU 90-302.

N.1 General

For some applications, it is desirable to allow the completion of the transmission path associated with a bearer service prior to receiving call acceptance. In particular, the completion of the backward direction for non-peer communication or both directions for peer-to-peer communication (see Annex D for peer-to-peer call operation) of the transmission path prior to receipt of a CONNECT message from the called user may be desirable to:

1) allow the called user to provide internally-generated tones and announcements that are sent in-band to the calling user prior to answer by the called user; or,

2) avoid speech clipping on connections involving an NT2 where delays may occur in relaying the answer indication within the called user equipment.

The procedures described in this annex are applicable to the speech and 3.1 kHz audio bearer services, for non-peer communication of both directions for peer-to-peer communication (see Annex D for peer-to-peer call operation).

N.2 Procedures

Completion of the transmission path prior to receipt of a call acceptance indication shall be provided in three ways:

1) For peer-to-peer communications on receipt of a CALL PROCEEDING message or an ALERTING message indicating completion of successful channel negotiation.

2) For non-peer communication on receipt of an ALERTING message; and

3) For non-peer communications on receipt of a PROGRESS message.

When criteria (1) is used to determine that a transmission path should be established, the sender of the SETUP message shall connect, both directions of the transmission path upon receipt of either a CALL PROCEEDING message or an ALERTING message containing an acceptable B-channel indication.

When criteria (2) is used to establish the transmission path, the network shall connect, the backward direction of the transmission path upon receipt of an ALERTING message assuming channel negotiation procedures have been successful.

When criteria (3) is used to establish the transmission path, the network shall connect, the backward direction of the transmission path upon receipt of a PROGRESS message containing progress indicator 1 "call is not end-to-end ISDN; further call progress information may be available in-band," assuming that the user has already returned a CALL PROCEEDING message and channel negotiation procedures have been successful.

If an ALERTING message follows a PROGRESS message containing progress indicator 1, it should be treated as an unexpected message.

The network may choose to further restrict when message(s) will result in establishment of the transmission path. These restrictions may be imposed on a per interface basis to provide an administrative means for limiting potential misuse of the early connection capabilities.

Acronyms

3PTY Three Party Service
ACD Automatic Call Distributor
ACT1 Abstract Conformance Test Group for Layer 1
ACT23 Abstract Conformance Test Group for Layers 2 and 3
AE ASI Entity
ALLF Additional Lower Layer Functions
ANS American National Standard
ANSI American National Standards Institute
AOC Advice of Charge
AOW Asian Oceanic Workshop
AP Application Profile
ARS Automatic Route Selection
ACSE Association Control Service Element
ASI Application Software Interface
BLLF Basic Lower Layer Functions
BOC Bell Operating Company
BRA Basic Rate Access
BRI Basic Rate Interface
CCBS Completion of calls to busy subscribers
CCITT International Telephone and Telegraph Consultative Committee
CCR Concurrency, Commitment, and Recovery
CD Call Deflection
CFB Call Forward Busy
CFNR Call Forward No Reply
CFU Call Forwarding Unconditional
CLID Calling Line Identification
CLIP Calling Line Identification Presentation
CLIR Calling Line Identification Restriction
CO Central Office
COLP Connected Line Identification Presentation
COLR Connected Line Identification Restriction
CONF Conference calling
COS Corporation for Open Systems
CPE Customer Premises Equipment
CPN Calling Party Number
CRED Credit Card Calling
CSD Circuit-Switched Data
CSV Circuit-Switched Voice
CT Conformance Test
CT Call Transfer
CUG Closed User Group
CVN Call Forwarding No Answer
CW Call Waiting
DCE Data Circuit-Terminating Equipment
DN Directory Number
DSS1 Digital Subscriber Signalling System Number 1
DTE Data Terminal Equipment
DTP Distributed Transaction Processing
EAMF Equal Access Multi-Frequency

ECMA European Computer Manufacturers Association
EDI Electronic Data Interchange
ESCA Exchange Carriers Standards Association
ETSI European Telecommunications Standards Institute
EWOS European Workshop for Open Systems
FIPS Federal Information Processing Standard
FTAM File Transfer and Management
FTP File Transfer Protocol
HLDC High-Level Data Link Control
HLF High Level Function
HOLD Call Hold
IA Implementation Agreements
ICOT ISDN Conformance Test
ICS Implementation Conformance Statement
IIW ISDN Implementors Workshop
INTAP Interoperability Technical Association Processing
ISDN Integrated Services Digital Network
ISER(M) ISDN Station Event Recording (Module)
ISP International Standardized Profile
ISPICS International Standardized Profiles Implementation Conformance Statement
IUW ISDN Users Workshop
IWF Interworking Functions
LAN Local Area Network
LAPD Link Access Procedure, D-Channel
LLSIG Lower Layer Special Interest Group
MA Messaging and Answering
MCI Malicious Call Identification
MSN Multiple Subscriber Number
MWI Message Waiting Indicator
NA Network Adapter
NFS Network File System
NIST National Institute of Standards and Technology
NIUF North American ISDN Users Forum
NMWG Network Management Expert Working Group
NT Network Termination
NUI Network User Identification
OIW OSI Implementors Workshop
OSI Open Systems Interconnection
pAP proposed Application Profile
PBX Private Branch Exchange
PNP Private Numbering Plan
PRA Primary Rate Access
PRI Primary Rate Interface
PSD Packet-Switched Data
PSN Private Switched Network
REV Reverse Charging
RL Requirments List
RPN Redirecting Party Number
SAP Service Acces Point
SCAI Switch-Computer Applications Interface
SNA Systems Network Architecture

SPID Station Profile Identification
SPO Standards Promotion Organization
SS Supplementary Service
SS7 Signalling System Number 7
SUB Sub-addressing
SWG Signalling Working Group
TA Terminal Adapter
TE Terminal Equipment
TEI Terminal Endpoint Identifier
TFN Transferred From Number
TP Transaction Processing (Distributed)
TPN Transferred Party Number
TPSE Transaction Processing Service Element
TTCN Tree and Tabular Combined Notation
TTN Transferred To Number
UUS User-to-User Signalling
VMS Voice Messaging Systems
VPN Virtual Private Network
WAN Wide Area Network
WG Working Group

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