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SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – ISDN user part

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**Signalling System No. 7 – Application transport  
mechanism**

ITU-T Recommendation Q.765

(Formerly CCITT Recommendation)

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ITU-T Q-SERIES RECOMMENDATIONS  
**SWITCHING AND SIGNALLING**

SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE	Q.1–Q.3
INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING	Q.4–Q.59
FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN	Q.60–Q.99
CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS	Q.100–Q.119
SPECIFICATIONS OF SIGNALLING SYSTEMS No. 4 AND No. 5	Q.120–Q.249
SPECIFICATIONS OF SIGNALLING SYSTEM No. 6	Q.250–Q.309
SPECIFICATIONS OF SIGNALLING SYSTEM R1	Q.310–Q.399
SPECIFICATIONS OF SIGNALLING SYSTEM R2	Q.400–Q.499
DIGITAL EXCHANGES	Q.500–Q.599
INTERWORKING OF SIGNALLING SYSTEMS	Q.600–Q.699
SPECIFICATIONS OF SIGNALLING SYSTEM No. 7	Q.700–Q.799
General	Q.700
Message transfer part (MTP)	Q.701–Q.709
Signalling connection control part (SCCP)	Q.711–Q.719
Telephone user part (TUP)	Q.720–Q.729
ISDN supplementary services	Q.730–Q.739
Data user part	Q.740–Q.749
Signalling System No. 7 management	Q.750–Q.759
<b>ISDN user part</b>	<b>Q.760–Q.769</b>
Transaction capabilities application part	Q.770–Q.779
Test specification	Q.780–Q.799
Q3 INTERFACE	Q.800–Q.849
DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1	Q.850–Q.999
PUBLIC LAND MOBILE NETWORK	Q.1000–Q.1099
INTERWORKING WITH SATELLITE MOBILE SYSTEMS	Q.1100–Q.1199
INTELLIGENT NETWORK	Q.1200–Q.1699
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000	Q.1700–Q.1799
BROADBAND ISDN	Q.2000–Q.2999

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## **ITU-T Recommendation Q.765**

### **Signalling System No. 7 – Application transport mechanism**

#### **Summary**

This Recommendation describes the additions to the ISDN User Part (ISUP) for providing a transport mechanism used by applications requiring a bearer in conjunction with the support of the application's signalling information flow. This transport mechanism shall provide the same capabilities as the Transaction Capabilities Application Part (TCAP) provides to its users.

#### **Source**

ITU-T Recommendation Q.765 was revised by ITU-T Study Group 11 (1997-2000) and approved under the WTSC Resolution 1 procedure on 15 June 2000.

#### **Keywords**

APM, ISUP.

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## CONTENTS

	<b>Page</b>
1	Scope..... 1
2	References..... 2
3	Definitions ..... 2
4	Abbreviations..... 3
5	Recommendation structure ..... 4
6	Modelling..... 4
6.1	Network model ..... 5
6.2	Specification model ..... 6
6.2.1	Introduction..... 6
6.2.2	General model..... 6
6.2.3	Dynamic primitive flows ..... 8
7	Application Process functions ..... 11
7.1	General..... 11
7.2	APM Application Process (AP) functions ..... 12
7.2.1	Introduction..... 12
7.2.2	Primitive interface (AP-SACF) ..... 13
7.2.3	Procedures ..... 13
7.2.4	Primitive contents ..... 14
8	Single Association Control Function (SACF) ..... 15
8.1	Introduction..... 15
8.2	Information flows related to messages sent by the node..... 15
8.3	Information flows related to messages received by the node..... 16
9	ISDN user part ASE (ISUP ASE)..... 17
9.1	Primitive interface..... 17
9.2	Procedures..... 17
9.3	Primitive contents ..... 18
10	Application transport mechanism ASE (APM ASE)..... 18
10.1	Primitive interface..... 18
10.2	Procedures..... 19
10.2.1	Normal procedures – Sending ..... 19
10.2.2	Normal procedures – Receiving ..... 19
10.2.3	Sending of acknowledgement..... 21
10.2.4	Segmentation ..... 21
10.3	Primitive contents ..... 24

11	Application Transport Mechanism User ASE (APM-user ASE) .....	24
11.1	Primitive interface.....	24
11.2	Procedures.....	25
11.2.1	General.....	25
11.2.2	Signalling congestion.....	25
11.2.3	Handling of unrecognized signalling information.....	25
11.3	Primitive contents .....	25
12	Network Interface function.....	26
12.1	Introduction.....	26
12.2	Primitive interfaces .....	26
12.2.1	MTP interface .....	26
12.2.2	AEI interface.....	26
12.3	Procedures.....	26
12.3.1	Formats and codes .....	26
12.3.2	Distribution.....	26
12.3.3	Primitive mapping .....	27
13	Errors Handling ASE (EH ASE).....	27
13.1	Introduction of unidentified context and addressing errors handling mechanism .....	27
13.1.1	Unidentified context and addressing errors handling – Local error handling .....	28
13.1.2	Unidentified context and addressing errors handling – Remote error handling .....	28
13.2	Reassembly error handling.....	29
13.3	Primitive interface.....	29
13.4	Procedures.....	29
13.4.1	Normal procedures – Remote error handling .....	29
13.4.2	Normal procedures – Local error handling.....	30
13.4.3	Exceptional procedures – Context identifier error.....	31
13.4.4	Exceptional procedures – Unrecognized reason value .....	31
13.5	Primitive contents .....	31
14	Application transport notification information.....	31
15	Timers .....	32
	Appendix I – Example sequence diagrams of APM segmentation.....	33
	Appendix II – Setting of parameter and message instruction indicators.....	34

**Signalling System No. 7 – Application transport mechanism**

**1 Scope**

This Recommendation describes the additions to the ISDN User Part (ISUP) for providing a transport mechanism used by applications requiring a bearer in conjunction with the support of the application's signalling information flow. This transport mechanism shall provide the same capabilities as the Transaction Capabilities Application Part (TCAP) provides to its users. The definition of the applications that use this mechanism are documented in their own Recommendation and are therefore outside the scope of this Recommendation.

The Application Transport Mechanism (APM) is capable of creating signalling associations between APM-user application logic located at a Public Initiating Node (PIN) and its peer APM-user application logic located at the Public Addressed Node (PAN). (The PIN/PAN concept is described in clause 6.) The ability to create different PIN/PAN relationships is only limited by the addressing mechanism used. At call setup, the ISUP basic call mechanism is used to route the call through the network towards the PAN in the same manner as it normally establishes a call. The APM addressing mechanism is used to determine the node in the call path where the Application Information has to be handled but has no influence on the routing of the call.

This transport mechanism provides the APM "2000"-user applications (APM "2000"-user applications) with both an implicit and an explicit APM addressing capability. The applications originally designed to use the APM "98" [6] (APM "98"-user applications) can be supported without alterations by the mechanism described in this Recommendation. APM "98"-user and APM "2000"-user applications are differentiated by their application context identifiers.

The coexistence along a call path of nodes with the APM "98" capability and nodes supporting the APM "2000" functionality may cause in two very specific configurations, an inappropriate handling of application transport parameters sent by an APM "2000"-user application.

- 1) The first scenario is the following:
  - a) An APM "2000"-user application sends information at call set-up towards a remote application.
  - b) An intermediate node supporting the previous APM version [6] is encountered in the call path before the node where the application information has to be delivered.
  - c) This intermediate node is addressed by the called party number.

In this specific case, the intermediate APM "98" node will reject the application information associated to the APM "2000"-user application according to the procedures defined in [6].

- 2) The second scenario is the case where an error notification has to be generated by an APM "98" node on receipt of application information associated to an APM "2000"-user application. This notification may not be delivered to the initiating application if the explicit addressing mechanism was used by this application. An APM "98" node does indeed not support the EH ASE (see clause 13) and cannot therefore use the explicit addressing mechanism for the sending of a notification. Apart from the case explained above (intermediate APM "98" node addressed by the called party number), such a problem can only possibly occur if application information generated by an application using the explicit addressing mechanism is received by an end node with APM "98" capability.

Because of the above reasons future standardized applications shall not be defined as APM "98"-user applications.

At any time of the call, it is possible to create the following PIN/PAN relationships:

- PIN and PAN at end exchanges;
- PIN at transit exchange and PAN at end exchange;
- PIN at end exchange and PAN at transit exchange;
- PIN and PAN at transit exchanges.

It means that a PIN located anywhere in the call path has the capability to create a PIN/PAN relationship with any exchange in the call path having the APM-user capability. The intermediate exchanges having the APM capability but not the APM-user capability will transit the APM information.

It is, of course, possible to communicate in both directions once a PIN/PAN relationship has been created. It should be noted that only one PIN/PAN relationship may exist over the same segment of the call path for a given application (Context identity value) which does not use the explicit addressing mechanism. For example, if a PIN/PAN relationship has been established (PIN) between the Originating Local Exchange (OLE) and an intermediate exchange in the call path (PAN), it is not possible to later establish a PIN/PAN relationship from the destination local exchange to the originating local exchange for the same application since its corresponding PAN would be located at the OLE and would therefore result in two PIN/PAN relationships overlapping at the call leg between the OLE and the intermediate exchange. However, it is possible to establish overlapping PIN/PAN relationships for a given application using the explicit addressing mechanism.

## 2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T Q.761 (1999), *Signalling System No. 7 – ISDN User Part functional description*.
- [2] ITU-T Q.762 (1999), *Signalling System No. 7 – ISDN User Part general functions of messages and signal*.
- [3] ITU-T Q.763 (1999), *Signalling System No. 7 – ISDN User Part formats and codes*.
- [4] ITU-T Q.764 (1999), *Signalling System No. 7 – ISDN User Part signalling procedures*.
- [5] ITU-T Q.1400 (1993), *Architecture framework for the development of signalling and OA&M protocols using OSI concepts*.
- [6] ITU-T Q.765 (1998), *Signalling System No. 7 – Application transport mechanism*.

## 3 Definitions

This Recommendation defines the following terms:

**3.1 context:** A set of rules by which to interpret the contents of the Encapsulated Application Information field as identified by a context identifier which uniquely represents an application to which data are associated.

**3.2 APM "98"-user application:** An APM-user application which was originally designed to be supported by the application transport mechanism defined in ITU-T Q.765 [6].



**3.3 APM "2000"-user application:** An APM-user application which is defined to be supported by the application transport mechanism specified in this Recommendation.

**3.4 APM end node:** A node which determines that the APM application information cannot be passed on beyond that node. The way a node determines that it is the APM end node is beyond the scope of this Recommendation.

#### **4 Abbreviations**

This Recommendation uses the following abbreviations.

ACM	Address Complete Message
AE	Application Entity
AEI	Application Entity Invocation
ALS	Application Layer Structure
AP	Application Process
APM	Application Transport Mechanism
APM-user	Application Transport Mechanism User
APP	Application Transport Parameter
ASE	Application Service Element
CPG	Call Progress message
EH	Errors Handling
EUCEH	Enhanced Unidentified Context and Error Handling
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
LE	Local Exchange
M/O	Mandatory/Optional
MTP-3	Message Transfer Part
NI	Network Interface
NNI	Network Node Interface
OSI	Open Systems Interconnection
PAN	Public Addressed Node
PIN	Public Initiating Node
PRI	Pre-Release Information Message
SACF	Single Association Control Function
SAO	Single Association Object
SDL	Specification and Description Language
SID	Signalling Identifier
SIO	Service Indicator Octet
SLS	Signalling Link Set

TE	Transit Exchange
UCEH	Unidentified Context and Error Handling

## 5 Recommendation structure

The description of the ISDN User Part procedures in this Recommendation are structured according to the model described in 6.2. The description is thus divided into two main parts:

- Protocol functions.
- Non-protocol functions, i.e. exchange nodal functions; this is referred to as the "Application Process".

This Recommendation describes only the part of the total Application Process and Protocol functions in the exchange, that relates to NNI enhancements for the support of the Application Transport Mechanism.

The protocol functions relate only to signalling associations with a bearer (ISUP) and describe the additional information and procedures to that defined for ISUP Basic Call [4] and its associated formats and codes [3] required to support the Application Transport Mechanism.

The signalling association with a bearer is subdivided into three parts: APM-user Protocol Control (APM-user ASE), Application Transport Mechanism protocol control (APM ASE), and the ISUP Basic Call (ISUP ASE). These are coordinated by the Single Association Control Function (SACF).

The Application Entity (AE) can contain more than one APM-user application. It may contain APM "98"-user applications and APM "2000"-user applications. It also contains Errors Handling (EH ASE) for taking the appropriate actions in the case when either the addressed node (PAN) does not support the APM-user application or for the handling of APM error cases.

The Application Process (AP) contains all Call Control functions; however, this Recommendation will only describe the enhancements required to support the Application Transport Mechanism (APM). The AP relevant to the public ISUP basic call can be found in [4], whereas the APM-user functionality can be found in the suitable Recommendations that define the given application.

The service primitive technique, used to define the ISUP ASEs and the SACF specific to the Application Transport Mechanism's signalling needs, is a way of describing how the services offered by:

- an ASE or SACF can be accessed by the user of the services; or
- the provider of a (set of) service(s) can be accessed by the SACF or the AP, respectively.

The service primitive interface is a conceptual interface and is not a testable or accessible interface. It is a descriptive tool. The use of service primitives at an interface does not imply any particular implementation of that interface, nor does it imply that an implementation must conform to that particular service primitive interface to provide the stated service. All conformance to the ISUP specification is based on the external behaviour of a node, i.e. on the generation of the correct message structure and in the proper sequence (as specified in [3] and [4], and in this Recommendation).

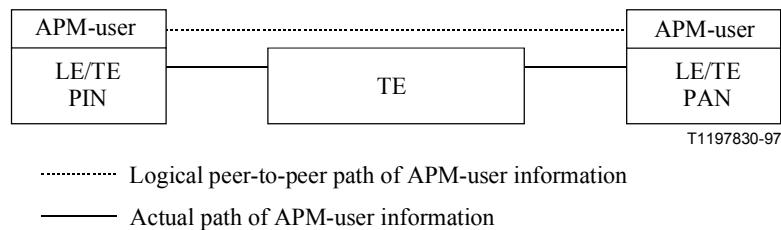
The structure and examples of its usage are illustrated in 6.2.

Examples of primitive flow sequence diagrams for APM segmentation can be found in Appendix I.

## 6 Modelling

The models described in this clause introduce concepts and terminology used in this specification of the Application Transport Mechanism.

## 6.1 Network model



**Figure 1/Q.765 – Network model**

This clause illustrates the relationship between the APM-user Application and the APM implemented across a public network. Figure 1 provides an example of a call from an initiating application to an addressed application via a public transit network. The APM provides the APM-user application with the service of providing both a signalling association as well as a bearer between remote applications.

The Public Initiating Node (PIN) and Public Addressed Node (PAN) concept is introduced here to assist in the description of the APM. The PIN represents the point in the network that wishes to initiate communications towards a peer APM-user application located at an addressed location (PAN). An APM-user application may result in the establishment of a signalling and bearer association, in which case it will use the services of the public basic call.

A PIN/PAN signalling relationship may be established:

- 1) at any time in association with an already established public basic call;
- 2) at call set-up by utilizing the received IAM; or
- 3) by the application establishing a new call.

In the third case, the initiating APM-user's Application Process supplies a normal public E.164 number which is used to route through the public network, thus establishing an association between the Public Initiating Node (PIN) and the Public Addressed Node (PAN). At any phase of the call, the APM addressing mechanism is used to specify the location of the PAN. Either the initiating APM-user supplies the address of the node where the Application Information shall be delivered (explicit addressing), or no address is provided by the initiating application, in which case:

- 1) if the application information is associated to an APM "2000"-user application, the PAN is the next node supporting the APM-user application (implicit addressing); or
- 2) if the application information is associated to an APM "98"-user application, the PAN is determined as specified in 10.2.2.

The APM destination address does not influence the routing of the call through the public network but is only used to determine whether a node in the call path is the PAN. The PAN identifies the particular APM-user application by the Context Identifier value carried within the Application Transport Parameter (APP).

The public basic call mechanism is employed to provide an association between the PIN and the PAN. In routing through the public network the call may pass through intermediate public nodes with or without the ability to support the particular APM-user functionality. However, if the application is not addressed towards that node, it will behave as a normal intermediate public node.

As a number of APM-user applications may be independently active on the same basic call, it is possible to have a number of PIN/PAN relationships established in either the forward or backward direction and at different phases with respect to the ISUP basic call.

## 6.2 Specification model

### 6.2.1 Introduction

The model used to structure the description of ISUP procedures herein are based on the OSI Application Layer Structure (ALS) model, see [5]. This clause presents the model, gives a general description of its operation and shows the generalized model for the "Exchange Application Process" for the support of applications making use of the Application Transport Mechanism over the Network Node Interface (NNI).

### 6.2.2 General model

The generalized model for the bearer related (ISUP) Application Transport Mechanism Application Process is shown in Figure 2. This figure does not represent the situation at any specific point during ISUP procedures, but instead it shows the full picture of the architecture. The specific application of this model is discussed in 6.1. Figure 2 shows the primitive interfaces between the functional blocks, as used in the body of this Recommendation for calls with bearer (ISUP).

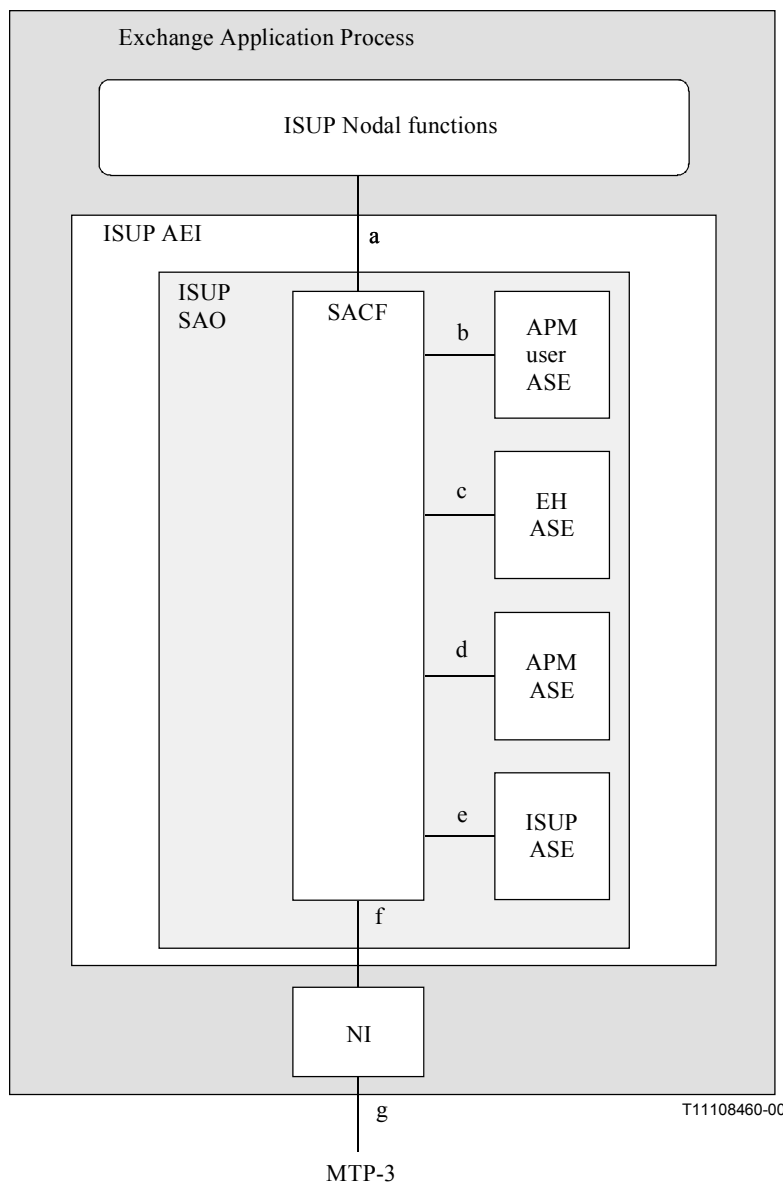


Figure 2/Q.765 – ISUP specification model

The definitions of the interfaces a) to g) are:

- a) Interface between the Application Process nodal functions (AP) and the SACF for the support of the APM over the NNI – see 7.2.2.
- b) Interface between SACF and APM-user ASE representing the application being supported by the APM. (Interface is out of the scope of this Recommendation, except for the primitive interface part used to access the services of the APM ASE.) – see 11.1.
- c) Interface between SACF and EH ASE representing the handling of unidentified context identifier values and error cases – see 13.1.
- d) Interface between SACF and APM ASE representing enhancements of the public functionality (ISUP) for providing a transportation mechanism for the support of various applications (APM-user) over the NNI – see 10.1.
- e) Interface to public ISUP basic call signalling ASE (interface is out of the scope of this Recommendation, except for the primitive interface part used by the APM ASE to access the services of the ISUP ASE) – see clause 9.
- f) Interface between SACF and NI function – see 12.2.2.
- g) Interface to MTP-3.

With respect to Figure 2, all functions also have an interface to a "Management application", this is not defined as a formal primitive interface.

The term "Exchange Application Process" is used to describe all the Application functionality in an exchange. ISUP is a part of the Exchange Application Process. Thus the ISUP Nodal functions shown on the model are referred to as the ISUP Application Process functions in the body of this Recommendation.

The ISUP AEI provides all the bearer-related communication capabilities required by the ISUP Nodal functions. For simplicity an ISUP AEI is defined as containing just one SAO; this avoids the need to specify a Multiple Association Control Function (MACF). Thus all coordination of ISUP signalling associations are performed via the ISUP Nodal functions.

The SACF has the responsibility of coordinating the flow of primitives between its interfaces in the appropriate manner.

The ISUP ASE is defined by [4]. Its main responsibilities are basic call procedures and the handling of protocol errors and unrecognized information handling [4]. The monolithic nature of these Recommendations means that both Public Call Control and Protocol Control functionality are defined together. It is not the intention of this Recommendation to redefine [4] in ALS format, therefore it is referenced *en bloc* within this Recommendation as the ISUP ASE. Conceptually, this should be considered to represent a logical division between the protocol control functionality within the ISUP ASE and its associated call control functionality within the application process. The modelling and interfaces with respect to this are outside the scope of this Recommendation.

The APM ASE provides the means for the transfer of information (including addressing) between nodes for signalling requiring a bearer, and to provide generic services to applications, while being independent of any of these. It is responsible for the enhancements to the NNI (ISUP) for the support of a mechanism which allows various applications to transport their information flows via the NNI. Its main responsibilities are:

- 1) to provide message segmentation in order to provide the APM-user the ability to transport up to 2048 octets of application information;
- 2) to provide the means to identify the PAN.

The APM ASE is able to support multiple APM-users where each is treated independently and provided with the same level of service.

The EH ASE handles the Application Transport Instruction Indicators (ATII), thereby providing a compatibility mechanism for the case where various levels of application (context) support exist within network nodes. It also handles APM reassembly error cases according to the ATII. For the compatibility mechanism it consists of two distinct sets of functions; one set used as the Public Addressed Node (PAN), and one set used as the Public Initiating Node (PIN) (supporting the signalling association to a subsequent exchange). The PIN/PAN concept is explained in 6.1.

The APM-user ASE is responsible for preparing the application specific signalling in a form that can be transported by the public Application Transport Mechanism. It is also responsible for providing any required addresses for the APM addressing mechanism.

To handle any particular ISUP function, the Exchange Application Process creates an instance of the required ISUP Nodal functions. ISUP will create instances, as required, of the ISUP AEI. The Network Interface (NI) function exists to distribute messages received from the MTP-3 to the appropriate instance of the ISUP AEI. There is only one instance of the NI in an exchange. The NI also fulfils the presentation layer function according to the formats and codes of [3].

The MTP-3 interface is defined in [1].

The SAO contained in the ISUP AE is one of the following types:

a) Public Initiating Node (PIN).

This contains:

- ISUP, Initiating APM, Initiating EH ASE, Initiating APM-user and ISUP SACF.

b) Public Addressed Node (PAN).

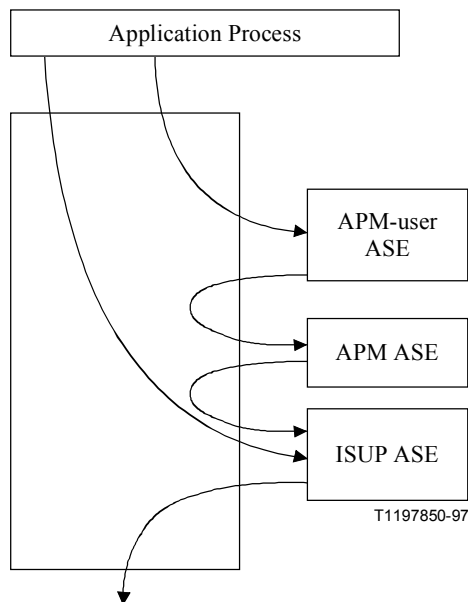
This contains:

- ISUP, Addressed APM, Addressed EH ASE, Addressed APM-user and ISUP SACF.

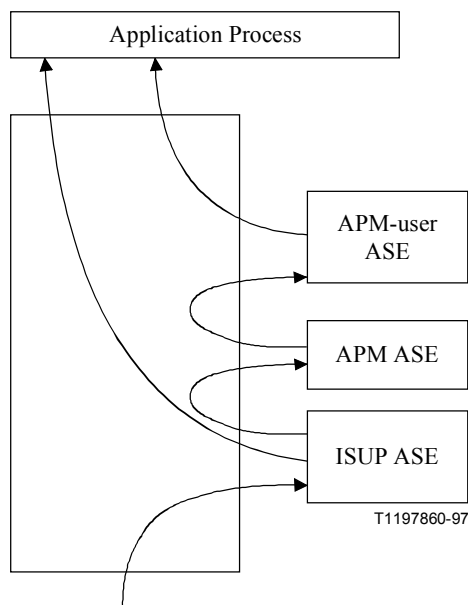
The ISUP may be incoming or outgoing depending on the direction of the PIN/PAN relationship with respect to the ISUP call.

### **6.2.3 Dynamic primitive flows**

Figures 3 and 4 illustrate the dynamic primitive flows for an APM-user call with a bearer being supported over the NNI (ISUP) for the case that a call control message is coincident with the application information flow. Figure 3 shows the case when a message is being sent; Figure 4 shows the case when a message is being received.

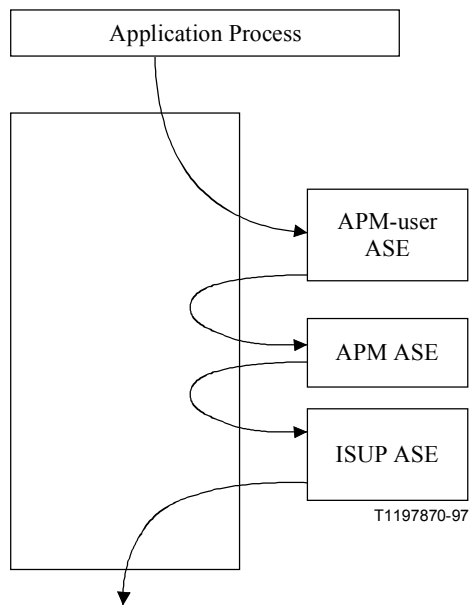


**Figure 3/Q.765**

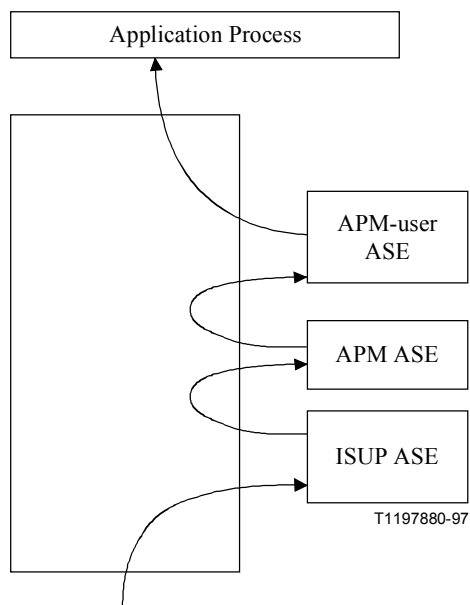


**Figure 4/Q.765**

Figures 5 and 6 illustrate the dynamic primitive flows for the NNI support of the APM-user information flow via a call with a bearer where no call control messages are sent coincidentally. That is, the APM ASE initiates a primitive towards the ISUP ASE which in turn sends an APM message which will provide a mechanism for supporting the information flow.



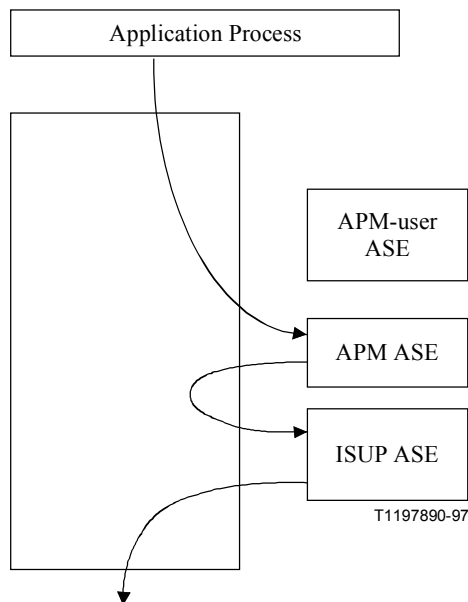
**Figure 5/Q.765**



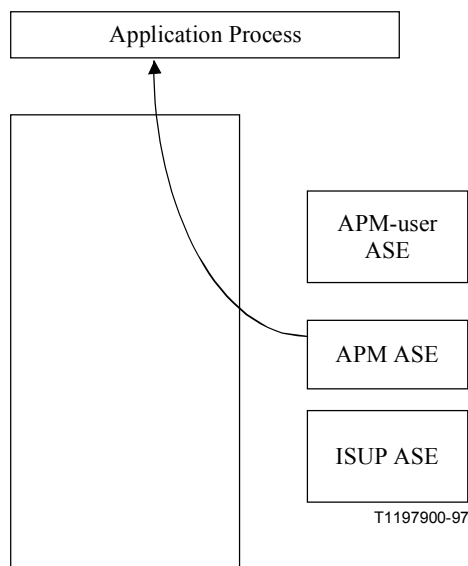
**Figure 6/Q.765**

When the APM ASE and associated AP logic must communicate, primitives are passed between them. Figure 7 illustrates the case when the AP requests a service directly from the APM ASE. Figure 8 illustrates an indication being sent directly from the APM ASE to the AP.





**Figure 7/Q.765**



**Figure 8/Q.765**

## 7 Application Process functions

### 7.1 General

The modelling of the Application Process (AP) is outside the scope of this Recommendation; however, in order to appreciate the role of the AP for the purposes of this Recommendation, it can be considered to consist of three different functional groups that are relevant to the support of an application over the public Network Node Interface (NNI). These are the APM-user application processes (out of the scope of this Recommendation), the public network ISUP basic call functionality, where the application process and protocol control functions are defined together in

the monolithic Recommendations of the ISUP [4], and the APM specific application process logic which is defined in this Recommendation.

It is the responsibility of the APM-user aspect of the application process to coordinate between the APM-user application process and the public basic call application process functionality. It must ensure that the basic call states are aligned between the public basic call and the APM-user application processes.

When the APM-user application requires the establishment of a PIN/PAN signalling association and the related ISUP call already exists, then the application makes use of the APM services in conjunction with the existing call. When no call already exists, it passes the routing information to the public application process such that it can route the call from the Public Initiating Node (PIN) to the appropriate node in the public network, Public Addressed Node (PAN), which contains the adjacent APM-user functionality. The PIN/PAN concept is described in 6.1. Details of the Public basic call routing information requirements can be found in [4].

The definition of the primitive interface (interface a) in Figure 2) between the AP and the SACF for both the specific public basic call primitives and those of the APM-user application are outside the scope of this Recommendation.

## **7.2 APM Application Process (AP) functions**

### **7.2.1 Introduction**

The following functions are fulfilled by the APM application process:

1) Transit node operation

The public network may contain a number of transit exchanges between the PIN and the PAN. Some or all of these exchanges may support the APM; however, they are not the addressed node (PAN) for the application using the APM. In this case, these nodes must pass the APM information transparently with the behaviour of a transit exchange.

2) Support of APM signalling association acknowledgement mechanism (sent from the PAN in conjunction with the APM segmentation/reassembly procedures)

When sending information in subsequent messages after an IAM but before the reception of a first backwards message, there is no guarantee that the information will successfully arrive at its destination. Since APM-user applications may wish to send a greater amount of information during the establishment phase than can be carried in an ISUP IAM message, it is necessary to send the information in subsequent messages. To ensure the reliable delivery of this information, the application process located at the PAN initiates the sending of an appropriate first backwards message (such as, an ACM with "no indication" or APM) towards the PIN on reception of an IAM indicating segmentation of APM information, has occurred. This provides an acknowledgement to the IAM, thereby confirming the establishment of a signalling association.

NOTE – In the case that such an acknowledgement for an APM signalling association initiated by the PIN at call set-up has not yet been received before reception of either:

- an ACM indicating "subscriber free"; or
- a CPG indicating "alerting"; or
- an ANM or CON

without the appropriate acknowledgement, then if the application association for the call was essential, the call shall be released and the maintenance function shall be notified.

3) The coordination of segmented APM-user information with public call control messages

When application data is segmented by the APM, the result is that the information is sent over the ISUP via a number of messages. It is therefore the responsibility of the APM to

ensure that the information is reassembled correctly and that the application data is associated with the correct call control message, where applicable. This is achieved by the APM ASE informing the AP that the complete information has not been made available to the AP (i.e. reassembly procedure under way). Similarly the AP is informed once the complete information has been passed to it, thus allowing it to complete its processing. It is the responsibility of the AP to coordinate all the application processes related to the call.

In the case of the receipt of segmented application data relating to a Release message the application data segments start with a Pre-release Information message, and the End\_APP\_Info indication primitive indicates to the application process that all the application information relating to the yet to be received Release message has been received.

- 4) The handling of instructions received from the SACF resulting from the handling of Application Transport Instruction Indicators.

The Application Transport Instruction Indicator (ATII) mechanism allows for an APM-user application to instruct a receiving node how to respond to error cases, for example it may wish to release the call in the case that the application is not supported at the PAN. This instruction is fulfilled when the AP receives the UCEH\_Release indication primitive.

- 5) Use of Pre-release Information message

This capability allows information to be transported at Release in a manner which is compatible with the 1992 and subsequent versions of the ISUP protocol. Any APM-user application requiring the transport of application data in the release phase of a call must make use of the pre-release mechanism (PRI message) described in ITU-T Q.761 [1], Q.762 [2], Q.763 [3] and Q.764 [4].

### 7.2.2 Primitive interface (AP-SACF)

The primitives in Table 1 have been introduced by the functionality specified in this Recommendation. All other primitives at this interface (public basic call or APM-user application) are outside the scope of this Recommendation.

**Table 1/Q.765 – Primitives between AP and SACF**

<b>Primitive name</b>	<b>Types</b>	<b>Direction (Note)</b>
APM_Transit	Indication/Request	→ / ←
APM_Acknowledgement	Request	←
More_APP_Info	Indication	→
End_APP_Info	Indication	→
UCEH_Release	Indication	→
NOTE – Primitive flow from SACF to AP: → Primitive flow from AP to SACF: ←		

### 7.2.3 Procedures

This clause describes the additional procedures required in the application process for the support of the APM.

#### 7.2.3.1 Transit Node

On receipt of an APM\_Transit Indication primitive, the contents are passed transparently through the transit exchange and sent to SACF in the APM\_Transit Request primitive.

### 7.2.3.2 Public Initiating Node (PIN)

#### 7.2.3.2.1 APM signalling association acknowledgement mechanism

No specific procedures for the PIN.

#### 7.2.3.2.2 Segmentation coordination

The coordination of segmentation must be performed by the receiving node. To achieve this coordination, the AP must not complete the processing of information received (basic call control primitive) in conjunction with the reception of the More\_APP\_Info indication primitive.

On reception of the End\_APP\_Info indication primitive, the AP may complete the processing of the received information.

### 7.2.3.3 Public Addressed Node (PAN)

#### 7.2.3.3.1 APM signalling association acknowledgement mechanism

The reception of the More\_APP\_Info primitive indicates that APP segmentation/reassembly procedures are underway. If the More\_APP\_Info indication primitive is received in conjunction with the receipt of an IAM, the signalling association must be acknowledged by sending the primitive corresponding to the appropriate first backwards message (e.g. ACM "no indication", CPG or APM) together with the APM\_Acknowledgement request primitive to SACF.

#### 7.2.3.3.2 Segmentation coordination

See 7.2.3.2.2.

#### 7.2.3.3.3 UCEH\_Release indication

On reception of the UCEH\_Release indication primitive, a release procedure is initiated with cause dependent on the received Reason parameter value as shown below:

Unidentified context/Addressing Error      79 – Service or option not implemented, unspecified.

Reassembly error      111 – Protocol error, unspecified.

The release of an ISUP public basic call is described in [4].

## 7.2.4 Primitive contents

Table 2 describes the contents of the primitives passed across interface (a).

The More\_APP\_Info indication primitive, the APM\_Acknowledgement request primitive and the End\_APP\_Info indication primitives are empty.

**Table 2/Q.765 – Contents of the UCEH\_Release Ind primitive**

Parameter	Mandatory/Optional
Reason	M

**Table 3/Q.765 – Contents of the APM\_Transit Ind/Req primitive**

Parameter	Mandatory/Optional
Transit_Data	M

## 8 Single Association Control Function (SACF)

### 8.1 Introduction

The main objective of SACF is to receive/deliver primitives from/to the appropriate entity and to perform a distribution function where appropriate. The flow of information is from the AP (interface a) in Figure 2) towards NI (interface f) in Figure 2) or vice versa. Therefore the SACF is also responsible to ensure that when multiple primitives are generated by the ASEs towards the AP, that they are delivered across the interface together to ensure that correct associations are maintained. The SACF described here only defines the mapping and functions related to the Application Transport Mechanism. The SACF functionality related specifically to the public basic call functionality or the APM-user application functionality is outside the scope of this Recommendation.

The interfaces referenced herein are illustrated in 6.2, Figure 2. Clause 6.2.3 also provides examples of the "Dynamic primitive flows".

The primitives on the interface between the AP and SACF, interface a), that are not specifically for the definition of the APM (i.e. public basic call and APM user applications) are outside the scope of this Recommendation.

The application specific primitives on the interface between SACF and APM-user ASE, interface b), is outside the scope of this Recommendation.

The primitives used on the interface between SACF and EH ASE, interface c), are defined in 13.3.

The parameters in these primitives are listed in Tables 27 to 29.

The primitives used on the interface between SACF and APM ASE, interface d), are defined in 10.1.

The parameters in these primitives are listed in Table 18.

The primitives related to ISUP basic call on the interface between SACF and ISUP ASE, interface e), are outside the scope of this Recommendation. Primitives associated with the APM's use of the ISUP ASE's services are defined in 9.1. Their associated contents are defined in 9.3.

### 8.2 Information flows related to messages sent by the node

On receipt of a primitive (request or response) from the Application Process (AP), via interface a), the SACF issues appropriate primitive(s) to the ASEs, populating the parameters in the generated primitives from the appropriate subset of the parameters received from the AP. The SACF also performs a distribution function of the responding primitives received from the ASEs prior to sending the resulting primitive to NI via interface f).

The APM-user ASE will send application data to the APM ASE, via SACF, using an APM\_U\_Data request primitive via interface b). Note that a number of APM-user ASEs may generate the APM\_U\_Data primitive. A parameter received by the APM ASE within the APM\_Data primitive is identifiable through its unique relationship with an application context, and hence the appropriate APM-user ASE. Other APM related primitives on interface b) are defined in 11.1. Their associated contents are defined in 11.3. Each APM\_U\_Data primitive sent by one APM-user ASE shall be handled independently from the APM\_U\_Data primitives generated by other APM-user ASEs or even the same APM-user ASE.

Tables 4 to 8 show the mapping of primitives performed by the SACF.

**Table 4/Q.765 – Mapping from APM-user ASE to APM ASE primitives**

<b>Interface b), APM-user ASE</b>	<b>Interface d), APM ASE</b>
APM_U_Data	APM_Data

**Table 5/Q.765 – Mapping from EH ASE to APM ASE primitives**

Interface c), EH ASE	Interface d), APM ASE
APM_U_Data	APM_Data
Send_APM_Transit	Send_APM_Transit

**Table 6/Q.765 – Mapping from APM ASE to ISUP ASE primitives**

Interface d), APM ASE	Interface e), ISUP ASE
APM_Transfer	APM_Transfer

**Table 7/Q.765 – Mapping from AP to APM ASE primitives**

Interface a), AP ASE	Interface d), APM ASE
APM_Acknowledgement	APM_Acknowledgement
APM_Transit	APM_Transit

**Table 8/Q.765 – Mapping from ISUP ASE to NI primitives**

Interface e), ISUP ASE	Interface f), NI
Transfer	Transfer

### 8.3 Information flows related to messages received by the node

On receipt of a Transfer Indication primitive (see Table 22) from the NI, the SACF distributes the contents of the primitive to the ISUP ASE. In the case that an Application Transport Parameter (APP) is present, the ISUP ASE will then pass it to the APM ASE via the APM\_Transfer indication primitive (see Table 16). More than one APP may be present in the ISUP message, hence multiple APPs may be passed to the APM ASE. When the APM ASE is ready to pass the received information to the APM-user ASE, then it sends the APM\_Data indication primitive to SACF. The SACF will distribute the primitive(s) to the appropriate APM-user ASE(s) in the APM\_U\_Data indication primitive according to the context identifier value which is used to uniquely identify the APM-users.

Tables 9 to 13 show the mapping of primitives performed by the SACF. For received messages, the mapping of APM\_U\_Data and APM\_Transfer (Tables 4, 5 and 6) primitives is the reverse to that described in the tables for messages sent by the node in 8.2.

**Table 9/Q.765 – Mapping from EH ASE to APM-user ASE primitives**

Interface c), EH ASE	Interface b), APM-user ASE
APM_Error	APM_U_Error

**Table 10/Q.765 – Mapping from EH ASE to AP primitives**

Interface c), EH ASE	Interface a), AP
UCEH_Release	UCEH_Release

**Table 11/Q.765 – Mapping from APM ASE to AP primitives**

Interface d), APM ASE	Interface a), AP
APM_Transit	APM_Transit
More_APP_Info	More_APP_Info
End_APP_Info	End_APP_Info

**Table 12/Q.765 – Mapping from APM ASE to EH ASE primitives**

Interface d), APM ASE	Interface c), EH ASE
APM_UCEH_Error	APM_UCEH_Error

**Table 13/Q.765 – Mapping from NI to ISUP ASE primitives**

Interface f), NI	Interface e), ISUP ASE
Transfer	Transfer

## 9 ISDN user part ASE (ISUP ASE)

The ISUP ASE is defined in [4]. Its main responsibilities are basic call procedures and the handling of protocol errors and unrecognized information handling [4]. The monolithic nature of this Recommendation means that both Public Call Control and Protocol Control functionality are defined together. It is not the intention of this Recommendation to redefine [4] in ALS format, therefore they are referenced *en bloc* as the ISUP ASE. Conceptually, this should be considered to represent a logical division between the protocol control functionality within the ISUP ASE and its associated call control functionality within the application process. The modelling and interfaces with respect to this are outside the scope of this Recommendation.

### 9.1 Primitive interface

The SACF uses the services provided by the ISUP ASE primitive interface (interface e) in Figure 2) as listed in Table 14.

**Table 14/Q.765 – Primitives between ISUP ASE and SACF**

Primitive name	Types	Direction (Note)
APM_Transfer	Indication/Request	➔/ ➜
NOTE – Primitive flow from SACF to ISUP ASE: ➜ Primitive flow from ISUP ASE to SACF: ➔		

ISUP ASE uses the SACF service primitives: Transfer request/indication.

It is also a receiver of the indications: Remote\_Status, Destination\_Available, Destination\_Unavailable.

### 9.2 Procedures

The procedures of the ISUP ASE are defined in [4]. With respect to the Application Transport Mechanism, on reception of APM\_Transfer request primitive(s), it is the responsibility of the ISUP

ASE to include the APP(s) within a suitable call control message, when available, or alternatively to generate an Application Transport Mechanism message (APM message; see [3]). Similarly it must handle the reception of the APP parameter(s) and the transfer of the received data in the APM\_Transfer indication primitive(s). The APM message can only be sent/received on a non-idle circuit and does not cause a state change. The ISUP parameter compatibility instruction indicators should have the same settings as the ATII. In the case that a message contains more than one APP, then the ATII settings for each APP will be according to the needs of each APM-user application. However, the ISUP parameter compatibility settings must be according to the most stringent case with regard to the ATII.

### 9.3 Primitive contents

Primitive contents is shown in Table 15.

**Table 15/Q.765 – Contents of the APM\_Transfer Ind/Req primitive**

Parameter	Mandatory/Optional	Reference
Application Transport (APP)	M	ITU-T Q.761, Q.762, Q.763 and Q.764

## 10 Application transport mechanism ASE (APM ASE)

The APM ASE specifies the extensions to ISUP in order to provide the underlying services to the APM-user ASE(s) and support the application's (APM-user's) information flows. The APM ASE is responsible for the signalling procedures and the parameters specific to the Application Transport Mechanism.

The APM ASE provides a segmentation mechanism to the APM-user(s) such that the ISUP message length limitation does not restrict the APM-user information flows. The maximum supported size of APM-user information is 2048 octets in length, per Application Information field. The APM ASE may serve many APM-users which are differentiated by their Context Identifiers.

### 10.1 Primitive interface

The ISUP SACF uses the services provided by the APM ASE primitive interface (interface d) in Figure 2) as listed in Table 16.

**Table 16/Q.765 – Primitives between APM ASE and ISUP SACF**

Primitive name	Types	Direction (Note)
More_APP_Info	Indication	→
End_APP_Info	Indication	→
APM_Transit	Indication/Request	→ / ←
APM_Acknowledgement	Request	←
APM_UCEH_Error	Indication	→
APM_Data	Indication/Request	→ / ←
Send_APM_Transit	Request	→
NOTE – Primitive flow from APM ASE to SACF: → Primitive flow from SACF to APM ASE: ←		



The APM ASE uses the services provided by the ISUP SACF primitive interface (interface d) in Figure 2) as listed in Table 17.

**Table 17/Q.765 – Primitives between ISUP SACF and APM ASE**

<b>Primitive name</b>	<b>Types</b>	<b>Direction (Note)</b>
APM_Transfer	Indication/Request	→ / ←
NOTE – Primitive flow from SACF to APM ASE: → Primitive flow from APM ASE to SACF: ←		

## 10.2 Procedures

### 10.2.1 Normal procedures – Sending

On receipt of an APM\_Data request primitive, the APM ASE constructs the Application Transport Parameter (APP) according to the definition in ITU-T Q.761, Q.762, Q.763 and Q.764. The context identifier is set based on the APM-user. The Application Transport Instruction indicators are supplied by the APM-user.

For APM "2000"-user applications using explicit addressing, the APM-user shall supply the address of the PAN and should supply the address of the PIN.

NOTE – If the address of the PIN is not supplied in the case of explicit addressing, then the PAN may be unable to address error notifications or other application information towards the PIN. Problems are also likely to arise with the segmentation and reassembly procedures.

If no originating (destination) address is supplied by the APM-user, then the originating (destination) address field in the APP parameter will be of zero length. When provided by the APM-user, the originating and destination addresses shall uniquely identify the PIN and the PAN respectively.

For APM "98"-user applications, neither address length fields nor address fields are included in the APP.

The APM Segmentation indicator is set to zero (0), the Sequence Indicator field is coded "new sequence" and the Segmentation Local Reference is absent, unless segmentation procedures apply (see 10.2.4). APM segmentation procedures shall only apply if it is not possible to transfer all parameters in the IAM, ACM, CON, ANM or PRI message and SGM, if simple segmentation procedures are used, because the 272 octet MTP limit would be exceeded.

NOTE – The threshold for the initiation of the APM segmentation procedure may alternatively depend on network characteristics. The value of this threshold may vary per traffic relation depending on the typical network configuration and interconnection arrangements. Based on the set of services supported (e.g. ISDN end-to-end information, Call Diversion, User-to-user, etc.) and the set of APM applications (VPN, BICC, GAT, etc.), the exchange performing the segmentation is able to calculate the maximum length of the first segment to leave enough space in a message for use by any subsequent exchange. This maximum length may vary per traffic relation depending on the typical network configuration and interconnection arrangements.

The Application Data received from the APM-user is encapsulated and the whole APP is transferred in the APM\_Transfer request primitive.

On receipt of an APM\_Transit request primitive, the APM ASE transfers the received information transparently in an APM\_Transfer request primitive.

### 10.2.2 Normal procedures – Receiving

On receipt of an APM\_Transfer indication primitive, the subsequent action depends on the Application Context Identifier associated to the received APP.

If the APP is associated to an APM "98"-user application, the action depends on whether it was received at call setup or at another time.

If the APP is associated to an APM "2000"-user application, the procedures are the same at any phase of the call.

#### **10.2.2.1 Procedures at call establishment (IAM message) for APM "98"-user applications**

On receipt of an APM\_Transfer indication at call setup, if the received APP is associated to an APM "98"-user application, the action depends on whether this node is addressed by the called party number. If not, the APM ASE notes that this node is a "pass-on" node for this context and transfers the APP parameter unchanged in an APM\_Transit indication primitive. A pass-on node does not verify the contents of the Transit\_Data parameter.

If this is the addressed node, the action depends on whether the context in question is supported at this node:

- 1) If the context is supported, the parameter is checked to see if segmentation has occurred. If so the segmentation reassembly procedure applies (see 10.2.4) and the completely reassembled Application Information is sent in the APM\_Data indication primitive.
- 2) If the context is not supported, then an APM\_UCEH\_Error indication primitive is sent. The Application Context and Application Transport Instruction Indicators are set as received in the APM\_Transfer primitive and the Reason is set to "Unidentified Context". If the parameter had been segmented, the APM ASE notes that the reassembly procedure for this sequence has been abandoned.

#### **10.2.2.2 Procedures at other times for APM "98"-user applications and any time of the call for APM "2000"-user applications**

On receipt of an APM\_Transfer indication, the APM ASE checks whether this is a "pass-on" node for this context. If so, the APP parameter is passed on unchanged within an APM\_Transit indication primitive. A pass-on node does not verify the contents of the Transit\_Data parameter.

If not, the action depends on whether the context in question is supported at this node:

- 1) If the context is supported:
  - If the node is addressed by the destination address field contained in the APP (in case of explicit addressing), or if no destination address field is contained in the APP, the APM ASE checks whether it is expecting for the received context an acknowledgement to an initial segment sent at call setup according to the segmentation procedure of 10.2.4:
    - If so, the segmentation procedures apply.
    - If the APM ASE is not expecting such an acknowledgement, the parameter is checked to see if segmentation has occurred. If so, the segmentation reassembly procedure applies (see 10.2.4) and the completely reassembled Application Information is sent in the APM\_Data indication primitive.
  - If the node is not addressed by the destination address field contained in the APP parameter in case of explicit addressing then:
    - If the node is not an APM end node, the APP parameter is passed on unchanged within an APM\_Transit indication primitive.
    - If the node is an APM end node, then an APM\_UCEH\_Error indication primitive is sent. The Originating Address, the Application Context and the Application Transport Instruction Indicators are set as received in the APM\_Transfer primitive, the Reason is set to "Unidentified Context/Addressing Error".

- 2) If the context is not supported:
- If the node is not an APM end node, then the APM ASE notes that this node is a "pass-on" node for this context and transfers the APP parameter unchanged in an APM\_Transit indication primitive.
  - If the node is an APM end node, then if this is the first or only segment of a sequence, an APM\_UCEH\_Error indication primitive is sent. The Originating Address (if received), the Application Context and Application Transport Instruction Indicators are set as received in the APM\_Transfer primitive. The Reason is set to "Unidentified Context/Addressing Error". If the parameter had been segmented, the APM ASE notes that the reassembly procedure for this sequence has been abandoned. Subsequent segments in this case are discarded.

### **10.2.2.3 Reception of the Send\_APM\_Transit primitive**

On receipt of the Send\_APM\_Transit primitive, the contents shall be passed unchanged in the APM\_Transit primitive.

### **10.2.3 Sending of acknowledgement**

On receipt of an APM\_Acknowledgement request primitive, an APP will be constructed for each sequence currently under reassembly (Note). The ATII will be set to "release call" and "do not send notification" and the Application Information field shall be empty.

If the Context is associated to an APM "2000"-user application, the originating address field and the destination address field will contain the destination address and the originating address, respectively, received in the segments currently under reassembly. The address fields will be of zero length if no addresses are contained in the segments currently under reassembly.

If the Context is associated to an APM "98"-user application, neither address length fields nor address fields are included in the APP.

This APP will then be sent in an APM\_Transfer request primitive.

NOTE – One acknowledgement only is sent for sequences associated with the same application context identifier, originating address and destination address.

### **10.2.4 Segmentation**

Segmentation procedures may be separately and simultaneously applied to multiple application data fields generated by one or several APM-user applications. The procedures in 10.2.4.1 describe the handling of segmentation and reassembly for application information sent in one APM\_Data request primitive. It should be noted that when multiple APM-users are utilizing the services of the APM for a single call, that the procedures may be applied concurrently and independently with respect to each APM-user and that each application data field sent by one APM-user shall be handled independently from any other application data field generated by the same or any other APM-user.

The initial segment of each sequence must be transported in the first message and this initial segment size may be of zero length. In case that segmentation is applied on different application data fields simultaneously, it must start in the same message. The first message may be an IAM, ACM, CPG, CON, ANM or PRI message (when available) and this procedure ensures that the reassembling node is able to associate the APM information with the first ISUP message. A maximum of one such message can be associated with the transport of segmented application data. Any additional segments will be included in the APP within subsequent APM message(s). In order to associate all the reassembled application data with the first ISUP message, the AP is informed when reassembly procedures are invoked by sending the More\_APP\_Info indication primitive. On completion of reassembly for all sequences for which initial segments were received in the first message, the End\_APP\_Info indication primitive is sent.

NOTE – In the case of the first message being a PRI message the End\_APP\_Info indication primitive indicates to the AP that all the APP information relating to the subsequent REL message has been received.

There would be a possibility that user information segments could be lost when sent forward during call setup if sent before the receipt of a first backwards message. To avoid this situation occurring, the PIN shall not send subsequent segments to an IAM message until a backward message is received containing an empty APP, which implicitly indicates that a path has been successfully routed through the network to the PAN. The PAN initiates the backwards acknowledgement indication only in the case that an IAM is received containing an APP which indicates that segmentation has occurred.

For segmented application data associated with an ACM, CPG, CON, ANM or PRI message, this message shall be sent first, followed by the SGM message (when ISUP Simple segmentation applies to remaining information in the ISUP message), and then followed by the APM messages containing subsequent segments. In case a PRI message is sent, the REL message shall be sent following the APM message containing the last segment.

#### **10.2.4.1 Procedures for segmentation**

The following rules apply when Application Information in an APM\_Data request primitive has to be segmented:

- a) The maximum number of segments is 10 (one initial, possibly empty, segment plus up to 9 segments). The maximum size of Application Information that can be supported is 2048 octets. If the Application Information is too long to be segmented, then the local maintenance function shall be notified, and the APM\_Data request primitive is discarded.
- b) The Encapsulated Application Information field in the first segment shall begin with the first octet of the application Information and sequentially fill the Encapsulated Application Information field. (Alternatively the first segment may contain zero octets of Application Information, and the second segment is filled as described.) The Sequence Indicator field will be set to indicate "new sequence", the APM segmentation indicator field will indicate the number of segments that remain to be sent and a Segmentation Local Reference value included that is unique to the call.
- c) The encapsulated information field in each subsequent segment shall begin with the first octet following the last octet transmitted in the previous segment, thus continuing segmentation until no further encapsulated application data octets remain. The Sequence indicator field shall indicate "subsequent segment to first segment" and the APM segmentation indicator field shall be decremented to indicate the number of segments that remain to be sent and the Segmentation Local Reference shall have the same values as sent in the first segment.
- d) Once the first segment has been transmitted, then all remaining segments of that Application Information shall be sent except in the case that the first segment is sent in an IAM, in which case the reception of an empty APP is awaited prior to the sending of subsequent segments. This APP acknowledgement must originate from the PAN for the segmentation sequence.
- e) Only failure conditions shall cause the transmission of a segmented message to be aborted. In this case the maintenance function is to be notified.
- f) The ATII, the originating address and the destination address should be set as provided by the APM-user in the APM\_Data request primitive for the first and all subsequent segments (see Note).

NOTE – The address fields will be of zero length if they are not provided by the APM-user and if this APM-user is an APM "2000"-user application. If the Application Information is associated to an APM "98"-user application, neither address length fields nor address fields are included in the APPs.

#### 10.2.4.2 Procedures for reassembly

Reassembly procedures may be simultaneously applied to multiple sequences related to the same or different contexts. Each sequence characterized by its Application Context Identifier, its originating address (possibly absent) and its Segmentation Local Reference is handled by one reassembly function. Each segment is therefore directed towards a specific reassembly function according to the Application Context Identifier, the originating address and the Segmentation Local reference it contains.

The following rules apply to the receipt and reassembly of segmented Application Information:

- a) A reassembly function, on receiving an APM\_Transfer indication primitive containing an APP with the Sequence indicator field indicating "new sequence" and the APM segmentation indicator field set to a value greater than zero (0), and not exceeding nine (9), shall treat that Encapsulated Application Information as a valid first segment and save the segment contents, the Application Context Identifier, the originating address (if received – see 10.2.1) and the received Segmentation Local Reference value. (The first segment may have zero octets of Encapsulated Application Information.) Timer  $T_{reass}$  shall be started on receipt of a valid first segment.
- b) A reassembly function, on receiving a subsequent segment with the Sequence Indicator field indicating "subsequent segment to first segment" and the APM segmentation indicator field set to a value one less than the value in the previously received segment, the same Application Context Identifier, the same originating address (if received – see 10.2.1) and the same Segmentation Local Reference value as received in the first segment shall treat the segment as a valid next segment.
- c) A reassembly function, on receiving a valid next segment in which the APM segmentation indicator field has a value greater than zero, shall save the segment contents along with the saved contents of the previous segment or segments.
- d) A reassembly function, on receiving a valid next segment in which the APM segmentation indicator field has a value equal to zero, final segment, shall deliver the accumulated segments, including the last segment, as the complete Application Information to the APM-user with the APM\_Data indication primitive. Timer  $T_{reass}$  shall be stopped on receipt of the final segment of the sequence.
- e) A reassembly function in which no reassembly process is active shall discard any received segment which is not a valid first segment and send the APM\_UCEH\_Error Indication primitive indicating "reassembly error".

This applies to:

- Segments with a Sequence Indicator coded "Subsequent segment to first segment".
- Segments in which the APM segmentation indicator field has a value exceeding 9.

- f) A reassembly function shall discard the received and any saved segments on receipt of any subsequent segment which is not a valid next segment and send the APM\_UCEH\_Error Indication primitive indicating "reassembly error" for both reassembly sequences.

This applies to:

- Segments with a segmentation indicator field value that is not decremented from the value of the previous segment.

- g) A reassembly function shall discard any saved segments on receipt of any subsequent segment which is not a valid next segment and send the APM\_UCEH\_Error Indication primitive indicating "reassembly error".

This applies to:

- Segments with a Sequence Indicator coded "New sequence".

- h) On expiry of timer  $T_{reass}$ , the reassembly function shall discard all segments received for the current sequence and send the APM\_UCEH\_Error indication primitive indicating "reassembly error".
- i) In the case that an APM\_UCEH\_Error indication primitive indicating "reassembly error" is sent, the ATII settings shall reflect those applicable to the sequence undergoing the reassembly procedure.

### 10.3 Primitive contents

The following primitives are already defined elsewhere:

APM\_Transfer primitive is defined in Table 15.

More\_APP\_Info primitive is defined in 7.2.4.

End\_APP\_Info primitive is defined in 7.2.4.

APM\_Acknowledgement primitive is defined in 7.2.4.

APM\_Transit primitive is defined in Table 3.

APM\_UCEH\_Error primitive is defined in Table 28.

Send\_APM\_Transit primitive is defined in Table 29.

Table 18 defines the primitive used across the SACF/APM ASE interface d).

**Table 18/Q.765 – Contents of the APM\_Data Ind/Req primitive**

Parameter	Mandatory/Optional
Application Context Identifier	M
Application Transport Instruction Indicators	M
Originating Address	O
Destination Address	O
Application Information	M

## 11 Application Transport Mechanism User ASE (APM-user ASE)

The APM-user ASE is responsible for the detailed protocol control signalling aspects specific to the application it represents. The definition of the application is outside the scope of this Recommendation. The APM-user ASE utilises a specific interface towards SACF in order to access the services of the APM ASE.

An APM-user is uniquely identified by the SACF through its "context identifier value". This represents the application that it supports and defines the "context" in which this APM-user operates.

### 11.1 Primitive interface

The SACF/APM-user ASE interface (interface b) in Figure 2), is application specific and therefore outside the scope of this Recommendation, except for the primitive interface part used to access the services of the APM ASE. The Application Transport Mechanism specific primitives are listed in Table 19.

**Table 19/Q.765 – Primitives between APM-user ASE and SACF**

Primitive name	Types	Direction (Note)
APM_U_Data	Indication/Request	→ / ←
APM_U_Error	Indication	→
NOTE – Primitive flow from SACF to APM-user: → Primitive flow from APM-user to SACF: ←		

APM-user ASE may be a receiver of the SACF service primitive indications: Remote\_Status, Destination\_Available, Destination\_Unavailable dependent on the needs of the given application.

Multiple APM\_U\_Data request primitives may be sent from the APM-user ASE to the SACF. The procedures are applied concurrently and independently with respect to each primitive.

## 11.2 Procedures

### 11.2.1 General

The procedures for the APM-user ASE are application specific and therefore outside the scope of this Recommendation.

### 11.2.2 Signalling congestion

In order to avoid congestion in the No. 7 signalling network, it is necessary that applications that contribute signalling load towards a congested destination limit their signalling traffic in a controlled manner. As the AP makes use of the ISUP ASE, the ISDN User Part signalling congestion control procedure [4] may reduce traffic towards an affected destination. As such, new call attempts may temporarily be rejected.

Since this mechanism does not restrict the signalling load being generated by already established calls, APM-users should consider the inclusion of procedures to restrict the application's request for generating signalling load. For this purpose, the APM-user ASE would subscribe to the "Remote\_Status" primitive.

### 11.2.3 Handling of unrecognized signalling information

APM-users should consider the inclusion of procedures for the handling of unrecognized signalling information carried in the Encapsulated Application Information field of the Application Transport Parameter (APP).

## 11.3 Primitive contents

**Table 20/Q.765 – Contents of the APM\_U\_Data Ind/Req primitive**

Parameter	Mandatory/Optional
Application Context Identifier	M
Application Transport Instruction Indicators	M
Originating Address	O
Destination Address	O
Application Data	M

**Table 21/Q.765 – Contents of the APM\_U\_Error Ind primitive**

Parameter	Mandatory/Optional
Notification	M

## 12 Network Interface function

### 12.1 Introduction

The Network Interface (NI) function is the part of ISUP that provides a transport interface for instances of the ISUP AEI. The MTP-3 Service Primitive interface is a single interface within an exchange, but multiple instances of signalling associations exist within one exchange. NI associates the signalling instance representation (session layer [5]) of the external interface to the internal instances. NI also represents the presentation layer [5] for ISUP.

### 12.2 Primitive interfaces

#### 12.2.1 MTP interface

The interface (interface g) in Figure 2) to the MTP-3 is the Service Primitive interface defined in reference [1].

#### 12.2.2 AEI interface

The primitives listed in Table 22 are present on the interface between the NI and the SACF in the ISUP AEI (interface f) in Figure 2).

**Table 22/Q.765 – Primitive between NI and SACF**

Primitive name	Types	Direction (Note)
Transfer	Request/Indication	→ / ←
Remote_Status	Indication	←
Destination_Unavailable	Indication	←
Destination_Available	Indication	←
NOTE – Primitive flow from SACF to NI: → Primitive flow from NI to SACF: ←		

### 12.3 Procedures

#### 12.3.1 Formats and codes

The NI performs the presentation layer [5] function for the ISUP. The details of ISUP formats and codes can be found in [3].

MTP\_Transfer indication primitives received from the MTP, (interface g) in Figure 2) are decoded according to the formatting rules defined in [3] and procedures defined in reference [4].

#### 12.3.2 Distribution

MTP\_Transfer indication primitives received from the MTP are distributed to AEIs. Before this distribution can be performed, the circuit to which the incoming message is addressed must be tied to an AEI. Through the use of the CIC, NI, OPC and DPC values of the circuit, AEI identity, mapping is performed according to the following rules:



- If the circuit value corresponds to an existing ISUP AEI, the message is distributed to that AEI.
- If the circuit value does not correspond to an existing ISUP AEI, a new instance of ISUP AEI is created.

When a Transfer request primitive is received from an ISUP AEI, it is mapped into a MTP\_Transfer request primitive. The AEI identity to which the message is associated is used to identify the CIC, NI, OPC and DPC values to use when sending the message. The SIO and SLS fields are completed as specified in [3].

### 12.3.3 Primitive mapping

Tables 23 and 24 show the primitive mapping performed by the NI.

**Table 23/Q.765 – NI primitive mappings from MTP to SACF**

<b>Interface g) from MTP</b>	<b>Interface f) to SACF</b>
MTP_Transfer indication	Transfer indication
MTP_Status indication	Remote_Status indication
MTP_Pause indication	Destination_Unavailable indication
MTP_Resume indication	Destination_Available indication

**Table 24/Q.765 – NI primitive mappings from SACF to MTP**

<b>Interface f) from SACF</b>	<b>Interface g) to MTP</b>
Transfer request	MTP_Transfer request

## 13 Errors Handling ASE (EH ASE)

The EH ASE handles error cases such as unidentified context values, addressing errors and reassembly errors. The EH ASE takes action according to the Application Transport Instruction Indicators (ATII) received together with the application information in the APP. Based on the Release Call Indicator, the call may be released or allowed to proceed. The Send Notification Indicator determines if a notification is sent. On reception of such a notification at the node which sent the original application information, the EH ASE is responsible for informing the appropriate APM-user application that the error has occurred. For example, to notify the application located at the PIN that the desired context identifier value was not supported at the PAN. The EH ASE is a mandatory ASE in the AEI that supports the APM ASE.

### 13.1 Introduction of unidentified context and addressing errors handling mechanism

The unidentified context and Addressing Errors handling mechanism describes the cases when:

- 1) an APM "98"-user application initiates a signalling association with a remote exchange (PAN) which has the APM capability but does not support the application; or
- 2) Application Information generated by an exchange (PIN), supporting an application identified by a specific context identifier, is received by an APM end node which has the APM capability but does not support the application indicated by the context identifier or which is not the node addressed by the Destination Address received in the APP parameter (in case of explicit addressing).

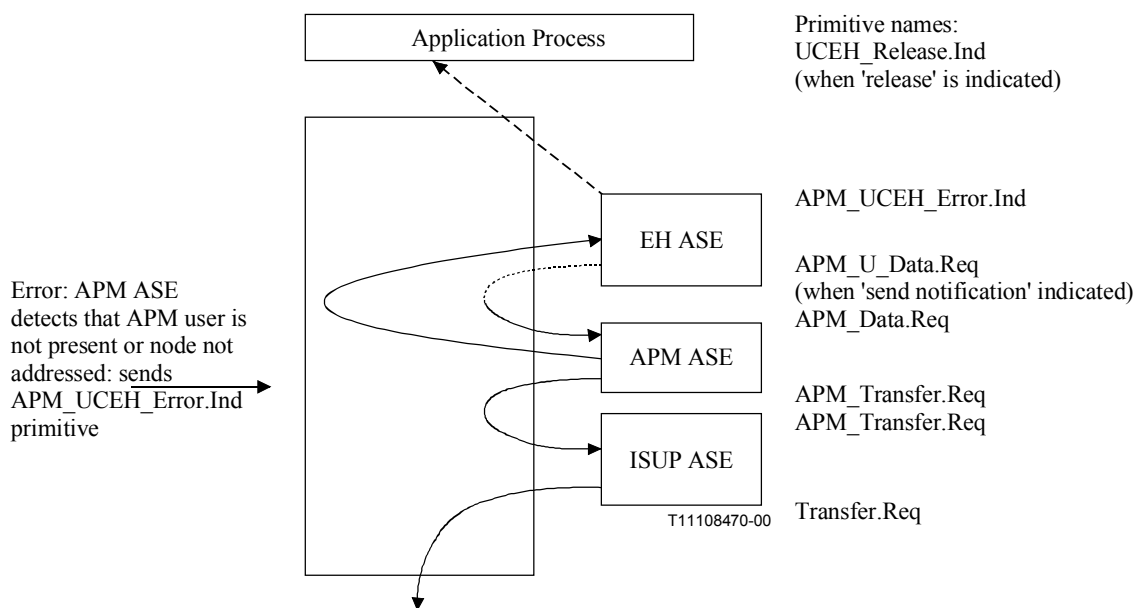
The unidentified context and addressing errors handling mechanism ensures these situations are handled according to the specific needs of the initiating application.

### 13.1.1 Unidentified context and addressing errors handling – Local error handling

- When an exchange is the addressed node for an APP associated to an APM "98"-user application but does not support the specified context; or
- when an APM end node receives an unidentified context identifier value or a destination address which is not its own,

the EH ASE takes action according to the Application Transport Instruction Indicators (ATII). Based on the Release Call Indicator, the call may be released or allowed to proceed. The Send Notification Indicator determines if a notification is sent back from these exchanges towards the PIN.

Figure 9 illustrates the dynamic flow of information from the point where the APM ASE identifies that the APM-user is not supported or that the node is not addressed (in case of explicit addressing). In the case that there is no APM-user supporting the context identifier of a received APP or that the node is not addressed by the Destination Address contained in the APP, then the APM ASE sends an APM\_UCEH\_Error indication primitive indicating the context identifier received and supplies the received Originating Address (if available) and Application Transport Instruction Indicators (ATII). This initiates the unidentified context and addressing errors handling procedures. These procedures can be seen as a user of the APM mechanism by the manner in which the notification is transported.



**Figure 9/Q.765 – Dynamic flow in an exchange when an unidentified context or addressing error is detected**

### 13.1.2 Unidentified context and addressing errors handling – Remote error handling

When an APP is received with Context Identifier "Unidentified Context and Error Handling ASE", the contents are passed to the EH ASE in the same manner as any other APM-user. The procedures described in 13.4.1 are then applied.

When an APP is received with Context Identifier "Enhanced Unidentified Context and error Handling ASE", the procedures described in 10.2.2.2 are applied. If the node is addressed by the destination address received in the APP, the contents are passed to the EH ASE and the procedures described in 13.4.1 are then applied.

### 13.2 Reassembly error handling

When a reassembly error occurs in the APM ASE, the APM\_UCEH\_Error primitive is sent, via SACF, to the EH ASE indicating "reassembly error". The application context identifier and the originating address (if available) are supplied as received by the APM ASE. Actions taken by the EH ASE are according to the ATIL. If a notification is to be sent, the reason given indicates "reassembly error". A reassembly error may occur for any segmented message in either a PIN or a PAN, therefore the procedures are equally applicable to both.

### 13.3 Primitive interface

The SACF uses the services provided by the EH ASE primitive interface (interface c) in Figure 2) as listed in Table 25.

**Table 25/Q.765 – Primitives between EH ASE and SACF**

Primitive name	Types	Direction (Note)
APM_Error	Indication	→
UCEH_Release	Indication	→
NOTE – Primitive flow from EH ASE to SACF: →		

The EH ASE uses the services provided by the SACF primitive interface (interface c) in Figure 2) as listed in Table 26.

**Table 26/Q.765 – Primitives between SACF and EH ASE**

Primitive name	Types	Direction (Note)
APM_UCEH_Error	Indication	→
APM_U_Data	Indication/Request	→ / ←
Send_APM_Transit	Request	←
NOTE – Primitive flow from SACF to EH ASE: → Primitive flow from EH ASE to SACF: ←		

### 13.4 Procedures

#### 13.4.1 Normal procedures – Remote error handling

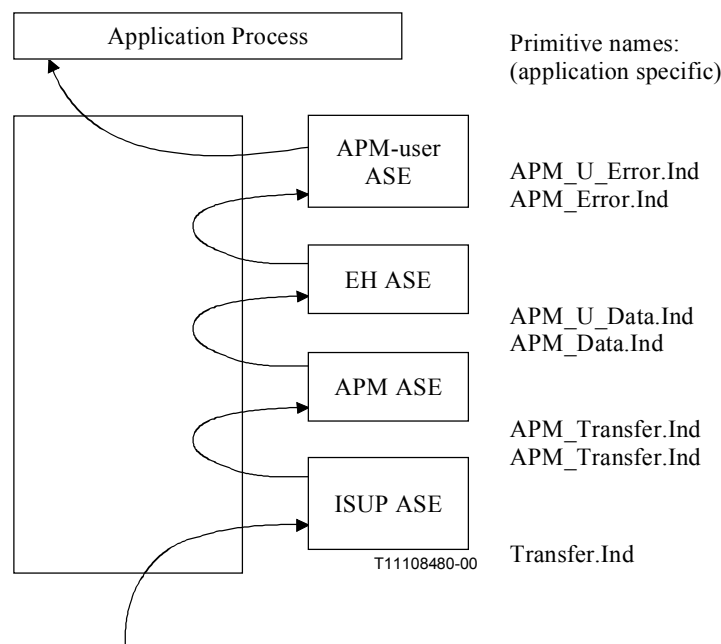
When the EH ASE receives an APM\_U\_Data indication primitive with Context Identifier "UCEH ASE", the ASE checks whether this is a "pass-on" node for each context indicated in the "APM-user Context Identifier" field within the Application Transport Notification information. If this is so, for any of the received Context Ids, then a new Application Transport Notification information field is constructed containing the received Context and Reason information for only those contexts for which this is a "pass-on" node. This information is then passed on within the Send\_APM\_Transit indication primitive.

For those contexts where this node is not to behave as a "pass-on" node then the Context Identifier(s) within the received Notification parameter (clause 14) are used to determine the APM-user(s) which should be notified. If the APM-user indicated by the Context Identifier does not exist, then the associated Notification parameter within the Application Transport Notification Information will be discarded. If the APM-user indicated by the Context Identifier does exist, an APM\_Error indication

primitive is sent to each APM-user via SACF indicating the Reason for the error. The maintenance function will be notified.

When the EH ASE receives an APM\_U\_Data indication primitive with Context Identifier "EUCEH ASE", the ASE checks whether each context indicated in the "APM-user Context Identifier" field within the Application Transport Notification Information is supported by the node. If the APM-user indicated by the Context Identifier does not exist, then the associated Notification parameter within the Application Transport Notification Information will be discarded. For the received contexts which are supported by the node, the associated APM-users are notified: an APM\_Error indication primitive is sent to each APM-user via SACF indicating the Reason for the error. The maintenance function will be notified.

Figure 10 illustrates the dynamic flow of information when the notification is sent to the APM-user.



**Figure 10/Q.765 – Dynamic flow in the PIN to handle reception of APM notification**

### 13.4.2 Normal procedures – Local error handling

When one or more APM\_UCEH\_Error indication primitive(s) are received by the EH ASE, the Application Transport Instruction Indicators of each are checked to determine the appropriate actions. If any "send notification" bit is set, then a single Notification (clause 14) is constructed indicating the context and associated reason for each APM\_UCEH\_Error indication whose ATII indicated "send notification". The following procedures for the sending of a notification depend on the presence of the originating address (address of the PIN) in the received APM\_UCEH\_Error indication primitives:

The Notification parameters associated to APM\_UCEH\_Error indication primitives which did not contain any originating address are concatenated to construct an Application Transport Notification information field which is then sent to the APM ASE via the APM\_U\_Data request primitive for transport. The ATII is set to "release call" and "do not send notification". The application context identifier is set to "Unidentified Context and Error Handling ASE".

Each Notification parameter associated to APM\_UCEH\_Error indication primitives containing the same originating address are concatenated to construct an Application Transport Notification information field which is then sent to the APM ASE via the APM\_U\_Data request primitive for

transport. The destination address sent by the EH ASE in the APM\_U\_Data request primitive is the originating address previously received in the APM\_UCEH\_Error indication primitive. The address of the node is supplied by the EH ASE in the originating address field of the APM\_U\_Data request primitive. The ATII is set to "release call" and "do not send notification" and the application context identifier is set to "Enhanced Unidentified Context and Error Handling ASE".

For each of the received APM\_UCEH\_Error indications indicating "release call", a UCEH\_Release indication primitive is sent to the AP via SACF. The maintenance function will be notified.

### 13.4.3 Exceptional procedures – Context identifier error

If a context identifier is received as "no information", then the information is discarded and the maintenance function will be notified.

### 13.4.4 Exceptional procedures – Unrecognized reason value

If an Unrecognized Reason value is received in the Application Transport Notification Information parameter, then the information is discarded and the maintenance function will be notified.

## 13.5 Primitive contents

Tables 27 to 29 define the primitives used across the SACF/EH ASE interface (interface c) in Figure 2). The APM\_U\_Data primitive is described in Table 20. The UCEH\_Release primitive is described in Table 2.

**Table 27/Q.765 – Contents of the APM\_Error Ind primitive**

Parameter	Mandatory/Optional
Notification	M

**Table 28/Q.765 – Contents of the APM\_UCEH\_Error Ind primitive**

Parameter	Mandatory/Optional
Reason	M
Application Context Identifier	M
Application Transport Instruction Indicators	M
Originating Address	O

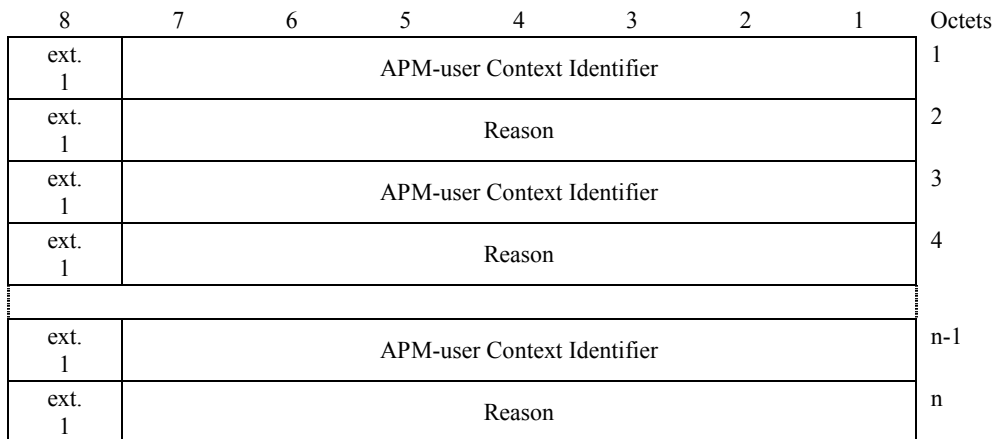
**Table 29/Q.765 – Contents of the Send\_APM\_Transit Request primitive**

Parameter	Mandatory/Optional
Application Context Identifier	M
Application Transport Instruction Indicators	M
Application Data	M

## 14 Application transport notification information

The Application Transport Notification information is carried within the Encapsulated Application Information field of the Application Transport Parameter (APP), when the context identifier value is set to "UCEH ASE" or "EUCEH ASE" (see Figure 11).

Each Notification parameter within the Application Transport Notification Information field consists of the APM-user Context Identifier and the Reason of the error.



NOTE – n is even and greater than or equal to 2.

**Figure 11/Q.765 – Application Transport Notification Information**

- a) *Extension indicators*
  - 0 Further octet exists
  - 1 Last octet
- b) *APM-user Context Identifier*
  - 0 No Information
  - 1-16383 Refer to "Application Context Identifier" field in the Application Transport Parameter [3].
- c) *Reason*
  - 0 No Information
  - 1 Unidentified Context/Addressing Error
  - 2 Reassembly Error
  - 3-127 Spare

## 15 Timers

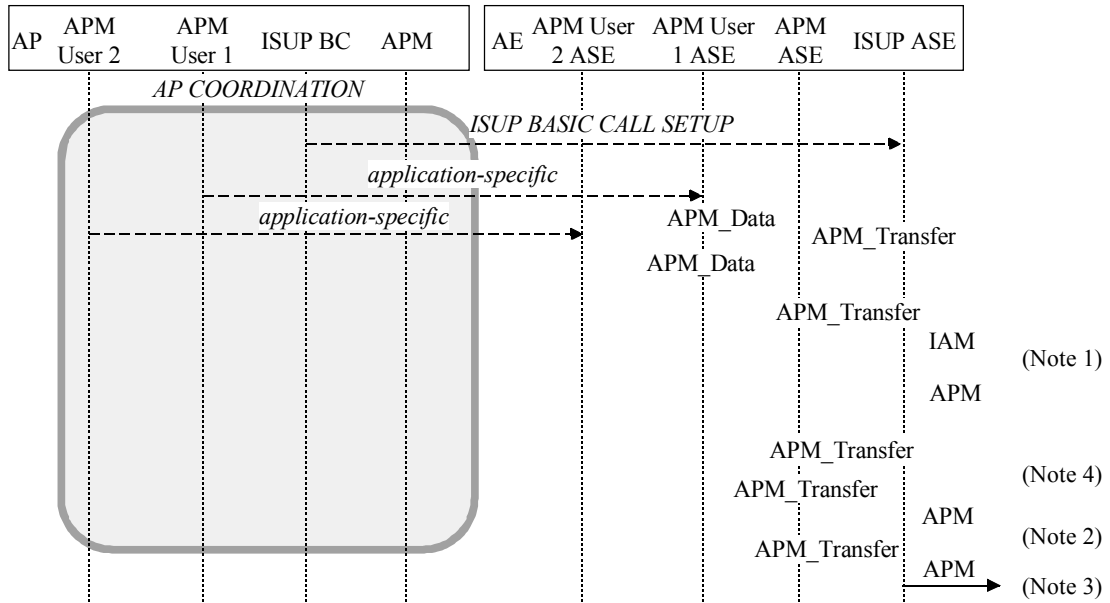
See Table 30.

**Table 30/Q.765 – Timers**

Symbol	Time-out value	Cause for initiation	Normal termination	At expiry	Reference
T <sub>reass</sub>	10-18 sec	Receipt of APP indicating "new sequence" for reassembly	Receipt of last segment	Apply "reassembly error handling"	10.2.4.2

APPENDIX I

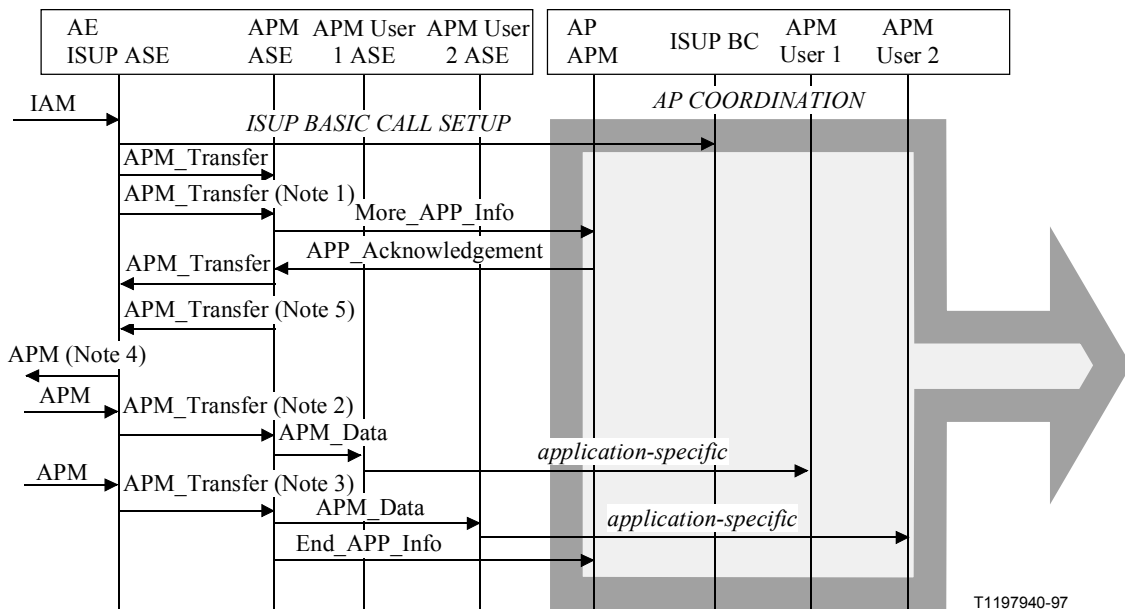
Example sequence diagrams of APM segmentation



T1197930-97

- NOTE 1 – IAM includes initial APP for each APM User, these may be "empty".
- NOTE 2 – APM includes last APP segment for APM User 1.
- NOTE 3 – APM includes last APP segment for APM User 2.
- NOTE 4 – Will be repeated for each context that is being segmented.

**Figure I.1/Q.765 – Sending of an IAM containing initial APM segments for 2 applications**



NOTE 1 – Contains initial APPs for each APM User.  
 NOTE 2 – Contains last segment for APM User 1.  
 NOTE 3 – Contains last segment for APM User 2.  
 NOTE 4 – An APM message is used if there is no concurrent call control message being sent.  
 NOTE 5 – Will be repeated for each context that is being segmented.

**Figure I.2/Q.765 – Receipt of an IAM containing initial APM segments for 2 applications**

APPENDIX II

**Setting of parameter and message instruction indicators**

Tables II.1 and II.2 for PCII and MCII show recommended mappings from the ATII value provided by an application. These tables do not define a definitive coding but should be read as a guide to derive compatibility information from the ATII.

**Table II.1/Q.765**

ATII provided by application		PCII sent for APP parameter							
A	B	A	B	C	D	E	GF	H (Note 1)	JI (Note 1)
Release	Notify	Transit	Release	Notify	Discard message	Discard parameter	PONP	EXT	B/N I/W
0	0	0	0	0	0	0	10	1 or 0	00
0	1	0	0	1	0	0	10	1 or 0	00
1	0	0	0 or 1 (Note 2)	0	0	0	00 or 10 (Note 2)	1 or 0	00
1	1	0	0 or 1 (Note 2)	1	0	0	00 or 10 (Note 2)	1 or 0	00



**Table II.1/Q.765 (concluded)**

NOTE 1 – If bits JI are sent then they should be set as shown, and bit H is set accordingly.  
 NOTE 2 – Two options are identified for the settings of B and GF:  
 a) B=1 and GF=10, i.e. release call at any type A exchange (setting of GF is arbitrary, but proposed value is simplest).  
 b) B=0 and GF=00, i.e. release call at type A exchange only if pass on is not possible.  
 The choice between a) and b) may depend on the types of application deployed in the network, e.g. if a network specific context value is being used, or if only the internationally standardized context values are being used. In the absence of any network specific consideration option b) is proposed to be employed.

**Table II.2/Q.765**

ATH provided by application		MCII sent for APM or PRI containing an APP (Note 2)						
A	B	A	B	C	D	E	GF	H
Release	Notify	Transit	Release	Notify	Discard message	PONP	B/N i/w	EXT
0	0	0	0	0	0	1	00	1
0	1	0	0	1	0	1	00	1
1	0	0	0 or 1 (Note 1)	0	0	0 or 1 (Note 1)	00	1
1	1	0	0 or 1 (Note 1)	1	0	0 or 1 (Note 1)	00	1

NOTE 1 – Two options are identified for the settings of B and E:  
 a) B=1 and E=1, i.e. release call at any type A exchange (setting of E is arbitrary, but proposed value is simplest.)  
 b) B=0 and E=0, i.e. release call at type A exchange only if pass on is not possible.  
 The choice between a) and b) may depend on the types of application deployed in the network, e.g. if a network specific context value is being used, or if only the internationally standardized context values are being used. In the absence of any network specific consideration option b) is proposed to be employed.  
 NOTE 2 – If the message is also being used to carry other parameters with a more stringent compatibility requirement the MCII setting shown may be overridden.

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