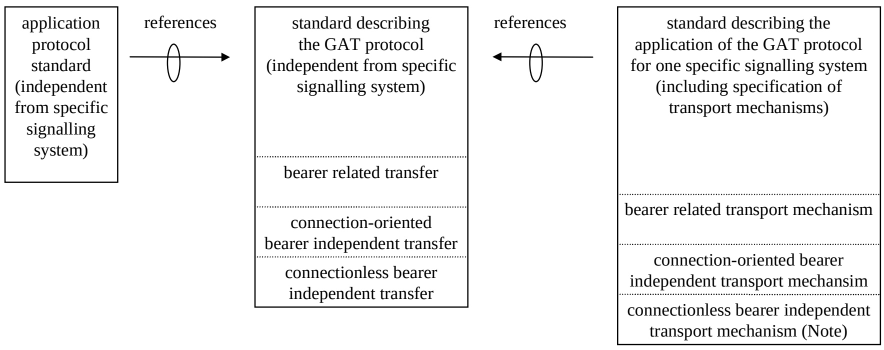
LIAISON STATEMENT

Source:	Working group	ETSI SPAN5 SWG1A	(Herentals, September 1999)
To:	Working group Working group Working group Working group Working group Project	3GPP TSG-T 3GPP TSN-N ECMA TC 32 TG 14 ECMA TC 32 TG 15 SPAN 1 TIPHON WG 3	(for action) (for action) (for action) (for action) (for action) (for action)

Subject: **Transport mechanisms for the Generic Addressing and Transport (GAT) protocol**

Contact point: Axel Stossno
VIAG Interkom GmbH & Co.
Riesstr. 25
D-80992 Munich
GERMANY
Phone: +49 89 1480-3014
Fax: +49 89 1480-3805
E-mail: Axel.Stossno@viaginterkom.de

ETSI SPAN5 SWG1A is developing the specification of the Generic Addressing and Transport (GAT) protocol, in parallel with similar activities of ITU-T Study Group 11 Q.11.
The attachment “Benefits and capabilities of the GAT protocol” provides further information.
The latest ITU-T draft of the GAT protocol specification is also attached. ETSI SPAN 5 SWG 1A intend to approve an EN with the same technical content soon. Future versions will be available on the ETSI docbox under the following URL:
http://docbox.etsi.org/Tech-Org/SPAN/Document/spAN5/07-drafts/177-1/
The GAT protocol provides a signalling system independent layer. To use the GAT protocol in the domain of a specific signalling system, transport mechanisms of that signalling system must be available.
To endorse the GAT protocol for a specific signalling system and to specify transport mechanisms, ETSI SPAN 5 SWG1A recommend the following documentation structure:



Do you intend to develop a standard endorsing the GAT protocol and providing transport mechanisms for the signalling system you are responsible for? If yes, in which timeframe?

Attachment 1

Benefits and capabilities of the Generic Addressing and Transport (GAT) protocol

0 Summary

- The GAT protocol is a protocol for exchanging Application Protocol Data Units (APDUs) between service provision points.The GAT protocol supports the following types of service provision points:
  - an Intelligent Network,
  - a transit node or server,
  - an end node, and/or
  - a terminal.
  The APDU exchange may occur between adjacent or non-adjacent entities, and it may cross network boundaries.
- The GAT protocol unbundles service provision from the access. The service is provided by the node to which the terminal is directly attached or by another entity, which may even be located in another network. (The service functionality for traditional ISDN supplementary services is always provided in the node serving the terminal, which may be a local exchange or a private node.)
- The GAT protocol and its transport mechanisms optionally allow the user to select a value added service provider. The GAT protocol facilitates value added service provision in a multi service provider environment.
- The GAT protocol helps minimising the number of entities which must be upgraded to introduce a new service.
- The GAT protocol interacts with the Intelligent Network Application Protocol (INAP) to provide the Intelligent Network (IN) mechanisms "Out channel call related user interaction (OCCRUI)" and "Out channel call unrelated user interaction (OCUUI)", i.e. to convey information between a terminal and an IN service control point (SCP).
- The GAT protocol provides a means for the conveyance of mobility management protocols, even between entities which are in the domain of different signalling systems.
- The GAT protocol is proposed to be used to convey the application protocols for the Remote Control service and to provide the Universal Short Message Service to ISDN terminals, because these applications require control information exchange between non-adjacent entities and in some cases across network boundaries. Additional application protocols (standardised or non-standardised) running on top of the GAT protocol may be developed in future.
- The GAT protocol helps minimising the number of application protocols to be standardised.
- The GAT protocol helps to achieve fixed-mobile convergence.
- The GAT protocol facilitates that providers of mobility services can differentiate their service offering, because it allows service provision in the home network, enven to users roaming in other networks.

1 Requirements that lead to the development of the GAT protocol

1.1 Out-channel user interaction with the Intelligent Network and centralised service providing entities

The Intelligent Network (IN) standards for Capability Set 2 (CS 2) and beyond define the requirements and the Intelligent Network Application Protocol (INAP) extensions for the following two mechanisms:

- out-channel call related user interaction (OCCRUI) and
- out-channel call unrelated user interaction (OCUUI).

These mechanisms cover the communication between an IN Service Control Point (SCP) and a terminal. Since the scope of the INAP does not extend to the terminal, INAP alone cannot cover the requirements completely. A protocol for the transport of a higher layer protocol between the IN Service Switching Function (SSF) or Call Unrelated Service Function (CUSF) and the terminal is required.

The draft ITU-T supplement on IN/ISDN integration contains more detailed information.

The domains of several different signalling systems (e.g. DSS 1, QSIG, signalling protocols of the H.323 family, Signalling System No. 7) may be crossed on the way between the SSF/CUSF and the terminal. It is therefore useful to separate the requirements into two protocol layers:

a signalling system independent protocol layer and

a signalling system specific transport mechanism.

The Generic Addressing and Transport (GAT) protocol provides the signalling system independent layer.

Further information on the relation between the GAT protocol and transport mechanisms is provided in section 3.

1.2 Transport of mobility management protocols

Recently new mobility services were proposed, for example Cordless Terminal Mobility (CTM) and Universal Personal Telecommunication (UPT). These mobility services require a mobility management protocol.

For CTM, two mobility management protocols are required:

- a mobility management protocol which runs between a DECT fixed part (attached like an ISDN terminal) and a mobility management entity in the network (alpha reference point), and
- a mobility management protocol between a private network and a public network (beta reference point).

The domains of several different signalling systems (e.g. DSS 1, QSIG, signalling protocols of the H.323 family, Signalling System No. 7) may be crossed on the way between the fixed part and the mobility management entity in the public network for the alpha reference point, or between the mobility management entity in the private network and the one in the public network for the beta reference point. This leads to requirements which are very similar to IN out-channel user interaction.

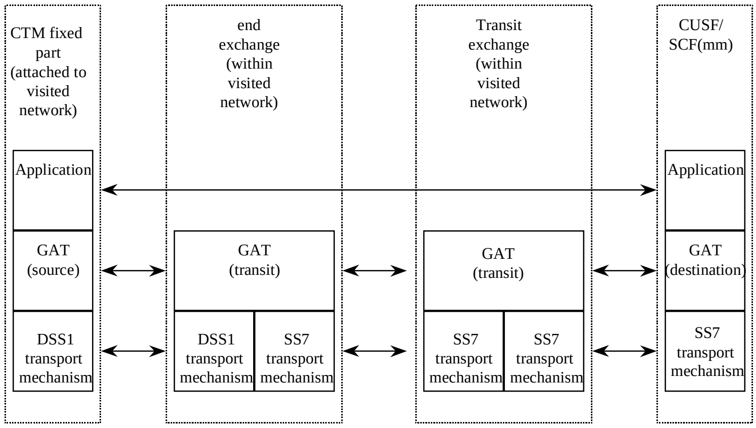


Figure 1 Use of the GAT protocol to carry the mobility management protocol at the CTM alpha reference point

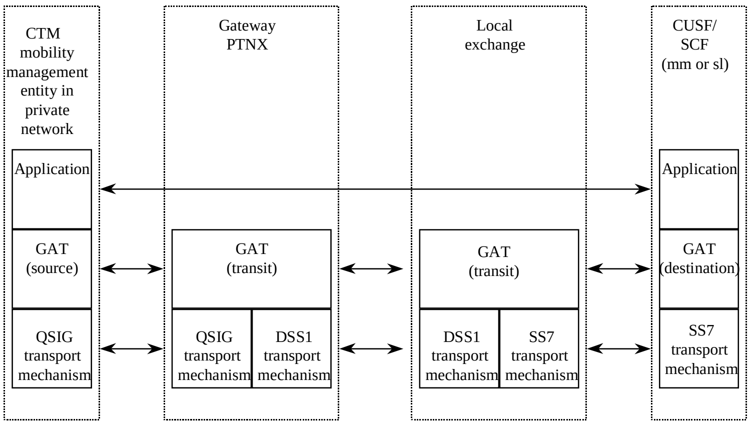


Figure 2 Use of the GAT protocol to carry the mobility management protocol at the CTM beta reference point

1.3 Support of new applications such as the Universal Short Message Service and the Remote Control supplementary service

The Universal Short Message Service (uSMS) and the Remote Control (RC) supplementary service have in common that service control information has to be exchanged between entities which are not necessarily located in the same network, and which are not necessarily adjacent even if they are located in the same network.
The existing DSS1 generic functional protocol (EN 300 196-1) supports the exchange between adjacent entities only. Due to this limitation, it cannot support uSMS and RC.

1.4 Increasing the efficiency of application protocol specification and network upgrade

1.4.1 Services provided in end nodes

The original ISDN concept for service provision assumed that supplementary services are provided by the end node (i.e. the node serving the terminal). In the case of a terminal attached to a private network node, it is the private network node (and not the local exchange to which the private network node is attached) that provides the service. Intervening nodes only provide transport of signalling information.
According to that concept, ideally only two service control protocols would have been required: a protocol between the terminal and a protocol between end nodes to be transported transparently by transit nodes. The latter was not achieved: Application specific functions are required at the boundary between different signalling systems, in particular at both sides of the T reference point.

Example To standardise the Completion of Calls to Busy Subscriber (CCBS) supplementary service, it was necessary to specify separate application protocols for: DSS1, Signalling System No. 7 (for fixed network application), access protocol for mobile networks, inter-nodal signalling protocol for mobile networks, inter-nodal signalling protocol for private network exchanges (e.g. PSS1), and the access protocol for private network terminals. To provide the service also in B-ISDN, it would be necessary to extend DSS2 in addition (this standard does not exist yet). All these application protocols need to interwork in order to provide a seamless service to the user. This requires that the application protocols are processed at some entities even though no switching function is performed by that entity.

As a consequence, all local exchanges and all gateway PINXs have to be upgraded to introduce a new service when the original ISDN concept is followed.
Application protocols running on top of the GAT protocol can be specified so that the nodes attached at either side of the T reference point do not have to provide service specific functionality. That means they do not have to be upgraded to provide new services to private networks (but still have to be upgraded to provide new services to directly attached terminals). As in the ideal situation, only two protocols need to be developed.

1.4.2 Services provided in central locations

The intelligent network allows services to be provided at centralised locations. Also, some services are provided by servers. According to that concept, ideally only one service control protocol is required: a protocol between a terminal and the centralised service provision point.

Note Some services, such as the uSMS, are based on an architecture with multiple centralised service provision points. In that case, additional protocols may be required to allow the exchange of service control information between service provision points.

In that case, the service provision point is not necessarily adjacent to the terminal. Addressing and routing becomes an issue.
To introduce a new service, only a single protocol is developed, and only the terminal and the centralised service provision point is upgraded.

1.5 Fixed-mobile convergence

Mobile networks use the same service provision concepts as fixed networks.
In GSM, a protocol for call control and service control exists. This protocol runs between the mobile station and the mobile services switching centre. This protocol is very similar to DSS1 at the coincident S and T reference point. 3GPP are working on a similar protocol for UMTS, which is based on the GSM protocol. (Mobility management and radio resource control are provided by separate protocols.)
Fixed-mobile convergence aims at providing seamless services to users irrespective of access types (fixed or mobile). This is best achieved if the same service control protocols are used in fixed and mobile networks.
Furthermore, fixed-mobile convergence should allow that service provider can choose to use the same equipment to serve fixed and mobile customers.
Following the traditional approach, to introduce a new fixed-mobile service, the fixed network AND the mobile network would have to be upgraded, AND at least one new protocol by which the two networks can communicate has to be specified and

introduced. If that fixed-moble service operates in an environment with numbers that identify a person rather than the access, it may become difficult or impossible for a terminal or service providing network equipment to choose the appropriate protocol, because the number says nothing about the nature of the destination access.
Following the GAT approach, fixed and mobile networks would introduce the GAT protocol and underlying transport mechanisms. A single application protocol running on top of the GAT protocol would be defined. This application protocol would allow mobile stations and fixed network terminals to access the same service providing network entity using the same protocol.

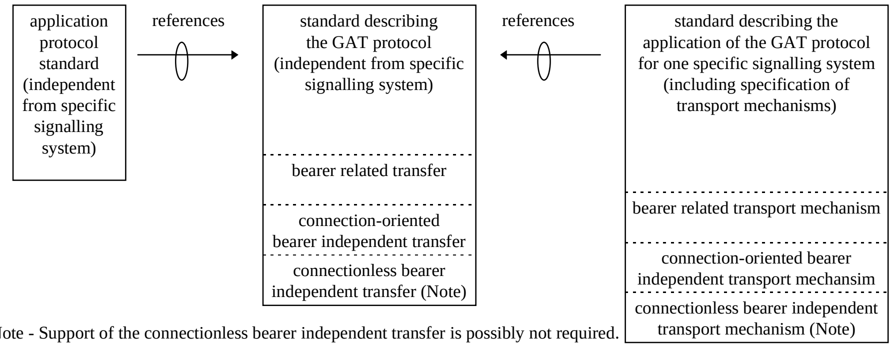
1.6 Multi service provider environments

When services are provided in centralised locations, these services are accessible irrespective of the location of the user and irrespective of the access type. Addressing and routing become an issue. The user can be given the choice of service providers by means of these addressing mechanisms.
This will support the following scenarios:

- A mobility service provider wants to provide value-added services in its own network, even when the customer is roaming in another network. This increases the service provider's ability to differentiate the services from those of other providers. (In conventional mobility services, the service spectrum is limited either to that of the visited network, or to the subset of services that both the visited and the home network support.)
- A value added service provider (maybe a non-telecommunication company) wants to offer its services to all customers, irrespective of which access provider the customer has selected. This increases the number of potential customers, which makes it easier to justify offering this value added service.

2 Relation of application protocols, the GAT protocol, and transport mechanisms

According to current agreements, the GAT protocol specification will be documented in a single standard.
Other standards will describe the transport mechanisms for specific signalling systems, and will endorse the GAT protocol for a particular signalling system.
It is assumed that the standardisation groups responsible for a particular signalling system are responsible for discussing contributions on the transport mechanism (if any are submitted) for the signalling system concerned. For example, ETSI SPAN 5 is working on the DSS1 transport mechanism.
Application protocols run on top of the GAT protocol, and make reference only to the GAT protocol but not to underlying signalling systems.
The figure below shows this relation.



Note - Support of the connectionless bearer independent transfer is possibly not required.

Several application protocol standards may use the GAT protocol. Different application protocols may be specified by different standardisation groups. The GAT protocol specification contains a framework which allows the coexistence of different application protocols (e.g. ensuring uniqueness of coding, handling of unrecognised information).

3 Addressing mechanisms

3.1 Transport mechanism addresses

At the level of the transport mechanism, the following addresses may be present:

- the origin of the transport mechanism,
- the endpoint of the transport mechanism (for the bearer-related transport mechanism, this is identical to the address of the called party), and
- the selected service provider.

These addresses are provided per transport mechanism, and they are included in the first transport mechanism establishment message. Transport mechanism addresses may influence routing of the transport mechanism.

3.2 GAT addresses (Network Facility Extension)

GAT addresses identify the following:
- source entity
- destination entity
- USI service indicator.

The GAT addresses are provided per application protocol data unit (APDU). GAT addresses can only be used to reach an entity along the path of the transport mechanism, and they have no impact on the routing of the transport mechanism.

3.3 Application addresses

The application protocol running on top of the GAT protocol may define addressing mechanisms. Such mechanisms are an application protocol specification issue, to be discussed on an application-by-application basis.

Attachment 2

Draft ITU-T Recommendation Q.GFT

ITU - Telecommunication Standardisation Sector | Temporary Document _____

STUDY GROUP 11 | Original: English

Geneva, 22nd November - 10th December 1999

Document addressed to: PLEN/11

Question(s): 11/11

Source:Editor Q.860 (Generic Addressing and Transport (GAT) protocol)

Title: Proposed draft Recommendation Q.860 (was Q.gft)

Contact person: Keith Drage
Siemens Communications Limited
Technology Drive, Beeston,
Nottingham, NG9 1LA, UK
Tel: +44 115 9434991
Fax: +44 115 9434992
E-mail: keith.drage@siemenscomms.co.uk

This document contains the draft Recommendation Q.860 which is submitted by Q.11/11 to WP2/11 and SG11 as a candidate for determination at this meeting.

Recommendation Q.860

INTEGRATED SERVICES DIGITAL NETWORK (ISDN) AND BROADBAND INTEGRATED SERVICES DIGITAL NETWORK (B-ISDN) GENERIC ADDRESSING AND TRANSPORT (GAT) PROTOCOL

Summary

This Recommendation provides the protocol for Generic Addressing and Transport (GAT). GAT is a protocol for exchanging Application Protocol Data Units (APDUs) between service provision points that may be located within the same network, between networks, or between a terminal and a network.

The protocol is applicable to the signalling network, and may be used in conjunction with the Digital Subscriber Signalling System No. one (DSS1) protocol, Digital Subscriber Signalling System No. two (DSS2) protocol, Signalling System No. seven (SS#7), and is applicable at interfaces where those protocols are applicable.

1 Scope

This Recommendation provides the protocol for Generic Addressing and Transport (GAT). GAT is a protocol for exchanging Application Protocol Data Units (APDUs) between service provision points that may be located within the same network, between networks, or between a terminal and a network. This Recommendation also provides a common framework for the use of ROSE and interpretation capabilities in conjuction with the GAT protocol.

The protocol is applicable to the signalling network, and may be used in conjunction with the Digital Subscriber Signalling System No. one (DSS1) protocol, Digital Subscriber Signalling System No. two (DSS2) protocol, Signalling System No. seven (SS#7), and is applicable at interfaces where those protocols are applicable.

The details of addressing and routeing at the level of the transport mechanism are outside the scope of this specification.

2 References

The following 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 addition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] ITU-T Recommendation I.411 (1993), *ISDN user-network interfaces – reference configurations*

[2] ITU-T Recommendation Q.932 (2000), *Digital subscriber signalling system No. 1 – Generic procedures for the control of ISDN supplementary services*

[3] CCITT Recommendation X.219 (1988), *Remote operations: model, notation and service definition.*

[4] ITU-T Recommendation X.880 (1994), *Information technology – remote operations: concepts, model and notation*.

[5] CCITT Recommendation X.229 (1988), *Remote operations: Protocol specification*

[6] CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*

[7] CCITT Recommendation X.209 (1988), *Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1).*

[8] ITU-T Recommendation X.680 (1994), *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*.

[9] ITU-T Recommendation X.690 (1994), *Information technology – ASN.1 encoding rules; Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*.

[10] ITU-T Recommendation I.413 (1993), *B-ISDN user-network interface*

[11] ITU-T Recommendation I.112 (1993), *Vocabulary of terms for ISDNs*

3 Definitions

For the purposes of this Recommendation, the following definitions apply:

AnyNode: a value for the sourceEntity and destinationEntity of the GAT network facility extension, such that (two cases exist):

- when specified without an address, the requested service functionality is to be provided at the next service provision point along the path of the transport mechanism that supports the service within the same or any subsequent service provider. For this value an end node acts to provide end GAT-Control functionality; or,
- when specified with an associated address, the requested service functionality is to be provided at the next service provision point along the path of the transport mechanism within the same or any subsequent service provider that has the given address. Where the first service provision point that has the given address does not wish to provide the service, it can alter the address to that of another service provision point either within the same service provider or within a different service provider. For this value an end node that is not addressed discards the information.

Broadband Integrated Services Digital Network (B-ISDN): an ISDN that supports rates greater than primary rate.

Coincident S and T reference point: see ITU-T Recommendation I.411 [1]. Unless otherwise stated, this should also be understood to include the coincident S_B and T_B reference point, as defined in ITU-T Recommendation I.413 [10].

End GAT-Control: this entity is located at the entity providing the destination service provision point. It provides information to the application concerning the source of the service user APDUs (Apdu portion parameter), taken from the GAT-PDU, and passes the service user APDU to the application.

End node: the node that is at either: the end point of the transport mechanism; or at the local exchange; whichever comes first along the path of the transport mechanism.

EndNode: a value for the sourceEntity and destinationEntity of the GAT network facility extension, such that the requested service functionality is to be provided at the last service provision point along the path of the transport mechanism before a terminal is reached. This may be within the current service provider or in any subsequent service provider. For this value an end node acts to provide end GAT-Control functionality.

EndTerminal: a value for the sourceEntity and destinationEntity of the GAT network facility extension, such that the requested service functionality is to be provided at the terminal along the path of the transport mechanism. This terminal can be attached to the current service provider or to any subsequent service provider.

GAT Control: the protocol entity supporting the GAT protocol. It provides services to the GAT users, both directly and through ROSE, and uses the services of various underlying protocols (e.g. DSS1, ISUP) in order to provide the transport of those GAT user protocol data units.

GAT user: a protocol entity that uses the services of the GAT protocol to transfer the GAT user protocol data units between the peer GAT user entities.

General signalling: a signalling procedure for the exchange of GAT user protocol data units between application entities that need not be adjacent.

Incoming gateway exchange: a public network exchange for which an incoming transport mechanism (bearer-related or bearer-independent) is received from a private network exchange in a private network, or from a public network exchange in another public network.

Incoming gateway PINX: a private network exchange for which an incoming transport mechanism (bearer-related or bearer-independent) is received from a public network exchange in a public network.

Incoming local exchange: a public network exchange for which an incoming transport mechanism (bearer-related or bearer-independent) is received from a terminal.

Integrated Services Digital Network (ISDN): See ITU-T Recommendation I.112 [9], definition 308.

Local signalling: a signalling procedure restricted to the exchange of application protocol data units between adjacent application entities.

No value at all: (i.e. a value for both the sourceEntity and destinationEntity of the GAT network facility extension assumed when the GAT network facility extension is absent) the requested service functionality is to be provided along the path of the transport mechanism at the immediate next entity (terminal or node) that provides GAT at a GAT-Control entity.

Outgoing gateway exchange: a public network exchange for which an outgoing transport mechanism (bearer-related or bearer-independent) is generated to a private network exchange in a private network, or to a public network exchange in another public network.

Outgoing gateway PINX: a private network exchange for which an outgoing transport mechanism (bearer-related or bearer-independent) is generated to a public network exchange in a public network.

Outgoing local exchange: a public network exchange for which an outgoing transport mechanism (bearer-related or bearer-independent) is generated to a terminal.

Owner domain: An owner domain is a domain under the control of a single operator, and can range from a single terminal, to a public network, and to other forms of service provider.

Receiving GAT-Control: an entity that could be a point of service provision, which can be one of end GAT-Control, or transit GAT-Control.

Redirection function: this entity is located at an exchange where the network owner domain providing the destination service provision point has been reached (i.e. an entity identify by the service address contained within the destination entity address). It operates in conjunction with transit GAT-Control. The function of this entity is to identify where in the network the service is to be provided, if it is not to be provided at this particular location. As a result, it modifies the GAT protocol data identifying the destination entity.

Sending GAT-Control: this entity is located at the entity providing the source service provision point. It provides information from the application concerning the destination of the service user APDU, and passes the service user APDU (ApduPortion parameter) to the peer receiving GAT-Control entity.

Service address: an address that identifies the service provision point. This can be any valid address within the available numbering plan and is assigned by the service provider.

NOTE: The following considerations can apply:

- for addressing from outside a service provider, an address that does not represent a geographical location is preferable, so that the service provision point can be changed to a different geographical location without resulting in a need to change the assigned number. This non-geographic address may identify either an individual service within the service provider, the entire service provider, or any appropriate grouping of functionality in between.

- for addressing within the network of a service provider, the same constraints do not apply, and therefore geographic addresses can be used. This is an issue for the service provider as to how routeing within the service provider's domain is reconfigured.

Service indicator: the service indicator provides information to identify an ASE.

Service provision point: a node capable of providing service functionality, and where checking should therefore be performed to see if the specific requested service is provided.

Service user APDU: an APDU that is carried on behalf of another application within the generic addressing and transport protocol. It is encoded as a ApduPortion parameter within the GAT-PDU.

Terminal address: an address assigned to the terminal by the network to which it is attached,

Terminal: the equipment provided at the user side of the coincident S and T reference point.

Transit exchange: a public network exchange for which an incoming transport mechanism (bearer-related or bearer-independent) is received from a public network exchange in the same public network, and for which an outgoing transport mechanism (bearer-related or bearer-independent) is generated to a public network exchange in the same public network.

Transit GAT-Control: this entity is an exchange located within a network, and its function is to pass on service user APDUs (ApduPortion parameter) unchanged.

Transport mechanism: A mechanism, or one of a set of mechanisms, within the underlying protocol, for transporting transport parameters between GAT-control entities.

Transport parameter: A transport parameter is the element of information transported by the transport mechanism on behalf of the GAT protocol. The transport parameter carries the GAT-PDU and information identifying that the information relates to the GAT protocol, rather than some other application making use of the transport mechanism. Multiple transport parameters can occur within a transport PDU.

Note - Where the transport parameter is a Facility information element, the GAT protocol is identified by the protocol profile field. Where the transport parameter is an Application TransPort parameter, the GAT protocol is identified by the Application Context Identifier field.

4 Abbreviations

For the purposes of this Recommendation, the following abbreviations are used:

APDU	Application Protocol Data Unit
APM	Application Protocol Mechanism
AS-ASE	Application Service Application Service Element
ASN.1	Abstract Syntax Notation No. one
B-ISDN	Broadband Integrated Services Digital Network
DSS1	Digital Subscriber Signalling System No. one
DSS2	Digital Subscriber Signalling System No. two
GAT	Generic Addressing and Transport
GAT-Control	Generic Addressing and Transport Control
GAT-PDU	Generic Addressing and Transport Protocol Data Unit
IN	Intelligent Networks
ISDN	Integrated Services Digital Network
ISUP	ISDN user part
N-ISDN	Narrowband Integrated Services Digital Network
PDU	Protocol Data Unit
PINX	Private Integrated Network Exchange
PSPDN	Packet Switched Public Data Network
ROSE	Remote Operations Service Element
SCP	Service Control Point
SS#7	Signalling System No. 7
SSP	Service Signalling Point

5 Description

5.1 Overview

5.1.1 Introduction

The Generic Addressing and Transport (GAT) protocol provides general signalling rather than local signalling in any of the underlying protocols.

The Generic Addressing and Transport (GAT) protocol within GAT-Control allows the exchange of information between applications located in terminals and/or networks which are not necessarily in entities adjacent to each other.

Note - The GAT protocol allows the AS-ASEs to communicate from more remote locations, e.g. the following:

- from a terminal to an IN SSP within a transit exchange of the local public network;
- from a terminal to an IN SSP within a transit exchange of a non-local public network;
- from a mobile terminal to its visited mobility management centre in support of the mobility management protocols;
- from a mobile terminal to its home service centre in support of the provision of home services to the mobile user;

The GAT protocol operates over a number of different protocols, including DSS1, DSS2, and SS#7, where the protocol has been extended to cover the underlying capabilities.

The establishment of the transport mechanism establishes a signalling relation between adjacent GAT entities. Detailed procedures for the establishment of these signalling relations are constrained in the protocol specifications for the transport mechanisms.

The GAT protocol data units are exchanged along the path that is defined by the chain of signalling relations that is created when the transport mechanism is established. Therefore only GAT entities along this path can be reached by means of the GAT protocol.

If the transport mechanism is released for any reason, APDUs that are in the process of being sent may never reach their destination. In such a case, the APDUs will be discarded.

NOTE: It is the responsibility of the application above GAT-Control to cater for this eventuality.

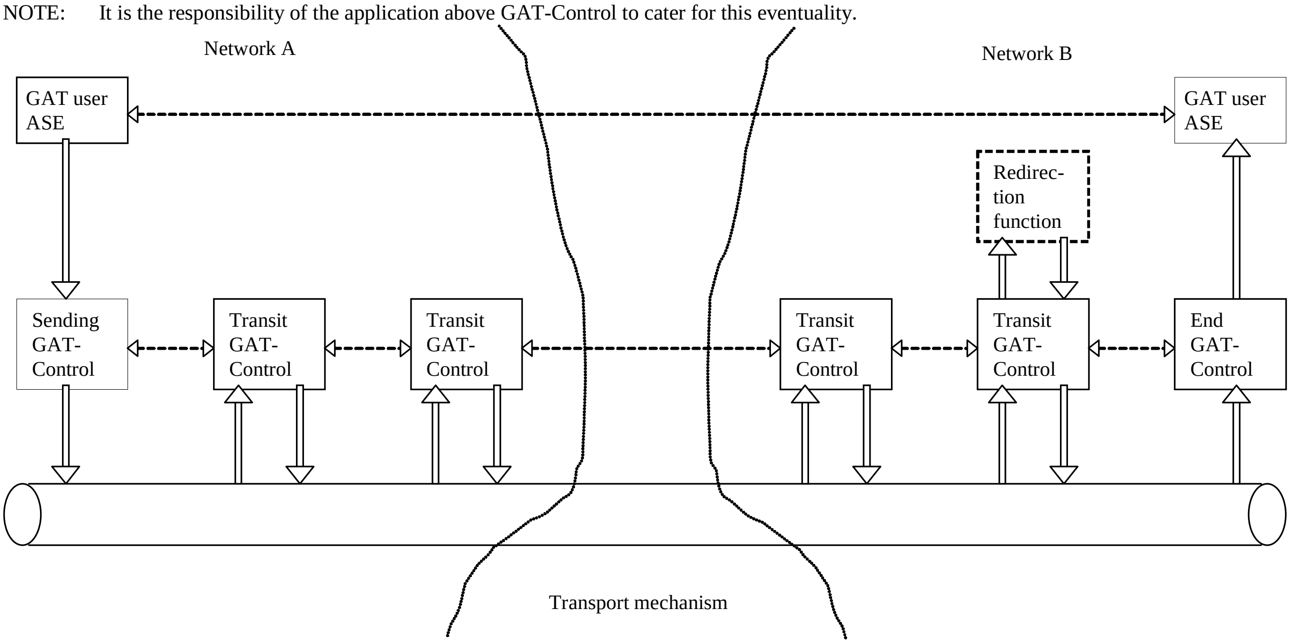


Figure 1

Example of GAT-Control entities supporting the GAT protocol (with redirection optionally performed within the recipient network)

Figure 1 shows a typical examples of the use of the GAT protocol, with a combination of all the possible GAT-Control entities that may be available. The sending application ASE uses the functions of sending GAT-control to determine how and where its service user APDU (ApduPortion parameter) shall be sent. A number of receiving GAT-control entities are then defined, where a receiving GAT-Control entity may be one of the following:

- **Transit GAT-Control**. This entity is an exchange located within a network, and its function is to pass on service user APDUs (ApduPortion parameter) unchanged.
- **End GAT-Control**. This entity is located at the entity providing the destination service provision point. It provides information to the application concerning the source of the service user APDUs (ApduPortion parameter), taken from the GAT-PDU, and passes the service user APDU to the application.

Note - The redirection function is an entirely optional capability and its use depends on the service addresses adopted by the service provider. The function of this entity is to identify where in the network the service is to be provided, if it is not to be provided at this particular location. As a result, it modifies the GAT protocol data identifying the destination entity (the GAT network facility extension field) and redirects the service user APDUs (ApduPortion parameter) to the new destination entity. The service user APDUs are passed on unchanged.The functionality of the redirection function is more fully described in Annex A.

Which entity the receiving GAT-Control entity becomes depends on the location of the receiving GAT-Control entity, and on the value of the information provided by the sending GAT-Control within the GAT protocol.

5.1.2 Provision of addresses

The addressing within this subclause does not include the use of the service indicator field.

The service addresses within this protocol are assumed to be provided so that they are consistent with address of the underlying transport mechanism.

Service addresses may need to be assigned to all owner domains that form either the sending owner domain or receiving owner domain for the provision of the GAT protocol. Any assigned addressed will need to be advertised and therefore used by prior arrangement between the sender and the receiver. In some cases, it is appropriate to use the GAT protocol without addresses dependent on the entity type used.

Where the source entity or destination entity is a network, then a special number will need to be assigned to that network. The assigned number shall be reachable in the normal routeing tables of any intervening networks. Translation in gateway GAT-Control will be required to reach a specific node within the network unless the functionality exists at the incoming gateway to the network itself.

Where the source entity or destination entity is a service within the network, then a special number can be assigned to that service. The assigned number shall be reachable in the normal routeing tables of any intervening networks, and where no translation takes place in a redirection function (see annex A), within the network itself.

Numbers need only be assigned where they are used, i.e. if there is no requirements to address the network, then a network address need not be assigned.

Depending on the domains involved, these numbers may be in different numbering plans, in which case appropriate translation mechanisms will need to be provided at appropriate points between the numbering plans. Usage of different numbering plans shall be on an identical basis to that of those used in basic call, and the translation mechanisms between numbering plans shall be used in the same manner. This is independent of any GAT-Control functionality that might otherwise be provided at any location within the network, and how it is performed is solely a matter for the design of the network, and is therefore implementation dependent. Such design should be such that any potential end GAT-control entity (both for the initial service user APDU transport and for subsequent service user APDU transport) receives the addresses in a numbering plan that is one of the numbering plans in use in the network in which it resides.

Special numbers are assigned to all nodes that form either the sending or receiving points of service provision within a network owner domain. This number is not normally known outside the network owner domain, but can be advertised outside the network owner domain whenever a service user APDU is sent. This number is then used for the reply. That number shall be reachable in the normal routeing tables of any intervening networks, and within the network owner domain itself.

An example allocation of these numbers is shown in figure 2.

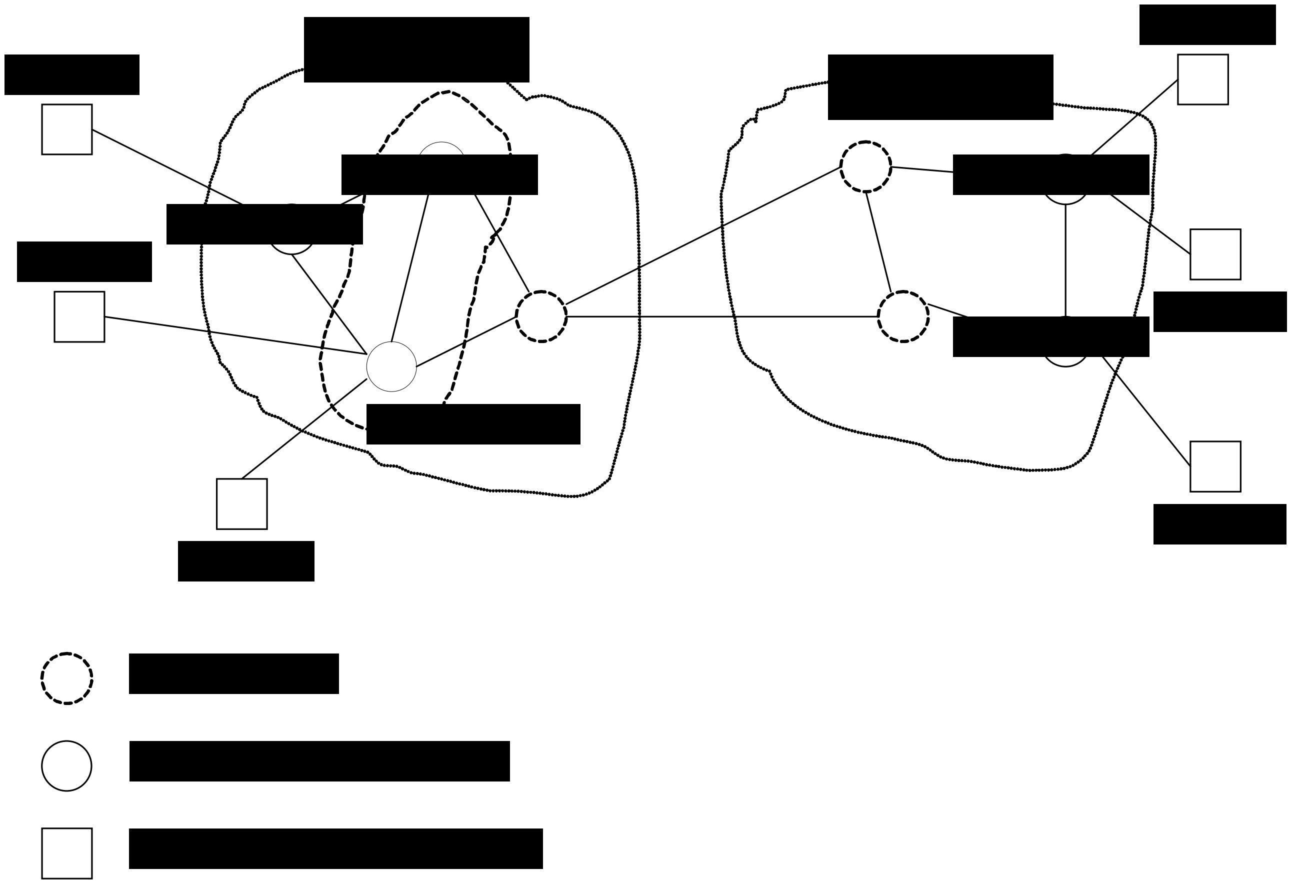


Figure 2

Example allocation of addresses for the use of the GAT protocol

5.2 Protocol architecture

The protocol architecture is shown in Figure 3.

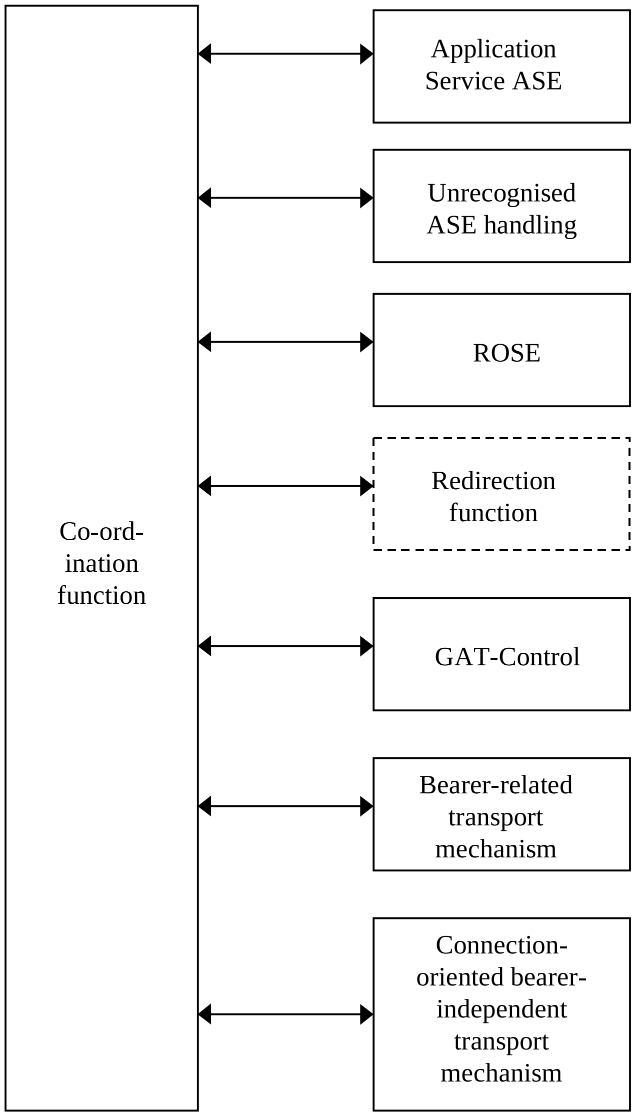


Figure 3

Protocol architecture

The coordination function, the bearer-related transport mechanism, and the connection-oriented bearer-independent transport mechanism, are specific to the supporting protocol, and will thus vary from protocol to protocol.

5.3 Transport mechanisms

Each underlying protocol will identify a number of transport mechanisms that can be used for the transport of ADPUs with the support of the GAT protocol. These transport mechanisms will fall into the following categories:

a) bearer-related transport mechanism. This mechanism is provided in association with the signalling used to support basic call control, and may either be transported in the same call control PDUs, or additionally within addition PDUs within the same signalling stream. Addressing of the transport mechanism is that of basic call.

b) connection-oriented bearer-independent transport mechanism. This mechanism is provided such that all APDUs pass through the same underlying transit protocol entities, and therefore arrive in sequence at the destination entity. Addressing of the transport mechanism is only provided in the first PDU of the transport mechanism.

No use is made of a connectionless bearer-independent transport mechanism.

Specifications of the application protocols using the GAT protocol should indicate which category of transport mechanism is to be used to transport the APDUs of that application protocol, and this information exists as part of the primitive interface to GAT-Control.

Where interworking is required between underlying protocols providing the transport mechanism, interworking can only occur between two transport mechanisms in the same category, and therefore a transport mechanism of the appropriate category will need to exist in all underlying protocols occurring between the source application entity and the destination application entity, otherwise the transport will fail.

5.4 Services provided by individual protocol entities

5.4.1 Services provided by ROSE

ROSE provides a set of services to AS-ASEs to support the ROSE protocol. These services are specified in Recommendation X.219 [3], or Recommendation X.880 [4], dependent on the abstract syntax used to define the application providing the AS-ASE.

5.4.2 Services provided by GAT-control

This entity provides the following services to AS-ASE and ROSE via the coordination function:

a) *Bearer-related service*
   - GAT-Setup: request for the transfer of data in the bearer establishment phase. This service is a confirmed service;
   - GAT-Release: request for the transfer of data in the bearer release phase. This service is a confirmed service;
   - GAT-Reject: rejection of the ability to use a transport mechanism. This service is an unconfirmed service;
   - GAT-Data: request for the transfer of data in active phase of a bearer. This service is an unconfirmed service.

b) *Connection-oriented bearer-independent service*
   - GAT-Setup: request for the establishment of a bearer-independent signalling association (with data transfer if required). This service is a confirmed service;
   - GAT-Release: request for the release of a bearer-independent signalling association (with data transfer if required). This service is a confirmed service;
   - GAT-Reject: rejection of the ability to use a transport mechanism. This service is an unconfirmed service;
   - GAT-Data: request for the transfer of data in active phase of a bearer-independent signalling association. This service is an unconfirmed service.

5.4.3 Services provided by the transport mechanisms

These entities provides the following services to GAT-ASE via the coordination function:

a) *Bearer-related service*
   - Transport-Setup: request for the transfer of data in the bearer establishment phase. This service is a confirmed service;
   - Transport-Release: request for the transfer of data in the bearer release phase. This service is a confirmed service;
   - Transport-Reject: rejection of the ability to use a transport mechanism. This service is an unconfirmed service;
   - Transport-Data: request for the transfer of data in active phase of a bearer. This service is an unconfirmed service.

b) *Connection-oriented bearer-independent service*
   - Transport-Setup: request for the establishment of a bearer-independent signalling association (with data transfer if required). This service is a confirmed service;
   - Transport-Release: request for the release of a bearer-independent signalling association (with data transfer if required). This service is a confirmed service;
   - Transport-Reject: rejection of the ability to use a transport mechanism. This service is an unconfirmed service;

– Transport-Data: request for the transfer of data in active phase of a bearer-independent signalling association. This service is an unconfirmed service.

6 Operational requirements

6.1 Provision and withdrawal

There are no direct requirements for provision and withdrawal of capabilities within this Recommendation. Provision and withdrawal of applications using this Recommendation are specified in the Recommendations describing those applications. Support of options within this Recommendation is conditioned by Recommendations defining the use of this Recommendation.

6.2 Requirements on the originating network side

The requirements for provision of capabilities of this Recommendation are dependent on applications using this Recommendation. Capabilities in this Recommendation are therefore network and user options, but may become mandatory according to the requirements of other Recommendations.

6.3 Requirements on the destination network side

The requirements for provision of capabilities of this Recommendation are dependent on applications using this Recommendation. Capabilities in this Recommendation are therefore network and user options, but may become mandatory according to the requirements of other Recommendations.

7 Primitive definitions and state definitions

7.1 Primitive definitions

Primitives are not explicitly defined but may be assumed from the service definition list within clause 5.

7.2 State definitions

The GAT protocol does not require the definition of additional states.

8 Coding requirements

8.1 Message functional definitions and content

No new PDUs are defined for the underlying protocols in order to use the GAT protocol.

8.2 General message format and information element coding

The GAT PDU structures are defined in Table 1 using ASN.1 as specified in Recommendation X.208 [6]. A representation using ASN.1 as specified in Recommendation X.680 [8] is defined in Table 2.

Table 1

Proposed Generic addressing and transport APDU coding using Recommendation X.208 [6]

```
GAT-PDU
                                     {itu-t recommendation q 860 gat-pdu(1)}

DEFINITIONS::=
          EXPORTS     GATPDU;
          IMPORTS     PartyNumber FROM Addressing-Data-Elements
                          { CCITT-recommendation q932 addressing-data-elements(7) },
                      Interpretation-APDU FROM Interpretation-APDU
                          {iso standard pss1-generic-procedures(11582) interpretation-apdu(3)},
                      Component FROM Facility-Information-Element-Component
                          {ccitt recommendation q 932 facility-information-element-component (3) };
BEGIN

GATPDU      ::=  SEQUENCE
                { gatNetworkFacilityExtension        GATNetworkFacilityExtension OPTIONAL,
                  serviceIndicator              ServiceIndicator,
                  localValueDiscriminator            LocalValueDiscriminator DEFAULT itu-tLocalValue,
                  interpretation-APDU                Interpretation-APDU OPTIONAL,
                  apduPortion                   ApduPortion
                 }

GATNetworkFacilityExtension      ::=     [10] IMPLICIT SEQUENCE
               { sourceEntity                 [0] IMPLICIT EntityType,
                 sourceEntityAddress                [1] IMPLICIT AddressInformation  OPTIONAL,
                 destinationEntity            [2] IMPLICIT EntityType,
                 destinationEntityAddress           [3] IMPLICIT AddressInformation  OPTIONAL
               }

EntityType     ::=  INTEGER
                { endNode( 2),
                  anyNode( 3),
                  endTerminal( 4)
                }

AddressInformation   ::=   PartyNumber

ServiceIndicator       ::= OBJECT IDENTIFIER

LocalValueDiscriminator  ::=        INTEGER
                           { itu-tLocalValue (0),
                             iso-iecLocalValue(1)
                           }

ApduPortion   ::=   SEQUENCE (SIZE (1..max)) OF
                        Component

END    -- of GAT-PDU
```

Table 2

Proposed Generic addressing and transport APDU coding using Recommendation X.680 [8]

```
GAT-PDU
                                        {itu-t recommendation q 850 gat-pdu(1)}

DEFINITIONS::=
EXPORTS       NetworkFacilityExtension;
           IMPORTS       PartyNumber FROM Addressing-Data-Elements
                             { CCITT-recommendation q932 addressing-data-elements(7) },
                         Interpretation-APDU FROM Interpretation-APDU
                             {iso standard pss1-generic-procedures(11582) interpretation-apdu(3) },
                         Component FROM Facility-Information-Element-Component
                             {ccitt recommendation q 932 facility-information-element-component (3) };
BEGIN

GATPDU        ::=   SEQUENCE
                  { gatNetworkFacilityExtension          GATNetworkFacilityExtension OPTIONAL,
                    serviceIndicator               ServiceIndicator,
                    localValueDiscriminator                LocalValueDiscriminator DEFAULT Itu-tLocalValue,
                    interpretation-APDU                    Interpretation-APDU OPTIONAL
                    adpuPortion                    ApduPortion

GATNetworkFacilityExtension        ::=         [10] IMPLICIT SEQUENCE
                { sourceEntity                 [0] IMPLICIT EntityType,
                  sourceEntityAddress                    [1] IMPLICIT AddressInformation  OPTIONAL,
                  destinationEntity            [2] IMPLICIT EntityType,
                  destinationEntityAddress               [3] IMPLICIT AddressInformation  OPTIONAL
                }

EntityType      ::=   INTEGER
                 { endNode( 2),
                   anyNode( 3),
                   endTerminal( 4)
                 }

AddressInformation    ::=   PartyNumber

ServiceIndicator        ::= OBJECT IDENTIFIER

LocalValueDiscriminator   ::=          INTEGER
                            {  itu-tLocalValue(0),
                               iso-iecLocalValue(1)
                            }

ApduPortion    ::=    SEQUENCE (SIZE (1..max)) OF
                         ROSComponent

END     -- of Network Facility Extension
```

When specified according to Recommendation X.208 [6], all data structures in the Facility information element (octet 6, etc.) shall be encoded according to the Basic Encoding Rules (BERs) as specified in Recommendation X.209 [7].
When specified according to Recommendation X.680 [8], all data structures in the Facility information element (octet 6, etc.) shall be encoded according to the BER as specified in Recommendation X.690 [9].

NOTE – The following guidelines apply for the application of the different length encodings:

- the short form definitive length encoding should be used to indicate the length of a data value with a length less than 128 octets;
- when the long form definitive length encoding is used, the minimum number of octets should be used;
- OCTET STRING and BIT STRING values should be encoded in a primitive form.

Receiving entities shall be able to interpret all length forms of the basic encoding rules.

9 Signalling procedures

9.1 Sending GAT-Control

9.1.1 Introduction

In order to send a service user APDU, or APDUs, using the GAT protocol, two different procedures apply depending on the following:

- if it is the initial service user APDU, or APDUs, of a transaction. If this applies, then the procedures of subclause 9.1.2 apply;
- if it is a subsequent service user APDU, or APDUs of a transaction, where a service user APDU has already been received, and a response is required to the same peer entity in the same location (i.e. the same entity within the same owner domain). If this applies then the procedures of subclause 9.1.3 apply.

In order to send a service user APDU, or APDUs, it is necessary to encode them as ApduPortion parameters within a GAT-PDU component with a special parameter named the GAT network facility extension. A single GAT-PDU containing a single GAT network facility extension parameter is contained within a single transport parameter. Multiple GAT-PDUs may be used in a single transport parameter, either between the same locations, or between different locations, by encoding multiple transport parameters. The procedures may be used interchangeably with other means of transporting components, so that, for example in DSS1, some components may be sent using the existing procedures of Recommendation Q.932 [2], and some may be sent using the GAT protocol.

In order to use the GAT protocol, the intention to use the GAT protocol shall be indicated in the transport parameter.

Note - The protocol profile field of each Facility information element using the GAT protocol shall be set to “GAT protocol”. Each Application Context Identifier of the Application transPort parameter shall be set to “GAT protocol”.

In addition, a suitable transport mechanism is required, and GAT-control determines whether an existing transport mechanism is used, or whether a new transport mechanism is created.

The requirements of the application using GAT protocol will determine which mechanism is used. The procedures below describe the various capabilities that are available.

9.1.2 Sending a service user APDU as the initial APDU of a transaction

9.1.2.1 Encoding of the destination entity and destination entity address of the GAT network facility extension

The destinationEntity field and destinationEntityAddress field of the GAT network facility extension shall be encoded as shown in table 3.

Table 3

Encoding of the destination entity and destination entity address of the GAT network facility extension parameter when sending an initial service user APDU

Case No.	Communication between ..	destination entity	destination entity address
1	Any entity (terminal, or network node)➞ End node (destination or origination, depending on direction), whether in this network, or in any other network	endNode	NOT Included
2	Any entity (terminal, or network node) ➞ End terminal (destination or origination, depending on direction)	endTerminal	NOT Included
3	Any entity (terminal, or network node) ➞ addressed node, whether in this network, or in any other network	AnyNode	service address
4	Any entity (terminal, or network node) ➞ Next node which understands contents, whether in this network, or in any other network	AnyNode	NOT Included
5	Any entity (terminal, or network node) ➞ Next entity, whether in this network, or in any other network or a terminal	GAT network facility extension field omitted	GAT network facility extension field omitted

9.1.2.2 Encoding of the source entity and source entity address of the GAT network facility extension

The sourceEntity field and sourceEntityAddress field of the GAT network facility extension shall be encoded as shown in table 4.

NOTE - These cases should be selected by application specifiers using the GAT protocol, based on the following criteria:

- in many instances the need will be to respond to the same entity that initiated the transaction (particularly where there is a return result to an original invoke component, rather than a subsequent operation to a series of operations between two entities involved in the same service. In these instances, cases 3 should be selected;
- in other instances the need will be to respond to the appropriate functionality in the call, even if it is no longer located at the same location. An example of where it may not be is after the transfer of a call, where the endpoints of the connection, are no longer at the transferring exchange, but communication is still required between the end exchanges of the connection, no matter where the connection now goes. In these instances, cases 1 and 2 should be used. There may also be a use for case 4.

Table 4

Encoding of the source entity and source entity address of the GAT network facility extension parameter when sending a service user APDU

Case No.	Communication between ..	source entity	source entity address
1	End node (origination or destination), whether destination in this network, or in any other network ➞ Any entity (terminal, or network node)	EndNode	NOT Included
2	End terminal (origination or destination) ➞ Any entity (terminal, or network node)	EndTerminal	NOT Included
3	addressed node whether in this network, or in any other network ➞ Any entity (terminal, or network node)	AnyNode	service address
4 (Note 1)	Previous node which understands contents, whether in this network, or in any other network ➞ Any entity (terminal, or network node)	AnyNode	NOT included
5	Previous entity, whether in this network, or in any other network or a terminal ➞ Any entity (terminal, or network node)	GAT network facility extension field omitted	GAT network facility extension field omitted
NOTE 1 - The usage of these cases is not envisaged except in special cases where the usage and actions are clearly understood.			

9.1.2.3 Encoding of the service indicator parameter

The serviceIndicator field of the GAT-PDU shall be encoded with a value of serviceIndicator that both the sending owner domain and the receiving owner domain have previously agreed to both support, and which is appropriate to the service user ASE sending the service user APDUs, and such that the receiving owner domain will undertake to send to the correct point of service provision of the peer service user ASE.

If the entity providing the end GAT-control (i.e. the point of service provision) contains an intelligent network to provide the service, then this parameter may be required in order to allow the SSP to select the appropriate SCP. To allow for this case the serviceIndicator field of the GAT network facility extension shall be encoded with a value of serviceIndicator that is appropriate to the service user ASE

9.1.2.4 Selection and provision of a transport mechanism

An appropriate transport mechanism of the underlying protocol shall be selected based on the indications of the application on which of the following categories of transport should be used:

a) bearer-related transport mechanism;

b) connection-oriented bearer-independent transport mechanism;

Sending GAT-control shall package the GAT network facility extension with the application PDUs to which it relates in a Facility information element where the protocol profile field is encoded “GAT protocol” or into an Application TransPort parameter where the Application Context Identifier field is encoded “GAT protocol”.

9.1.3 Responding to a service user APDU that has been received

9.1.3.1 Encoding of the destination entity and destination entity address of the GAT network facility extension

The destinationEntity and destinationEntityAddress fields of the GAT network facility extension being sent shall be set to the sourceEntity and sourceEntityAddress field of the GAT network facility extension that accompanied the service user APDU being responded to.

9.1.3.2 Encoding of the source entity and source entity address of the GAT network facility extension

The sourceEntity and sourceEntityAddress fields of the GAT network facility extension being sent shall be set to the destinationEntity and destinationEntityAddress field of the GAT network facility extension that accompanied the service user APDU being responded to.

9.1.3.3 Encoding of the service indicator parameter

The serviceIndicator field of the GAT-PDU being sent shall be set to the serviceIndicator field of the GAT-PDU that accompanied the service user APDU being responded to.

9.1.3.4 Selection and provision of a transport mechanism

The transport mechanism on which the service user ADDU being responded to was received shall be used for the response. If the transport mechanism has subsequently been cleared by the remote end, this indicates that the transaction has been terminated by the remote end and the service user ASE should be informed accordingly.

9.2 Receiving GAT-Control

9.2.1 Introduction

This subclause describes how GAT-Control receives a GAT PDU and decides whether transit GAT-Control or End GAT-Control is to be provided.

9.2.2 Receiving GAT-Control located at a terminal

Within this subclause, the term “correctly coded” and the term “incorrectly coded” does not include the full syntactic check of the ASN.1 of the ApduPortion. The check of the ApduPortion is performed by ROSE in conjunction with GAT-Control in conjunction with the AS-ASE when a decision has been reached that end GAT-Control should be provided.
If the value of the received protocol profile field is set to “GAT protocol” then the remainder of the procedures of subclause are followed.

Note 1 - If the value of the received protocol profile field is not set to “GAT protocol” then the handling of the information is outside the scope of this standard, and the appropriate procedures of the underlying transport protocol should be followed.

If the first and only APDU within the transport parameter is not a GAT PDU, then the contents of the transport parameter shall be discarded and no further processing occur on that information.
If the first and only APDU within the transport parameter is a GAT PDU, and is correctly coded, and has a destinationEntity field of the GAT network facility extension field with a value of “endTerminal”, then the procedures for end GAT-Control shall be followed for the APDU portion of the GAT PDU in accordance with subclause 9.4.

Note 2 - Any address contained (in error) within the destinationEntityAddress field in association with an EntityType field with a value of “endTerminal” is ignored.

If the first and only APDU within the transport parameter is a GAT PDU, and is correctly coded, and has a destinationEntity field with any other value, then the APDU portion contained within this transport parameter shall be discarded, and no further processing performed on the information within that transport parameter.
If the first and only APDU within the transport parameter is a GAT PDU and is incorrectly coded, then the APDU portion contained within this transport parameter shall be discarded, and no further processing performed on the information within that transport parameter.

9.2.3 Receiving GAT-Control located at a transit exchange, incoming local exchange, incoming gateway PINX, incoming gateway exchange outgoing local exchange or outgoing gateway exchange

Within this subclause, the term “correctly coded” and the term “incorrectly coded” does not include the full syntactic check of the ASN.1 of the ApduPortion. The check of the ApduPortion is performed by ROSE in conjunction with GAT-Control in conjunction with the AS-ASE when a decision has been reached that end GAT-Control should be provided.
If the value of the received protocol profile field or Application Context Identifier is set to “GAT protocol” then the remainder of the procedures of subclause are followed.

Note - If the value of the received protocol profile field or Application Context Identifier is not set to “GAT protocol” then the handling of the information is outside the scope of this standard, and the appropriate procedures of the underlyiong transport protocol should be followed.

If the first and only APDU within the transport parameter is not a GAT PDU contents of the transport parameter shall be discarded and no further processing occur on that information
If the first and only APDU within the transport parameter is a GAT PDU, and is correctly coded, but contains no GAT network facility extension field, then the procedures of end GAT-Control shall be followed for the ApduPortion in accordance with subclause 9.4.
If the first and only APDU within the transport parameter is a GAT PDU, and is correctly coded, then depending on the value of the destinationEntity field of the GAT network facilities extension field, the following actions occur:

- for a value of “endTerminal”, then the procedures for transit GAT-Control shall be followed for the ApduPortion in accordance with subclause 9.3;

- for a value of “anyNode”, and the destinationEntityAddress is present but is not equivalent to the service address at this location, then the procedures for transit GAT-Control shall be followed for the ApduPortion in accordance with subclause 9.3;
- for a value of “anyNode”, and the destinationEntityAddress is present and is equivalent to the service address at this location, then the procedures for transit GAT-Control shall be followed for the ApduPortion in accordance with subclause 9.3;
- for a value of “anyNode”, and the destinationEntityAddress is absent, and the application is not present at this node by examination of the service indicator or operation values within the ApduPortion of the GAT-PDU, then the procedures for transit GAT-Control shall be followed for the ApduPortion in accordance with subclause 9.3;
- for a value of “anyNode”, and the destinationEntityAddress is absent, and the application is present at this node by examination of the service indicator or operation values within the ApduPortion of the GAT-PDU, then the procedures for end GAT-Control shall be followed for the remaining APDUs in accordance with subclause 9.4;
- for a value of “endNode”, and the GAT-ASE is at an outgoing local exchange, or for a connection-oriented bearer-independent transport mechanism the GAT-ASE is at the origin or destination of the transport mechanism, then the procedures for end GAT-Control shall be followed for the remaining APDUs in accordance with subclause 9.4;
- for a value of “endNode”, and the GAT-ASE is not at an outgoing local exchange, or for a connection-oriented bearer-independent transport mechanism the GAT-ASE is not at the origin or destination of the transport mechanism, then the procedures for transit GAT-Control shall be followed for the remaining APDUs in accordance with subclause 9.3;

If the first and only APDU within the transport parameter is a GAT PDU and is incorrectly coded, then the remaining APDUs contained within this transport parameter shall be discarded, and no further processing performed on the information within that transport parameter.

9.3 Transit GAT-Control

The next determined node will depend on the address used for the transport mechanism.

If the address used for the transport mechanism is the same as the node providing transit GAT-control, then the GAT PDU shall be discarded.

If the node is interworking with a signalling system that does not support the GAT protocol, then the provisions of clause 10 shall be applied.

If the node is not the endpoint of the transport mechanism, transit GAT-Control shall send the service user APDU unchanged to the next entity along the transport mechanism with:

a) the same value of protocol profile field as received;

b) the same value of the GAT network facility extension as received.

If the GAT network facility extension field of the GAT-PDU contains a destinationEntityType with value “endTerminal” or “EndNode”, and a destinationEntityAddress is included (in error), then this shall be removed from the GAT network facility extension field before passing the GAT-PDU on.

9.4 End GAT-Control

If the identified AS-ASE is present at the location (as identified either from the service indicator field or from the operation value of an invoke component, or from a previously assigned invoke identifier), then the contents of the service indicator field and APDU portion is passed to the AS-ASE.

Note 1 - The service indicator is advisory of the operation values, or invoke identifiers related to previous operation values that may have been used. Therefore, the final decision on support of an application will be made on the operation values supported.

If the GAT-PDU for which the end GAT-Control is being provided is the last remaining GAT-PDU in a transport parameter that was used to establish a connection-oriented bearer-independent transport mechanism, then the GAT-Control shall indicate to the transport mechanism that the connection-oriented bearer-independent transport mechanism establishment shall be accepted at that point.

Note 2 - These procedures will be applied by the transport mechanism independently of the destination address of the transport mechanism. The procedures are also independent of whether the ApduPortion of the GAT-PDU was correctly coded or is an acceptable request, as the transport mechanism is accepted in order to send either a return error or a reject component.

If the identified AS-ASE is not present at the location, then the contents of the service indicator field and APDU portion is passed to the unrecognised ASE handling function, which is described in subclause 9.7.2.

9.5 Interpretation

9.5.1 Inclusion of an Interpretation APDU at a Source entity

If a Source entity wishes to include additional information to facilitate handling of unrecognised ROSE APDUs of type InvokePDU (see ITU-T Recommendation X.229 [5] subclause 7.1 or ITU-T Recommendation X.880 [4] subclause 9.3) at a Destination node, it shall include an Interpretation APDU within the GAT-PDU sent to GAT-Control.

9.5.2 Handling of APDUs at a Destination entity

If an Interpretation APDU is received by the Destination entity within the GAT-PDU, it shall examine any ROSE APDU of type RejectPDU generated as a result of the processing of these APDUs. If the element problem in the RejectPDU is of type InvokeProblem and has value unrecognisedOperation the action taken shall depend on the contents of the Interpretation APDU as follows:

- If the Interpretation APDU indicates rejectUnrecognisedInvokePdu the ROSE APDU of type RejectPDU shall be delivered to the destination entity ASE;
- If the Interpretation APDU indicates clearCallIfAnyInvokePduNotRecognised the ROSE APDU of type RejectPDU shall be delivered to GAT-Control and the coordination function shall be requested to clear the basic call or the connection oriented bearer independent transport mechanism to which the InvokePDU was related.
- If the Interpretation APDU indicates discardAnyUnrecognisedInvokePDU the ROSE APDU of type RejectPDU shall be discarded.

If no Interpretation APDU is received, any ROSE APDUs of type RejectPDU shall be delivered to the destination entity ASE.
If an Interpretation APDU is received that is not the first APDU in the sequence of APDUs received from GAT-Control, or does not conform to the structure in ITU-T X.229 [5] subclause 7.1 or ITU-T Recommendation X.880 [4] subclause as imported into the underling protocol, it shall be ignored.

10 Interactions with other networks

10.1 Interworking with private ISDNs

Interworking may be possible if the application related to the GAT user is present at the incoming or outgoing gateway PINX (depending on the direction of the interworking), and this application is able to provide the interworking function. This application can use equivalent functionality within the private ISDN form of the generic functional protocol if so required. For interworking from the GAT protocol to the private network environment, this functionality may be provided even if transit GAT-Control would otherwise be specified.

10.2 Interworking with non-ISDNs

Interworking of the GAT protocol with non-ISDNs is not possible.
All information received within the GAT protocol is discarded at the interworking function. If there is an Interpretation APDU is the first subsequent APDU to the network facilities extension APDU, then the requirements of the interpretation APDU shall be followed for any discarded service user APDUs (see subclause 9.7).

10.3 Interworking with frame-relay

Interworking of the GAT protocol with frame-relay is not possible.
All information received within the GAT protocol is discarded at the interworking function. If there is an Interpretation APDU is the first subsequent APDU to the network facilities extension APDU, then the requirements of the interpretation APDU shall be followed for any discarded service user APDUs (see subclause 9.7).

10.4 Interworking with PSPDNs

Interworking of the GAT protocol with PSPDNs is not possible.
All information received within the GAT protocol is discarded at the interworking function. If there is an Interpretation APDU is the first subsequent APDU to the network facilities extension APDU, then the requirements of the interpretation APDU shall be followed for any discarded service user APDUs (see subclause 9.7).

10.5 Interworking with H.323 environments

Interworking may be possible if the application related to the GAT user is present at the incoming or outgoing gateway (depending on the direction of the interworking), and this application is able to provide the interworking function. This application can use equivalent functionality within the H.323 form of the generic functional protocol if so required. For interworking from the GAT protocol to the H.323 environment, this functionality may be provided even if transit GAT-Control would otherwise be specified.

11 Parameter values

No new parameter values are defined by this Recommendation, or for the use of this Recommendation.

Annex A

Redirection function

(this Annex forms an integral part of this Recommendation)

These procedures are optional, and are only provided if the nature of the address usage within the network owner domain so requires it. It allows non-geographic based addresses to be advertised outside the network owner domain, but still allows geographic based addresses to be used within the domain.

NOTE - The redirection function is only provided if the received GAT network facility extension is coded with a DestinationEntity value of anyNode and the service address matches the location reached, but end GAT-Control cannot be provided. In other cases Transit GAT-Control is provided.

If the node is the endpoint of the transport mechanism, then the GAT network facility extension parameter and the service user APDU shall be discarded. If there is an Interpretation APDU is the first subsequent APDU to the network facilities extension APDU, then the requirements of the interpretation APDU shall be followed for any discarded service user APDUs (see subclause 9.7).

If there is a received ServiceIndicator value in the received GAT-PDU, the Redirection function shall check the received ServiceIndicator value against an internal serviceIndicator list identifying locations where the functionality is provided. If this functionality is locally provided, then the remaining procedures shall be as defined for End GAT-Control. If this functionality is not locally provided, then the GAT network facility extension shall be updated by changing the destinationEntity and destinationEntityAddress to the values indicated in the serviceIndicator list.

Transit GAT-Control shall then send the service user APDU unchanged to the next determined node with:

a) the same value of protocol profile or Application Context Identifier field as received;

b) the same value of the GAT network facility extension as received.

If there is no received ServiceIndicator value in the received GAT network facility extension, then a default location value shall be taken and the above procedures followed.

Appendix I

Examples of GAT protocol architectures

I.1 Introduction

Within these diagrams, the following descriptions apply:

1) Transport mechanism. For DSS2, this is either:
   - the existing basic call, for bearer-related transport, as defined in Q.2932.1 and using the signalling procedures of Q.2931;
   - the Connection-Oriented Bearer-Independent (COBI) transport mechanism as defined in Q.2932.1.

   For DSS1 this is either:
   - the existing basic call, for bearer-related transport, as defined in Q.932 and using the signalling procedures of Q.931;
   - the Networking Call Indepenendent Connection-oriented Signalling (NCICS) transport mechanism as defined in Q.932.

   Both mechanism are link by link, i.e. a separate state machine exists at each node that is passed through that controls the establishment, use and release of this mechanism. The transport mechanism is routed by the Called party number information element, and in the absence of information is routed based on information from GAT protocol. The transport mechanisms for SS#7 are ISUP in the narrowband network environment and B-ISUP in the broadband network environment (with the use of the APM) or TCAP. As the mechanism is link by link, any protocol that is defined as a local acknowledgment, rather than of end significance, should not be delayed by remote activities (e.g. in an SCF).
2) GAT-control. This provides an entity that analyses whether service functionality should be provided locally, or should be provided at some entity further along a transport mechanism (either existing or yet to be created, possibly further created based on information from GAT protocol).
3) ROSE. This is as defined by Recommendation X.219/X.229 and is equivalent to the functionality used within TCAP and Recommendation X.880. In an IN implementation, we understand that this functionality will be within the SCF for Mobility Management specific APDUs. Other PDUs that are not related to the same application in the same message may be handled differently.
4) Application ASE. This provides the Application specific protocol. If IN provides this functionality, it is located within the SCP. INAP is assumed to transport the information transparently and the INAP ASE passes information to this ASE within the SCF.

Note - A key to these figures and a bibliography exists at the end of this Appendix.

I.2 Examples for use in narrowband ISDN

Figure I.1 and figure I.2 show the protocol ASEs used for the transport of information relating to the Application ASE when used in the narrowband ISDN.

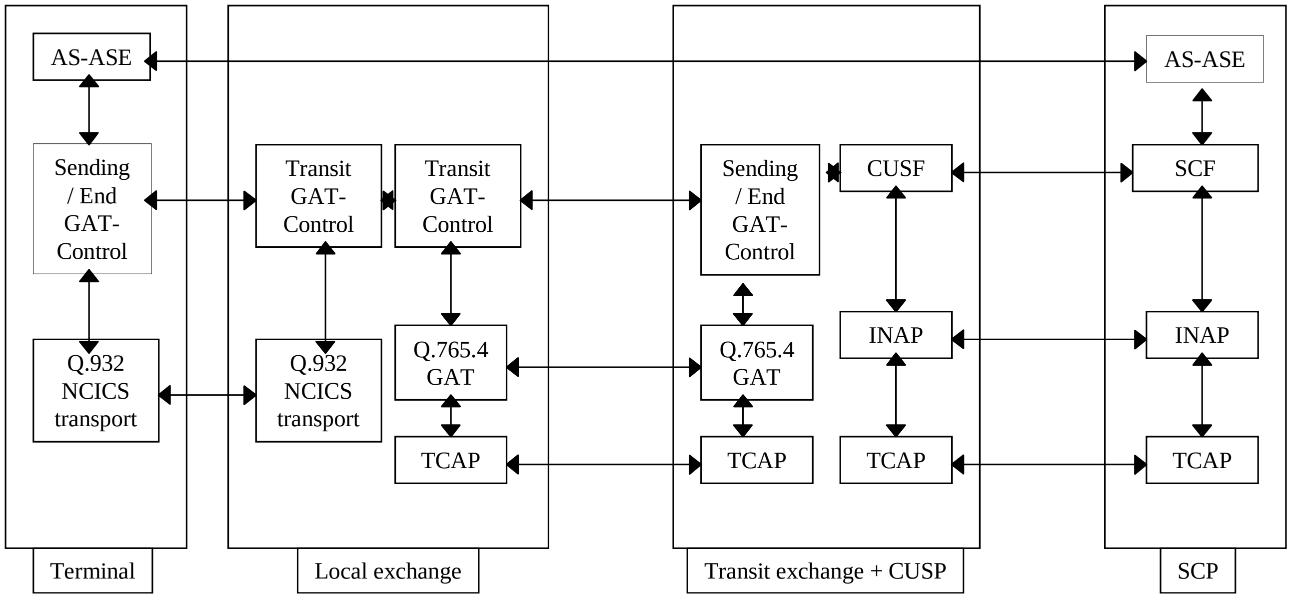


Figure I.1

GAT protocol architecture used in a bearer-independent narrowband ISDN environment using DSS1 and Signalling System No. 7

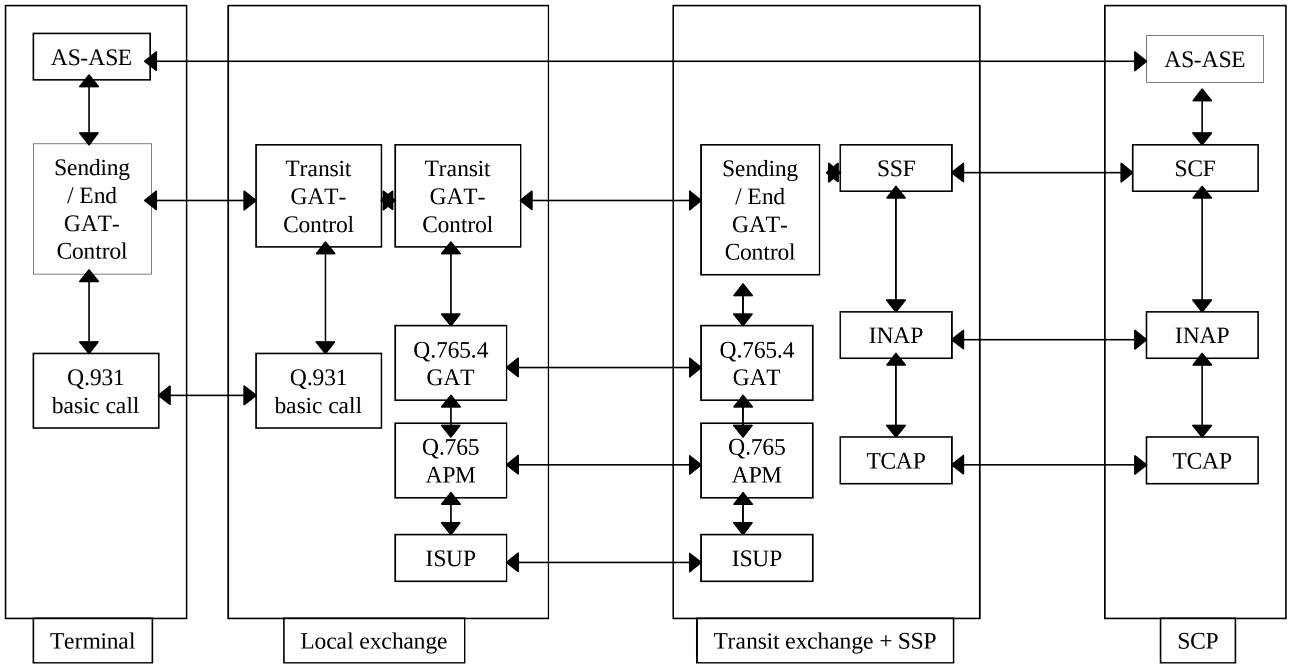


Figure I.2

GAT protocol architecture used in a bearer-related narrowband ISDN environment using DSS1 and Signalling System No. 7 (ISUP)

I.3 Examples for use in broadband ISDN

Figure I.3 and figure I.4 show the protocol ASEs used for the transport of information relating to the Application ASE when used in the broadband ISDN.

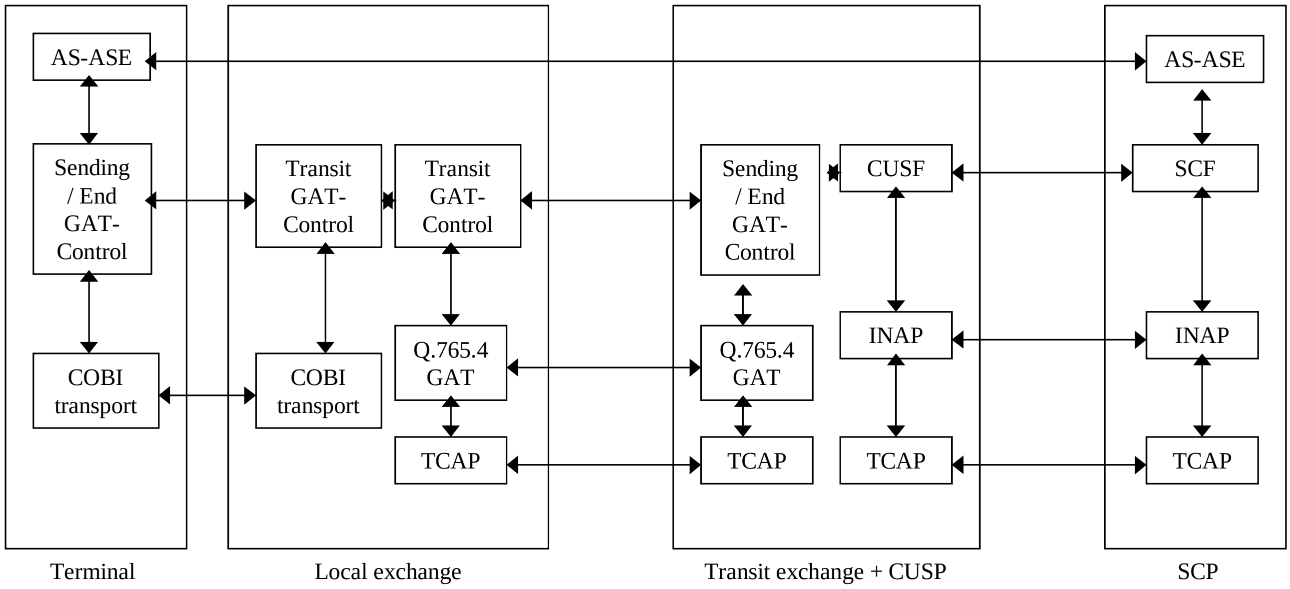


Figure I.3

GAT protocol architecture used in a bearer independent broadband ISDN environment using DSS2 and Signalling System No. 7

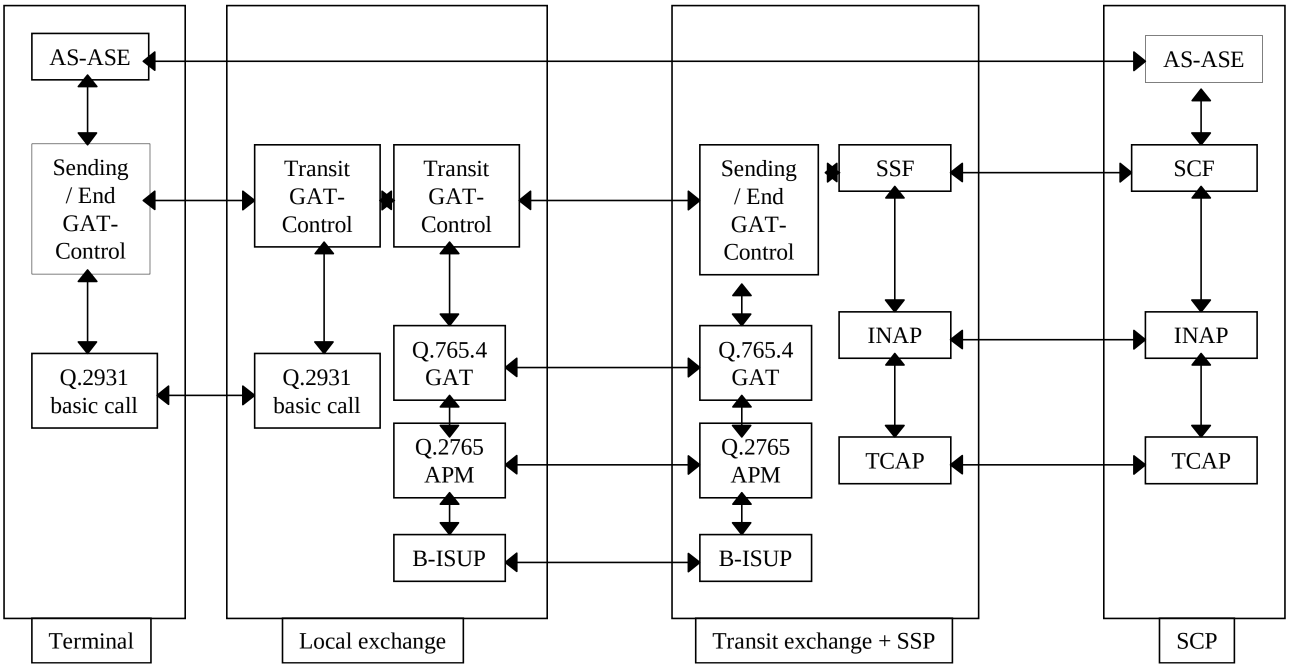


Figure I.4

GAT protocol architecture used in a bearer-related broadband ISDN environment using DSS2 and Signalling System No. 7 (ISUP)

I.4 Key to figures within this appendix

B-ISUP	Broadband Integrated Services User Part	Q.2761-2764
COBI	Connection Oriented Bearer Independent	Q.2932.1
CUSF	Call Unrelated Service Function	Q.1238
CUSP	Call Unrelated Service Point	Q.1238
GAT-Control	Generic Addressing and Transport Control (for the purposes of this representation this includes the ROSE functionality)	Q.860
INAP	Intelligent Network Application Protocol	Q.1238
ISUP	Integrated Services User Part	Q.761-Q.764
NCICS	Networking Call Independent Connection-oriented Signalling	Q.932
Q.2765 APM	Application Protocol Transport Mechanism (note an extension compatible with the extensions in Q.765 is assumed)	Q.2765
Q.2931 basic call	Q.2931 basic call	Q.2931
Q.765 APM	Application Protocol Transport Mechanism (note that for the B-ISDN, it is assumed that the provisions of this document are equally applicable)	Q.765
Q.765.4 GAT	APM user specification for GAT	Q.765.4
Q.931 basic call	Q.931 basic call	Q.931
SCF	Service Control Function	Q.1238
SCP	Service Control Point	Q.1238
SSF	Service Switching Function	Q.1238
SSP	Service Switching Point	Q.1238
TCAP	Transaction Capabilities Application Protocol	Q.771-Q.774

I.5 Bibliography for figures within this appendix

Q.761 (1999) Signalling System No. 7 - ISDN User Part functional description
Q.762 (1999) Signalling System No. 7 - ISDN User Part general functions of messages and signals
Q.763 (1999) Signalling System No. 7 - ISDN User Part formats and codes
Q.764 (1999) Signalling System No. 7 - ISDN User Part signalling procedures

Q.765 (2000) Signalling system No. 7 - Application transport mechanism
Q.771 (1997) Functional description of transaction capabilities
Q.772 (1997) Transaction capabilities information element definitions
Q.773 (1997) Transaction capabilities formats and encoding
Q.774 (1997) Transaction capabilities procedures
Q.775 (1997) Guidelines for using transaction capabilities
Q.860 Integrated Services Digital Network (ISDN) And Broadband Integrated Services Digital Network (B-ISDN) Generic Addressing and Transport (GAT) Protocol
Q.931 (5/98) ISDN user-network interface layer 3 specification for basic call control
Q.932 (5/98) Digital subscriber signalling system No. 1 – Generic procedures for the control of ISDN supplementary services
Q.1238 (2000) Interface Recommendation for intelligent network Capability Set 3
Q.2761 (1999) Functional description of the B-ISDN user part (B-ISUP) of signalling system No. 7
Q.2762 (1999) General Functions of messages and signals of the B-ISDN user part (B-ISUP) of Signalling System No. 7
Q.2763 (1999) Signalling System No. 7 B-ISDN User Part (B-ISUP) - Formats and codes
Q.2764 (1999) Signalling System No. 7 B-ISDN User Part (B-ISUP) - Basic call procedures
Q.2765 (2000) Signalling System No. 7 B-ISDN User Part (B-ISUP) - Application transport mechanism
Q.2931 (2000) Digital Subscriber Signalling System No. 2 - User-Network Interface (UNI) layer 3 specification for basic call/connection control
Q.2932.1 (1996) Digital subscriber signalling system No. 2 - Generic functional protocol - Core functions
X.219 (1988), Remote operations: model, notation and service definition
X.229 (1988), Remote operations: Protocol specification
X.880 (1994), Information technology – remote operations: concepts, model and notation

Appendix II

General information for the definition of GAT user applications

(this appendix does not form part of this Recommendation)

II.1 Introduction

This appendix gives some general information applicable to applications using the GAT protocol.

II.2 ROSE

The GAT protocol can only carry ROSE structured components on behalf of an application. This is necessary in order to allow the compatibility mechanisms defined in the GAT protocol to operate (as defined by the procedures for reject in ROSE, and the procedures for the interpretation field). This does not preclude the transfer of unstructured data, but the application will need to define an enveloping mechanism within a ROSE invoke component.

II.3 Service indicator

It is necessary for the GAT application user to define what value the GAT PDU should carry as a service indicator, and how the GAT network facility extension field is used. These parameters provide a wide scope of usage.

II.4 Addressing mechanisms

II.4.1 Transport mechanism addresses

At the level of the transport mechanism, the following addresses may be present:

- the origin of the transport mechanism,
- the endpoint of the transport mechanism (for the bearer-related transport mechanism, this is identical to the address of the called party), and
- the selected service provider (not for the bearer-independent connectionless transport mechanism).

These addresses are provided per transport mechanism, and they are included in the first transport mechanism establishment message. Transport mechanism addresses may influence routing of the transport mechanism.

II.4.2 GAT addresses (Network Facility Extension)

GAT addresses identify the following:

- source entity
- destination entity
- service indicator.

The GAT addresses are provided per application protocol data unit (APDU). GAT addresses can only be used to reach an entity along the path of the transport mechanism, and they have no impact on the routing of the transport mechanism.

II.4.3 Application addresses

The application protocol running on top of the GAT protocol may define addressing mechanisms. Such mechanisms are an application protocol specification issue, to be discussed on an application-by-application basis.

II.5 Other application data issues

The GAT protocol passes information transparently between two application entities. The application information may include data that might otherwise be processed or converted at intermediate points when carried by basic call. This includes data such as numbers and addresses, which might otherwise be converted from one form to another, or have a country code added, or have the number digits restricted. It is the responsibility of the application design to ensure that if this processing is required, that either the sending or receiving side application performs it.

Appendix IV

Assignment of object identifiers

The following object identifiers are assigned within this Recommendation.

GAT-PDU {itu-t q 860 gat-pdu(1)}