INTERNATIONAL TELECOMMUNICATION UNION

# ITU-T

**F.16**

(02/95)

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

## OPERATIONS AND QUALITY OF SERVICE
## TELEGRAPH SERVICES

---

# GLOBAL VIRTUAL NETWORK SERVICE

## ITU-T Recommendation F.16

(Previously “CCITT Recommendation”)

---

## FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation F.16 was prepared by ITU-T Study Group 1 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 21st of February 1995.

---

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

# CONTENTS

*Page*

## SUMMARY

The Global Virtual Network Service (GVNS) is a multi-network international service which provides private network functions to users at geographically dispersed international locations while minimizing the need for dedicated network resources. It may be offered to customers over the PSTN and/or ISDN.

## INTRODUCTION

This Recommendation focuses on how interworking service providers can provide the seamless Global Virtual Network Service (GVNS). It presents the service description of GVNS that supports global virtual networking. The GVNS is described here from the user's point of view and is characterized by a prose service definition description in accordance with Recommendation I.130.

**Recommendation F.16**

# GLOBAL VIRTUAL NETWORK SERVICE

*(Geneva, 1994)*

## 1 Definition

The **Global Virtual Network Service (GVNS)** is a multi-network international service which provides private network functions to users at geographically dispersed international locations while minimizing the need for dedicated network resources. It may be offered to customers over the PSTN and/or ISDN.

The Global Virtual Network Service is a feature-rich communications service. It provides the functions typically associated with the private networks (see 1.3.10), but utilizing the public switched network(s). The GVNS Customer's network configuration is defined per the customer's direction using customer-specific service information resident in multiple networks. The network configurations may be administered by the GVNS Customer directly, the GVNS Participating Service Provider(s) and/or the GVNS Coordinator(s) (see 1.3.11 and 1.3.12).

The GVNS provides the customers with global services as a result of internetworking among the GVNS Participating Service Providers in various countries. GVNS may accommodate this interconnection both via ISDN and non-ISDN facilities.

### 1.1 Scope

This Recommendation contains the service description of GVNS for the PSTN and ISDN. This Recommendation defines the service from a user's perspective. This Recommendation does not specify the requirements where the service is provided to the user by the private networks; however, it addresses the interworking requirements with private networks.

This Recommendation is the Stage 1 service description for the ISDN and is applicable to the ISDN Stages 2 and 3 Recommendations for GVNS. The terms Stages 1, 2 and 3 are defined in CCITT Recommendation I.130.

### 1.2 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 edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- CCITT Recommendation I.130 (1988), *Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN*.
- ITU-T Recommendation I.112 (1993), *Vocabulary of terms for ISDNs*.
- ITU-T Recommendation I.210 (1993), *Principles of telecommunication services supported by an ISDN and the means to describe them*.
- ITU-T Recommendation Z.100 (1993), *CCITT specification and description language (SDL)*.

### 1.3 Definitions

**1.3.1 GVNS customer**: A **GVNS Customer (e.g. a person or an organization)** is the entity that purchases the service (e.g. the telecommunication manager of a corporation). The GVNS Customer functions as an interface between the GVNS Service Provider(s) and the GVNS Users. The GVNS Customer can define aspects of the service; for example, the on-net locations, numbering plan, and/or the calling privileges of the GVNS Users.

**1.3.2 GVNS user**: A GVNS User is the end-user of the service. Typically, GVNS Users are not allowed to change their calling privileges.

**1.3.3 on-net locations**: These are stations, user-network interfaces and authorized remote access locations that are logically defined by the GVNS Customer to be part of its virtual network during service provisioning or remote access (see 2.2.2.3).

GVNS Customers may define a physical entity (station or user network interface) as multiple on-net locations during service provisioning. As a result, one physical entity may be registered to one or more GVNS User Groups.

The relationship between the logical virtual networks and the physical networks is depicted in Figure 1.

**1.3.4 off-net locations**: These are stations and user-network interfaces that are not defined by the GVNS Customer to be part of the GVNS. In some cases, a customer may define off-net locations as part of its customer-defined numbering plan. Such locations are termed as virtual on-net locations.

**1.3.5 virtual on-net locations**: These are off-net locations included in the customer-defined numbering plan. The numbers that are defined in the numbering plan to reach to these off-net locations may be subject to GVNS-specific treatments (e.g. Call Screening).

**1.3.6 GVNS calls**: GVNS Calls are calls from an on-net location. It may terminate to an on-net, off-net, or virtual on-net location. GVNS Calls include the following two types of calls:

– *On-net Calls:*

  An On-net Call is a call from an on-net location to another on-net location of the same GVNS User Group.

– *Off-net Calls:*

  An Off-net Call is a call from an on-net location to an off-net location. These calls can be specified with a customer-defined number (to a virtual on-net location) or as a public number.

**1.3.7 GVNS user group and subgroup**: A GVNS user group is made up of a group of on-net locations defined by the GVNS Customer (including authorized remote access locations, see 2.2.2.3).

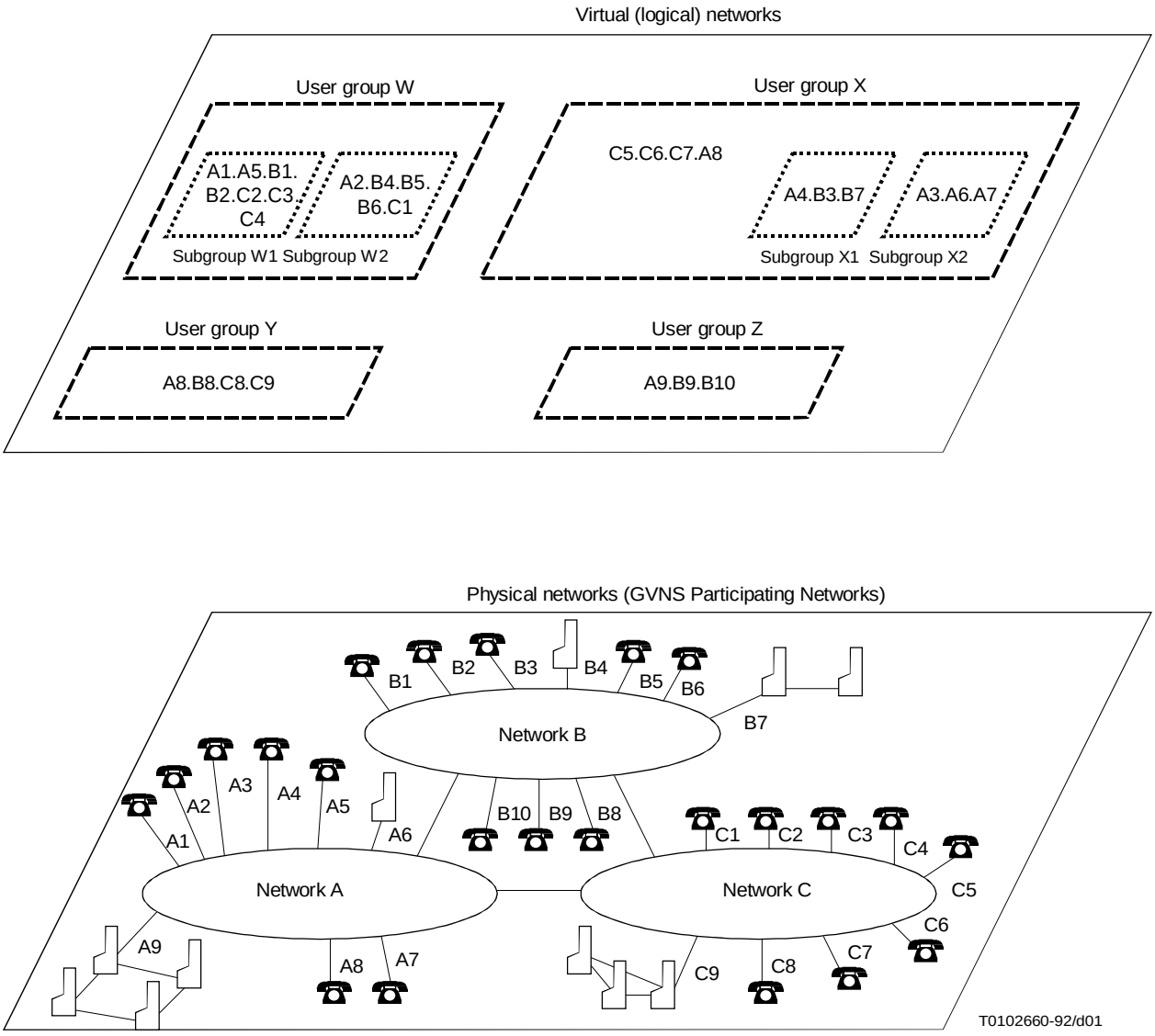
A GVNS Customer may optionally define GVNS subgroups when they are offered by the GVNS Participating Service Provider. A GVNS subgroup is made up of a subset of the locations defined by the GVNS Customer as on-net locations (including authorized remote access locations). An on-net location belongs to one and only one GVNS subgroup. Subgroup identification is required to support subnetworking (see 2.4.8). The relationship between the user group and subgroups is depicted in Figure 1.

**1.3.8 GVNS user group and subgroup identifier**: A GVNS user group is assigned a unique GVNS user group identifier to identify a group among supporting networks. The subgroup identifier uniquely identifies a group of users within a customer's GVNS user group, and has meaning only within that user group.

**1.3.9 numbering plan**: A GVNS Customer has a numbering plan which associates addresses with locations in the GVNS (on-net addresses). These numbers may be public numbers or customer-defined (private). The GVNS Customers may also define private numbers to identify off-net addresses. When a GVNS Customer uses customer-defined numbers, the capabilities may include, but are not limited to those of the Support of Private Numbering Plans supplementary service. These capabilities are defined by each GVNS Participating Service Provider.

**1.3.10 private network functions**: Private network functions include those provided by dedicated private networks and dedicated business groups. The private network functionality can be customer based (e.g. PBX), network based (e.g. business group) or a combination of both.

**1.3.11 GVNS participating service provider**: The GVNS Participating Service Provider is a ROA that provides customer access and egress to and from the GVNS. The GVNS Participating Service Provider optionally offers the features defined in 2.4 on a national and/or international basis. The interworking of such services between ROAs in multiple countries creates the GVNS offering.




User Group W
Subgroup W1
Subgroup W2

User Group X
Subgroup X1
Subgroup X2

User Group Y
No Subgroups

User Group Z
No Subgroups

GVNS participating service provider for W = A, B, C
GVNS participating service provider for X = A, B, C
GVNS participating service provider for Y = C, A, B
GVNS participating service provider for Z = B, A
A1 ... B9 = physical connections to Network A
B1 ... B10 = physical connections to Network B
C1 ... C9 = physical connections to Network C
A8 = one physical connection belonging to two user groups (X and Y)

FIGURE 1/F.16

**GVNS user groups and subgroups**

**1.3.12 GVNS coordinator**: One or more GVNS Coordinators may be elected by the GVNS Customer to provide and arrange with other ROAs (GVNS Participating Service Providers) the provision of GVNS.

The GVNS Coordinator(s) will arrange customers ordering, provisioning, and billing procedures currently undertaken by each GVNS Participating Service Provider for the establishment and ongoing provision of GVNS.

### 1.4 Abbreviations

| | |
|---|---|
| CLI | Calling Line Identification |
| GVNS | Global Virtual Network Service |
| ISDN | Integrated Services Digital Network |
| PBX | Private Branch Exchange |
| PIN | Personal Identification Number |
| OAM&P | Operation, Administration, Maintenance and Provisioning |
| PSTN | Public Switched Telephone Network |
| ROA | Recognized Operating Agency |
| SDL | Specification and Description Language |

## 2 Description

### 2.1 General description

The GVNS allows service providers to offer subscribing customers a service with the features and functionality similar to that of a private network while minimizing the need for dedicated network resources. However, dedicated network resources may be used to access GVNS or in conjunction with GVNS.

A GVNS Customer may optionally elect one or more GVNS Coordinators to provide one or more of the following functions:

a) Single End Service Ordering;

b) Single End Fault Reporting;

c) Maintenance Coordination;

d) Configuration Management;

e) Network Management Reporting Tools.

A GVNS Customer is assigned a unique identifier which identifies the global GVNS User Group (see 1.3.7). GVNS User Group identification provides a means by which various networks can recognize the GVNS Customer.

A GVNS Customer may choose to group users into one or more subgroups (see 1.3.7) in order to allow subgroup dependent service interactions and operations.

GVNS users can be located in one or more networks, and may interwork with private network resources.

A variety of routing privileges may be assigned to GVNS calls. GVNS users can make calls to other users within their GVNS and to non-GVNS users. GVNS calls can also be made from non-GVNS locations. At the customer's request, appropriate verification of the calling party may be required.

### 2.2 GVNS access

Dependent upon GVNS Participating Service Provider capabilities, the customer can choose from various user access procedures and physical access arrangements.

### 2.2.1 User access procedures

Based upon the GVNS Participating Service Provider capabilities, the customer can choose either direct or indirect access to the GVNS.

#### 2.2.1.1 Direct access

This type of access allows the user to reach the GVNS without providing any code(s). This is only possible from on-net locations if the network recognizes the GVNS location by performing Calling Line Identification (CLI) screening or using another automatic mechanism (e.g. physical network connection).

An example of User Access Procedures:

a) the GVNS user lifts the handset and waits for network response;

b) the network sends an acknowledgement (e.g. dial tone);

c) depending upon customer requirements, the user may be required to provide an authorization code and the network sends an acknowledgement to the user;

d) the user is now connected to the GVNS and can use the service features available.

If the GVNS location from which the user accesses its GVNS is a PBX extension, the procedure could change in a way that is PBX dependent (e.g. dialling a prefix).

#### 2.2.1.2 Indirect access

This type of access allows the GVNS user to reach its GVNS by providing a service access code and/or authorization code. This type of access is available both from on-net and off-net locations.

##### 2.2.1.2.1 Indirect access from on-net locations

When indirect access is used from an on-net location, the user is only required to provide a service access code. The network recognizes the GVNS location by CLI screening or using another automatic mechanism (e.g. physical network connection).

An example of User Access Procedures:

a) the GVNS user lifts the handset and waits for a network response;

b) the network sends a network acknowledgement;

c) the user provides a service access code;

d) the network sends another network acknowledgement;

e) depending upon customer requirement, the user may be required to provide an authorization code and the network sends an acknowledgement to the user;

f) the user is now connected to the GVNS and can use the service features available.

##### 2.2.1.2.2 Indirect access from off-net locations

When indirect access is used from an off-net location (see Remote Access 2.2.2.3), the network cannot identify the user via CLI or another automated mechanism. Therefore, the user is required to provide both a Remote Access Number and an authorization code. The user privileges and network authentication are based upon the authorization code.

An example of User Access Procedures:

a) the GVNS user lifts the handset and waits for a network response;

b) the network sends a network acknowledgement;

c) the Remote Access Number (e.g. a public number) is provided by the user;

d) an indication is provided to guide the caller to provide an authorization code;

e) the authorization code is provided.

Depending upon the GVNS Participating Network Provider's implementation, the authorization code may be a single set of digits or split (e.g. separate network prompts for authorization code and PIN);

f) the network informs the user by means of tone(s), announcement(s), and/or other mechanisms that indicate access to the GVNS has been successful.

### 2.2.2 Physical access arrangements

Dependent upon GVNS Participating Service Provider capability, the customer can choose from various Dedicated, Switched and Remote Access arrangements to receive the features and functions of the GVNS.

#### 2.2.2.1 Dedicated access

Dedicated access is a physical connection from the user to a network that supports the relevant GVNS for only one GVNS Customer. If the GVNS for only one GVNS Customer uses the same dedicated access for more than one service, the user may need to dial a special code (e.g. prefix or access code) to identify GVNS calls.

#### 2.2.2.2 Switched access

Switched access is a switched connection from the user to a GVNS via one or more networks on which:

a) the particular GVNS is not supported; and

b) the circuits to the GVNS Participating Service Provider carry the GVNS traffic of various GVNS User Groups and possibly non-GVNS traffic.

The user may need to dial a special code (e.g. prefix or access code) to identify the desired GVNS Participating Service Provider. The availability of Calling Line Identification (network provided or network verified) is necessary to provide authorized access to the GVNS.

#### 2.2.2.3 Remote access

Remote access can be used to make GVNS calls from locations not identified as part of the GVNS at service provisioning. The caller makes a call to a Remote Access Number (e.g. public number or service code) and, optionally, provides an authorization code. Either the Remote Access Number or the authorization code provides authorized access to the GVNS. Once a non-GVNS location receives authorized access from a GVNS participating service provider, it becomes an on-net location (authorized remote access location, see 1.3.3).

## 2.3 GVNS calling

All calls made from an on-net location may terminate on an on-net, off-net, or virtual on-net location. If terminating on an on-net location, it could be done via dedicated or a switched access. The user may provide a customer-defined or a public number to reach on-net, off-net or virtual on-net locations.

## 2.4 GVNS features description

A GVNS Participating Service Provider may support one or more of the following optional features. The GVNS Participating Service Providers will interwork their systems and procedures to provide GVNS features for customers in multiple countries.

### 2.4.1 Call screening

The GVNS Customer can define call screening to determine what type of calls are allowed from on-net or remote access locations. This may include, but is not limited to, restrictions such as, allow private number dialled calls only, or allow all private number and public number calls in a particular country only.

Call screening is also a mechanism which may be used by the GVNS Customer to restrict GVNS users access and/or calling privileges.

### 2.4.2 Customer-defined numbering

GVNS allows the customer to define a private numbering plan for some or all of their dialling needs. The number of digits sent and received between the customer's equipment and the GVNS service point will be at the customer's discretion, within a given range, specified by each GVNS Participating Service Provider. The GVNS Customers should have the capability to define an on-net location with a customer-defined private number or a public number.

### 2.4.3 Private network interface

The GVNS Customers should be able to interconnect with their private network(s) using GVNS. The GVNS must be able to communicate to and from the customer's private network(s) (see 5.2).

### 2.4.4 Standard announcements

General and network announcements are to be provided when appropriate for GVNS calls. A verbal announcement may be played when a certain predefined condition occurs (e.g. "All circuits are busy" at the general level; "You are not authorized to dial this number" at the network level).

### 2.4.5 Customized announcements

A GVNS Customer can select a particular announcement to the caller given the dialled digits or any of several intercept conditions (e.g. "Welcome to XYZ company's private network"). The customer sets up the routing to the announcements. The customized announcements capability may have the flexibility to support multiple messages in different languages and countries.

### 2.4.6 Authorization code

Authorization codes may be used by the GVNS Customer to identify whether the GVNS User has the authorization to place the call. Authorization codes may also be used to assign varying levels of functionality. As a GVNS Service Provider option, the calling party could place additional calls without requiring re-entry of the authorization code.

### 2.4.7 Accounting code

The accounting code may be used by the user to identify an individual or group with which a GVNS call should be associated.

### 2.4.8 Subnetworking (subgrouping)

A customer of the GVNS service may choose to group its users into subnetworks with their own access and routing restrictions. Optionally, each subnetwork may have its own numbering plan. The subnetworking provides the flexibility to the GVNS Customer by allowing its users to associate subnetworks with functional organizations, e.g. manufacturing, marketing, or with geographical locations.

### 2.4.9 Direct termination overflow

If the dedicated access for the GVNS call termination is busy, the incoming call can overflow to another dedicated access, switched access, or to an announcement.

## 2.5 GVNS operation, administration, maintenance and provisioning

The GVNS coordinator(s), if elected (see 1.3.12) will coordinate the Operation, Maintenance, Administration and Provisioning (OAM&P) aspects of the GVNS with the service providers involved in providing the service in multiple countries. The supporting networks should be able to identify the GVNS coordinator(s), i.e. the country and the network in order to provide some of the OAM&P functionalities, e.g. billing. Some examples of such OAM&P activities are listed below[1)].

### 2.5.1 Provisioning

This function provides means of order processing, provisioning and installing the GVNS service for the customer.

### 2.5.2 Configuration management

The customer should be able to configure its GVNS according to its needs from domestic and international locations[2)]. The configuration management involves GVNS dialling plan changes, activation/deactivation of authorization codes, routing changes, etc.

---

1) The concept of Telecommunication Management Network (TMN) is in the M-Series Recommendations. The TMN embodies these OAM&P aspects. TMN would facilitate the customer being able to access one system for configuration management.

2) The GVNS coordinator can also provide the configuration management capability on the customer's behalf.

#### 2.5.3 Performance monitoring

In order to properly monitor the performance of its GVNS, the customer should be able to obtain various traffic statistics, e.g. trunk group usage, originating/terminating traffic from/to a particular location. The GVNS coordinator or the customer may create reports based on these statistics. These reports could provide input for decisions to reconfigure and/or add additional resources to the GVNS.

### 2.6 Applicability

This service is applicable to the PSTN and circuit mode bearer services in the ISDN.

## 3 Procedures

Specific procedures for the provision and withdrawal of access methods (see 2.2) and features (see 2.4) could vary by GVNS Participating Service Providers and, therefore, are not defined below.

### 3.1 Provision/withdrawal

The GVNS is provided to the customer by subscription. Provision and coordination of GVNS may be required in multiple networks depending on the location of the GVNS Users.

### 3.2 Normal procedures

#### 3.2.1 Activation/deactivation/registration

Activation, deactivation, and registration of GVNS may be performed by the GVNS Participating Service Providers and/or Coordinator(s) by arrangements with the customer. If the customer elects a GVNS Coordinator, the Coordinator may arrange activation, deactivation, and registration among the GVNS Participating Service Providers. The GVNS Participating Service Providers and/or Coordinator(s) and the customer can change the information relating to GVNS, e.g. on-net and off-net locations by following appropriate procedures.

#### 3.2.2 Invocation and operation

Depending upon the access arrangement (see 2.2.2), a GVNS User may be required to dial an access code, Remote Access Number, or Authorization Code which identifies the call as being a GVNS call. Optionally, the user only dials a customer-defined or public number. The network then, handles the call according to the customer-specific record stored in the network, (e.g. routes to the proper destination), and creates a record for billing, international accounting, and various reporting purposes. Call screening may be performed before the call is routed to ensure calling security and authorization.

### 3.3 Exceptional procedures

If the call cannot be routed to the proper destination due to, e.g. unavailability of network resources, unauthorized access, an appropriate indication shall be returned to the calling user.

#### 3.3.1 Activation/deactivation/registration

None identified.

#### 3.3.2 Invocation and operation

None identified.

### 3.4 Alternate procedures

None identified.

# 4 Network capabilities for charging

The GVNS Participating Service Provider may choose to offer a call charge for GVNS which is different from other network charges as part of the GVNS service. The exact nature of the call charges is the subject of the D-Series Recommendations. In any case, the GVNS Participating Service Provider should record the relevant details in order to be able to charge the customer accurately for the service.

# 5 Interworking requirements

## 5.1 Interworking with non-ISDN networks

If during interworking it is not possible to sustain the association of the call with the specific GVNS information, the call may still be allowed to proceed if the network has enough information to bill the call properly and the customer has chosen this treatment.

## 5.2 Interworking with the private networks (non-ISDN and ISDN)

The GVNS Customers should be able to interconnect with their private network(s) using GVNS. The GVNS must be able to communicate to and from the customer's private network(s).

The GVNS service provides the same features and functions to users directly connected to the public networks as to users connected via private networks. Locations connected to GVNS via private network(s) are not required to send or to receive additional information for GVNS calls over and beyond those required to initiate or to complete basic calls via PSTN or ISDN.

Certain features and functions provided within the private networks may not be implemented on GVNS.

# 6 Interactions with supplementary services

Interaction with the ISDN supplementary services defined in the I.250-Series Recommendations is described in this clause. The GVNS interactions for some of these supplementary services are defined below. Interactions with the remaining supplementary services are for further study.

A description of the interaction with PSTN supplementary services is not possible as there are no descriptions that have been standardized on an international basis.

A list of possible supplementary telephone services is contained in Supplement No. 1 of the CCITT *Blue Book*, Fascicle II.2.

## 6.1 Number related supplementary services

### 6.1.1 Calling Line Identification Presentation

No customer-defined number will be provided to an off-net location.

If a GVNS call is made to an off-net location (including to a virtual on-net location), the calling line identity is the public number. If no public number is available, the calling line identity will not be provided to the called user. If the call is forwarded to an on-net location, the customer-defined number is provided unless the customer specifies a public number.

If a GVNS call is made to an on-net location, the calling line identity is the customer-defined number; however, if a public number is provided by the caller, the calling line identity is the public number. If the call is forwarded to another on-net location, the same calling line identity treatment is provided.

### 6.1.2 Calling Line Identification Restriction

No impact.

### 6.1.3 Connected Line Identification Presentation

No customer-defined number will be provided to an off-net location.

If a GVNS call is made to a public number, the connected line identity is the public number. If the call is forwarded to another public number, that public number will be the connected line identity. If the call is forwarded to an on-net or virtual on-net location, the connected line identity is the customer-defined number of that location; however, if a public number is provided by the connecting user, the connected line identity is the public number.

If a GVNS call is made to an on-net location or virtual on-net location, the connected line identity is the customer-defined number of that location; however, if a public number is provided by the connecting user, the connected line identity is the public number. If the call is forwarded to another on-net location, the connected line identity is the customer-defined number of that location; if the call is forwarded to a public number, the connected line identity is the public number of that location.

### 6.1.4 Connected Line Identification Restriction

No impact.

### 6.1.5 Sub-addressing

No impact. Subaddressing can be employed as an addition to the GVNS defined number.

## 6.2 Community of interest supplementary services

### 6.2.1 Support of Private Numbering Plans

It is possible for the GVNS Customer to assign private numbers for all of their calling needs. Additional aspects are for further study.

## 6.3 Charging supplementary services

### 6.3.1 Telecommunications Charge Card Service

It may be possible to make GVNS calls using a charge card. Additional aspects are for further study.

## 6.4 Other supplementary services

### 6.4.1 User-to-User Signalling

No impact.

# 7 SDL diagrams

Figures 2 and 3 specify the dynamic description of GVNS Stage 1 using graphic means.

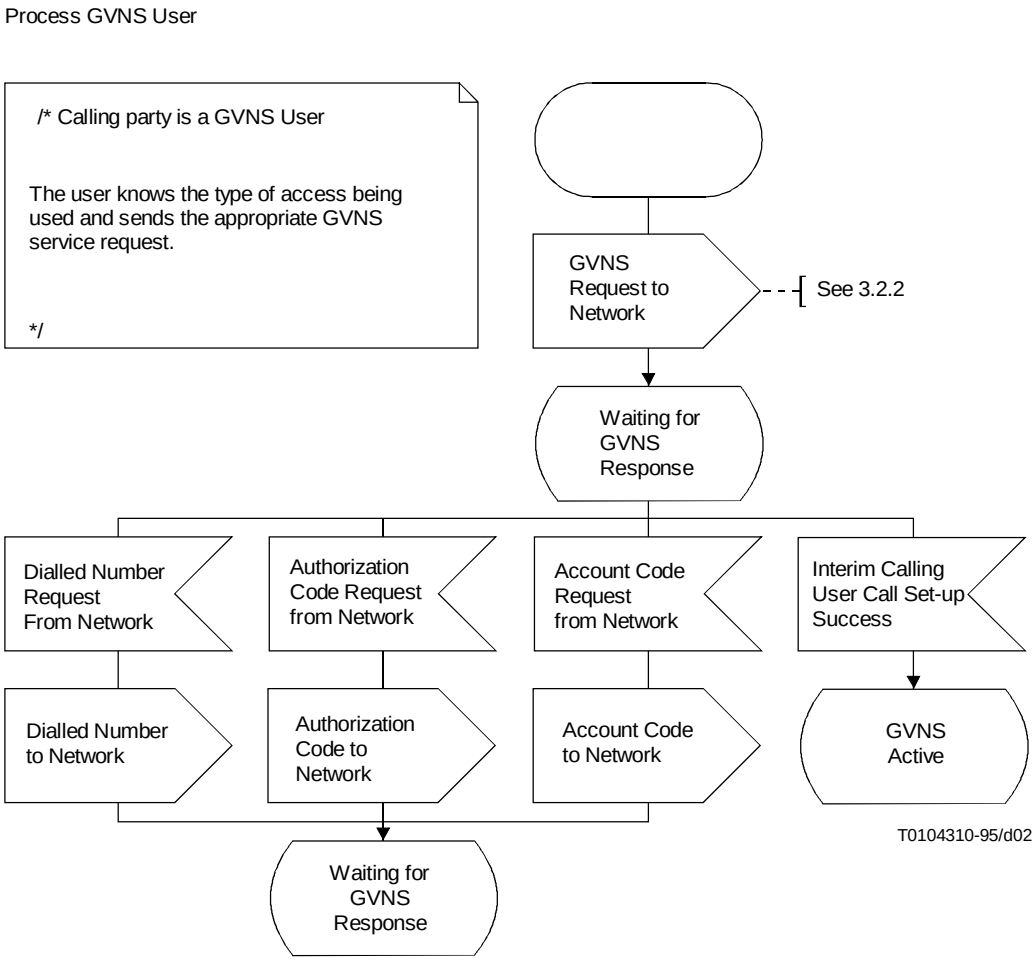



FIGURE 2/F.16 (sheet 1 of 2)

**SDL diagram for user's view of GVNS**

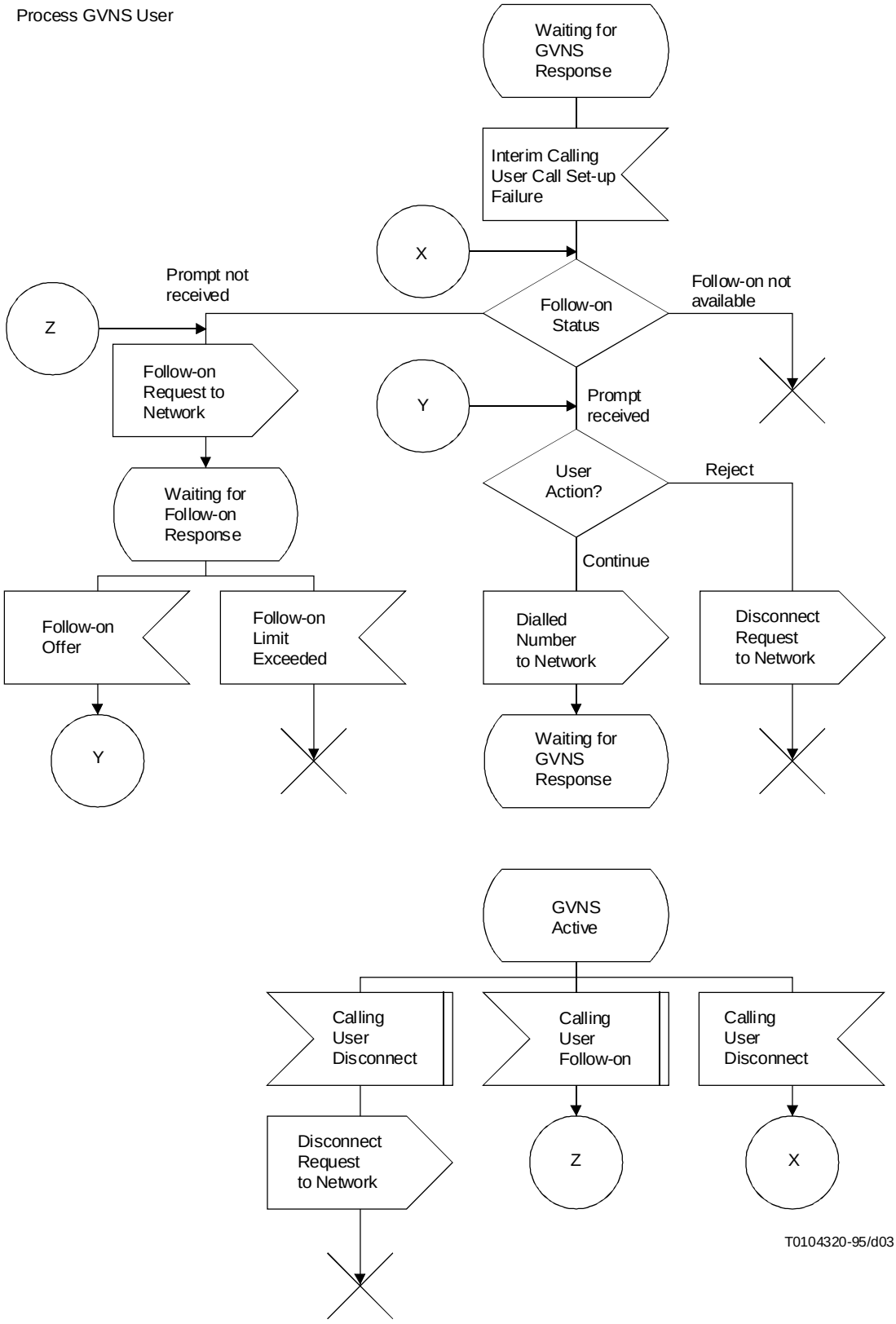



FIGURE 2/F.16 (sheet 2 of 2)

**SDL diagram for user's view of GVNS**

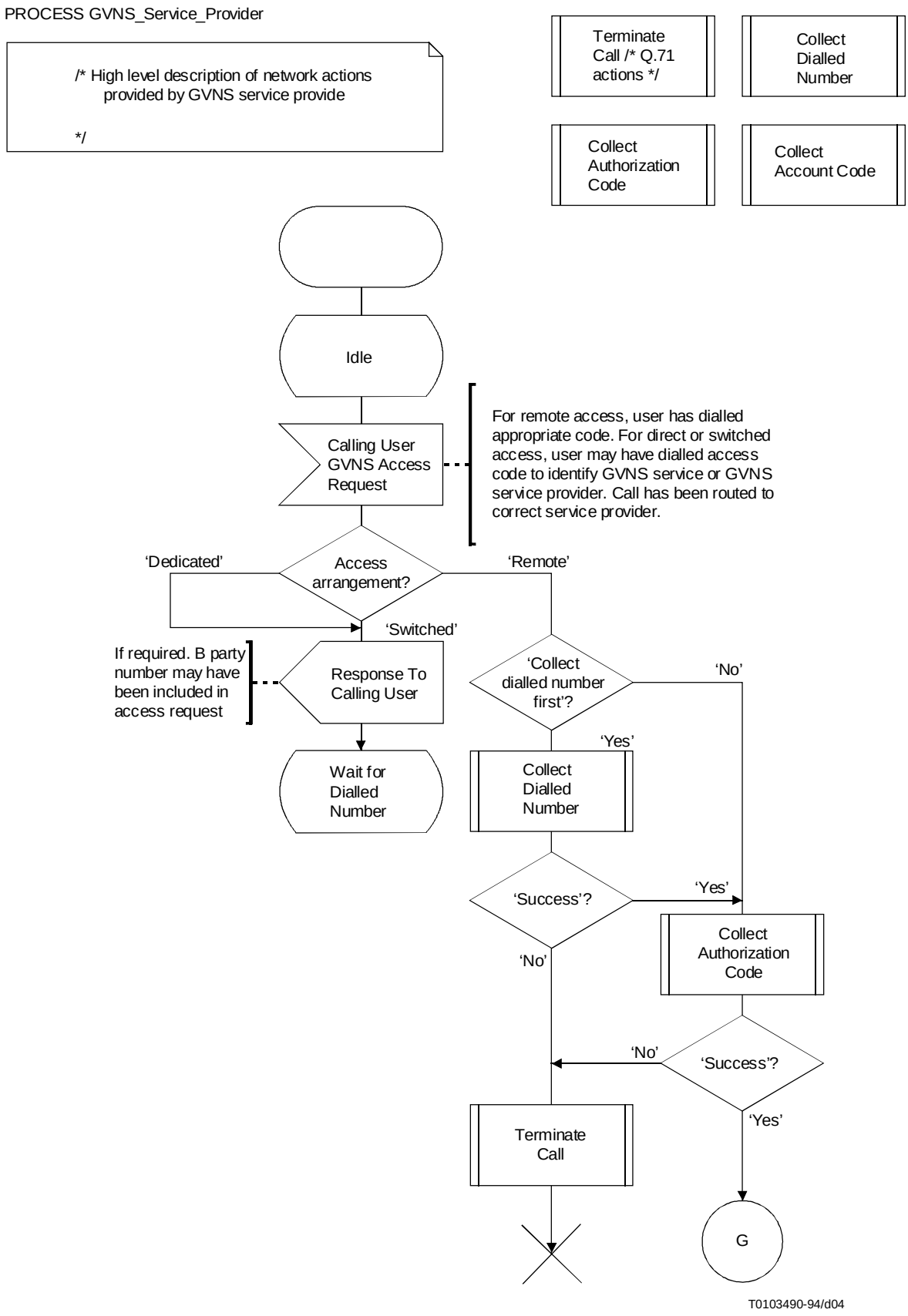



FIGURE 3/F.16 (sheet 1 of 7)

**SDL diagram for GVNS service provider's view of GVNS**

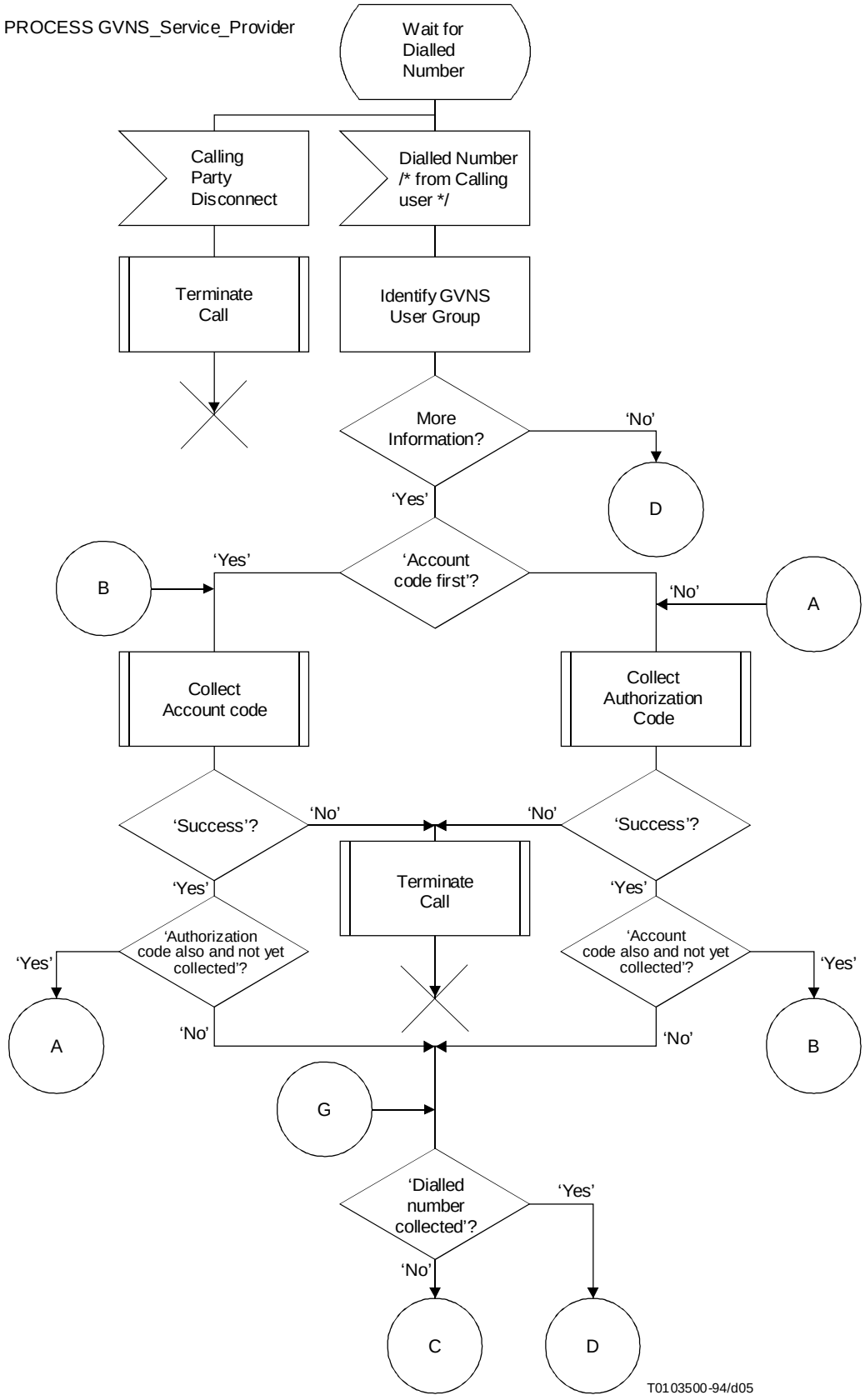



FIGURE 3/F.16 (sheet 2 of 7)

**SDL diagram for GVNS service provider's view of GVNS**

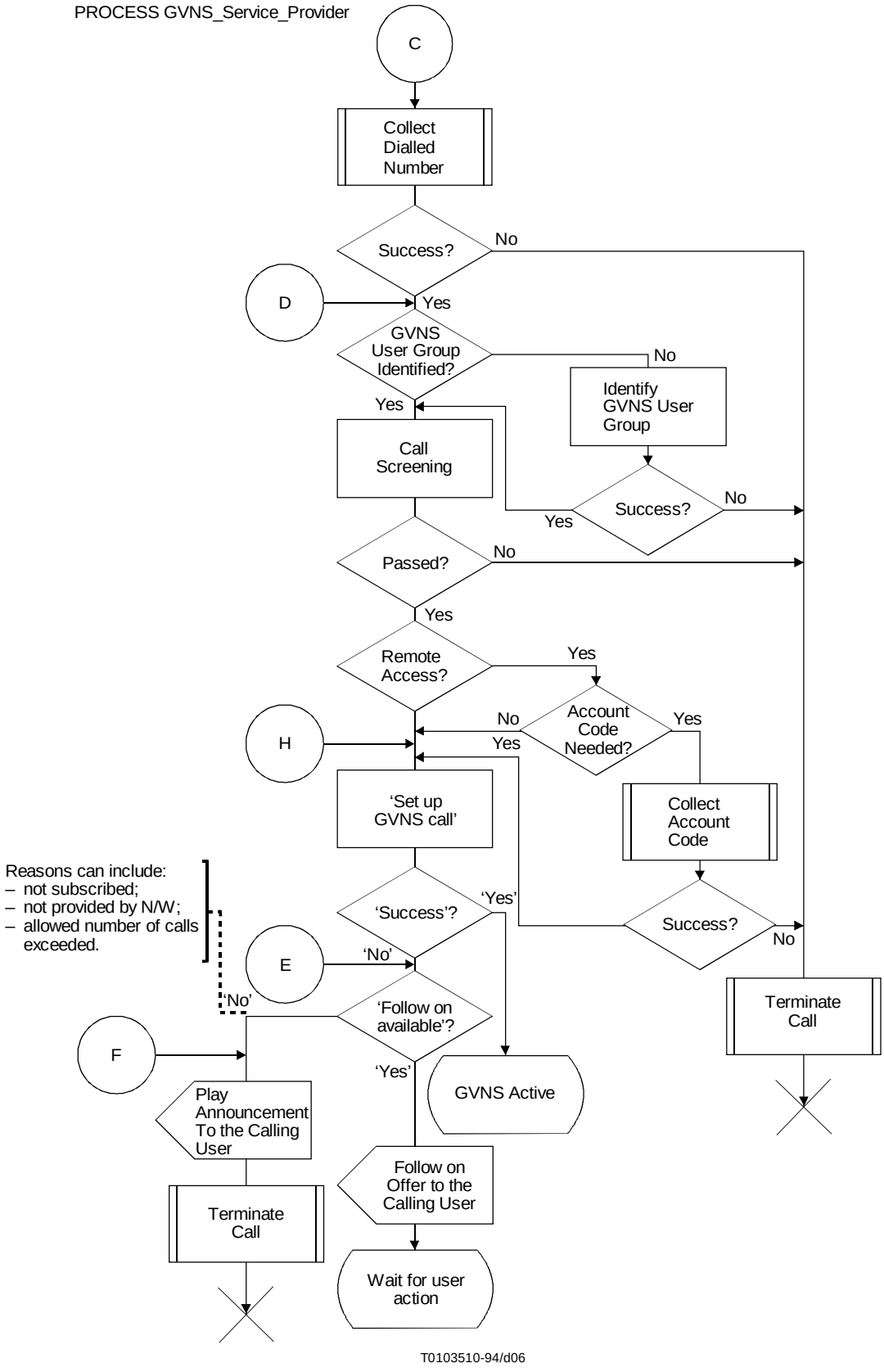



FIGURE 3/F.16 (sheet 3 of 7)

**SDL diagram for GVNS service provider's view of GVNS**

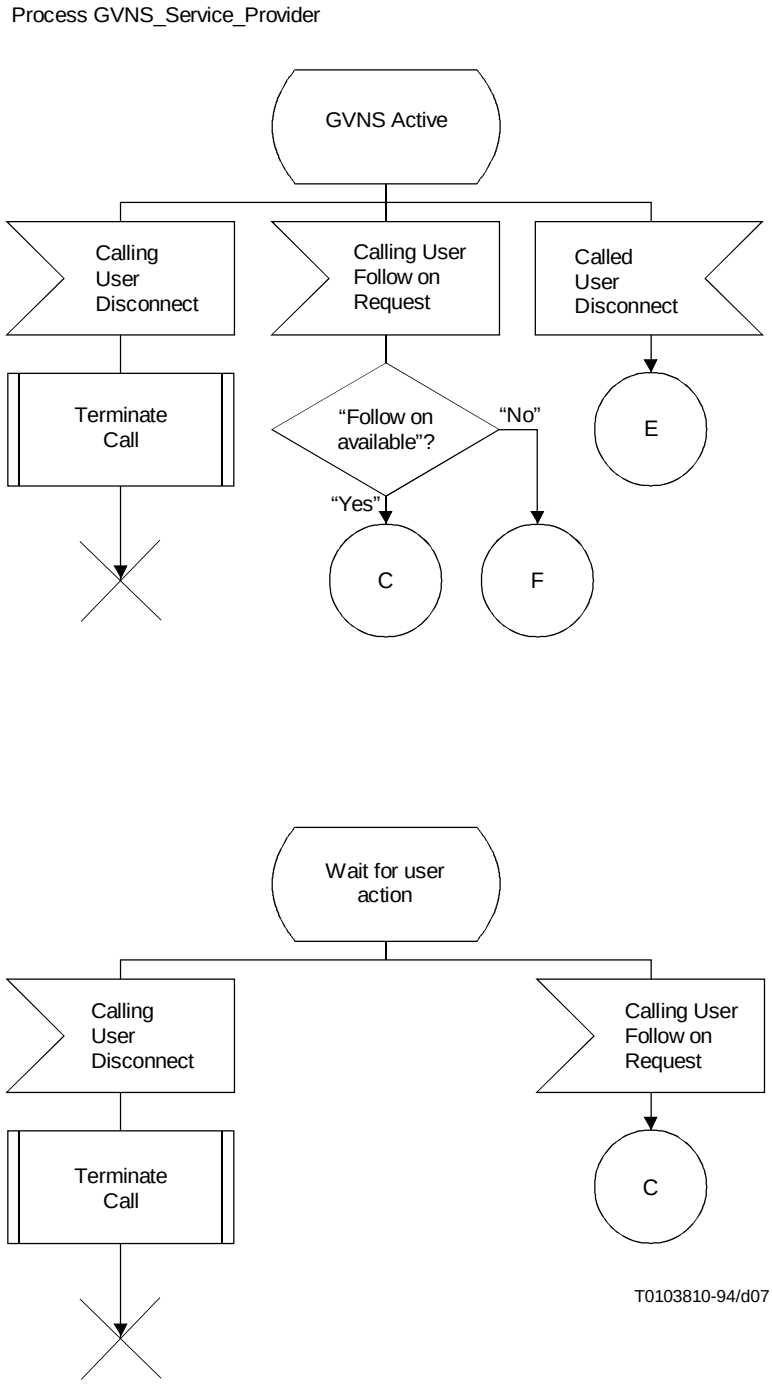



FIGURE 3/F.16 (sheet 4 of 7)

**SDL diagram for GVNS service provider's view of GVNS**

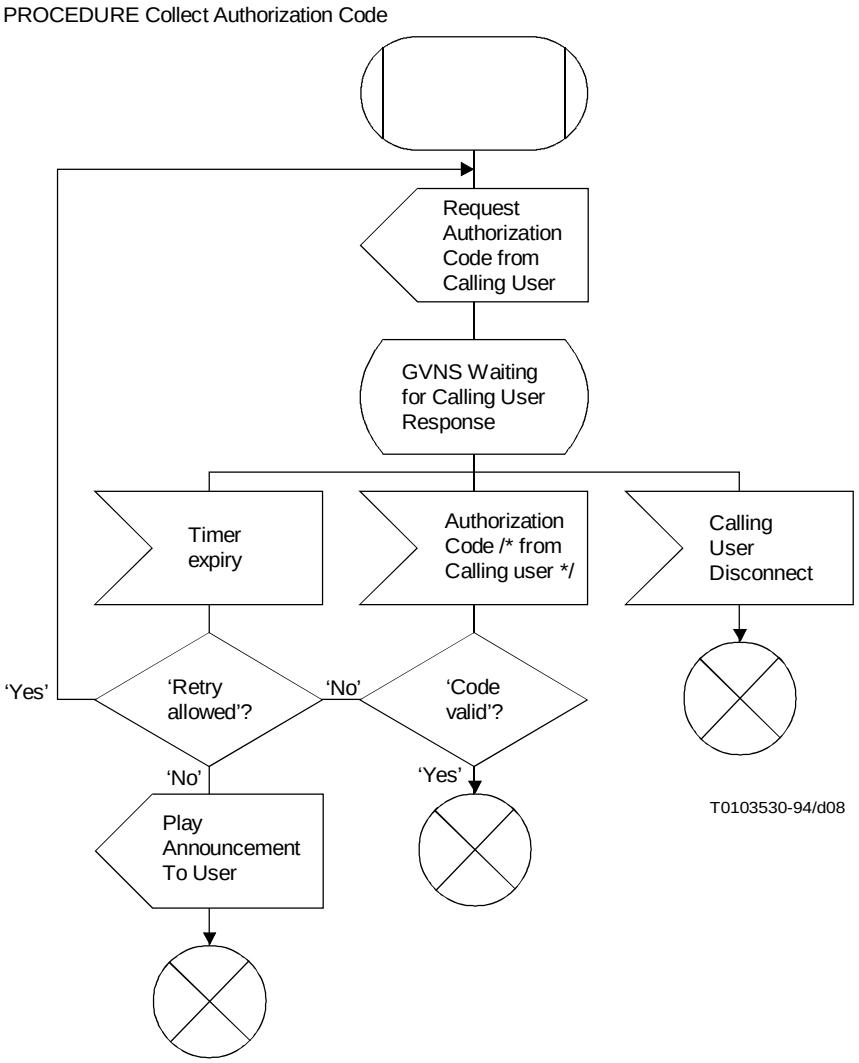



FIGURE 3/F.16 (sheet 5 of 7)

**SDL diagram for GVNS service provider's view of GVNS**

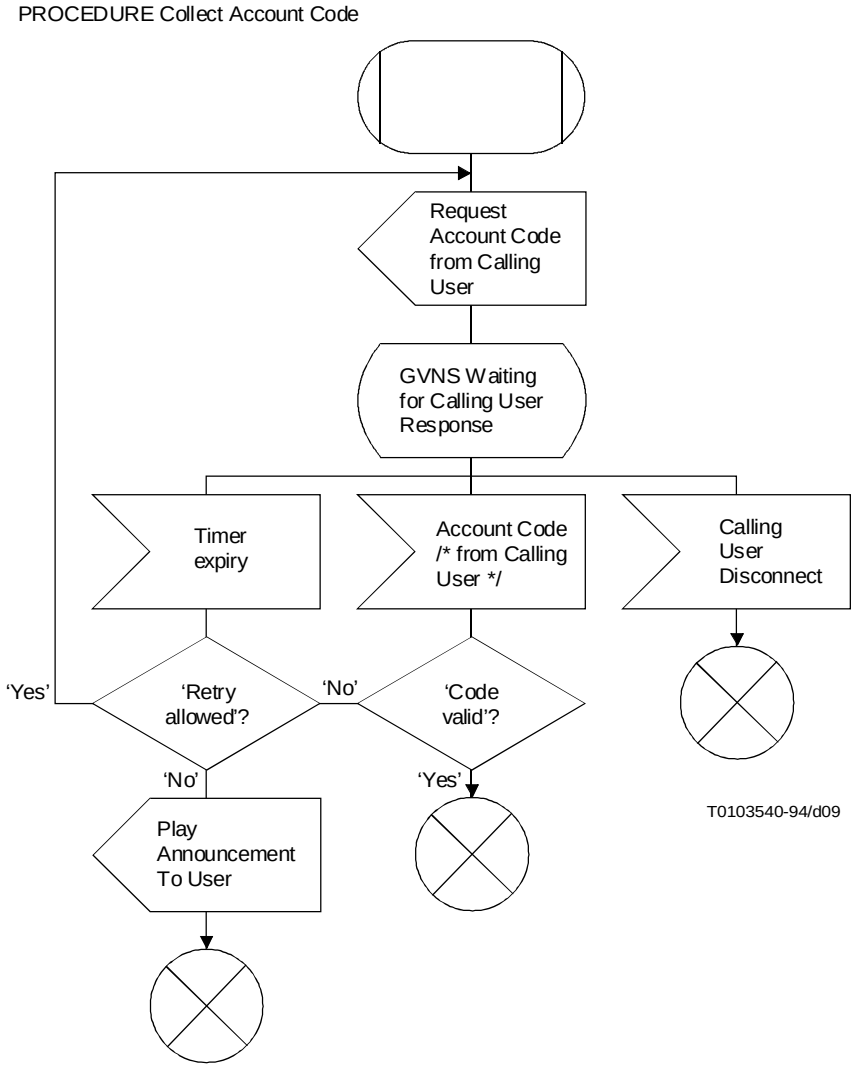



FIGURE 3/F.16 (sheet 6 of 7)

**SDL diagram-for GVNS service provider's view of GVNS**

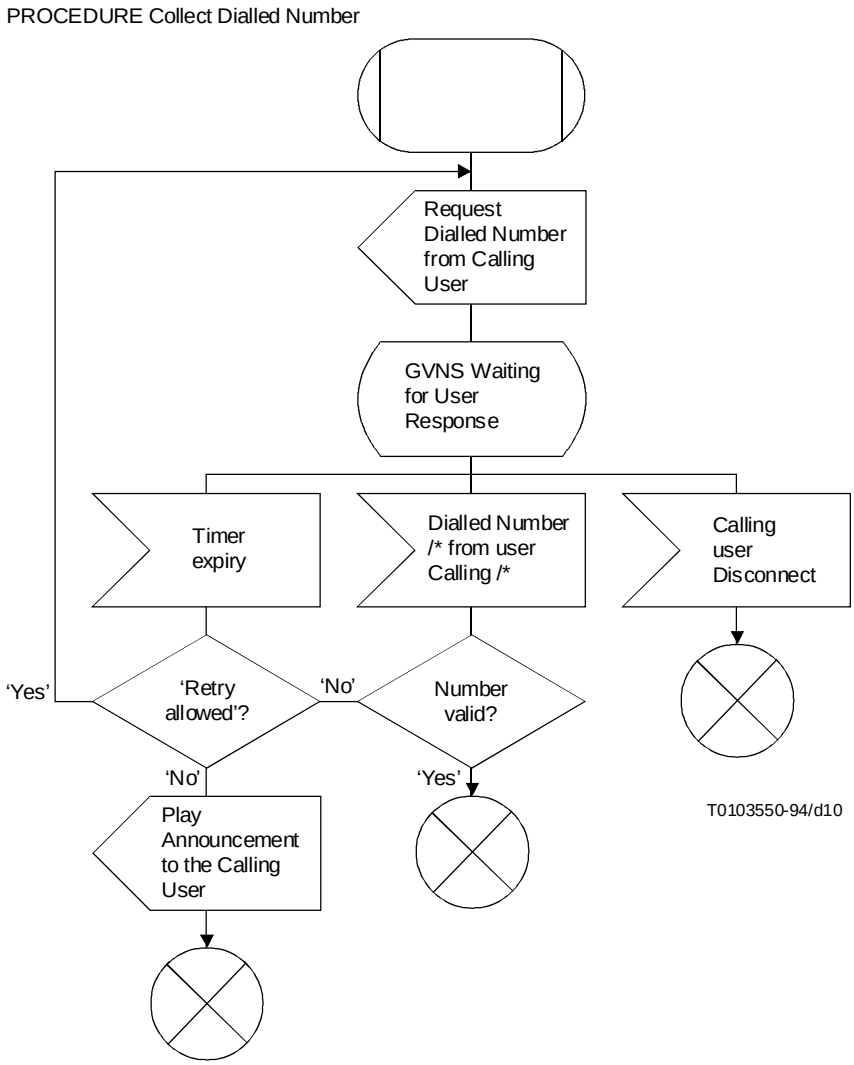



FIGURE 3/F.16 (sheet 7 of 7)

**SDL diagram for GVNS service provider's view of GVNS**