INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

Q.1214

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(10/95)

INTELLIGENT NETWORK

DISTRIBUTED FUNCTIONAL PLANE FOR INTELLIGENT NETWORK CS-1

ITU-T Recommendation Q.1214

(Previously “CCITT Recommendation”)

FOREWORD

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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 Q.1214 was revised by ITU-T Study Group 11 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 17th of October 1995.

NOTE

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

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SUMMARY

This Recommendation defines the Intelligent Network (IN) Distributed Functional Plane (DFP) architecture for IN capability set 1 (IN CS-1). It does define the IN DFP for IN CS-1 based on the general framework for IN DFP studies provided in Recommendation Q.1204, consistent with the scope of IN CS-1 defined in Recommendation Q.1211.

This Recommendation provides:

- the IN DFP architecture for IN CS-1, in terms of a subset of the general IN DFP architecture encompassing only the functional entities related to IN service execution;
- static and dynamic models of the functional entities related to IN service execution (including service switching/call control, service control, specialized resource, and service data functions), to define how IN service control interacts with basic call processing and to understand the nature of the functional entity relationships required for IN CS-1;
- SIB stage 2 descriptions to identify information flows and functional entity actions for IN CS-1;
- detailed information flow descriptions, including information elements and functional descriptions, as the basis for specifying IN protocols;
- a starting point for the study of call party handling capabilities beyond two-party call set-up and clearing.

This Recommendation forms a useful basis for gaining implementation experience with the IN DFP. As with any project of this size and complexity, it can be anticipated that there may be difficulties in interworking the various implementations of physical elements based on IN CS-1 DFP functionality. To achieve the IN objective of a multi-vendor environment, this Recommendation may go through some future revision in the light of implementation experience.

Within the Q.1210-series Recommendations, this Recommendation describes the distribution of global functional plane functionality defined in Recommendation Q.1213 (i.e. service independent building blocks [SIBs] for IN CS-1) in a service and vendor/implementation independent manner, as constrained by the capabilities of the embedded base of evolvable network technology. This provides the flexibility to allocated distributed functionality into multiple physical network configurations, as described in Recommendation Q.1215, and to evolve IN from CS-1 to some future CS-N. It also provides a framework from which IN protocols are specified for IN CS-1, as described in Recommendation Q.1218.

DISTRIBUTED FUNCTIONAL PLANE FOR INTELLIGENT NETWORK CS-1

(Helsinki, 1993; revised at Geneva, 1995)

1 General

General aspects of the DFP are contained in clause 1/Q.1204.

2 Scope of IN distributed functional plane for capability set 1

The scope of the IN distributed functional plane (DFP) architecture for IN capability set 1 (CS-1) is driven by the service requirements of desired CS-1 services, and constrained by the capabilities of the embedded base of evolvable network technology. The scope of functionality required to support desired CS-1 services includes functionality to provide:

- end user access to call/service processing;
- service invocation and control;
- end user interaction with service control; and
- service management.

The scope of each of these aspects is addressed below.

2.1 End user access

End user access to call/service processing for CS-1 will be provided via the following access arrangements:[1)]

- analogue line interfaces;
- ISDN BRI and PRI; and
- traditional trunk and SS No. 7 interfaces.

2.2 Service invocation and control

Call/service processing for CS-1 builds upon the current call processing infrastructure of existing digital exchanges. It does so by using a generic model of existing call control functionality to process basic two-party calls, then adding service switching functionality to invoke and manage IN service logic. Once invoked, IN service logic is executed under the control of service control functionality, in conjunction with service data functionality. With this distributed approach to call/service processing, the existing call control functionality retains ultimate responsibility for the integrity of calls, as well as for the control of call processing resources. The following call/service processing constraints apply for CS-1:

a) Call control and service switching functionality are tightly coupled, thus the relationship between SSF and CCF is not standardized in CS-1.

b) A call is either between two or more end users that are external to the network and addressable via a directory number or combination of directory number and bearer capability, or a call is between one or more end users and the network itself.

[1)] This does not preclude the use of these interfaces to support access from private or mobile networks.

c) A call may be initiated by an end user, or by an SCF within the network on behalf of an end user. To supplement a call, IN service logic may either be invoked by an end user served by an IN exchange, or by the network on behalf of an end user.

d) A call may span multiple exchanges. As such, each exchange only controls the portion of the call in that exchange - call processing is functionally separated between exchanges. IN service logic invoked on IN exchanges in such an inter-exchange call are managed independently by each IN exchange.

e) Existing exchanges can be viewed as having two functionally separate sets of call processing logic that coordinate call processing activities to create and maintain a basic two-party call. This functional separation is provided between the originating portion of the call and the terminating portion of the call. This functional separation should be maintained in an IN exchange to allow IN service logic invoked on the originating portion of the call (i.e. on behalf of the calling party) to be managed independently of IN service logic invoked on the terminating portion of the call (i.e. on behalf of the called party).

f) It is desirable to allow multiple IN-supported service logic instances to be simultaneously active for a given end user. It is also recognized that non-IN service logic will continue to exist in the network. As such, service feature logic instances mechanisms for CS-1 should:

– determine which service logic to invoke for a given service request. This mechanism should select the appropriate IN-supported service logic or non-IN-supported service logic, and block the invocation of any other service logic for that particular service request;

– limit simultaneously active IN- and non-IN-supported service logic instances;

– ensure that simultaneously active IN-supported service logic instances adhere to the single-ended, single point of control restriction on CS-1 service processing.

g) The distributed approach and added complexity of call/service processing for CS-1 requires mechanisms for fault detection and recovery, allowing graceful termination of calls and appropriate treatments for end users.

2.3 End user interaction

End user interaction with the network to send and receive information is provided by service switching and call control resources, augmented by specialized resources. These specialized resources are controlled by service control functionality, and are connected to end users via call control and service switching functionality.

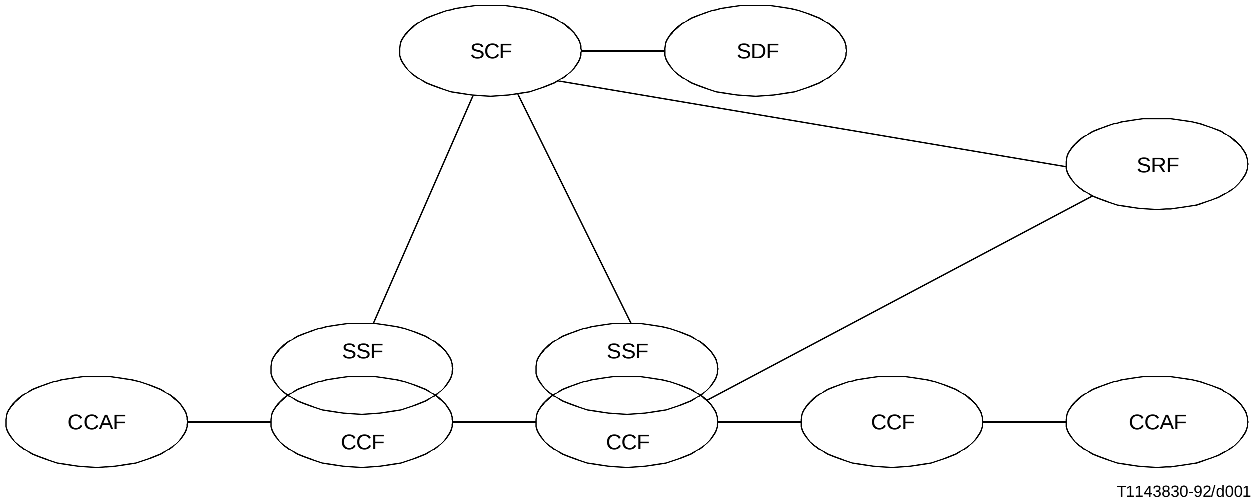
2.4 Service management

Service management functionality is used to provision and manage the service control functionality, service data functionality, and specialized resource functionality in the network, outside of the context of call/service processing. Standardized interfaces for this functionality are outside the scope of CS-1. However, the ability of a service subscriber to interact directly with subscriber-specific service management information will not be excluded or constrained for CS-1.

3 Distributed functional model for CS-1

3.1 Explanation of diagram

Figure 3-1 identifies the IN DFP model for CS-1. This diagram depicts the functional entities and relationships applicable to CS-1. This diagram is a subset of the generic IN DFP model described in clause 2/Q.1204. A general explanation of functional entities, relationships, and the diagram are contained in 2.1/Q.1204.



CCAF Call Control Agent Function
CCF Call Control Function
SCF Service Control Function
SDF Service Data Function
SRF Specialized Resource Function
SSF Service Switching Function

NOTES

1 The two SSF/CCF have identical functionality and are only shown for some procedures like assist.

2 The definition of CCAF and CCF are based on corresponding Q.71 ISDN definitions, but may be modified for use in IN.

FIGURE 3-1/Q.1214

IN distributed functional plane model for CS-1

3.2 IN functional model

As stated in 3.1, the IN DFP for CS-1 is a subset of the general IN-DFP. In particular:

– only the CCAF, CCF, SSF, SCF, SDF, and SRF functional entities are included;

– SCF-SCF and SDF-SDF relationships are not addressed;

– only the relationships related to IN service execution are addressed, as shown in the diagram;

– service management and administration aspects of each functional entity are implied, but not specifically addressed in CS-1. No attempt has been made in CS-1 to limit an individual Administration's implementation of the service management functionality associated with the functional entities.

3.3 Definition of functional entities related to IN service execution

3.3.1 CCA function (CCAF): The CCAF is the Call Control Agent (CCA) function that provides access for users. It *is* the interface between user and network call control functions. It:

a) provides for user access, interacting with the user to establish, maintain, modify and release, as required, a call or instance of service;

b) accesses the service-providing capabilities of the Call Control Function (CCF), using service requests (e.g. setup, transfer, hold, etc.) for the establishment, manipulation and release of a call or instance of service;

c) receives indications relating to the call or service from the CCF and relays them to the user as required;

d) maintains call/service state information as perceived by this functional entity.

3.3.2 CC function (CCF): The CCF is the Call Control (CC) function in the network that provides call/service processing and control. It:

a) establishes, manipulates and releases call/connection as "requested" by the CCAF;

b) provides the capability to associate and relate CCAF functional entities that are involved in a particular call and/or connection instance (that may be due to SSF requests);

c) manages the relationship between CCAF functional entities involved in a call (e.g. supervises the overall perspective of the call and/or connection instance);

d) provides trigger mechanisms to access IN functionality (e.g. passes events to the SSF).

3.3.3 SS function (SSF): The SSF is the Service Switching (SS) function, which, associated with the CCF, provides the set of functions required for interaction between the CCF and a service control function (SCF). It:

a) extends the logic of the CCF to include recognition of service control triggers and to interact with the SCF;

b) manages signalling between the CCF and the SCF;

c) modifies call/connection processing functions (in the CCF) as required to process requests for IN provided service usage under the control of the SCF.

3.3.4 SC function (SCF): The SCF is a function that commands call control functions in the processing of IN provided and/or custom service requests. The SCF may interact with other functional entities to access additional logic or to obtain information (service or user data) required to process a call/service logic instance. It:

a) interfaces and interacts with service switching function/call control function, Specialized Resource function (SRF) and Service Data Function (SDF) functional entities;

b) contains the logic and processing capability required to handle IN provided service attempts.

3.3.5 SD function (SDF): The SDF contains customer and network data for real-time access by the SCF in the execution of an IN provided service. It interfaces and interacts with SCFs as required.

NOTE – The SDF contains data relating directly to the provision or operation of IN provided services. Thus it does not necessarily encompass data provided by third party such as credit information, but may provide access to these data.

3.3.6 SR function (SRF): The SRF provides the specialized resources required for the execution of IN provided services (e.g. digit receivers, announcements, conference bridges, etc.). It:

a) interfaces and interacts with SCF and SSF (and with the CCF);

b) may contain the logic and processing capability to receive/send and convert information received from users;

c) may contain functionality similar to the CCF to manage bearer connections to the specialized resources.

4 Functional entity call/service logic processing models

4.1 Overview

IN call/service logic processing encompasses call and connection processing in the SSF/CCF, service logic execution in the SCF, and the use of supporting resources and data in the SRF and SDF, respectively. This subclause describes this IN call/service logic processing in terms of call modelling and modelling of service logic processing.

- Call modelling provides a high-level service and vendor/implementation independent abstraction of IN call and connection processing in the SSF and CCF. This abstraction provides an observable view of SSF/CCF activities and resources to the SCF, enabling the SCF to interact with the SSF in the course of executing service logic.

- The modelling of service logic processing provides an abstraction of SCF activities and resources needed to support this service logic execution, as well as an abstraction of SRF and SDF activities and resources accessible to the SCF.

Since this modelling only provides an observable (i.e. external) view of SSF/CCF, SCF, SRF, and SDF activities and resources, this modelling does not imply an obligation to vendors to implement functional entities into products as a one-to-one mapping of functional entity model components.

The modelling in this subclause is based on the modelling objectives, assumptions, and architecture described in clause 3/Q.1204, and makes use of the tools identified in its annexes, as applicable to IN CS-1.

4.2 SSF/CCF model

4.2.1 General

A model of the SSF/CCF is shown in Figures 4-1 a) and 4-1 b). Figure 4-1 a) shows the SSF/CCF model for a single-ended service logic instance related to a calling or called party. Figure 4-1 b) shows the SSF/CCF model for separate single-ended service logic instances related to the calling and called parties on the same call. The purpose of this model is to provide a framework for call modelling subjects with respect to the SSF/CCF.

The aspects of the SSF/CCF model briefly described below include the Basic Call Manager (BCM), the IN Switching Manager (IN-SM), the Feature Interactions Manager (FIM)/Call Manager (CM) the relationship of the BCM to the IN-SM, the relationship of the BCM and IN-SM to the FIM/CM, and the functional separation provided in the SSF/CCF. Additional detail is provided in subsequent subclauses.

a) *BCM* – The BCM is not a functional entity. It provides an abstraction of a part of a switch that implements basic call and connection control to establish communication paths for users and to interconnect such communication paths. It detects basic call and connection control events that can lead to the invocation of IN service logic instances or should be reported to active IN service logic instances, and manages CCF/SSF resources required to support basic call and connection control.

   The BCM also implements the BCSM and the DP processing.

   The DP processing is the entity of the BCM that interacts with the FIM/CM as described in the FIM/CM description below.

b) *IN-SM* – The entity in the SSF that interacts with the SCF in the course of providing IN service features to users. It provides the SCF with an observable view of SSF/CCF call/connection processing activities, and provides the SCF with access to SSF/CCF capabilities and resources. It also detects IN call/connection processing events that should be reported to active IN service logic instances, and manages SSF resources required to support IN service logic instances. The IN-SM interacts with the FIM/CM as described below.

c) *FIM/CM* – The entity in the SSF that provides mechanisms to support multiple concurrent instances of IN service logic instances and non-IN service logic instances on a single call. In particular, the FIM/CM can prevent multiple instances of IN and non-IN service logic instances from being invoked. The ability of the FIM/CM to arbitrate between multiple instances of IN and non-IN service logic instances is for further study. The FIM/CM integrates these interactions mechanisms with the BCM and IN-SM [see e) below] to provide the SSF with a unified view of call/service processing internal to the SSF for a single call.

d) *BCM relationship to IN-SM* – The relationship that encompasses the interaction between the BCM and the IN-SM, through the FIM/CM. The information flow related to this interaction is not externally visible and is not standardized for IN CS-1. However, an understanding of this subject is required to identify how basic call and connection processing and IN call/connection processing may interact.

e) *BCM and IN-SM relationships to FIM/CM* – The relationships that encompass the interaction between the BCM and the FIM/CM, and the IN-SM and the FIM/CM. The information flows related to these interactions are not externally visible and are not standardized for IN CS-1. However, an understanding of this subject is required in order to unify the BCM, IN-SM and FIM/CM.

f) *Functional separation in the SSF/CCF* [Figure 4-1 b)] – The functional separation of processes and resources in the SSF/CCF that provides a means of handling service logic instance interactions for IN CS-1. This functional separation serves to isolate single-ended service logic instances related to the calling party from single-ended service logic instances related to the called party for the same call. Within the scope of IN CS-1, there is no functionality in the SSF for handling service feature interactions between the separate SSF calling party processes and SSF called party processes.

Other aspects shown in Figure 4-1 are not addressed for IN CS-1, but are assumed to exist.

4.2.2 Basic Call Manager (BCM)

A brief description of the BCM is provided in 4.2.1. The particular BCM subjects addressed below include the Basic Call State Model (BCSM), basic call and connection events that can lead to the invocation of IN service logic instances, and basic call and connection events that should be reported to active IN service logic instances. A high-level description of these subjects is provided below.

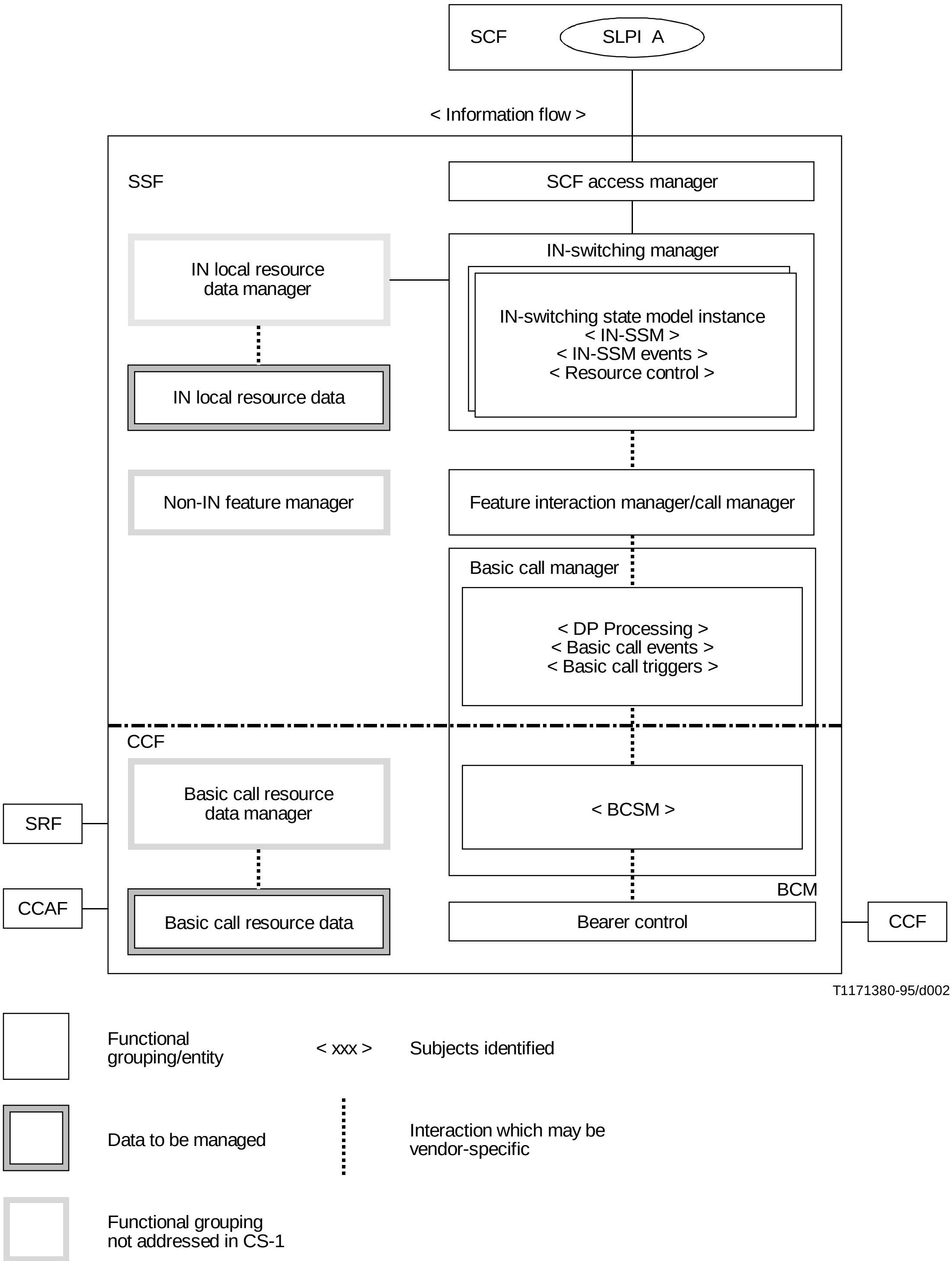
4.2.2.1 BCSM

In this Recommendation, the BCSM provides a high-level model of CCF activities required to establish and maintain communication paths for users. As such, it identifies a set of basic call and connection activities in a CCF and shows how these activities are joined together to process a basic call and connection (i.e. establish and maintain a communication path for a user).

Many aspects of the BCSM are not externally visible to IN service logic instances. However, aspects of the BCSM that are reflected upward to the IN-FM and FIM/CM are visible to IN service logic instances. Only these aspects of the BCSM will be the subject of standardization. As such, the BCSM is primarily an explanatory tool for providing a representation of CCF activities that can be analysed to determine which aspects of the BCSM will be visible to IN service logic instances, if any, and what level of abstraction and granularity is appropriate for this visibility.

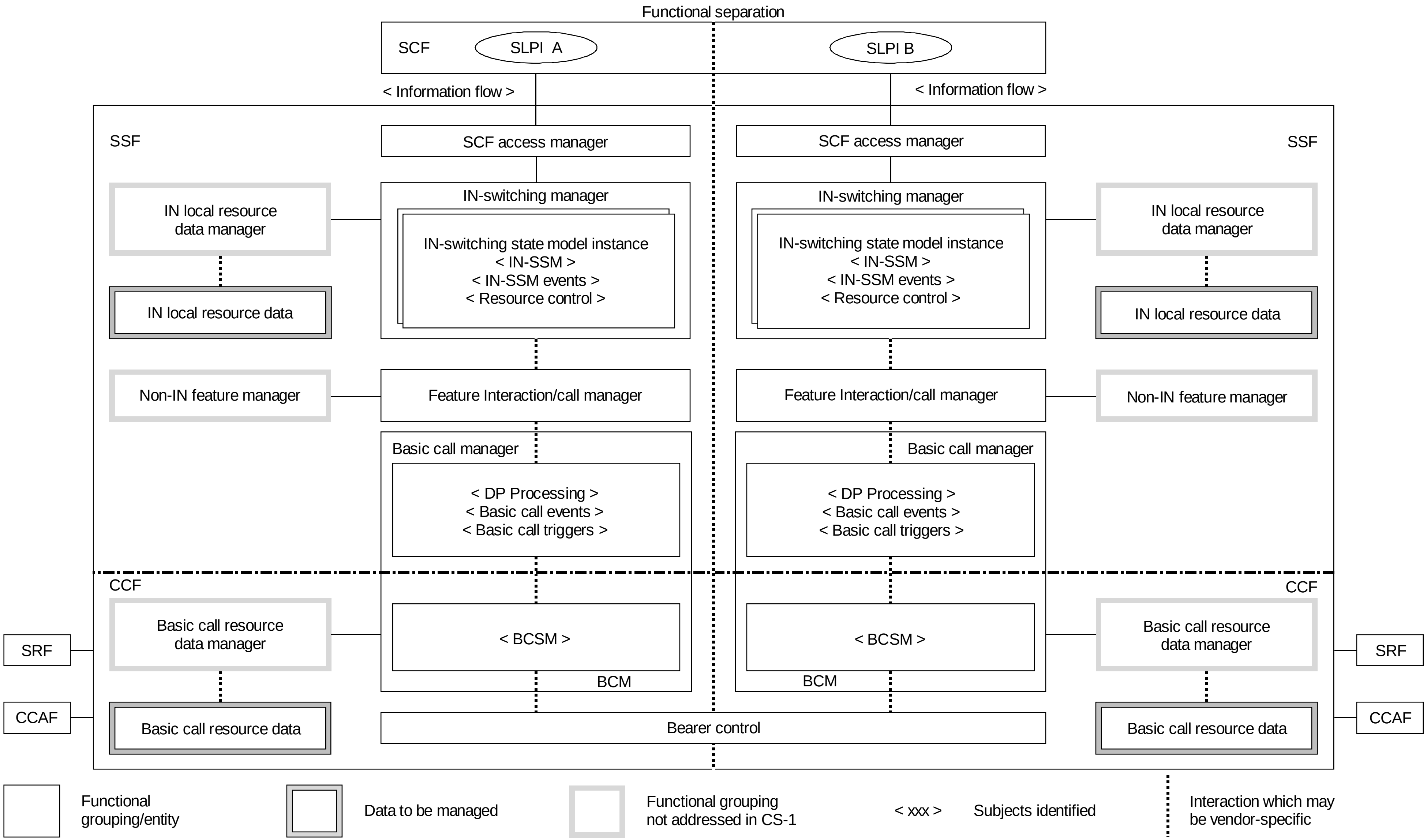
The BCSM identifies points in basic call and connection processing when IN service logic instances are permitted to interact with basic call and connection control capabilities. In particular, it provides a framework for describing basic call and connection events that can lead to the invocation of IN service logic instances or should be reported to active IN service logic instances, for describing those points in call and connection processing at which these events are detected, and for describing those points in call and connection processing when the transfer of control can occur.

Figure 4-2 shows the components that have been identified to describe a BCSM, to include: Points In Call (PICs), Detection Points (DPs), transitions, and events. PICs identify CCF activities associated with one or more basic call/connection states of interest to IN service logic instances. DPs indicate points in basic call and connection processing at which transfer of control can occur. Transitions indicate the normal flow of basic call/connection processing from, for example, one PIC to another. Events cause transitions into and out of PICs.



a) SSF/CCF model – Single-ended SLPI related to calling or called party

FIGURE 4-1/Q.1214



b) SSF/CCF model – Separate single-ended SLPIs related to calling and called parties

FIGURE 4-1/Q.1214

The BCSM for IN CS-1 should model existing switch processing of basic two-party calls, and should reflect the functional separation between the originating and terminating portions of calls reflected in Figure 4-1. In addition, though CCAF functionality is not explicitly modelled in the BCSM, a mapping is required between access signalling events and BCSM events, for each access arrangement supported by IN CS-1.

Since the BCSM is generic, it may describe events that do not apply to certain access arrangements. It is important to understand and describe how each access arrangement applies to the BCSM.

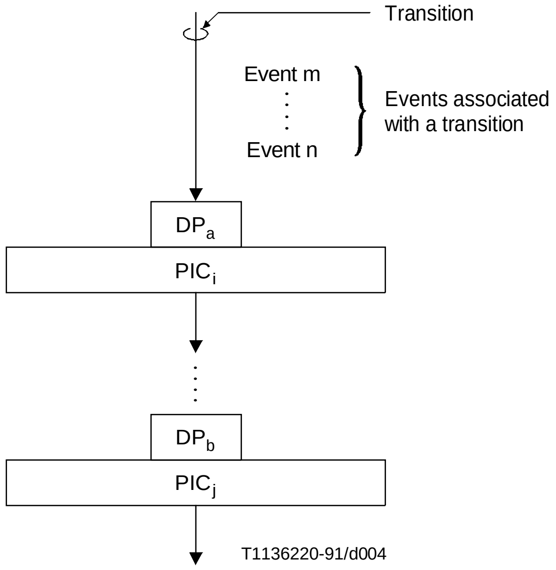


FIGURE 4-2/Q.1214

BCSM components

4.2.2.2 IN CS-1 BCSM description

The BCSM for IN CS-1 described in this subclause is based on the overall BCSM in Annex A/Q.1204, refined as applicable to IN CS-1.

It reflects the functional separation between the originating and terminating portions of calls as illustrated in Figures 4-3 and 4-4. These figures show an originating half BCSM and a terminating half BCSM, each of which is managed by a functionally separate BCM in the SSF/CCF. The description is a starting point to identify the aspects of the BCSM that are visible to IN service logic instances, and the nature of the information flows between the SSF/CCF and SCF (see clause 6).

In the following descriptions, the PICs are related at a high level to Q.931 ISDN call states. This is not intended to be a detailed formal definition of the relation between the PICs and Q.931 ISDN call states, but is intended as a point of reference to use in understanding the PICs. In particular, there are a number of possible ways in which the Q.931 call states may be traversed in certain situations which are not considered below.

To enable independence between services offered during one call session when the PICs may be traversed several times, it is necessary – at each PIC – to maintain available a specific set of data until the calling (controlling) user releases and to ensure that software resources are returned to a coherent status when call processing passes through the PICs.

For each PIC, an initial list of BCSM information that must be maintained, if available, is given. Information that is available at all PICs is given at the beginning of the O- and T-BCSM descriptions.

The information that is sent to the SCF at a given trigger detection point is a subset of the information described here. Other information may be available at a given PIC that is not used by processing at the PIC or is only used by underlying call processing. Other information that may be sent to the SCF in support of future services is for further study.

In order to maintain uniqueness of DP names between the originating and terminating half BCSMs, "O" and "T" is prefixed to certain originating and terminating DP names, respectively.

For ease of reference, the DPs associated with the transition implied by each entry and exit event for each PIC are listed along with the PIC descriptions. When in PIC processing an exit event is detected, it is for further study.

4.2.2.2.1 Originating BCSM for IN CS-1

The originating half of the BCSM corresponds to that portion of the BCSM associated with the originating party (see Figure 4-3).

The following information is available at all PICs in the O-BCSM:

- Service Address Information – see Recommendation Q.1290.
- Calling Party Category – see Q.762 Calling Party Category signalling information.
- SRF/SSF capabilities – see Recommendation Q.1290. Used to decide if an assist of hand-off procedure is to be used.
- Call Gapping Encountered – see Recommendation Q.1290.
- Terminal Type – see Recommendation Q.1290. The SCF uses this to determine the most appropriate form of user-interaction to use (e.g. in-band announcements). This information is only available at originating or terminating local exchanges.
- Location Number – see Q.762 Location Number signalling information. Used if the calling party is a mobile subscriber.
- ISDN Access Related Information – see Q.762 Access Transport Parameter.

The description for each of the PICs in the originating half of the BCSM are described below:

1) O_Null & Authorize_Origination_Attempt

Entry event – Disconnect and clearing of a previous call (DPs 9 – O_Disconnect and 10 – O_Abandon), or default handling of exceptions by SSF/CCF completed.

Functions

- Interface (line/trunk) is idled (no call exists, no call reference exists, etc.). Supervision is being provided.
- Given an indication from an originating party of a desire to place an outgoing call (e.g. off-hook, Q.931 set-up message, ISDN-UP IAM message), the authority/ability of the party to place the call with given properties (e.g. bearer capability, line restrictions) is verified. The types of authorization to be performed may vary for different types of originating resources (e.g. for lines vs. trunks).

Information available – After detecting the Origination Attempt event, it is assumed that the SSF/CCF has the following information available associated with the originating call portion, with restrictions as noted. If the SSF/CCF determines that the origination is denied, the cause of the failed authorization is also known.

- Bearer Capability – see Q.762 User Service Information and Q.931 Bearer Capability information element.
- Calling Party Number – see Q.762 Calling Party Number signalling information. This information is available at the SSF/CCF for a non-lSDN line and may be available for SS7 trunks, but is not available from trunks supported by conventional signalling or private-facility trunks. For an **[Agreed Sept. 1994]** DSS 1 interface, this is determined by the information provided in the SETUP message or by the default number assigned to the caller (see ISDN SETUP information below).

– SRF available – see Recommendation Q.1290.

– Service Profile Identifier (SPID) – see Annex A/Q.932. This information may be available at the SSF/CCF if the calling party is served by a BRI interface on this SSF/CCF.

– Called Party Number – see Q.762 Called Party Number signalling information. Used to identify the called party in the forward direction. Available only for trunks or ISDN lines.

– Charge Number – see Recommendation Q.1290. This information is available at the SSF/CCF for a non-lSDN line or DSS 1 interface served by the SSF/CCF and may be available for trunks supported by SS7, but is not available for trunks supported by conventional signalling or private-facility trunks.

– Class of Service – see Recommendation Q.1290.

– Calling Party Business Group ID (BGID) – see Q.1290 Business Group ID. This information is available for a non-lSDN line, ISDN 1 interface, private-facility trunk group, or possibly an SS7 trunk when the caller is a member of a Business Group.

– Calling Facility Group – see Recommendation Q.1290. Available on conventional or SS7 trunks.

– Calling Facility Group Member – see Recommendation Q.1290. Available on conventional or SS7 trunks.

– Travelling Class Mark – see Recommendation Q.1290.

– Feature Code – see Q.762 Feature Code Signalling Information where this parameter is defined for national use only. Available, if used, for a party served by an ISDN interface using *en bloc* sending or for an SS7 trunk.

– Access Code – see Recommendation Q.1290. Available, if used, for a party served by an ISDN interface using *en bloc* sending.

– Operator Services Information – see Recommendation Q.1290. This information element is not included in a SETUP message containing the keypad information element.

– ISDN SETUP feature-related information – see Recommendation Q.931. The SSF/CCF receives a SETUP message from a DSS 1 interface and this SETUP message can contain the following information:

  • Bearer Capability – see Q.931 Bearer Capability information element.

  • Progress Indicator – see Q.931 Progress Indicator information element.

  • Keypad Facility – see Q.931 Keypad Facility information element. This information element is not expected in a SETUP message also containing the called party number, called party number subaddress, transit network selection, or Operator Services Information information elements.

  • Feature activation – see Q.932 Feature Activation information element.

  • Calling party number - see Q.931 Calling Party Number information element.

  • Called party number – see Q.931 Called Party Number information element.

    The called party number information element is sent when *en bloc* sending is used and the keypad information element is not present. When the type of number and numbering plan identification field within the called party number information element is set to “unknown,” the SSF/CCF treats the string as if it has been received within a keypad information element. In this case, it is not expected to be sent with the transit network selection or Operator Services Information information elements.

- Calling party subaddress and called party subaddress – see Q.931 Calling Party Subaddress and Called Party Subaddress information elements.

- Transit Network Selection – see Q.931 Transit Network Selection information element. This information element is included in a SETUP message containing other information elements than the Keypad information.

- Other information, as defined by Recommendation Q.932, Generic Procedures for the Control of ISDN Supplementary Services, can be included. Some of this information may be of interest to the SCF. Conditions for their inclusion in IFs to the SCF is for further study.

– ISDN User Part IAM feature-related information. The IAM can contain the following information (see Recommendation Q.762/Q.763:

- Nature of connection indicators – see Q.763 Nature of Connection Indicators parameter.

- Forward call indicators – see Q.763 Forward Call Indicators parameter. The caller's access is identified as ISDN or non-ISDN, and an indication is given of whether an end-to-end SS7 supported connection is required.

- User service information – see Recommendation Q.762. User Service Information parameter. For the purposes of IN CS-1, this parameter identifies the call as circuit-mode/speech, circuit-mode/3.1 kHz audio, circuit-mode/unrestricted digital information (64 kbit/s), or circuit-mode/restricted digital information.

- Called party number – see Q.762 Called Party Number parameter.

- Calling party number – see Q.762 Calling Party Number Parameter.

- Generic number – see Q.762 Generic Number Parameter. More than one generic number parameter may be present within a given IAM.

- Generic name – see Recommendation Q.1290. Detailed conditions for availability are for further study.

- Charge number – see Recommendation Q.1290.

- Transit network selection – see Q.763 Transit Network Selection parameter. This parameter, if present, identifies the Carrier Identification Code and the Circuit Code.

- Carrier selection – see Recommendation Q.1290.

- Feature code – see Q.762 Feature Code Signalling Information where this parameter is defined for national use only.

- Generic digits – see Recommendation Q.762. May contain a travelling class mark (network operator specific).

- Other parameters may be included in the IAM. These parameters may be included because of features provided by other switches in the connection (e.g. information relating to the call being forwarded). Some of this information may be of interest to the SCF and conditions for its inclusion in IFs to the SCF is for further study.

– Any information relating to switch-based features that have already been invoked for the call will also be available. Conditions for additional feature-related information being included in IFs to the SCF is for further study.

Exit event

– Indication of desire to place outgoing call (e.g. offhook, Q.931 Setup message, ISDN-UP IAM message) and authority/ability to place outgoing call verified. (DP 1 – Origination_Attempt_Authorized)

– The following exception exit events are applicable to PIC 1. For this PIC, if the call encounters one of these exceptions during PIC 1 processing, the exception event is not visible because there is no corresponding DP.

  The O_Abandon occurs when the calling party disconnects. For example, this event can result from one of the following:

  - The SSF/CCF receives an on-hook indication from a caller served by a non-ISDN line, following switchhook flash timing.
  - The SSF/CCF receives a call clearing message from a caller served by a DSS 1 interface.
  - The SSF/CCF receives a disconnect indication from a conventional trunk or private facility trunk.
  - The SSF receives a release Message from an SS7 trunk.
  - Authority/ability to place outgoing call denied. (Exception.)

Corresponding Q.931 call state – 0. Null.

2) Collect_Information

Entry event – Indication of desire to place outgoing call (e.g. off-hook, Q.931 Setup message, ISDN-UP IAM message) and authority/ability to place outgoing call verified (DP 1 – Origination_Attempt_Authorized).

Functions

– Initial information package/dialling string (e.g. service codes, prefixes, dialled address digits) being collected from originating party. Information being examined according to dialling plan to determine end of collection. No further action may be required if an *en bloc* signalling method is in use (e.g. an ISDN user using *en bloc* signalling, an incoming SS No. 7 trunk).

– The SSF/CCF shall be able to support subsequent digit collection according to trigger criteria assigned before sending the query. For example, if a feature code (e.g. *64) is entered, the SSF/CCF may:

  - collect digits according to the normal dialling plan; or
  - collect a variable number of digits.

Information available – After the SSF/CCF determines that information collection is complete, it is assumed that the SSF/CCF has the following information available associated with the originating call portion:

– Charge Number, Calling Party Number, Calling Party BGID, Class of Service, Bearer Capability, Calling Facility Group, Calling Facility Group Member, Service Profile Identifier, other feature-related information – This information is available for each access type under the conditions defined in PIC 1.

– Collected Information – As described below.

  From a non-lSDN line or DSS 1 interface, the collected information consists of one or more of the following:

  - Access Codes within a Customized Dialling Plan (CDP) – see Recommendation Q.1290.

    The Customer Dialling Plan (CDP) in force may specify that after a given access code is dialled, more digits are to be collected according to the “normal dialling plan,” i.e. the dialling plan in force. In this case, Access Code and Collected Address Information are known. If the CDP in force specifies that after a given access code is dialled, a variable number of digits are to be collected, then Access Code and Collected Digits are known.

  - Feature Code – see Q.762 Feature Code Signalling Information where this parameter is defined for national use only.

    If the numbering plan in force specifies that after a given feature code is dialled, more digits are to be collected according to the “normal dialling plan”, then Feature Code and Collected Address Information are known. If the dialling plan in force specifies that after a given feature code is dialled, a variable number of digits are to be collected, then Feature Code and Collected Digits are known. The service associated with the feature code is dependent upon the users service profile.

- Facility Code – see Recommendation Q.1290. This information may be provided if and when facility selective service signalling is supported.

- Feature Activation – see Recommendation Q.932. Feature Activation information element. If the CDP in force specifies that after a given feature activator is received, more digits are to be collected according to the numbering plan, then Feature Activation Indicator and Collected Address Information are known. If the CDP in force specifies that after a given feature activator is received, a variable number of digits are to be collected, then Feature Activation Indicator and Collected Digits are known.

- Prefix – see Recommendation Q.1290.

- Carrier Access Code/Carrier Identification Code – see Recommendation Q.1290. The caller may dial a Carrier Access Code (CAC) (e.g. a 10XXX or 101XXXX for use on this call). When the caller is served by an ISDN interface, a Carrier Identification Code, i.e., XXX or XXXX, may be received by the SSF/CCF within the transit network selection information element of the ISDN SETUP message.

- Collected Address Information – see Recommendation Q.1290. Available as per the numbering plan.

- Numbering Plan Indicator – see Q.762 Numbering Plan Indicator signalling information.

- Collected Digits – see Recommendation Q.1290. The numbering plan in force may specify that after a given Feature Activation, Feature Code, or Access Code within a CDP is dialled, a variable number of digits are to be collected using normal inter-digit timing. In this case, these collected digits are also known at this time.

From a conventional trunk interface, the Collected Information consists of one or more of the following:

– Charge Number – see Recommendation Q.1290. This is only known from a conventional trunk when multi-frequency signalling is used on the originating trunk (network operator specific). In this case, the charge number is provided in the second stage of overlap outpulsing.

– Collected Address Information – as defined above for non-ISDN line or DSS 1 interface.

– Carrier Identification Code – see Recommendation Q.1290. This is known if MF signalling is used on the originating trunk (network operator specific).

– Numbering Plan Indicator – see Q.762 Numbering Plan Indicator signalling information. The address received is expected to conform to Recommendation E.164.

– Prefix – as defined above for non-ISDN line or DSS 1 interface.

– Carrier Selection – see Recommendation Q.1290. This information is only provided when MF signalling is used on the originating trunk (network operator specific).

– Originating Line Information – see Recommendation Q.1290. This information is only known when MF signalling is used on the originating trunk (network operator specific). In this case, the Originating Line Information is sent during the second stage of overlap outpulsing.

From an SS7 trunk interface, the Collected Information consists of the information provided in the ISDN User Part called party number and transit network selection parameters, and possibly a Travelling Class Mark (TCM) and other feature-related information as described above for contents of the ISDN User Part IAM feature-related information.

From a private-facility trunk, the collected information consists of one or more of the following:

- Access Code within a CDP – as defined above for a non-lSDN line.
- Feature Code – as defined above for a non-lSDN line.
- Facility Code – as defined above for a non-lSDN line.
- Collected Address Information – as defined above for a non-lSDN line.
- Numbering Plan Indicator – as defined above for a non-lSDN line.
- Prefix – as defined above for a non-lSDN line.
- Carrier Access Code – as defined above for a non-lSDN line.
- Travelling Class Mark – if provided in the generic digits parameter of the IAM (see Recommendation Q.1290).
- Facility Restriction Level – see Recommendation Q.1290.

Exit events

- Availability of complete initial information package/dialling string from originating party. (This event may have already occurred in the case of *en bloc* signalling, in which case the waiting duration in this PIC is zero.) (DP 2 – Collected_Info.)
- The following exception exit events are applicable to PIC 2: CollectTimeout, CollectInfoFailure, InvalidInformation and O_Abandon.
  - The CollectTimeout event is detected when enough information to process the call was not received by the SSF/CCF before a normal inter-digit timer expires. For an SS7 trunk, this event corresponds to the IAM not containing the information necessary to process the call. In this case there may be no timing involved (timing may be involved for ISUP overlap sending). (Exception.)
  - The CollectInfoFailure event is detected when the SSF/CCF is unable to perform the information collection due to a lack of switch resources (e.g. no digit receivers are available). (Exception.)
  - The InvalidInformation event occurs when the information received from the caller is not valid, for instance the information received violates the dialling plan in force. (Exception.)
  - The O_Abandon event, as described in PIC 1. In this case, the event is visible because there is a corresponding DP. (O-Abandon DP.)

Comment – Some digit analysis is required to determine the end of dialling. However, it is assumed that this analysis may be modelled as separable from the rest of digit analysis, which occurs in PIC 3, Analyse_Information. There is no intention to specify an implementation. However, a switch should externally present the separable view described for closed numbering plans. (See Note 1).

In the case of ISDN *en bloc* sending, the receipt of a SETUP message detected at the Origination_Attempt_Authorized Detection Point (DP 1) causes the BCSM to pass through PIC 2 to the Collected_Information DP (DP 2), without further processing in PIC 2. Note that the BCSM transitions to DP 2 when the initial information package/dialling string is received from the calling party – this occurs when enough information is received to proceed with call processing (e.g. as in the case of ISDN overlap sending of MF outpulsing). Specifically, for the digit by digit collection case, if DP 2 is armed as a Trigger Detection Point-Request (TDP-R), the SSF sends an initiating DP request (i.e. InitialDP or CollectedInformation information flow) to the SCF when enough information is received to determine if the TDP criteria are met, it suspends BCSM processing but will collect further digits. It is network operator specific to determine when sufficient information is available. (See Note 2.)

NOTES

1 This separable view is provided by supporting distinct DPs for DP 2 (Collected_Info) and DP 3 (Analysed_Info), and by the populating information flows accordingly for corresponding TDP and EDP informaion flows to the SCF.

2 In some networks, it may not be possible for the CCF/SSF to determine when the called number information is complete. Therefore, TDP criteria for DP 2 may be met in such networks before the called number information is complete.

Corresponding Q.931 call state – 1. Call initiated and (optionally), 2. Overlap sending.

3) Analyse_Information

Entry event – Availability of complete initial information package/dialling string from originating party (DP 2 – Collected_Info) or route busy event reported from the Routing & Alerting PIC.

Function – Information being analysed and/or translated according to dialling plan to determine routing address and call type (e.g. local exchange call, transit exchange call, international exchange call).

One of the results of processing in this PIC is determination of routing address:

i) called party number only (called party number is served by the SSF);

ii) called party number and route index, where the route index is a pointer to a trunk group to route an outgoing call attempt on (called party number is served by another SSF);

iii) called party number and route index, where the route index is a pointer to a list of trunk groups to route an outgoing call attempt on (called party number is served by another SSF).

Information available – After the SSF/CCF determines that the information has been analysed, it is assumed that the SSF/CCF has the following information available associated with the originating call portion:

– Charge Number, Calling Party Number, Calling Party BGID, Class of Service, Bearer Capability, Calling Facility Group, Calling Facility Group Member, Service Profile Identifier, and other feature-related information – This information is available for each access type under the conditions defined in PIC 1.

– Analysis results (of the Collected Information) – as described below.

  From a non-lSDN line or DSS 1 interface, this consists of one or more of the following:

  - Called Party Number – as per dialling plan.
  - Numbering Plan Indicator – see Q.762 Numbering Plan Indicator signalling information.
  - Type Of Call – see Recommendation Q.1290.
  - Carrier – see Recommendation Q.1290.
  - Carrier Identification Code – see Recommendation Q.1290. Available for Internetwork carrier calls.
  - Carrier Selection – see Recommendation Q.1290. Available for Inter Serving Area ID carrier calls. See Recommendation Q.1218.
  - Route List – see Recommendation Q.1290.
  - Collected Information – Access Code within a CDP, Feature Code, Feature Activation, Prefix, Carrier Access Code/Carrier Identification Code, Collected Address Information/Digits – as described under PIC 2.

From a conventional or SS7 trunk interface, this consists of one or more of the following:

– Charge Number – as defined in PIC 1 (for an SS7 trunk) or PIC 2 (for a conventional trunk when EAMF signalling is used).

– Called Party Number and Numbering Plan Indicator (as defined above for non-ISDN line or DSS 1 interface).

– Carrier Identification – available for Inter Serving Area ID carrier calls. See Recommendation Q.1218.

- Carrier Selection – see Recommendation Q.1290. Available for Inter Serving Area ID carrier calls. See Recommendation Q.1218.
- Originating Line Information – see Recommendation Q.1290. Available for Inter Serving Area ID carrier calls, See Recommendation Q.1218.
- Route Index – see Recommendation Q.1290. Available if this call does not terminate on this SSF/CCF.
- Collected Information – Collected Address Information, Prefix, Carrier Identification Code, Feature Code, Facility Code – see description under PIC 2.

From a private-facility trunk, this consists of one or more of the following, depending on the type of private-facility trunk:

- Called Party Number and Numbering Plan Indicator (as defined above).
- Type Of Call (as defined above).
- Carrier – see Recommendation Q.1290. Private network/facility, intra-serving area, or a specific Inter Serving Area ID or international). See Recommendation Q.1218.
- Carrier Identification Code – see Recommendation Q.1290. Available for internetwork carrier calls.
- Carrier Selection – see Recommendation Q.1290. Available for Inter Serving Area ID carrier calls. See Recommendation Q.1218.
- Travelling Class Mark – see Recommendation Q.1290. Available if received on the facility.
- Route List – see Recommendation Q.1290.
- Facility Restriction Level – As described under PIC 2.
- Collected Information – Collected Address Information/Digits, Access Code within a Customer Dialling Plan, Feature Code, Carrier Access Code, Prefix – see description under PIC 2.

Exit events

- Availability of routing address and nature of address. (DP 3 – Analysed_Info.)
- The following exception exit events are applicable to PIC 3: O_Abandon and InvalidInformation.
  - The O_Abandon event, as described in PIC 1. In this case, the event is visible because there is a corresponding DP. (O_Abandon DP.)
  - The InvalidInformation event (e.g. wrong number). (Exception.)

Comments – Note that routing address does not necessarily mean that the final physical route has been determined (e.g. route list has not been searched, hunt groups have not yet been searched, directory number has not yet been translated to physical port address), though this may be the case (e.g. when routing to a specific private facility).

Corresponding Q.931 call state – Not applicable.

4) Routing and alerting (encompasses the following general BCSM PICs: Select_Route, Authorize_Call_Setup, Call_Sent, and O_Alerting)

Entry events

- Availability of routing address and call type. (DP 3 – Analysed_Info.)

Functions

- Routing address and call type being interpreted. The next route is being selected. This may involve sequentially searching a route list, translating a directory number into physical port address, etc. The individual destination resource out of a resource group (e.g. a multi-line hunt group, a trunk group) is not selected. In some cases (e.g. an analogue line interface), a single resource (not a group) is selected.

- Authority of originating party to place this particular call being verified (e.g. checking business group restrictions, toll restrictions, route restrictions). The types of authorization checks to be performed may depend upon the type of originating resource (e.g. line vs. trunk).

- Call is being processed by the terminating half BCSM. Continued processing of call set-up (e.g. ringing, audible ring indication) is taking place. Waiting for indication from terminating half BCSM that the call has been answered by terminating party.

Information Available – After the SSF/CCF determines that the route has been selected, the call set-up has been authorized, and the call has been delivered (to the terminating half), it is assumed the SSF/CCF has the following information available with restrictions as noted:

- Charge Number, Calling Party Number, Calling Party Business Group ID, Class of Service, Bearer Capability, Calling Facility Group, Calling Facility Group Member, Service Profile Identifier, other feature-related information – This information is available for each access type under the conditions defined in PIC 1.

- Analysis Results – See description in PIC 3.

- Routing Information – When more than one route has been specified for the call (either by the SCF or as part of the information stored at the SSF/CCF), the SSF/CCF remembers what routes have been tried for this call and which route to select next. If the call is to an Inter Serving Area ID carrier, the routing information includes Circuit Code information. See Recommendation Q.1218.

- Facility Restriction Level – As described under PIC 2.

Exit events

- Indication from the terminating half BCSM that the call is accepted and answered by terminating party (e.g. terminating party goes off-hook, Q.931 connect message received, ISDN-UP answer message received). (DP 7 – O_Answer.)

- A route busy event is detected when:

  i) an indication of a T-Busy event specifying route busy; or

  ii) a Call Rejected event specifying route busy (received when the route is found to be busy at a switch other than the local switch) is received from the terminal call portion. In both cases, the originating call portion returns to the Analyse_Information PIC. This event is not detected at a DP in IN CS-1.

  Route busy is a non-IN transition which is part of a basic call. This is needed in case the SSF/CCF needs to process a list of destination numbers. Upon busy, the route busy transition returns to the Analyse-Information PIC to analyse the next destination number in the list.

- The following exception exit events are applicable to PIC 4: Route_Select_Failure, O_Called_Party_Busy, O_No_Answer and O_Abandon.

  - The RouteSelectFailure event occurs when the SSF/CCF receives an indication that all the routes are busy. This event (e.g. unable to determine a correct route, no more routes on the route list) leads to the Route_Select_Failure DP.

  - The O_Called_Party_Busy event occurs when an indication of a T_Busy event specifying user busy (i.e. network determined user busy) is received from the terminating portion of the call.

    This event also occurs when an indication of CallRejected event specifying user busy (i.e. network determined user busy) is received from the terminating portion of the call. This event leads to the O_Called_Party_Busy DP.

- The O_No_Answer event occurs when the calling party receives no indication of an answer from the terminating side within a specified period of time. This event leads to the O_No_Answer DP. This event also occurs when the SSF/CCF receives a no answer indication from the terminating side of the call.

  The O_No_Answer event is an IN event; that is, it can only occur when an O_No_Answer trigger is assigned and detected or when requested by a RequestReportBCSMEvent operation.

- The O_Abandon event, as described in PIC 1. In this case, the event is visible because there is a corresponding DP. (O_Abandon DP.)

– Authority of calling party to place this call is denied (e.g. business group restriction mismatch, toll restricted calling line). (Exception.)

Corresponding Q.931 call state – 4. Call delivered.

5) O_Active

Entry event – Indication from the terminating half BCSM that the call is accepted and answered by terminating party. (DP 7 – O_Answer.)

Function – Connection established between originating and terminating party. Message accounting/charging data may be being collected. Call supervision is being provided.

Information available – Once the SSF/CCF has received an indication from the terminating half BCSM that the call has been answered, it is assumed the SSF/CCF has the following information available with restrictions as noted:

– Information as per PIC 4.

– Feature Activation - A service or feature request from the originating party (e.g. DTMF, hook flash, ISDN feature activator, Q.932 HOLD or RETRIEVE message).

Exit events

– A service/service feature request is received from the originating party (e.g. DTMF, hook flash, ISDN feature activator, Q.932 HOLD or RETRIEVE message). (DP 8 – O_Mid_Call.)

– A disconnect indication (e.g. on-hook, Q.931 disconnect message, SS7 release message) is received from the originating party, or received from the terminating party via the terminating half BCSM. (DP 9 – O_Disconnect.)

– A connection failure occurs. (Exception.)

Comments

– A terminating party may disconnect then reconnect before the expiration of disconnect timing. In this case, the call is considered to remain in the O_Active PIC.

– Disconnect indications and treatment are asymmetrical in the way disconnect timing is applied. Disconnect treatment and timing is different for call attempts originating from DSS 1 and analogue line interfaces.

Corresponding Q.931 call state – 10. Active.

Q.931 call states corresponding to disconnect – 11. Disconnect request, 12. Disconnect indication and 19. Release request.

6) O_Exception

Entry event – An exception condition is encountered (as described above for each PIC).

Function – Default handling of the exception condition is being provided. This includes general actions necessary to ensure no resources remain inappropriately allocated, such as:

– If any relationships exist between the SSF and SCF(s), send an error information flow to the SCF(s) closing the relationships and indicating that any outstanding call handling instructions will not run to completion (e.g. see Annex B).

– If an SCF previously requested that call parameters be provided at the end of the call (see the call information request information flow in clause 6), these should be included in the error information flow.

– The SSF/CCF should make use of vendor-specific procedures to ensure release of resources within the SSF/CCF so that line, trunk, and other resources are made available for new calls.

NOTE – This should be handled in the physical plane via an ABORT protocol procedure to close the relationship (i.e. close the TCAP transaction) and indicate that any outstanding operations will not be run to completion.

Information available – Once the SSF/CCF has determined that an exception condition has occurred, it is assumed the SSF/CCF has information available as when the exception within the PIC occurred.

Exit event – Default handling of the exception condition by SSF/CCF completed (Transition to O_Null & Authorize_Origination_Attempt PIC).

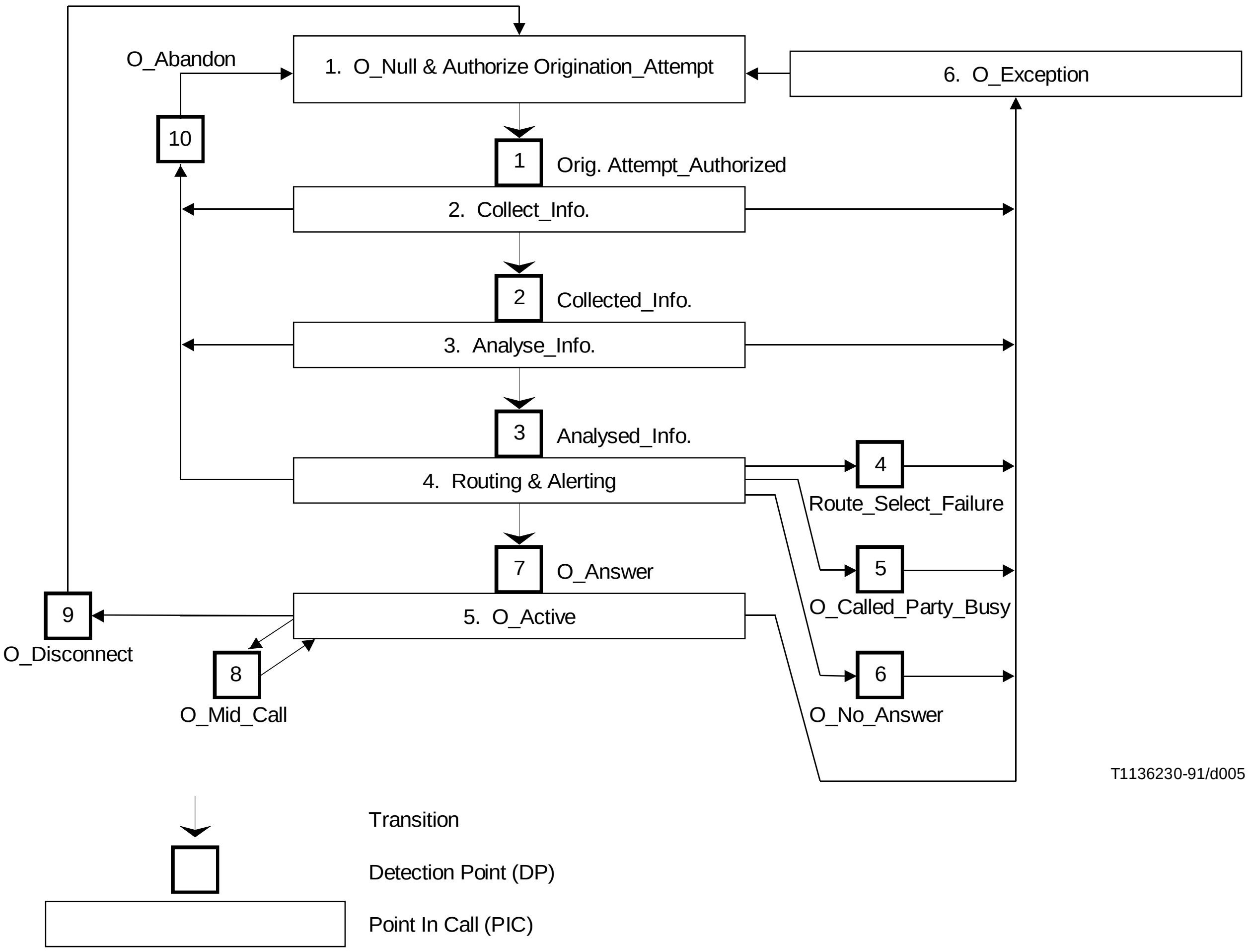


FIGURE 4-3/Q.1214

Originating BCSM for CS-1

4.2.2.2.2 Terminating BCSM for IN CS-1

The terminating half of the BCSM corresponds to that portion of the BCSM associated with the terminating party (see Figure 4-4). The description for each of the PICs in the terminating half of the BCSM are described below.

The following information is available at all PICs in the T-BCSM:

– Service Address Information – see Recommendation Q.1290.

– SRF/SSF capabilities – see Recommendation Q.1290. Used to decide if an assist of hand-off procedure is to be used.

- Call Gapping Encountered – see Recommendation Q.1290.
- Terminal Type – see Recommendation Q.1290. The SCF uses this to determine the most appropriate form of user-interaction to use (e.g. in-band announcements). This information is only available at originating or terminating local exchanges.
- Location Number – see Q.762 Location Number signalling information. Used if the calling party is a mobile subscriber.
- ISDN Access Related Information – see Q.762 Access Transport Parameter.

1) T_Null & Authorize_Termination_Attempt

Entry event – Disconnect and clearing of a previous call (DPs 17 – T_Disconnect or 18 – T_Abandon), or default handling of exceptions by SSF/CCF completed.

Function

- Interface (line/trunk) is idled (no call exists, no call reference exists, etc.). Supervision is being provided.
- Given an indication of an incoming call received from the originating half BCSM, authority to route this call to the terminating party is being verified (e.g. business group restrictions, restricted incoming access to line, bearer capability compatibility). This function may not be applicable for terminations to trunks.

Information available – Once the SSF/CCF has authorized the termination of the call, it is assumed the following information is available and associated with the terminating portion of the call with restrictions as noted (information associated with the originating portion of the call as per PIC 5 is assumed to be still available):

- Charge Number, Calling Party Number; Calling Party Business Group ID, Bearer Capability – available for each access type under conditions identified in PIC 1. This information is received from the originating call portion.
- Calling Party Category – see Recommendation Q.762. Determined by the Class of Service information, ISDN User Part originating line information parameter (see Recommendation Q.1290), or information from EAMF signalling.
- Called Party Number, Carrier, Carrier Identification Code, Circuit Code, Carrier Selection; Route Index; and Travelling Class Mark – This information is received from the originating call portion.
- Class of Service of Terminating Access – see Recommendation Q.1290. This is either a Customer Class of Service (see Recommendation Q.1290), a Trunk Class of Service (see Recommendation Q.1290), or a Private-Facility Class of Service (see Recommendation Q.1290) for the Terminating Access (Dialled Number, Circuit, or trunk group).
- Called Party Subaddress – see Recommendation Q.931.
- Calling Party Subaddress – see Recommendation Q.931.
- Called Party BGID – see Recommendation Q.1290. This information is determined in this PIC when the terminating party is a member of a Business Group and is served by a non-lSDN line or DSS 1 interface on this SSF/CCF.

Exit event

- Indication of incoming call received from originating half BCSM and authority to route call to a specified terminating resource (or group) verified. (DP 12 – Term_Attempt_Authorized.)
- The following exception exit events are applicable to PIC 7: TerminationDenied and T_Abandon. For this PIC, if the call encounters one of these exceptions during PIC processing, the exception event is not visible because there is no corresponding DP.
  - The TerminationDenied event occurs when an indication of an incoming call from the originating half of the BCSM is received and the authority to route the call to a specified terminating resource is denied. (Exception.)

- The T_Abandon occurs when an indication of call disconnection is received from the originating part of the call.

Corresponding Q.931 call state – 0. Null.

2) Select_Facility & Present_Call

Entry event – Indication of incoming call received from originating half BCSM and authority to route call to a specified terminating resource (or group) verified. (DP 12 – Term_Attempt_Authorized.)

Functions

– A particular available resource in the specified resource group is being selected. It is possible that all resources in the group could be busy. A single resource is treated as a group of size 1.

– Terminating resource informed of incoming call (e.g. line seizure, Q.931 Set-up message, ISDN-UP IAM message). In the case of an analogue line, ringing is applied.

Information available – Once the call is presented to the terminating facility, it is assumed the following information is available and associated with the terminating portion of the call with restrictions as detailed noted:

– Information as per PIC 7.

– Facility Group – see Recommendation Q.1290. For calls routed out of this SSF/CCF, this identifies the Trunk Group (private or public) that has been selected to route the call on. For calls terminating to a non-lSDN line or DSS 1 interface within the SSF/CCF, this may identify a particular Multi-line Hunt Group.

– Facility Group Member – see Recommendation Q.1290. For calls out of this SSF/CCF, this identifies the trunk (private or public) that has been selected to route the call on. For calls terminating to a non-lSDN line or DSS 1 interface on the SSF/CCF, this may identify the hunt-terminal within the Multi-line Hunt Group that has been selected for this call.

Exit events

– Terminating party is being alerted (e.g. ringing being applied, Q.931 Alerting message, ISDN-UP ACM message). (Transition to T_Alerting PIC.)

– Call is accepted and answered by terminating party (e.g. terminating party goes off-hook, Q.931 Connect message received, ISDN-UP answer message received). (DP 15 – T_Answer.)

– The following exception exit events are applicable to PIC 8: T_Busy and T_Abandon.

  - The T_Busy event occurs when the terminating access is busy meaning:

    1) Interface busy (e.g. a B-channel is unavailable for the call).

    2) Call-reference busy: there are no idle call reference values available on the terminating Directory Number and Call Type with which the call will be offered.

    3) All appearances of a closed user group are busy.

  - The T_Busy event may also be detected as a result of an analogue line being out of order, being marked as busy by a customer make-busy key or as a result of certain maintenance action. This event leads to the T_Busy DP. An indication of T_Busy event is passed to the originating half of the BCSM.

  - The T_Abandon as described in PIC 7.

Corresponding Q.931 call state – 6. Call present.

3) T_Alerting

Entry event – Terminating party is being alerted of incoming call.

Function – An indication is sent to the originating half BCSM that the terminating party is being alerted. Continued processing of call set-up (e.g. ringing, audible ring indication) is taking place. Waiting for the call to be answered by terminating party.

Information available – Once the terminating party is being alerted of the incoming call, it is assumed that information as per PIC 8 is available.

Exit events

- Call is accepted and answered by terminating party (e.g. terminating party goes offhook, Q.931 connect message received, ISDN-UP answer message received). (DP 15 – T_Answer.)
- The following exception exit events are applicable to PIC 9: T_No_Answer and T_Abandon.
  - The T_No_Answer event occurs when the terminating party does not answer before the switch-based ringing timer expires. An indication of T_No_Answer event is passed to the originating half of the BCSM. This event leads to the T_No_Answer DP.
  - The T_Abandon as described in PIC 7. (T-Abandon DP.)

Comment – For terminations to SS No. 7 trunk groups, this PIC is entered upon the receipt of an address complete (ACM) message.

Corresponding Q.931 call states – 7. Call received and 8. Connect request

4) T_Active

Entry events – Call is accepted and answered by terminating party (e.g. terminating party goes offhook, Q.931 Connect message received, ISDN-UP answer message received). (DP 15 – T_Answer.)

Function – An indication is sent to the originating half BCSM that the terminating party has accepted and answered the call. Connection established between originating and terminating party. Call supervision is being provided.

Information available – Once the call is accepted and answered by the terminating party, it is assumed the following information is available and associated with the terminating portion of the call with restrictions as noted:

- Information as per PIC 9.
- Feature Activation – see Recommendation Q.932. For this PIC, a service or feature request from the terminating party (e.g. DTMF, hook flash, ISDN feature activator, Q.932 HOLD or RETRIEVE message).

Exit events

- A service/service feature request is received from the terminating party (e.g. DTMF, hook flash, ISDN feature activator, Q.932 HOLD or RETRIEVE message). (DP 16 – T_Mid_Call.)
- A disconnect indication (e.g. on-hook, Q.931 disconnect message, SS7 release message) is received from the terminating party, or received from the originating party via the originating half BCSM. (DP 17 – T_Disconnect.)
- A connection failure occurs. (Exception.)

Comments

- A terminating party may disconnect then reconnect before the expiration of disconnect timing. In this case, the call is considered to remain in the T_Active PIC.
- Disconnect indications and treatment are asymmetrical in the way disconnect timing is applied.

Corresponding Q.931 call state – 10. Active.

Q.931 call states corresponding to T_Disconnect – 11. Disconnect request, 12. Disconnect indication, and 19. Release request

5) T_Exception

Entry event – An exception condition is encountered (as described above for each PIC).

Function – An indication of the exception condition is sent to the originating half BCSM. Default handling of the exception condition is being provided. This includes general actions necessary to ensure no resources remain inappropriately allocated, such as:

- If any relationships exist between the SSF and SCF(s), send an error information flow to the SCF(s) closing the relationships and indicating that any outstanding call handling instructions will not be run to completion (e.g. see Annex B).
- If an SCF previously requested that call parameters be provided at the end of the call (see the call information request information flow in clause 6), these should be included in the error information flow.
- The SSF/CCF should make use of vendor-specific procedures to ensure release of resources within the SSF/CCF so that line, trunk, and other resources are made available for new calls.

NOTE – This should be handled in the physical plane via an ABORT protocol procedure to close the relationship (i.e. close the TCAP transaction) and indicate that any outstanding operations will not be run to completion.

Information available – Once the SSF/CCF has determined an exception condition has occurred, it is assumed the SSF/CCF has information available as when the exception within the PIC occurred.

Exit event – Default handling of the exception condition by SSF/CCF completed (Transition to T_Null & Termination_Attempt_Authorized PIC).

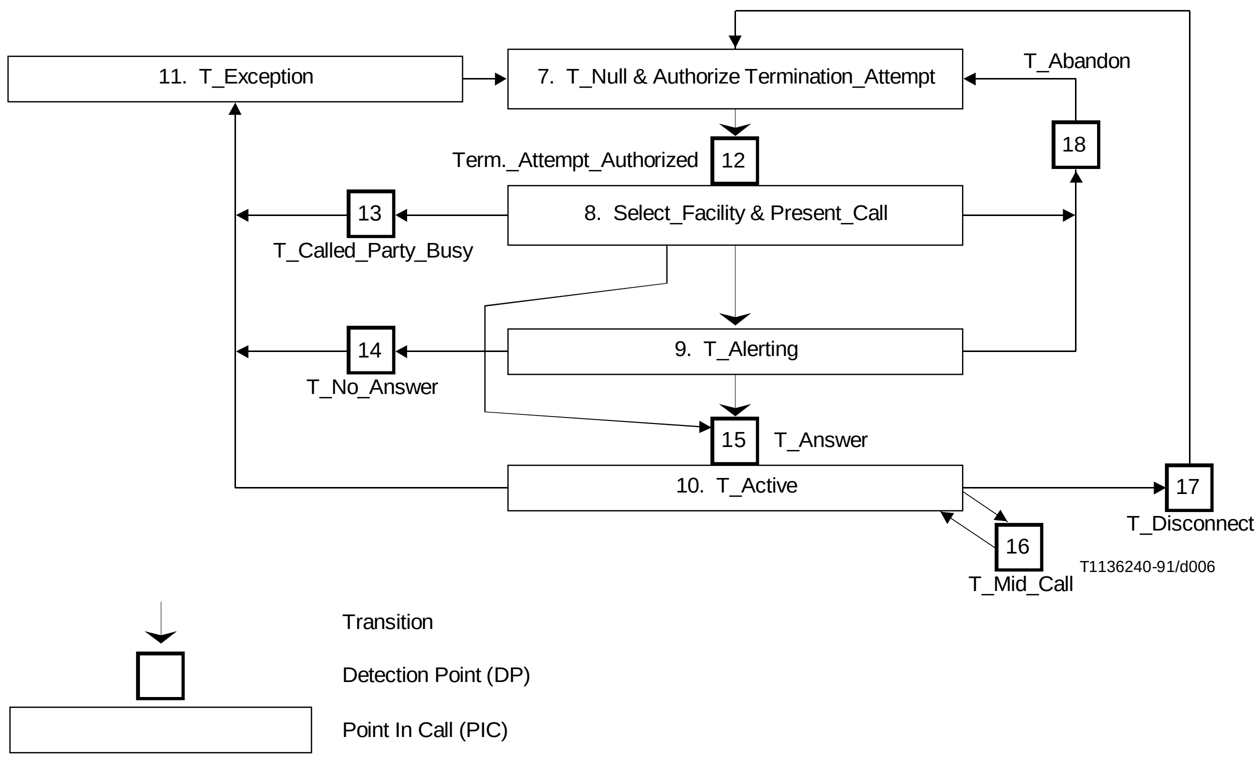


FIGURE 4-4/Q.1214

Terminating BCSM for CS-1

4.2.2.2.3 BCSM resume points and IN transitions in the IN CS-1 call model

A) Resume points and IN transitions beyond a basic call for IN CS-1

Tables 4-1 and 4-2 list the possible transitions to Resume Points for the IN CS-1 originating and terminating call models.

TABLE 4-1/Q.1214

IN transitions beyond a basic call – Originating call model

From detection point	To resume point
Origination_Attempt_Authorized DP	Collect_Information PIC Analyze_Information PIC Routing_&_Alerting PIC
Collected_Information DP	Collect_Information PIC Analyze_Information PIC Routing_&_Alerting PIC
Analyzed_Information DP	Collect_Information PIC Analyze_Information PIC Routing_&_Alerting PIC
Route_Select_Failure DP	Collect_Information PIC Analyze_Information PIC Routing_&_Alerting PIC
O_Called_Party_Busy DP	Collect_Information PIC Analyze_Information PIC Routing_&_Alerting PIC
O_No_Answer DP	Collect_Information PIC Analyze_Information PIC Routing_&_Alerting PIC
O_Disconnect DP	Collect_Information PIC Analyze_Information PIC Routing_&_Alerting PIC

TABLE 4-2/Q.1214

IN transitions beyond a basic call – Terminating call model

From detection point	To resume point
T_Busy DP	Select_Facility & Present_Call
T_No_Answer DP	Select_Facility & Present_Call

B) Set of all transitions for the IN CS-1 call model

Tables 4-3 and 4-4 together with Figures 4-5 and 4-6 describe the complete set of possible transitions for the IN CS-1 originating and terminating call models.

TABLE 4-3/Q.1214

Complete set of transitions for the IN CS-1 originating call model

From	To
Origination_Attempt_Authorized DP	Collect_Information PIC Analyse_Information PIC Routing_&_Alerting PIC
Collected_Information DP	Collect_Information PIC Analyse_Information PIC Routing_&_Alerting PIC
Analysed_Information DP	Collect_Information PIC Analyse_Information PIC Routing_&_Alerting PIC
Route_Select_Failure DP	O_Exception Collect_Information PIC Analyse_Information PIC Routing_&_Alerting PIC
O_Called_Party_Busy DP	O_Exception Collect_Information PIC Analyse_Information PIC Routing_&_Alerting PIC
O_No_Answer DP	O_Exception Collect_Information PIC Analyse_Information PIC Routing_&_Alerting PIC
O_Answer DP	O_Active PIC
O_Midcall DP	O_Active PIC

TABLE 4-3/Q.1214 *(end)*

Complete set of transitions for the IN CS-1 originating call model

From	To
O_Disconnect DP	O_Null_&_Authorize_Origination_Attempt PIC Collect_Information PIC Analyse Information PIC Routing_&_Alerting PIC
O_Abandoned DP	O_Null_&_Authorize_Origination_Attempt PIC
O_Null_&_Authorize_Origination_Attempt PIC	Origination_Attempt_Authorized DP
Collect_Information PIC	O_Exception O_Abandon DP Collected_Information DP
Analyse_Information PIC	O_Exception O_Abandon DP Analysed_Information DP
Routing & Alerting PIC	Route_Select_Failure DP O_called_Party_Busy DP O_No_Answer DP O_Answer DP O_Abandon DP Analyze_Information PIC O_Exception
O_Active PIC	O_Midcall DP O_Disconnect DP O_Exception
O_Exception	O_Null_&_Authorize_Origination_Attempt PIC

TABLE 4-4/Q.1214

Complete set of transitions for the IN CS-1 terminating call model

From	To
Termination_Attempt_Authorized DP	Select_Facility & Present_Call PIC
T_Busy DP	Select_Facility & Present_Call PIC T_Exception
T_No_Answer DP	Select_Facility & Present_Call PIC T_Exception
T_Answer DP	T_Active PIC
T_Midcall DP	T_Active PIC
T_Disconnect DP	T_Null & Authorize_Termination_Attempt PIC
T_Abandoned DP	T_Null & Authorize_Termination_Attempt PIC
T_Null & Authorize_Termination_Attempt PIC	Termination_Attempt_Authorized DP
Select_Facility & Present_Call PIC	T_Busy DP T_Abandon DP T_Answer DP T_Alerting PIC
T_Alerting PIC	T_No_Answer DP T_Answer DP T_Abandon DP
T_Active PIC	T_Midcall DP T_Disconnect DP T_Exception
T_Exception	T_Null & Authorize_Termination_Attempt PIC

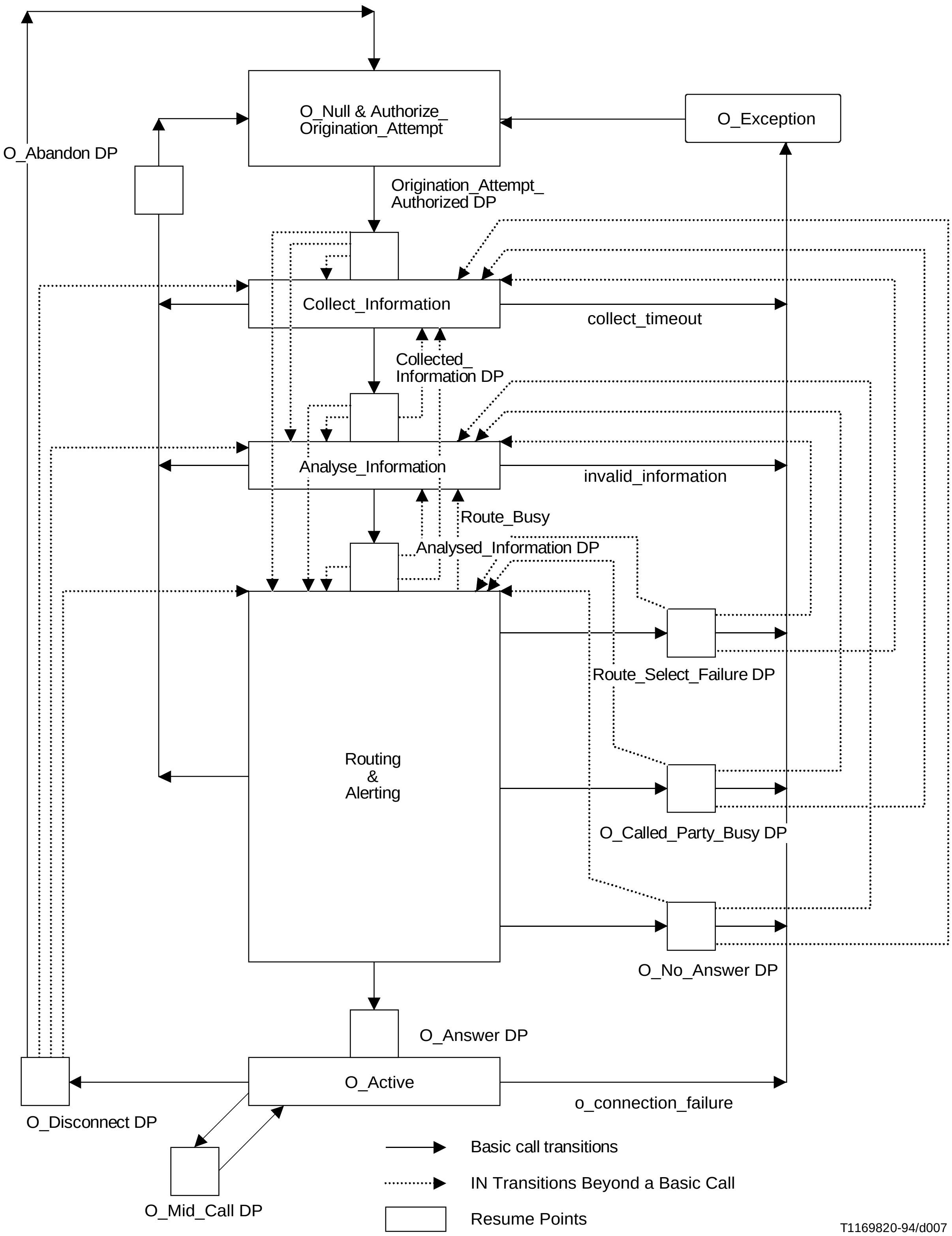


FIGURE 4-5/Q.1214

Complete set of transitions for the CS-1 originating call model

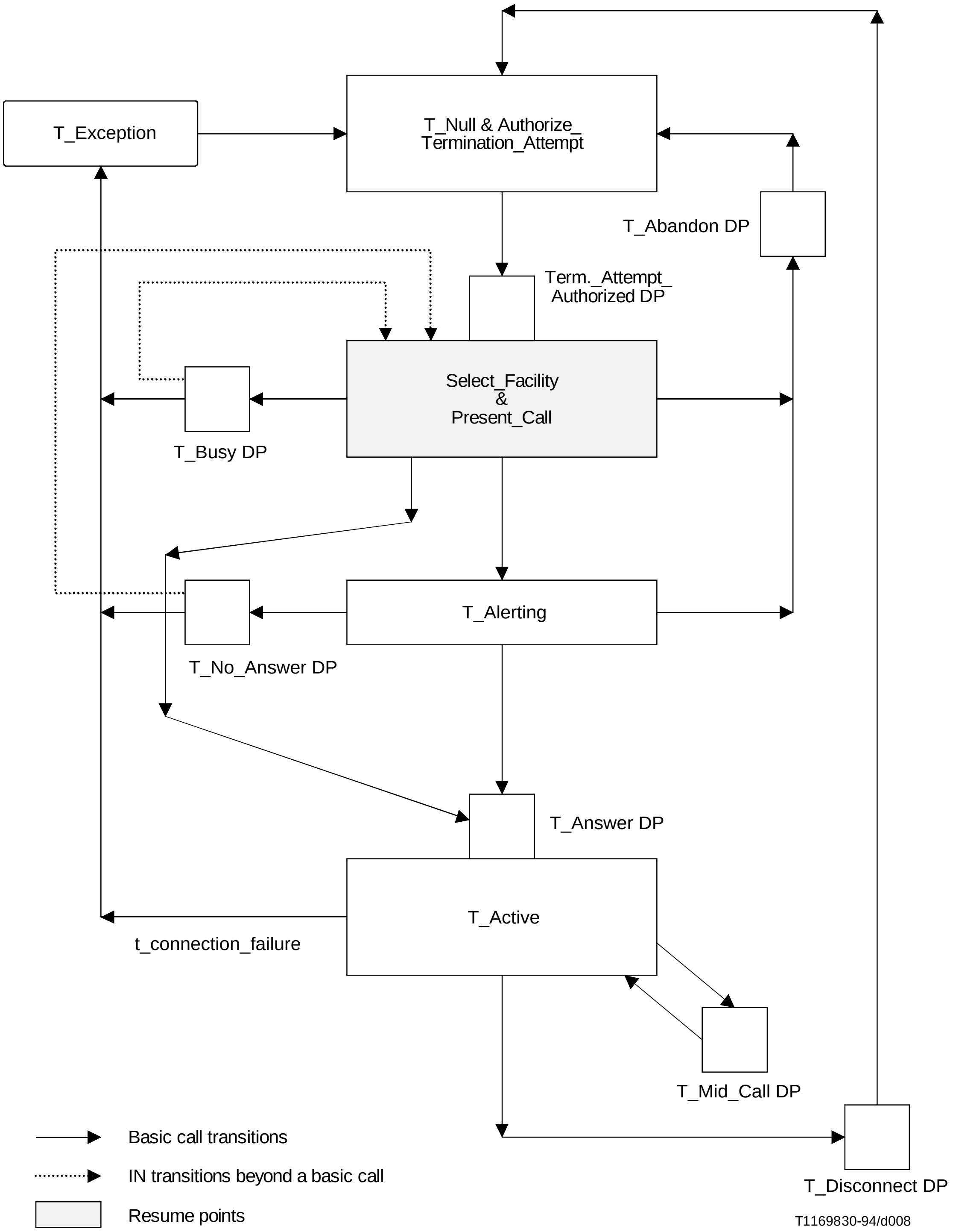


FIGURE 4-6/Q.1214

Complete set of transitions for the CS-1 terminating call model

4.2.2.3 BCSM indications for the IN CS-1 call model

4.2.2.3.1 User – O_BCSM Access Signalling Indications

Definition – These Indications include the representation of the network's perception of possible actions taken by the calling party as well as the calling party's perception of actions taken by the network. The Indications are between a user (i.e. calling party) and a local exchange that is originating a call. They include the definition of how actions by the user (originating call model) affect the originating call model (user). These Indications are derived from Access Signalling (e.g. DSS 1, analogue) as well as any other information that is available. Figure 4-7 illustrates these indications.

Indications

1) An Indication is sent from User to O_BCSM to initiate call establishment (e.g. SETUP).

2) An Indication is sent from O_BCSM to User that network is unable to initiate call (e.g. RELEASE COMPLETE).

3) An Indication is sent from O_BCSM to User acknowledging the call initiation Indication (e.g. SETUP ACKNOWLEDGE).

4) The User sends call (dialling) information to the O_BCSM (e.g. INFORMATION).

5) An Indication is sent from O_BCSM to the User to terminate the sending of call information (e.g. CALL PROCEEDING).

6) An Indication is sent from the User to the O_BCSM upon completion of call information.

7) User is informed that call has been routed to another environment or network (e.g. PROGRESS).

8) An Indication is sent from the O_BCSM to the User when the called party is being alerted (e.g. ALERTING).

9) An Indication is sent from the O_BCSM to the User when the call is accepted.

10) The User acknowledges that the call is accepted.

11) The O_BCSM sends an Indication to the User that the called party is unable to accept the call, due to busy condition.

12) The O_BCSM sends an Indication to the User since the called party is unable to accept the call, due to no answer condition.

13) An Indication is received by the O_BCSM from the User to end the call.

14) The O_BCSM indicates to the User that the call is being disconnected.

15) The User acknowledges to the O_BCSM that the call is being disconnected.

NOTES

1 Further indications for exceptions are for further study.

2 Indications which are shown as terminating on a DP in Figure 4-7 are received by the switch and are not part of the IN DP processing.

4.2.2.3.2 T_BCSM – User Access Signalling Indications

Definition – These Indications include the representation of the network's perception of possible actions taken by the called party as well as the called party's perception of actions taken by the network. The Indications are between a local exchange that is terminating a call and a user (i.e. called party). They include the definition of how actions by the terminating call model (user) affect the user (terminating call model). These Indications are derived from Access Signalling (e.g. DSS 1, analogue) as well as any other information that is available. Figure 4-8 illustrates these Indications.

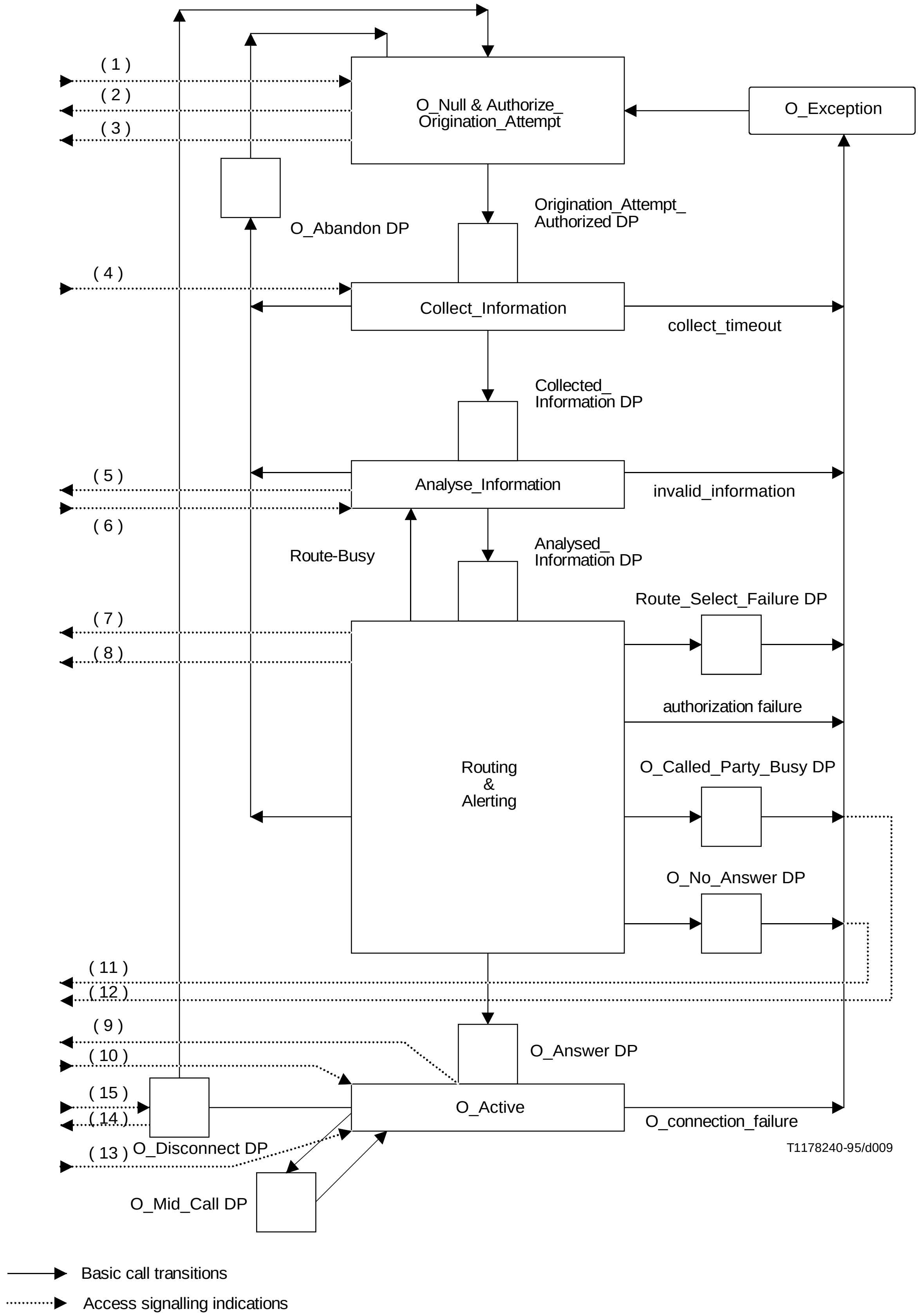


FIGURE 4-7/Q.1214

O_BCSM – User Access Signalling Indications for the CS-1 BCSM

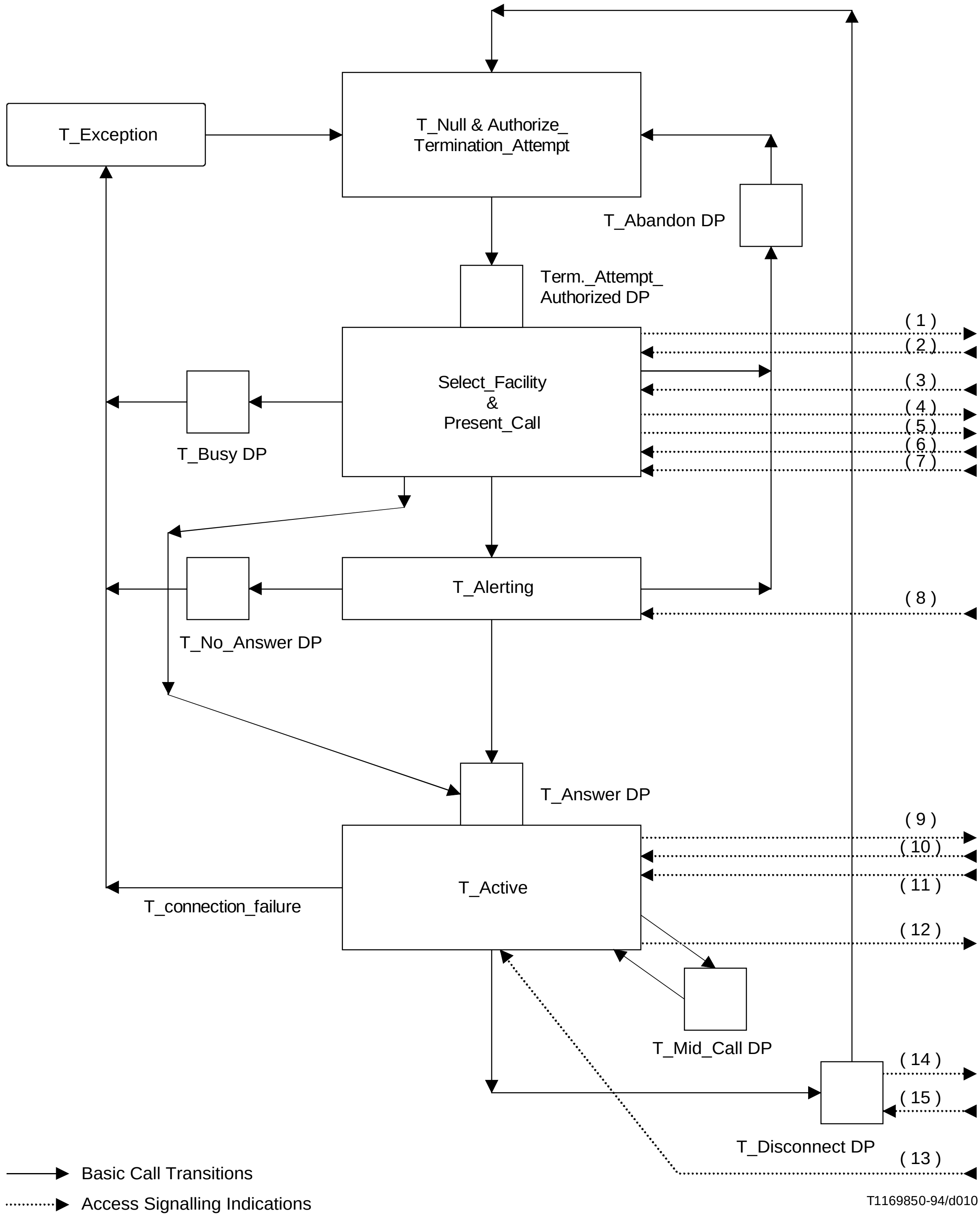


FIGURE 4-8/Q.1214

T_BCSM – User Access Signalling Indications for the CS-1 BCSM

Indications

1) An Indication is sent from T_BCSM to the User to terminate the call to an idle facility (e.g. SETUP).

2) An Indication is sent from User to T_BCSM indicating that the User cannot accept the call (e.g. RELEASE COMPLETE).

3) An Indication is sent from the User to the T_BCSM when the User determines compatibility with all call characteristics (e.g. SETUP ACKNOWLEDGE).

4) The T_BCSM sends any remaining call information to the User (e.g. INFORMATION).

5) An Indication is sent from the T_BCSM to the User upon the sending of sufficient call information.

6) An Indication is sent from the User to the T_BCSM upon receipt of sufficient call information (e.g. CALL PROCEEDING).

7) User sends an Indication to the T_BCSM that alerting is taking place (e.g., ALERTING).

8) An Indication is sent from the User to the T_BCSM upon acceptance of the incoming call (e.g. CONNECT).

9) An Indication is sent from the T_BCSM to the User acknowledging that the call can now be connected.

10) An Indication is sent from the User to the T_BCSM that the User suspends the call.

11) An Indication is sent from the User to the T_BCSM that the User resumes the call.

12) The T_BCSM sends an Indication to the User indicating that the calling party has gone on hook.

13) An Indication is received by the T_BCSM from the User to end the call.

14) The T_BCSM indicates to the User that the call is being disconnected.

15) The User acknowledges to the T_BCSM that the call is being disconnected.

NOTES

1 Further indications for exceptions are for further study.

2 Indications which are shown as terminating on a DP in Figure 4-8 are received by the switch and are not part of the IN DP processing.

4.2.2.3.3 Intra Local Exchange BCSM Indications

Figure 4-9 illustrates the communication between two call segments in the SSF/CCF for a basic two-party call. It shows the indications that flow between the originating and terminating BCSMs for IN CS-1, as described in 4.2.2.2. All possible indications are shown, except for any which may occur at the O-Exception and the T-Exception PICs. Note that these indications are not intended to be mapped to explicit information flows.

Explanations of indications concerning Figure 4-9

1) Initiate T-BCSM when the authority to place the call attempt has been verified in PIC 4 of the O-BCSM and the originating Basic Call Manager has sent the call attempt to the terminating Basic Call Manager for further processing [see Figure 4-1b].

2) An indication is sent from T-BCSM to O-BCSM that called party is busy (causes PIC 4 → DP 5 transition in O-BCSM).

3) An indication is sent from T-BCSM to O-BCSM that called party is being alerted (causes ring indication to be sent to calling party in PIC 4 of O-BCSM).

4) An indication is sent from T-BCSM to O-BCSM that called party has not answered within a specified time period (causes PIC 4 → DP 6 transition in O-BCSM).

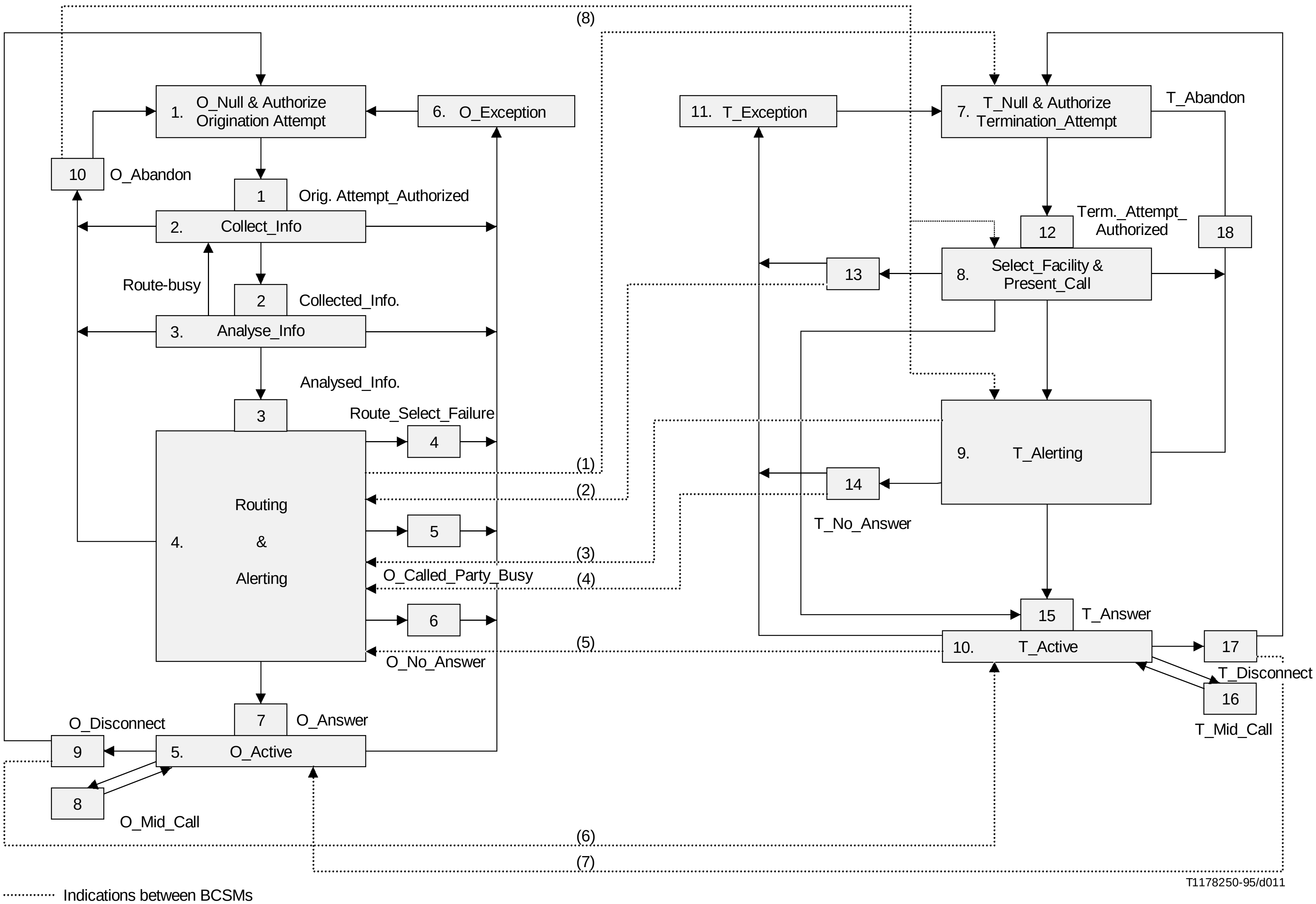


FIGURE 4-9/Q.1214

BCSM indications

5) An indication is sent from T-BCSM to O-BCSM that called party has accepted and answered the call attempt (causes PIC 4 → DP 7 transition in O-BCSM).

6) An indication is sent from O-BCSM to T-BCSM that calling party has disconnected (causes PIC 10 → DP 17 transition in T-BCSM).

7) An indication is sent from T-BCSM to O-BCSM that called party has disconnected (causes PIC 5 → DP 9 transition in O-BCSM).

8) An indication is sent from O-BCSM to T-BCSM that calling party has abandoned (causes PIC 8 or PIC 9 → DP 18 transition in T-BCSM).

NOTE – Indications 6) and 7) are mutually exclusive.

4.2.2.4 BCSM detection points

Certain basic call and connection events may be visible to IN service logic instances. DPs are the points in call processing at which these events are detected. DPs for the BCSM are identified in 4.2.2.2.

A DP can be armed in order to notify an IN service logic instance that the DP was encountered, and potentially to allow the IN service logic instance to influence subsequent call processing. If a DP is not armed, the SSF/CCF continues call processing without SCF involvement. DPs are characterized by the following four attributes:

a) *Arming/disarming mechanism* – The mechanism by which the DP is armed. A DP may be statically armed or dynamically armed. A DP is statically armed through SMF service feature provisioning. A statically armed DP remains armed until explicitly disarmed by the SMF. The ability of an SCF to statically arm or disarm a DP is for further study. A DP is dynamically armed by the SCF within the context of a call-associated IN service control relationship. The following DP disarming rules apply:

   – If an armed EDP is met, then it is disarmed.

   – If an EDP is met that causes the release of the related leg, then all EDPs related to that leg are disarmed.

   – If a call is released, then all EDPs related to that call are disarmed.

b) *Criteria* – In addition to the condition that a DP be armed, conditions that must be met in order to notify the SCF that the DP was encountered (see 4.2.2.5).

c) *Relationship* – Given that an armed DP was encountered and DP criteria are met, the SSF may provide an information flow via a relationship:

   i) If this relationship is between the SSF/CCF and the SCF for the purpose of call/service logic processing, it is considered to be an IN service relationship. This relationship may be of two types:

      – a control relationship if the SCF is able to influence call processing via the relationship;

      – a monitor relationship if the SCF is not able to influence call processing via the relationship.

      With respect to an IN service control relationship, the information flow provided by the SSF to the SCF on encountering a DP may initiate a control relationship, may be within the context of an existing control relationship, or may be within the context of an existing monitor relationship.

   ii) If this relationship is between the SSF/CCF and the SCF or SMF for management purposes, it is considered to be a service management control relationship. This relationship is for further study.

d) *Call processing suspension* – Given that an armed DP was encountered and DP criteria are met for an IN service control relationship, the SSF may suspend call processing to allow the SCF to influence subsequent call processing. When call processing is suspended, the SSF sends an information flow to the SCF requesting instructions, and waits for a response. When call processing is not suspended, the SSF sends an information flow notifying the SCF that a DP was encountered, and does not expect a response. This attribute is set by the same mechanism that arms the DP.

Based on these attributes, four types of DPs are identified for IN CS-1. The DP types are:

1) Trigger detection point – Request (TDP-R).
2) Trigger detection point – Notification (TDP-N).
3) Event detection point – Request (EDP-R).
4) Event detection point – Notification (EDP-N).

These DP types are defined by the DP attribute values in Table 4-5.

BCSM DPs may be any one of these DP types. DP processing for each DP type is illustrated in Figure 4-10 and described in 4.2.2.7.

TABLE 4-5/Q.1214

BCSM DP types

DP type	Arming mechanism	Criteria	IN service relationship	Suspension	Service feature examples
TDP-R	Static	Specific to DP	Initiates control relationship	Yes	All
TDP-N	Static	Specific to DP	Initiates and terminates monitor relationship	No	Televoting, call logging
EDP-R	Dynamic	None	Within context of existing control relationship	Yes	Call distribution, call rerouting distribution
EDP-N	Dynamic	None	Within context of existing control or monitor relationship	No	Charging for any service feature, call logging, call queueing
NOTE – The DP types applicable to service management relationships are for further study.					

4.2.2.5 DP criteria

As stated in 4.2.2.3, DP criteria are conditions that must be met in order to notify the SCF that the DP was encountered. These criteria can be assigned to a DP from the viewpoint of range of effectiveness, as identified below:

– *Individual line/trunk-based criteria*

  This type of criteria applies to each subscriber line or trunk line. For example, SCF processing is invoked when user A makes call origination. This criteria could be said to be specific for user A.

– *Group-based criteria*

  This type of criteria applies to a certain group of lines or users. For example, when a call origination from any user in a certain centrex group should invoke SCF processing the trigger should apply to that specific centrex group.

– *Office-based criteria*

  This type of criteria applies to the whole office. Any calls generated in the switching system will be subject to this criteria. For example, any call which makes access to the registered Freephone number is triggered and SCF processing is invoked.

The following criteria are DP criteria for IN CS-1, as applicable for a given DP:

– trigger assigned (unconditional/conditional on other criteria);
– Class of Service;
– specific B-channel identifier;

- specific digit strings;
- feature codes (e.g. *XX, #);
- prefixes (e.g. 0+, 00+, 0–, 00–, 011, 01, 1+);
- access codes (e.g. 8+) for customized numbering plan;
- specific abbreviated dialling strings for customized numbering plan;
- specific calling party number strings;
- specific called party number strings;
- nature of address (e.g. subscriber significant number, national significant number, international number);
- bearer capability;
- feature activation/indication (unconditional/conditional on specific feature patterns);
- facility information (unconditional/conditional on specific facility information patterns);
- cause (unconditional/conditional on specific cause patterns).

With respect to the DP criteria listed above, note that these DP criteria only apply to TDPs. DP criteria for Event Detection Points (EDPs) are addressed by the RequestReportBCSMEvent information flow. In addition, note that one or more DP criteria may be applicable at a given DP. The assignment of DP criteria to a TDP and the combinations of DP criteria applicable at a given DP continue to evolve. Further DP criteria and specific assignment of DP criteria to TDPs/EDPs may evolve through future capability sets. Note further that the assignment of DP criteria to a TDP on either a line/trunk, group or office basis may have an impact on the memory and real-time performance requirements of the SSF/CCF. The DP criteria for IN CS-1 are defined below, as applicable to a given TDP.

Note that the applicability of DP criteria at a given DP depends on when call processing information is available and how long it is retained. If network and service providers plan to implement IN CS-1 services in a multi-supplier environment, they should consider formulating such requirements to ensure consistent implementations across supplier equipment. Such requirements should be considered carefully so as not to adversely impact memory and real-time performance aspects of SSF/CCF processing.

1) Trigger assigned[2] (unconditional/conditional on other criteria) – An indicator of the armed/disarmed status of a TDP assigned on a line/trunk, group, or office basis.

   The trigger assigned criterion can be used by itself or in conjunction with other criteria at a TDP. If the trigger assigned criterion is unconditional at a TDP, then it is used by itself – no other DP criterion need to be satisfied at the TDP before informing the SCF that the TDP was encountered. If the trigger assigned criterion is conditional at a TDP, then it is used in combination with other criteria at the TDP – all of the other DP criteria in the combination need to be satisfied before informing the SCF that the TDP was encountered. Applies at all DPs (all DPs can be provisioned as TDPs).

2) Class of Service – This is either a:

   i) customer class of service;

   ii) trunk class of service;or

   iii) private facility class of service.

      i) is a code that identifies all attributes of a line that require distinctive call processing treatment (e.g. for party lines and coin lines); ii) is a code that identifies attributes of a trunk group such as type of signalling used, and iii) is a code that identifies attributes of a private trunk group such as type of signalling used and flash repeat capability.

   Originating access (user/network) class of service is available at DP 1 and could be applicable at DPs 1-10. Terminating access (user/network) class of service is available at DP 12 and could be applicable at DPs 12-18.

[2] It is possible that some DPs are always conditional. Further study may be required.

3) Specific B-channel identifier – An identifier of the specific B-channel on an ISDN interface from which a call attempt has originated or to which a call attempt is to be terminated.

A-party B-channel identifier is available at DP 1 for a party served by an ISDN interface only and could be applicable at DPs 1-10. B-party B-channel identifier is available during PIC 8 after an idle terminating facility has been selected for a party served by an ISDN interface only and could be applicable at DPs 14-17 and 18 (only after an idle terminating facility has been selected).

4) Specific digit strings – A string of digits that must match collected digit strings for numbering plans in which a variable number of digits are to be collected. It could be zero or more digits (e.g. to trigger on "off-hook delay").

The string of digits should be consistent with the structure of the dialling plan and should be administerable. For example, the network provider may specify the first N digits where N is consistent with the structure of the E.164 numbering plan, or any other appropriate numbering plan.

Collected digit strings can be available at DP 1 for a party served by an ISDN interface using *en bloc* sending and at DP 2 for a party served by a non-ISDN line. Since collected digit strings are not analysed until PIC 3 (except to determine if a sufficient number of digits have been collected), this criteria could be applicable at DPs 3-10. DP 3 (mandatory) and DPs 4-10 (optional) is proposed since not all SSP suppliers may retain this information for the duration of the call/attempt.

- Collected digit string can be available at DP 1 through ISUP signalling for an SS7 trunk.

- Collected digit string can be available at DP 2 for a party served by a conventional trunk (e.g. non-SS7), ISDN interface using overlap sending, and private facilities.

5) Feature codes (e.g. *XX, #) – A vertical service code, such as a "#" or a two-digit or three-digit code preceded by "*" or "11," that precedes any subsequent digit collection (e.g. according to the "normal numbering plan").

Feature codes can be available at DP 1 for a party served by an ISDN interface using *en bloc* sending or through ISUP signalling for an SS7 trunk, and can be available at DP 2 for non-ISDN lines and private facilities. Since collected digit strings are not Analysed until PIC 3 (except to determine if sufficient information has been collected), this criteria could be applicable at DPs 3-10. DP 3 (mandatory) and DPs 4-10 (optional) is proposed since not all SSP suppliers may retain this information for the duration of the call/attempt.

Feature codes can be available at DP 2 for a party served by an ISDN interface using overlap sending.

6) Prefixes (e.g. 0+, 00+, 011, 01, 1+) – A string of digits that are not feature codes or access codes and which precede any subsequent digit collection (e.g. according to the "normal numbering plan").

Prefixes can be available at DP 1 for a party served by an ISDN interface using *en bloc* sending, and can be available at DP 2 for non-ISDN lines, conventional trunks, and private facilities. Since collected prefix information is not analysed until PIC 3 (except to determine if sufficient information has been collected), this criteria could be applicable at DPs 3-10. DP 3 (mandatory) and DPs 4-10 (optional) is proposed since not all SSP suppliers may retain this information for the duration of the call/attempt.

Prefixes can be available at DP 2 for a party served by an ISDN interface using overlap sending.

7) Access codes (e.g. 8+) for customized numbering plan – A string of digits in a customized numbering plan that matches access codes such as attendant access codes, access codes to escape to the public network, access codes to access a private facility, access codes to access a private network, and feature access codes.

Access codes can be available at DP 1 for a party served by an ISDN interface using *en bloc* sending, and can be available at DP 2 for non-ISDN lines and private facilities. Since collected access codes are not Analysed until PIC 3 (except to determine if sufficient information has been collected), this criteria could be applicable at DPs 3-10. DP 3 (mandatory) and DPs 4-10 (optional) is proposed since not all SSP suppliers may retain this information for the duration of the call/attempt.

Access codes can be available at DP 2 for a party served by an ISDN interface using overlap sending.

8) Specific abbreviated dialling strings for customized numbering plan – An abbreviated called party number in a customized numbering plan that must match collected address information.

Abbreviated address information can be available at DP 1 for a party served by an ISDN interface using *en bloc* sending, and at DP 2 for a party served by a non-ISDN line or private facilities. Since collected address information is not analysed until PIC 3 (except to determine if sufficient information has been collected), this criteria could be applicable at DPs 3-10. DP 3 (mandatory) and DPs 4-10 (optional) is proposed since not all SSP suppliers may retain this information for the duration of the call/attempt.

Specific abbreviated dialling strings can be available at DP 2 for a party served by an ISDN interface using overlap sending.

9) Specific calling party number strings – A string of digits that must match the calling party number, which is a local, national, or international E.164 number or a number in a customized numbering plan. If a call has been forwarded, the calling party number is the number of the original calling party.

The calling party number is available at DP 1 in the originating BCSM and DP 12 in the terminating BCSM for a call originating from a non-ISDN line, ISDN interface, and can be available at DP 1 and DP 12 for SS7 trunks. This criterion could be applicable at all DPs.

10) Specific called party number strings – A string of digits that must match the called party number, which is either a local, national, or international E.164 number, or a number in a customized numbering plan; the latter is not supported by SS7 or conventional trunks. If a call has been forwarded, the called party number is the number of the party that the call is forwarded to.

The called party number can be available at DP 1 for a party served by an ISDN interface using *en bloc* sending or for an SS7 trunk, and can be available at DP 2 otherwise. Since collected address information is not analysed until PIC 3 (except to determine if sufficient information has been collected), this criteria could be applicable at DPs 3-10 and 12-18. In the originating, BCSM DP 3 (mandatory) and DPs 4-10 (optional) is proposed. No specific proposals are made for DPs 12-18 in the terminating BCSM.

11) Nature of address (e.g. Subscriber Significant Number, National Significant Number, International Number) – An indicator of whether the called party number is a private, local (or subscriber), national, or international number.

The nature of address is available at DP 3. This criteria could be applicable at DPs 3-10. DP 3 (mandatory) and DPs 4-10 (optional) is proposed since not all SSP suppliers may retain this information for the duration of the call/attempt.

12) Bearer capability – An indicator of the bearer capability as defined in Recommendation Q.1218.

The bearer capability information is available at DP 1. This criteria could be applicable at all DPs.

13) Feature activation/indication (unconditional/conditional on specific feature patterns) – In a local exchange only, a feature activation/indication on an ISDN interface or that is detected at the Mid_Call DP (e.g. “hook flash,” #, etc.) for ISDN and non-ISDN lines that can be sent in conjunction with or preceding other address/digit collection.

A feature activation/indication can be available at DP 1-10 in the originating BCSM for a party served by an ISDN interface, and can be available at DP 8 in the originating BCSM for a party served by a non-ISDN line. A feature activation/indication can be available at DP 14-18 in the terminating BCSM for a party served by an ISDN interface, and can be available at DP 16 in the terminating BCSM for a party served by a non-ISDN line. Since collected feature activation information is not acted upon before PIC 3 in the originating BCSM and before PIC 9 in the terminating BCSM, this criterion could be applicable at DPs 3-10 and DPs 14-18.

14) Facility information (unconditional/conditional on specific facility information patterns) – A match on the Facility Information Element contained in a signalling message as defined in DSS 1 and ISUP.

Applicable DPs can be determined by mapping signalling messages to the BCSM (see 4.2.2.2) and are for further study.

15) Cause (unconditional/conditional on specific cause patterns) – A match on the Cause IE contained in a signalling message as defined in DSS 1 and ISUP or an indicator of the cause of specific events of interest. Further study is required to identify the cause values needed as DP criteria for IN CS-1 services from the complete list of cause values specified in Recommendation Q.1218.

Route selection failure information is available at DP 4, busy cause information is available at DPs 5 and 13, and release cause information is available at DPs 9, 10, 17, and 18. This criteria is applicable at the identified DPs.

DP criteria assignment to a TDP is dependent on the information available at that TDP and the information available at a TDP is described in 4.2.2.2.

Table 4-6 denotes applicability of DP criteria to DPs 1 through 18.

The entries in the table can be:

- customer based;
- trunk group based;
- private facility based;
- office based.

TABLE 4-6/Q.1214

	DP																
DP Criteria	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18
Class of Service	X	O	O	O	O	O	O	O	O	O	X	O	O	O	O	O	O
Specific Digit String (Note 1)	–	X	X	O	O	O	O	O	O	O	–	–	–	–	–	–	–
Feature Code (Note 1)	–	X	X	O	O	O	O	O	O	O	–	–	–	–	–	–	–
Prefixes (Note 1)	–	X	X	O	O	O	O	O	O	O	–	–	–	–	–	–	–
Access Codes (Note 1)	–	X	X	O	O	O	O	O	O	O	–	–	–	–	–	–	–
Called Party Number (Note 1)	–	X	X	O	O	O	O	O	O	O	–	–	–	–	–	–	–
Facility Information (Note 2)	–	–	X	–	–	–	X	X	–	–	–	–	–	X	X	–	–
Feature Activation (Note 3)	–	–	X	X	X	X	X	X	X	X	–	–	X	X	X	X	X
Cause	–	–	–	X	X	–	–	–	X	X	–	X	–	–	–	X	X
Specific abbreviated dialling string (Note 1)	–	–	X	O	O	O	O	O	O	O	–	–	–	–	–	–	–
Specific Calling Party Number (Note 4)	X	O	O	O	O	O	O	O	O	O	X	O	O	O	O	O	O
Nature of Address	–	–	X	O	O	O	O	O	O	O	–	–	–	–	–	–	–

TABLE 4-6/Q.1214 *(end)*

DP Criteria	DP 1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18
Bearer Capability (Note 5)	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Trigger Assigned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Specific B-channel Identifier	O	O	O	O	O	O	O	O	O	O	–	–	O	O	O	O	O

X Applicable

– Not applicable

O Optional

NOTES

1 Same type of trigger requiring analysis of a specific number of received digits. The analysis can be based on the complete number of received digits or can be based on a predefined number of digits starting from the most significant digit of the received information. The inclusion for these criteria for DP 2 is due to the change in the originating BCSM.

2 A match on the Facility Information Element contained in a signalling message as defined in DSS1 and ISUP.

3 In a local exchange only. The BCSM has to analyse (if facility is allowed, stored as Class of Service attribute) the received information and has to initiate an IN trigger if required. A feature activation/indication can be available at DP 1-10 in the originating BCSM for a party served by an ISDN interface and can be available at DP 8 in the originating BCSM for a party served by a non-ISDN line. A feature activation/indication can be available at DP 14-18 in the terminating BCSM for a party served by an ISDN interface and can be available at DP 16 in the terminating BCSM for a party served by a non-ISDN line.

4 The analysis should not be based on the complete calling party number, it shall be based on a predefined number of digits, starting from the most significant digit of the calling party number.

5 Interpretation of Bearer Capability as optional for DP 2-18 needs further clarification (e.g. DP 1 mandatory means DP 12 mandatory). Further, B-channel selection does not appear as a DP-criteria in the table because specific selection of B-channel by the user is for further study: the network can override user selection of B-channel to be used.

If a criteria is marked with an “X” for a Detection Point, then this means that a conditional TDP which is armed at the Detection Point may require the criteria as listed in the table to be satisfied before informing the SCF that the TDP was encountered, e.g. a conditional TDP at DP 1 may require the class of service criteria to be satisfied before the SCF is informed that the TDP was encountered.

If a criteria is marked with an “O” for a Detection Point, then this means that it is implementation dependent if the criteria specific information is still present at that DP because not all suppliers may retain this information for the duration of the call/attempt. If the information is still present, the treatment is the same as a criteria marked with a “X”.

The trigger item is defined as a single set of DP criteria and the associated information that an SSF/CCF uses to determine if the criteria is met and how to process the trigger. The trigger item consists of trigger type, DP criteria, and the SCF routing information. The trigger items are assigned to users by management process. An SSF should use the SCF routing information to format and route the messages to the appropriate SCF application. The SCF may use existing MTP/SCCP capabilities to route to the SCF.

4.2.2.6 Trigger types and trigger precedence

Trigger types denote classes of events of interest. They are used to establish trigger precedence rules at TDPs and indicate to the SCF the service logic to be invoked. A non-exhaustive list of trigger types are defined. Implementation of this set of trigger types, or a subset of this set of trigger types, and further network provider defined trigger types are defined by the network operator. This subclause describes the current set of trigger types defined. Definition of further trigger types is for further study. Definition of further interfaces supporting the standard trigger types is for further study. The trigger types given are described in terms of:

1) TDP – The TDP at which the trigger can be detected.

2) DP criteria – The conditions needed to trigger.

3) Category – Office, group, or subscribed (line based).

4) Interface – Type of interface to which it can be assigned (e.g. ISDN line).

5) Trigger type – The value that identifies the type of criteria that caused the SSF/CCF to detect a valid trigger condition at this TDP (i.e. the trigger type).

6) Fault handling – Defines fault handling procedures for the case when the SCF does not respond to the SSF/CCF message. Details on possibilities for fault handling is for further study.

Escape codes apply to the Off-Hook delay and Channel Set-up PRI triggers. These codes provide an escape so that a subscriber to these triggers can still make certain calls (e.g. Emergency 911) when the SCF or the link to the SCF is down. Each SSF/CCF will have an administered list of escape codes. These codes are valid numbers as per the number plan, prefixed numbers (e.g. 0-, 00-), or an Emergency Service Code. The SSF/CCF provides the same escape treatment to calls in the following situations:

- A call from a line or trunk using the numbering plan in force corresponds to a number on the administered escape code list.

- A call from a line or trunk using the numbering plan in force corresponds to a prefix and number on the escape code list.

- A call from a line or trunk using the numbering plan in force corresponds to a feature code plus a number on the escape code list.

- A call from a line or trunk using a private numbering plan corresponds to an access code that results in the call being routed over the public network plus a number on the escape code list.

Network administrators should be aware that if a number is on the escape code list, then variations of that number that may occur because of different user dialling procedures may also need to be entered on the escape code list so that they also result in escape code treatment. If the SSF/CCF determines that an escape code applies, then the Off-Hook Delay trigger is not detected, a message is not sent to the SCF from the Collected_Information TDP, and the SSF/CCF continues with normal call processing at the Analyse_Information PIC. Triggers may be detected at subsequent TDPs.

After the BRI feature activator, public feature code, or customized numbering plan trigger is encountered, the SSF/CCF supports subsequent digit collection. Subsequent digit collection rules are the same for all subscribers to a particular numbering plan. This subsequent digit collection is specified by the numbering plan in force and, thus, is assumed to occur during the Collecting_Information PIC. Any subsequent digits are included in an CollectedInformation query if an Off_Hook_Delay trigger is hit.

The SSF/CCF supports the administration of the following rules for subsequent digit collection for a numbering plan, not an individual subscriber trigger. Each BRI feature activator, public feature code, or access code is administerable to do one of the following:

– Do not collect subsequent digits.

– Collect subsequent digits according to the normal numbering plan for that line or trunk. Second dial tone is applied after the feature code or indicator is dialled. A restart clears the digits dialled after the feature code, but does not clear the feature code itself. If the digits dialled are incomplete or invalid, the SSF/CCF shall not query the SCF, but will provide final treatment.

– Collect a variable number of digits (0 to 32). Digit collection is complete when the caller enters a "#" to indicate end of dialling, or when the normal inter-digit timing interval expires.

As the same DP may be armed multiple times as a TDP-R, precedence rules for trigger processing are specified as:

– For ISDN BRI lines, the same trigger may be assigned to the ISDN line interface or the ISDN Service Profile. These may be provisioned with different SCFs as the destination. The sequence of processing shall be Service Profile first and ISDN line last.

– Subscribed triggers have precedence over group triggers.

– Group triggers have precedence over office triggers.

The sequence for processing IN CS-1 triggers should be as detailed in Table 4-7. Table 4-7 reflects the above trigger precedence rules, giving higher precedence triggers first within the TDPs. Precedence rules for network operator defined trigger types are for further study.

TABLE 4-7/Q.1214

IN CS-1 Trigger precedence

Trigger detection point	Trigger type
Collected_Information	Off_Hook_Delay
	Channel_Setup_PRI
	Shared_Interoffice_Trunk
Analysed_Information	BRI_Feature_Activation_Indicator
	Public_Feature_Code
	Specific_Feature_Code
	Customized_Dialling_Plan
	Specific_Digit_String
	Emergency service

4.2.2.6.1 Origination_Attempt_Authorized

The SSF/CCF detects the originationAttemptAuthorized trigger when an origination indication from the interface is detected and the SSF/CCF completes authorization on it. The OriginationAttempt Authorized_TDP has been reached.

1) TDP: Origination_Attempt_Authorized.
2) DP criteria: trigger assigned (unconditional).
3) Category: subscribed.
4) Trigger assigned to: non-ISDN line, BRI service profile, BRI interface, PRI interface, private facility trunk group.
5) Trigger type: originationAttemptAuthorized.
6) Fault handling: final treatment (other treatment such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.2 Off-Hook_Delay

The Off-Hook_Delay trigger type denotes an event class on the originating interface such that the SSF/CCF receives enough information to process the call, information received does not violate the numbering plan in force, and escape codes/switch-based feature codes that prevent the Off-Hook_Delay trigger from being detected have not been entered. The Collected_Information TDP has been reached. This trigger occurs for all calls, but only on call origination. For example, the Off-Hook_Delay trigger type may be used in providing a feature to request user PIN prior to authorization of routing the call, after dialling is complete.

1) TDP: Collected_Information.
2) DP criteria: trigger assigned (unconditional).
3) Category: subscribed.
4) Trigger assigned to: non-ISDN line, BRI Service Profile, BRI interface, PRI interface, private facility trunk group.
5) Trigger type: offHookDelay.
6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.3 Channel_Setup_PRI

The Channel_Setup_PRI trigger type denotes a call attempt on a specific B-channel on a PRI interface. It is detected when SSF/CCF receives enough information to process the call, information received does not violate the numbering plan in force, and escape codes/switch-based feature codes that prevent the Channel_Setup_PRI trigger from being detected have not been entered. This trigger occurs for all calls that use identified B-channels. For example, if a B-channel is dedicated to a specific service (e.g. directory assistance), this trigger could be used in providing this service on the B-channel.

1) TDP: Collected_Information.
2) DP criteria: trigger assigned (conditional), specific B-channel identifier.
3) Category: subscribed.
4) Trigger assigned to: dedicated B-channel on a PRI interface.
5) Trigger type: channelSetupPRI.
6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.4 Shared_Interoffice_Trunk

The Shared_Interoffice_Trunk trigger type denotes a class of events in which a SSF/CCF performs trigger processing for a CCF. It is detected for calls routed to an SSF/CCF from a CCF: an assist procedure is to be invoked. The SSF/CCF supports a shared inter-office trunk trigger for the interface to a CCF. On this interface, SS7 or conventional signalling used by the CCF to route the call is used by the SSF/CCF for triggering a query to the SCF. For example, this trigger may be used in providing a feature to supply specific routing of a call when an assist has been invoked.

1) TDP: Collected_Information.
2) DP criteria: trigger assigned (unconditional).
3) Category: subscribed (on-trunk basis).
4) Trigger assigned to: public trunk groups.
5) Trigger type: sharedIOTrunk.
6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.5 BRI_Feature_Activation_Indicator

The BRI_Feature_Activation_Indicator trigger type is detected when the SSF/CCF detects a feature activation indicator. If the SSF/CCF receives a feature activator for a switch-based feature with or without dialled digits on the ISDN BRI line, it is desirable that the call escape the Off-Hook Delay trigger even if the other requirements for the trigger are met. This trigger is used for BRI features.

1) TDP: Analysed_Information.
2) DP criteria: trigger assigned (conditional), BRI feature activation/indication.
3) Category: subscribed.
4) Trigger assigned to: BRI Service Profile.
5) Trigger Type: featureActivator.
6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.6 Public_Feature_Code

The Public_Feature_Code trigger type is detected when any of the SSF/CCF supported feature codes (e.g. *XX) are dialled. Although several feature codes may cause the trigger to be detected, the SSF/CCF shall not differentiate between them for subscription purposes (e.g. *46, *53, *58 all cause the trigger to be detected). It is desirable that calls with a feature code that correspond to the activation, deactivation, or access to a switch-based feature with or without dialled digits for a call escape the Off-Hook delay trigger even if the other requirements for the trigger are met. For example, this trigger may be used within a service providers network to advertise other capabilities to the user when an existing feature code is used.

1) TDP: Analysed_Information.

2) DP criteria: trigger assigned (conditional), Feature Code (unconditional).

3) Category: subscribed.

4) Trigger assigned to: non-ISDN line, BRI Service Profile, BRI interface.

5) Trigger type: verticalServiceCode.

6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.7 Specific_Feature_Code

The Specific_Feature_Code trigger type is detected when the SSF/CCF analyses a specific feature code which is administered as a DP criteria (e.g. only *46 causes the trigger to be detected). It is desirable that calls with a feature code that correspond to the activation, deactivation, or access to a switch-based feature with or without dialled digits for a call escape the Off-Hook delay trigger even if the other requirements for the trigger are met. Invocation of call forward can be supported by this trigger type.

1) TDP: Analysed_Information.

2) DP criteria: trigger assigned (conditional), feature code on specific feature pattern.

3) Category: subscribed.

4) Trigger assigned to: non-ISDN line, BRI Service Profile, BRI interface.

5) Trigger type: specificFeatureCode.

6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.8 Customized_Dialling_Plan

The Customized_Dialling_Plan trigger type is detected when an access code is dialled within a customized numbering plan. For example, 8+ or a one to seven digit intercom code can be defined as a trigger to query the SCF. The customized numbering plan specifies, for each code, whether the SSF/CCF performs some manipulation of the dialled digits (e.g. digit insertion, deletion, or translation to public numbers), or queries the SCF with the digits as dialled. It is desirable that calls from users of a customized numbering plan with a feature access code that corresponds to the activation, deactivation, or access to a switch-based feature with or without dialled digits escapes the Off-Hook delay trigger even if the other requirements for the trigger are met. For example, this trigger type could be used in providing 5-digit dialling through the public network for a virtual private network.

1) TDP: Analysed_Information.

2) DP criteria: trigger assigned (conditional), Access Code or specific abbreviated dialling string for customized numbering plan.

3) Category: group.

4) Trigger assigned to: All lines and trunks assigned to a customized numbering plan or business group.

5) Trigger Type: customizedAccess customizedIntercom.

6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.9 Specific_Digit_String

The Specific_Digit_String trigger type is detected when the appropriate sequence of digits is dialled according to the numbering plan in use. For example, a 3, 6, or 10 digit sequence of digits can be provisioned as the trigger. Trigger provisioning specifies whether the SSF/CCF performs some manipulation of the dialled digits (e.g. digit insertion, deletion, or translation to public numbers), or queries the SCF with the digits as dialled. The numbering plan in force should ensure that emergency service numbers are distinct from provisionable specific digit strings. Precedence should be specified (e.g. most to least specific): for further study. For example, this trigger could be used to provide for customized call routing on a specific directory number.

1) TDP: Analysed_Information.

2) DP criteria: trigger assigned (conditional), Specific called party number string.

3) Category: office.

4) Trigger assigned to: All lines and trunks assigned to a public office numbering plan or the entire SSF/CCF (i.e. not every number may have facilities associated with it).

5) Trigger type: As per numbering plan (e.g. E.164, National, private numbering plans).

6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.10 Emergency_Service

The Emergency_Service trigger type is detected when a digit string denoting Emergency Service is dialled. The SSF/CCF detects the Emergency Service trigger on any call with access to the public office numbering plan when a designated Emergency Service (e.g. 911) number is dialled. This trigger can provide for emergency call handling under control of the SCF.

1) TDP: Analysed_Information.

2) DP criteria: trigger assigned (conditional), specific called party number string.

3) Category: office.

4) Trigger assigned to: All lines and trunks assigned to a public office numbering plan or the entire SSF/CCF.

5) Trigger Type: Emergency Service.

6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.11 AFR

The AFR trigger type denotes exhaustion of a list of selected routes within the SSF/CCF. This is used to specify route choices for both public and private network calls. A specific list of routes is assigned to each user. The SSF/CCF detects the Automatic Flexible Routing (AFR) trigger when the list of routes is exhausted (i.e. all routes are busy or unavailable). For example, this trigger type could be used in providing a feature to play a customized announcement when all routes are busy.

1) TDP: Route_Select_Failure.

2) DP criteria: trigger assigned (conditional), DP criteria for further study.

3) Category: group.

4) Trigger assigned to: All lines and trunks with access to the AFR pattern.

5) Trigger Type: aFR.

6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.12 O_Called_Party_Busy

The SSF/CCF detects the O_Called_Party_Busy trigger when the originating call portion receives a report of user busy from the terminating call portion. For example, this trigger may be used to supply an automatic ring again if the called party is busy.

1) TDP: O_Called_Party_Busy.
2) DP criteria: Trigger assigned (conditional), DP criteria for further study.
3) Category: Subscribed, Office.
4) Trigger assigned to: Subscribed – non-ISDN line, BRI Service Profile and Call Type, BRI/PRI interface; Office – non-ISDN line, ISDN interfaces.
5) Trigger Type: oCalledPartyBusy.
6) Fault handling: Final Treatment (Other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.13 O_No_Answer

The SSF/CCF detects the O_No_Answer trigger when the application timer associated with the O_No_Answer event expires: a time-out associated with the originating portion of the call occurs. For example, this trigger type may be used to provide automatic alternate routing when the time-out occurs.

1) TDP: O_No_Answer.
2) DP criteria: trigger assigned (conditional), DP criteria for further study.
3) Category: subscribed, office.
4) Trigger assigned to: subscribed – non-ISDN line, BRI Service Profile, BRI/PRI interface; Office – non-ISDN line, ISDN interfaces.
5) Trigger type: oNoAnswer.
6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.14 O_Answer

The SSF/CCF detects the oAnswer trigger when answer indication from the terminating BCSM is received.

1) TDP: O_Answer.
2) DP Criteria: Trigger assigned (unconditional).
3) Category: subscribed.
4) Trigger assigned to: non-ISDN line, BRI service profile, BRI interface, PRI interface, private facility trunk group.
5) Trigger Type: oAnswer.
6) Fault Handling: call continued (other treatments such as final treatment or default routing are for further study).

4.2.2.6.15 O_Disconnect

The SSF/CCF detects the oDisconnect trigger when either the call is cleared from the terminating BCSM or the originating facility disconnects.

1) TDP: O_Disconnect.
2) DP Criteria: trigger assigned (unconditional).
3) Category: subscribed.
4) Trigger assigned to: non-ISDN line, BRI service profile, BRI interface, PRI interface, private facility trunk group.

5) Trigger Type: oDisconnect.

6) Fault Handling: final treatment if clearing from the terminating BCSM (other treatments such as default routing or continue call processing are for further study), continue call processing if the originating facility disconnects.

4.2.2.6.16 Term_Attempt_Authorized

The SSF/CCF detects the termAttemptAuthorized trigger when an indication is received from the originating BCSM that a call is placed to the terminating BCSM, and the terminating authorization checks have completed successfully.

1) TDP: Term_Attempt_Authorized.

2) DP Criteria: trigger assigned (unconditional).

3) Category: subscribed.

4) Trigger assigned to: non-ISDN line, Directory Number and Call Type, BRI/PRI interface.

5) Trigger type: termAttemptAuthorized.

6) Fault handling: final treatment (other treatment such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.17 T_Busy

The SSF/CCF detects the T_Busy trigger when it determines that the terminating access is busy (i.e. network determined user-busy). For example, this trigger may be used to forward the call to another number (based on time of day) if the terminating access is busy.

1) TDP: T_Busy.

2) DP criteria: trigger assigned (unconditional).

3) Category: subscribed.

4) Trigger assigned to: non-ISDN line, Directory Number and Call Type, BRI/PRI interface.

5) Trigger type: tBusy.

6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.18 T_No_Answer

The SSF/CCF detects the T_No_Answer trigger when the application timer associated with the T_No_Answer event expires: a time-out associated with the terminating portion of the call occurs. For example, this trigger type can be used to automatically reroute the call to a voice mail system.

1) TDP: T_No_Answer.

2) DP criteria: trigger assigned (unconditional).

3) Category: subscribed.

4) Trigger assigned to: non-ISDN line, Directory Number and Call Type, BRI/PRI interface.

5) Trigger type: tNoAnswer.

6) Fault handling: final treatment (other treatments such as Default Routing or Continue Call Processing are for further study).

4.2.2.6.19 T_Answer

The SSF/CCF detects the tAnswer trigger when it detects an answer indication from the terminating facility.

1) TDP: T_Answer.

2) DP criteria: trigger assigned (unconditional).

3) Category: subscribed.

4) Trigger assigned to: non-ISDN line, BRI service profile, BRI interface, PRI interface, private facility trunk group.

5) Trigger type: tAnswer.

6) Fault handling: call continued (other treatments such as final treatment or default routing are for further study).

4.2.2.6.20 T_Disconnect

The SSF/CCF detects the tDisconnect trigger when either the call is cleared from the originating BCSM or the terminating facility disconnects.

1) TDP: T_Disconnect.

2) DP criteria: trigger assigned (unconditional).

3) Category: subscribed.

4) Trigger assigned to: non-ISDN line, BRI service profile, BRI interface, PRI interface, private facility trunk group.

5) Trigger type: tDisconnect.

6) Fault handling: final treatment if clearing from the terminating facility (other treatments such as default routing or continue call processing are for further study), continue call processing if the originating BCSM clears.

4.2.2.7 DP processing

DP processing involves:

– traffic management actions (see call gapping and service filtering information flows in clauses 5 and 6);

– determining if DP criteria are met (see 4.2.2.5 and this subclause);

– handling service logic instance interactions when invoking new instances of IN and non-IN service logic (see this subclause and 4.2.4.3);

– and formulating information flows to send to one or more SCFs (see this subclause and Initial DP and event report information flows in clauses 5 and 6).

See Figure 4-10.

Since a DP may be armed as a TDP and/or an EDP for the same call, the BCM should apply the following set of rules during DP criteria processing to ensure single point of control.

Rule 1: At any DP, a specific trigger condition can only trigger one service logic program instance (SLPI) at a time.

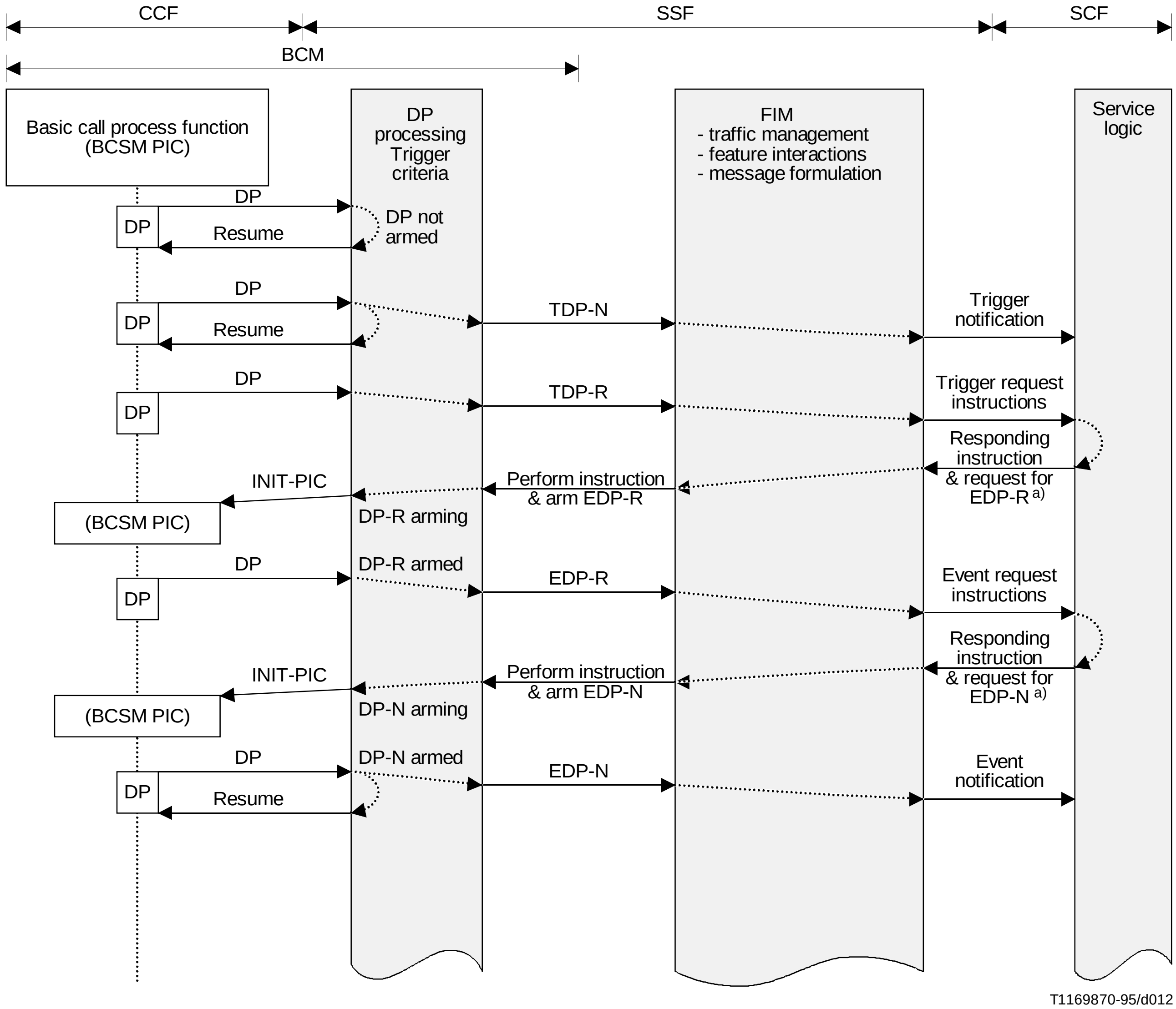
Rule 2: At any DP, processing of notifications – EDP-N and TDP-N – has higher priority than processing of requests – EDP-R and TDP-R. If several notifications exist, EDP-R and TDP-R are processed when all notifications have been processed.

Rule 3: If a DP is both armed as EDP and TDP, then the EDP processing has higher priority than the TDP processing since the EDP has been armed in an already existing SSF-SCF relationship.

Rule 4: If a DP is both armed as EDP-R and TDP-R, The EDP-R is first processed and, if the control relationship is terminated as a result of the EDP-R processing, processing of the TDP-R is allowed.

The rules are listed in descending priority order. They are illustrated with the diagram in Figure 4-11.

A control relationship persists as long as there is ≥ 1 EDP-R armed for this portion of the call. A control relationship terminates if there are no more EDPs armed or the call clears. During a control relationship, EDPs may be dynamically disarmed by the SCF, or are disarmed by the SSF as they are encountered and reported to the SCF, or when the call clears.



DP Detection point
TDP Trigger Detection Point
EDP Event Detection Point
R/N Request/notification
PIC Point In Call

[a] In this example, the responding instruction and request for EDP are shown together. These are independent information flows and may not be sent together in all cases.

FIGURE 4-10/Q.1214

DP processing for each DP type

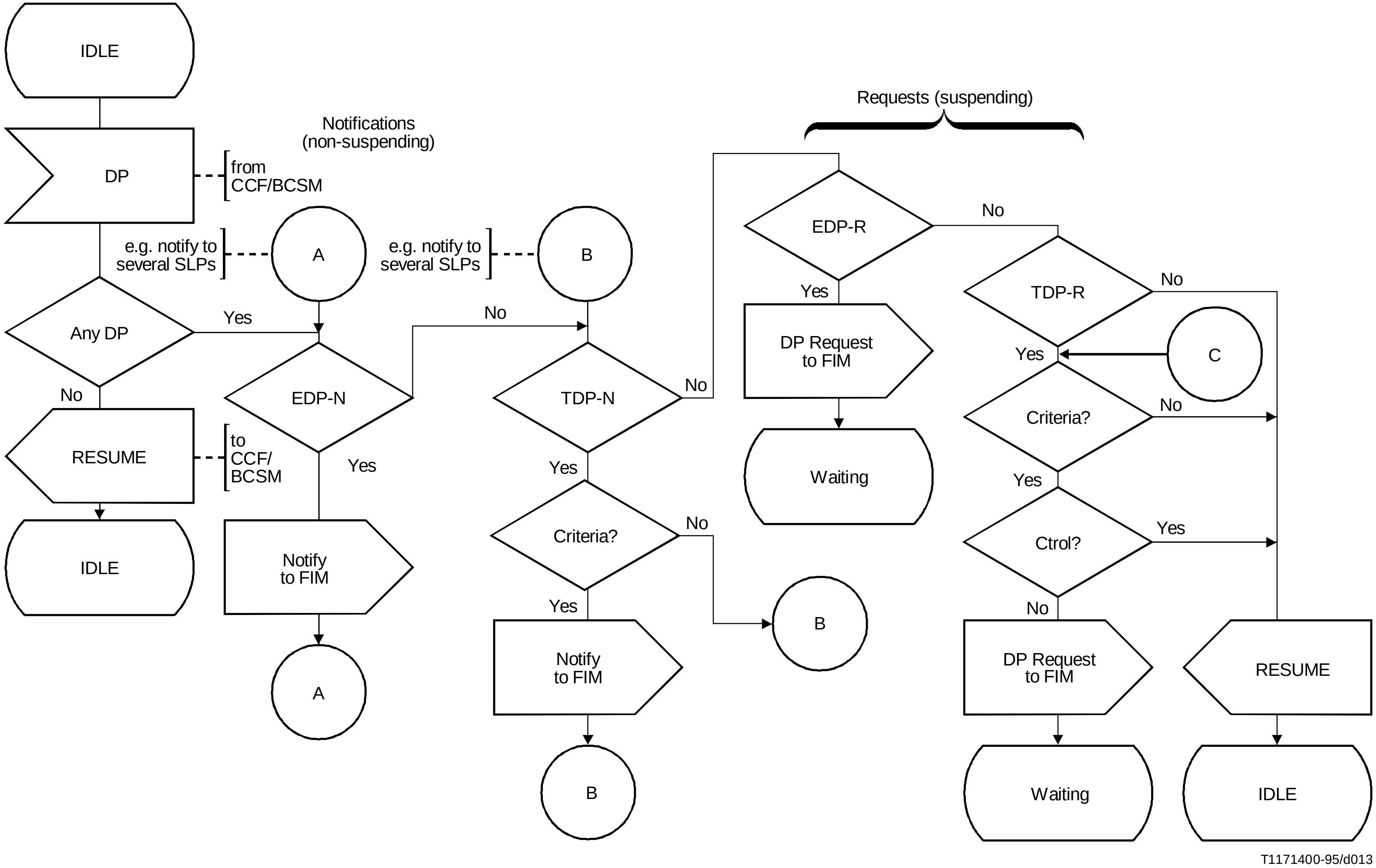


FIGURE 4-11a)/Q.1214

Detection point processing

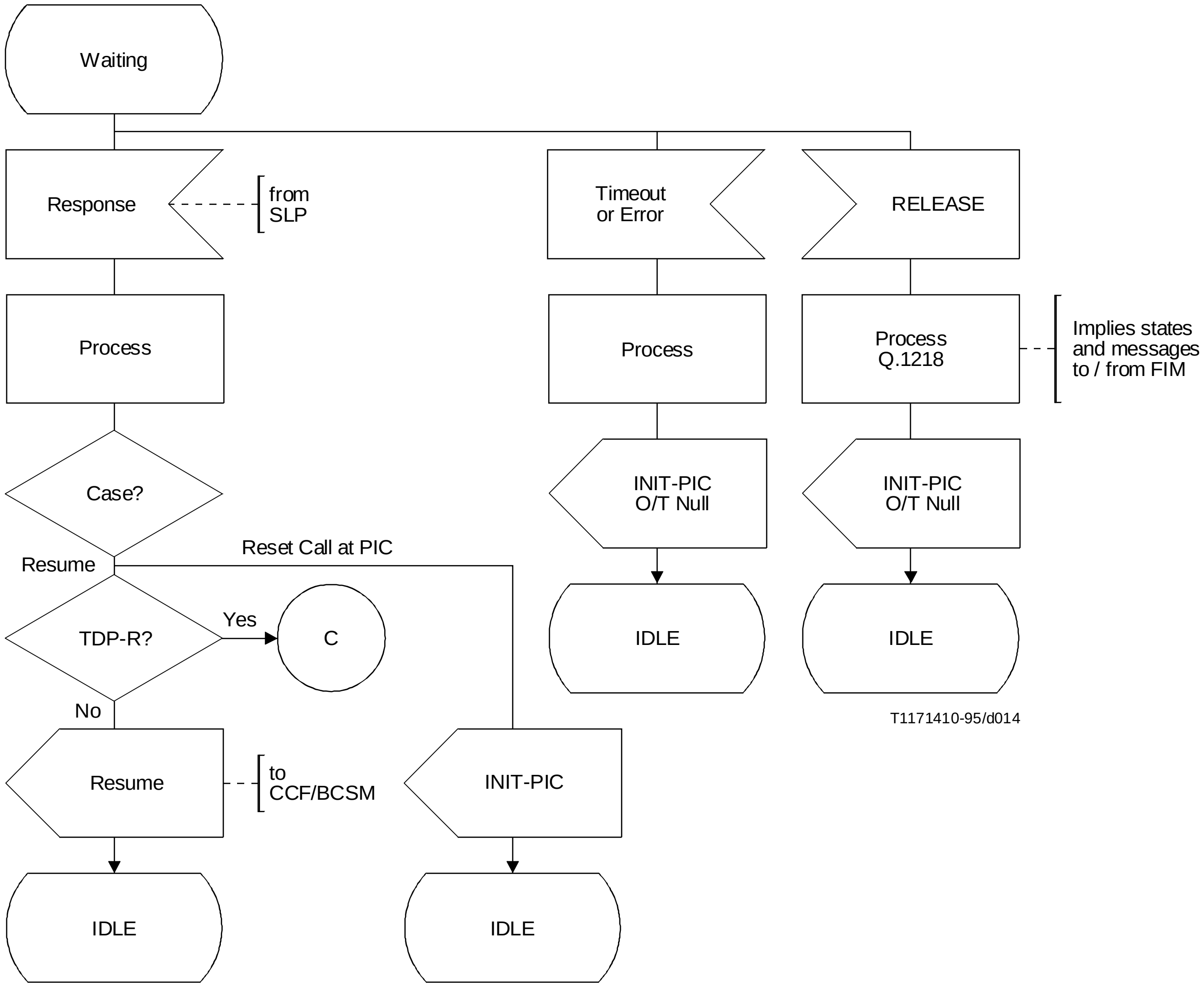


FIGURE 4-11b)/Q.1214

Detection point processing

A control relationship changes to a monitor relationship if there are no more EDP-Rs armed and ≥ 1 EDP-N armed. A monitor relationship terminates if there are no more EDP-Ns armed or the call clears. During a monitor relationship, EDP-Ns are disarmed by the SSF as they are encountered and reported to the SCF, or when the call clears.

TDP-N criteria may be processed whether or not there is an existing control relationship for the same portion of the call, since a TDP-N does not open a control relationship. This procedure has no effect on the existing control relationship.

As a consequence of these rules, the BCM should support a number of TDP/EDP processing combinations to ensure single point of control (refer to Annex A for the "Processing" terminology). These combinations are identified in Table 4-8, along with three error combinations that should not occur.

4.2.3 IN-switching manager (IN-SM)

A brief description of the IN-SM is provided in 4.2. The IN-SM centres around the IN-switching state model (IN-SSM) which provides a description of SSF/CCF IN call/connection processing in terms of IN call/connection states. Object-oriented techniques are used to describe the IN-SSM, based on the concepts and principles outlined in Annex B/Q.1204.

TABLE 4-8/Q.1214

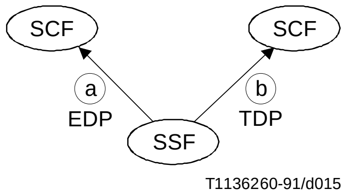
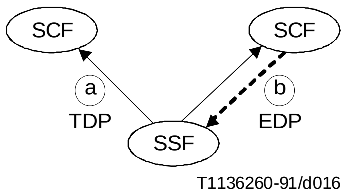
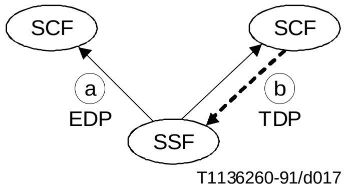
Scenario	TDP type	EDP type	Existing relationship	Processing
1	Not armed	Not armed	Do not care	Continue
2	TDP-R	Not armed	No	Initiating DP request
3.a	TDP-R	Not armed	Control	Continue (ignore TDP)
3.b	TDP-R	Not armed	Monitor	Initiating DP request
4	TDP-N	Not armed	Do not care	One-way DP notification Initiate Monitor relationship
5.a	Not armed	EDP-R	Control	Subsequent DP request, if ≥ 1 armed EDPs remaining, or terminating DP request, if last armed EDP
5.b	Not armed	EDP-R	Monitor	Error case – Continue (ignore EDP)
6	Not armed	EDP-N	Control or Monitor	Subsequent DP notification, if ≥ 1 armed EDPs remaining, or terminating DP notification, if last armed EDP
7	Not armed	EDP-R/N	No	Error case – Continue (ignore EDP)
8	TDP-N	EDP-N	Control or monitor	Process a and b: a) For EDP, process as scenario 6 b) For TDP, one-way DP notification, process as scenario 4 
9	TDP-N	EDP-R/N	No	Error case – Ignore EDP and process TDP as scenario 4
10.a	TDP-N	EDP-R	Control	Process a and b: a) For TDP, one-way DP notification, process as scenario 4 b) For EDP, subsequent DP request, process as scenario 5.a 
10.b	TDP-N	EDP-R	Monitor	Error case – Ignore EDP and process TDP as scenario 4
11.a	TDP-R	EDP-N	Control	Process a and b: a) For EDP, subsequent DP notification, process as scenario 6. b) Ignore TDP

TABLE 4-8/Q.1214 *(end)*

Scenario	TDP type	EDP type	Existing relationship	Processing
11.b	TDP-R	EDP-N	Monitor	Process a and b: a) For EDP, process as scenario 6 b) For TDP, initiating DP request, process as scenario 3.b 
12	TDP-R	EDP-R/N	No	Error case – Ignore EDP and process TDP as scenario 2
13.a	TDP-R	EDP-R	Control	Process EDP as scenario 5.a. If this EDP was the last of the previously established control relationship, process the TDP afterwards. Otherwise the TDP is ignored
13.b	TDP-R	EDP-R	Monitor	Error case – Ignore EDP and process TDP as scenario 3.b

The IN-SM subjects described in the following subclauses include the IN-SSM, IN-SSM events that can be reported to active IN service logic instances, and SSF resource control. A high-level description of these subjects is provided.

4.2.3.1 IN-switching state model (IN-SSM)

The IN-SSM provides an object-oriented finite state machine description of SSF/CCF IN call/connection processing in terms of IN call/connection states. It provides a framework for describing the scope of view and control of SSF/CCF activities offered to an SCF. The extent to which the IN-SSM is visible to the SCF is defined by the information flows identified for IN CS-1 between the SSF/CCF and SCF. Though this framework is consistent with the scope of IN CS-1 as identified in Recommendation Q.1211, not all of the capabilities implied by the IN-SSM are supported by the information flows and information elements defined in clause 6. In particular, the information flows for manipulating individual call parties, and information elements reflecting IN-SSM call/connection states, are for further study. A starting point for these studies is contained in Appendix I.

IN call/connection states can be described in terms of the IN-SSM, which defines the set of SSF/CCF objects visible to the SCF. Each IN-SSM instance provides the SCF with a limited aperture of visibility and influence into SSF/CCF IN call/connection processing. This aperture of visibility and influence is defined by the objects that constitute the IN-SSM. These objects are abstractions of SSF/CCF resources accessible to the SCF.

There can be various types of IN-SSMs, each type defined by the objects that constitute it. For example, a “connection control” IN-SSM would contain objects that are abstractions of switching and transmission resources. This subclause focuses on such a connection control IN-SSM, though it is recognized that other types of IN-SSMs may exist for accessing other types of resources.

There can also be various subtypes of a particular IN-SSM type, each defined by a subset of, or restriction on the use of, the total set of objects in the IN-SSM type. It is anticipated that IN-SSM subtypes will be identified to align with specific IN capability sets as they are defined.

A connection control IN-SSM instance is created when an IN service logic instance is invoked that requires IN connection control. It is either created as a result of encountering a TDP in a BCSM that satisfies DP criteria, or is initiated by the SCF independent of encountering TDPs. A connection control IN-SSM instance is destroyed when the SCF informs the SSF that the IN service logic instance is completed or the IN-SSM should be destroyed. The SSF can also initiate IN-SSM destruction (e.g. during error or abnormal conditions).

Figure 4-12 provides an example of a connection control IN-SSM instance. It illustrates two classes of objects that have been identified: legs and connection points. A leg is a representation of a communication path towards an addressable network entity, as viewed from the IN-SSM. A connection point is a representation of the interconnection of legs, as viewed from the IN-SSM, that allows information to flow between legs. It should be noted that the fundamental processes that establish communication paths, and maintain connections between them, are the basic call processes modelled by one or more BCSMs. As such, the connection control IN-SSM objects reflect both connectivity information (e.g. the relation of legs and connection points to each other) and call processing information (e.g. BCSM events and basic call-related information), which can be used by an instance of IN service logic to influence the connectivity and call processing aspects of a call.

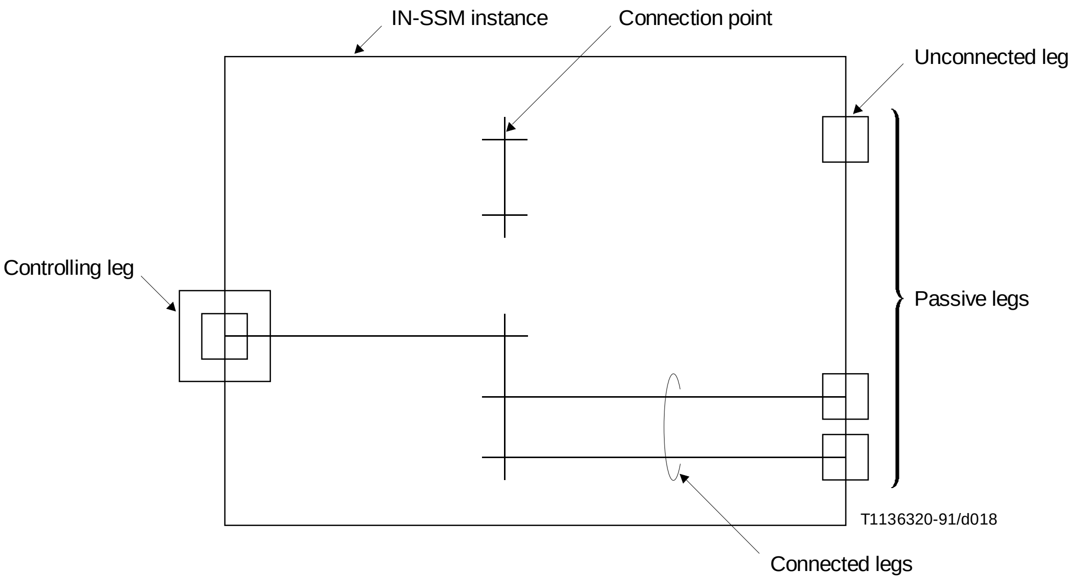


FIGURE 4-12/Q.1214

Connection control IN-SSM instance

The attributes of these objects and their relation to each other describe the state of the connections, and supporting basic call processes, represented by the IN-SSM. The SCF can invoke SSF functions that manipulate these objects (e.g. changing their attributes or their relationship to each other, thereby changing the state of the connections and supporting basic call processes). This state information is provided to the SCF via information flows and information elements (e.g. EDP-Request information flows and related information elements). The allowable state changes for IN CS-1 are reflected in the semantic description of SCF-SSF information flows related to basic call processing (see BCP SIB stage 2 description and related information flows in clauses 5 and 6, respectively) and leg manipulation, though the latter remains for further study (see Appendix I).

Objects in an IN-SSM are controlled within the context of an SCF-SSF interaction as defined by the IN-SSM type. As such, they are considered local to the IN-SSM. However, manipulating an object can have significance outside the IN-SSM and the SSF. In particular, leg manipulation has significance beyond the boundaries of the IN-SSM, even though it can only be controlled within the context of the IN-SSM. This is because a leg represents a path toward some addressable entity that may be supported by switching and transmission resources beyond the immediate control of the SSF/CCF. Thus, the relation between leg manipulation and signalling associated with switching and transmission resources should be identified as part of the semantic description of SCF-SSF information flows related to leg manipulation. This aspect is for further study.

Other object classes related to the connection control IN-SSM are abstractions of specialized resources such as tones and announcements. These objects will not be explicitly shown in a connection control IN-SSM for IN CS-1 (though they may appear in the context of other IN-SSM types, such as "resource management" IN-SSMs). However, they may be implicitly used within a connection control IN-SSM via SSF functions that manipulate connection control IN-SSM objects (e.g. functions to send/receive information to/from users via legs). In addition, their use may be reflected in a connection control IN-SSM as an appearance of a leg representing a path to some external entity that provides specialized resources (such as may be supported by an SRF). Other object classes are not explicitly modelled for IN CS-1, though they are implied by other information flows/information elements defined for IN CS-1.

The characteristics of SSF/CCF call processing represented by connection control IN-SSM objects for IN CS-1 are described below. These characteristics imply the attributes and functions related to IN-SSM objects, to be reflected in the call processing information flows/information elements defined for IN CS-1.

a) The IN CS-1 connection control IN-SSM provides the SCF with an abstract view of an isolated portion of a call managed by a functionally separate portion of the SSF/CCF. This isolated portion of a call is referred to as a "half-call" or call segment (see Figure 4-13).

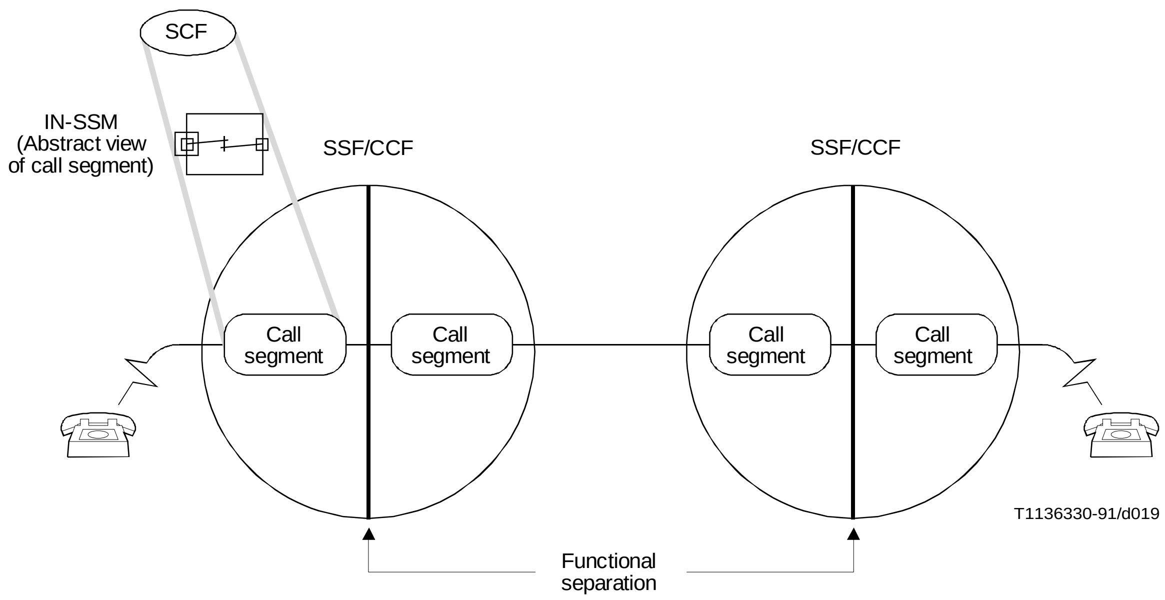


FIGURE 4-13/Q.1214

Call segments in two-party inter-SSF/CCF call

This term is used to refer to the physical resources (e.g. connectivity and transmission resources represented by legs and connection points) and to the processes (e.g. basic call processes as modelled by BCSMs) that are involved in the isolated portion of a call (see Figure 4-1).

The SCF does not have direct access to a call segment, but rather has access to the abstract representation of the call segment provided by the IN CS-1 connection control IN-SSM. For IN CS-1, access via an IN CS-1 connection control IN-SSM is limited to a single two-party or multi-party[3] call segment, or to a pair of associated call segments (see Figure 4-14). A pair of associated call segments are two call segments that can be related together by the SSF/CCF and manipulated as a pair (e.g. to merge them together into a single call segment). For IN CS-1, two call segments can only be associated if both call segments are for the same end user. For example, the SSF/CCF can associate two call segments if the end user is involved in an existing call and would like to originate an additional call, or if the end user is involved in an existing call and there is a new call directed to that end user. This latter example is shown in Figure 4-14. The extent to which associated call segments are visible to the SCF via an IN-SSM is for further study.

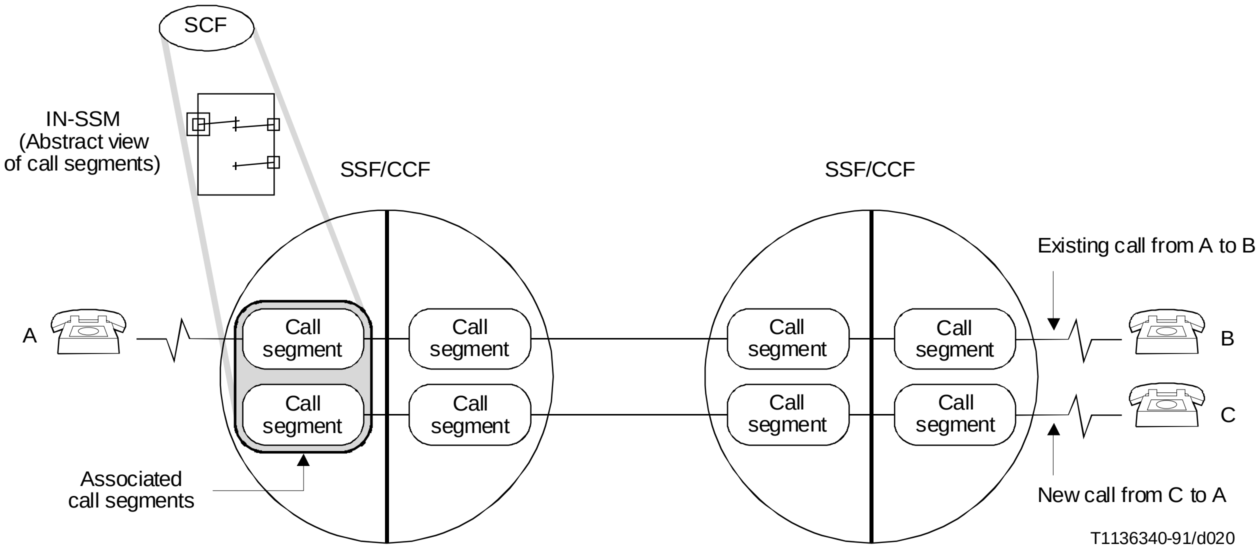


FIGURE 4-14/Q.1214

Associated call segments

b) An IN CS-1 connection control IN-SSM provides an SCF with an abstract view of a single two-party or multi-party call segment, or of a pair of associated call segments. The connection control IN-SSM represents the properties of a call segment or pair of associated call segments of interest to the SCF (e.g. the connectivity and call processing aspects) and describes these properties in terms of objects (i.e. virtual resources) that can be manipulated by the SCF. For connection control, these objects include legs and connection points.

– A leg can be designated as a controlling leg or as a passive leg. For IN CS-1, the controlling leg is the leg that represents the access interface (e.g. the incoming line or trunk in an originating call segment, or the outgoing line or trunk in a terminating call Segment). It is the leg for which IN service logic instances are invoked, either as a result of end user signalling (e.g. a mid-call event) or on behalf of an end user. There is no more than one controlling leg in a connection control IN-SSM. Transfer of control from an end user supported by a controlling leg to an end user supported by a passive leg is not feasible for IN CS-1.

[3] Only single-ended, single point of control multi-party call segments are within the scope of CS-1.

- For IN CS-1, controlling legs represent line or trunk interfaces. There may be a limitation on how these two types of controlling legs may be manipulated by the SCF for IN CS-1.

- Legs are uniquely identifiable in a IN CS-1 connection control IN-SSM.

- It should be possible to: influence the flow of basic call processing associated with a leg (e.g. generate a signalling event and continue basic call processing as appropriate for that event); add a passive leg to a IN CS-1 connection control IN-SSM by originating a call or terminating a call; to drop legs (one or more) by clearing calls; to make or break connections between legs (e.g. join or split); and to move legs from one connection point to another within the same IN CS-1 connection control IN-SSM (e.g. split a leg from one connection point then joining it to another). It may not be feasible in IN CS-1 to move a leg from one IN CS-1 connection control IN-SSM to another.

- A connection point represents a joint function between two legs, a conference function between three or more legs, or an information distribution function between two or more legs that specifies the directionality of information flow through the connection point (e.g. the connection point could receive information from multiple legs and distribute it to another leg). For IN CS-1, it interconnects legs supported by equivalent bearer services, and supports interworking between circuit mode/speech and circuit mode/3.1 kHz audio bearer services.

- There can be up to two connection points in an IN CS-1 connection control IN-SSM, one per call segment that is represented by the IN-SSM. There can only be two connection points if call processing for one of the call segments has progressed beyond call set-up. Further, only one of the two connection points in an IN CS-1 connection control IN-SSM can interconnect more than two legs. The other connection point can only interconnect two legs. In an IN CS-1 connection control IN-SSM, it should be possible to merge two connection points into a single connection point, thereby merging the corresponding call segments. Finally, it should be possible to release a connection point and all of its legs all at once, thereby clearing the corresponding call segment.

The call segment concept can be used to describe how the definitions of “single-ended service feature” and “single point of control” apply to the distributed functional plane.

A single-ended service feature, as described in 3.1/Q.1211, is described in terms of:

- the scope of control of the service logic instance that realizes the service feature, with respect to the call; and

- the interaction of the service logic instance with respect to other single-ended service logic instances on the same call.

The scope of control of a single-ended service logic instance is restricted to the isolated “half-call(s)” in an SSF/CCF (i.e. the call segments) accessible to the SCF via a control relationship. This is illustrated in Figure 4-15 for a two-party call, which shows the BCSMs related to each call segment.

This may also be extended in IN CS-1 for a pair of associated “half-calls”, or a multi-party “half-call”, though these scenarios are low priority for IN CS-1. These scenarios are illustrated in Figures 4-16 and 4-17.

All of these scenarios are based on the assumption that “half-calls” can be isolated from their complementary “half-calls” by the functional separation between an originating BCSM and its complementary terminating BCSM.

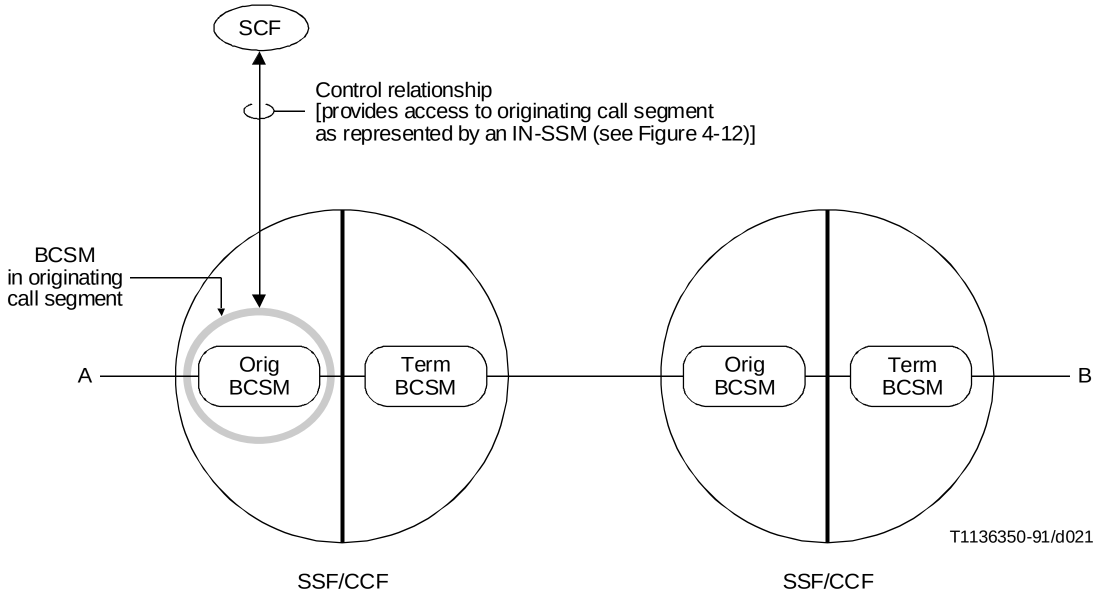


FIGURE 4-15/Q.1214

Single-ended control of a two-party call

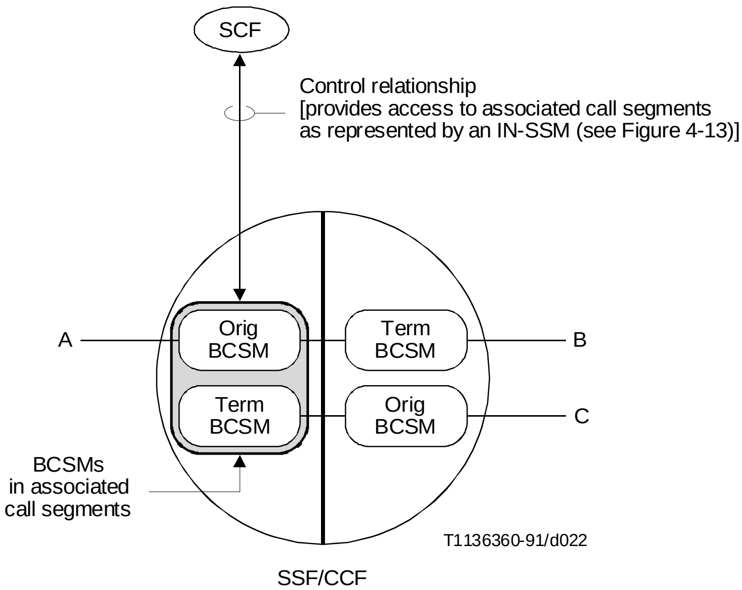


FIGURE 4-16/Q.1214

Single-ended control of associated calls

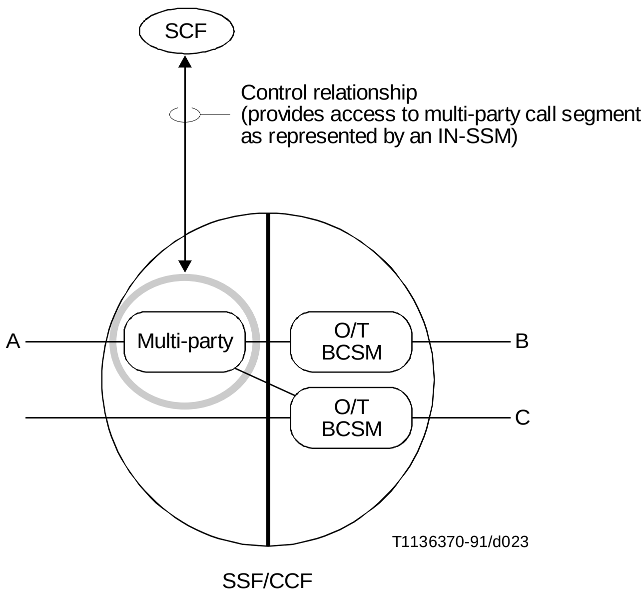


FIGURE 4-17/Q.1214

Single-ended control of a multi-party call

A single-ended service logic instance can only directly influence the processing of the isolated "half-call" (or associated "half-calls") in the SSF/CCF. The other "half-calls" can only be indirectly influenced via information propagating from one "half-call" to another (i.e. between originating and terminating BCSMs, or between BCSMs in different SSF/CCFs). As such, multiple single-ended service logic instances (one per "half-call") may be simultaneously active on a single call, each isolated from the other by the communication between "half-calls". The communication between originating and terminating BCSMs in the same SSF/CCF is described in 4.2.2.2 (IN CS-1 BCSM description), and is illustrated in Annex A. The communication between BCSMs in different SSF/CCFs is assumed to be the same as existing signalling between exchanges.

Single point of control, as it applies to the distributed functional plane is as follows:

– an isolated "half-call" in the SSF/CCF can only be influenced by one SCF at a time;
– while one SCF is influencing an isolated "half-call" in the SSF/CCF, it may be possible to:
  - send DP report[4] information flows from the SSF/CCF to the same SCF or different SCFs;
  - end the control relationship between the controlling SCF and the SSF/CCF, or change the control relationship to a monitor relationship, then initiate a control relationship between the SSF/CCF and a different SCF (see 4.2.2.6).

4.2.3.2 IN-SSM EDPs

Certain IN-SSM events can be reported to active IN service logic instances that have already been invoked. These events are referred to as IN-SSM EDPs. For example, events such as the successful completion or failure of a particular IN-SSM function may need to be reported. Detection of IN-SSM EDPs does not lead to the invocation of additional IN service logic instances. IN-SSM EDPs are handled implicitly for IN CS-1 for those information flows from the SCF that require confirmation by the SSF/CCF.

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[4] See BCP SIB Stage 2 description in clause 5.

4.2.3.3 SSF resource control

Local and remote specialized resources needed to perform IN call/service processing are accessible to the SSF/CCF. The treatment of specialized resources with respect to the connection control IN-SSM was described above. Objects that explicitly represent specialized resources are not explicitly modelled for IN CS-1, though they are implied by other information flows/information elements defined for IN CS-1.

4.2.4 Feature Interactions Manager (FIM)/Call Manager (CM)

A brief description of the FIM is provided in 4.2.1. The particular FIM subjects described below include FIM/CM functionality and service logic instance interactions aspects. A high-level description of these subjects is provided below.

4.2.4.1 FIM/CM Functions

As described in 4.2.3.1, an IN CS-1 connection control IN-SSM provides an SCF with an abstract view of a single two-party or multi-party call segment, or of a pair of associated call segments. As such, the SCF can control multiple communication paths and connections, supported by multiple BCSMs. Overall management of these various elements of call segments is provided by the CM functionality. The CM interacts with the BCM and IN-SM to:

a) coordinate event reporting among multiple BCSMs for a given IN CS-1 connection control IN-SSM (e.g. event reporting when the same event is detected in multiple BCSMs simultaneously, such as “hook-flash”, DTMF # or *XX, or when different events are detected in multiple BCSMs simultaneously, such as “hook-flash” from one party and “disconnect” from another);

b) coordinate the suspension and resumption of BCSM processing among multiple BCSMs for a given IN CS-1 connection control IN-SSM (e.g. when an event is detected in a BCSM for which the BCM requires further instructions on how to proceed, processing of all BCSMs for that IN CS-1 connection control IN-SSM may need to be halted);

c) enforce rules and restrictions applicable to an IN CS-1 connection control IN-SSM (e.g. rules and restrictions on when and how the SCF can manipulate legs, associate a pair of call segments, and merge a pair of associated call segments).

FIM functionality is described below.

d) The FIM should provide a service logic instance selection mechanism to determine which service logic instance to invoke at a DP. This mechanism should select the appropriate IN service logic instance or non-IN service logic instance, and for IN CS-1, may block the invocation of any other service logic instances for that particular DP (see 4.2.4.3).

e) The FIM may not always allow simultaneously active IN and non-IN service logic instance for IN CS-1 that control the call/connection. There are both static and dynamic mechanisms of realizing this restriction. The static mechanism may involve service management functionality (e.g. via service provisioning), whereas the dynamic mechanism may involve more complex FIM capabilities. For IN CS 1, the simplest mechanism should be implemented (see 4.2.4.2).

f) The FIM should provide mechanisms to support simple, restricted service logic instance interactions between simultaneously active service logic instances from different SCFs acting on the same call segment (see 4.2.4.3).

4.2.4.2 Service logic instance interactions considerations

It is recognized that services provided by an IN-structured network will be composed of one or more service features, which are constructed from one or more reusable units of capabilities (e.g. SIBs) provided to users by the network. It is also recognized that one or more service features may be simultaneously active on a single call. Finally, it is recognized that both IN service features and non-IN service features may be simultaneously active on a single call. A service feature interactions mechanism is needed to manage the potential interactions (both desirable and undesirable) between such service features. Given that these service features are realized by service logic instances, this mechanism needs to be described in terms of rules and procedures relative to triggering, compatibility, precedence, invocation, execution, and event reporting for multiple service logic instances. This subclause addresses the static and dynamic aspects of service logic instance interactions management, as well as mechanisms for determining compatibility and precedence.

a) *Static and dynamic aspects*

There are two aspects to service logic instance interactions management, to include the static and dynamic aspects. These two aspects are discussed below.

– *Static aspects*

The static aspects of service logic instance interactions management concerns the provision of service features to end users. To illustrate this, consider the following example: end user A already has service feature X, and it is known that service feature X and service feature Y are mutually incompatible; if an attempt is made to provision the invocation of a service logic instance for service feature Y to end user A using OAM procedures, then this attempt should be rejected.

– *Dynamic aspects*

There are three items to be considered under the dynamic aspects of service logic instance interaction management.

- If at a particular DP there is more than one service logic instance which can be invoked, then a decision must be made as to which of these service logic instances will be invoked first (i.e. service logic instance selection).

- If a service logic instance can be invoked, then a decision must be made as to whether or not the new service logic instance is compatible with any service logic instances already active on the same call segment.

- If the new service logic instance is compatible with any service logic instances already active on the same call segment, then a decision must be made as to its precedence for call processing events (such as signalling messages) with respect to other active service logic instances; if the new service logic instance is incompatible, it should be blocked.

For the latter two items, there are at least two potential approaches to service logic instance interactions management.

- The first approach is to make decisions as part of DP processing; with this approach, decisions about service logic instance compatibility and precedence are made before a service logic instance is invoked.

- The second approach is to make decisions independent of DP processing; with this approach, decisions about service logic instance compatibility and precedence are made after a service logic instance is triggered.

The first approach is simpler, though restrictive, since it can prevent service logic instances from being invoked, only requiring the management of a limited number of service logic instance interactions. The second approach is more complex, though flexible, since it does not prevent service logic instance from being invoked, thus requiring a mechanism that can manage all possible service logic instance interactions. Due to this complexity, the second approach is considered beyond the scope of IN CS-1.

b) *Mechanisms for determining compatibility and precedence*

At present, knowledge concerning the compatibility of service features and their precedence is "hard-coded" in to the SSF/CCF. This mechanism relies on specifying each possible interaction for every possible combination of service features. As the number of service features gets large (one of the aims of IN), this specification quickly becomes complex, complicating the task of the service designer. Furthermore, as each new service feature is added, its many possible interactions must be identified and specific rules and data must be introduced into the SSF/CCF or SCF to specify how each interaction is to be resolved.

A more general mechanism than "hard-coding" would be a "data-driven" mechanism in which the service designer could specify service feature compatibility and precedence during service creation and provisioning. The service creation environment could provide the service designer with information about the specific service features for a particular subscriber, enabling the service designer to specify such things as which service features are blocked by a new service feature, the relative precedence of the new service feature to other service features, and the DP at which the service logic instance for the service feature should be invoked. The output of such a mechanism could be introduced directly into the SSF/CCF or SCF from the service creation environment.

The ultimate mechanism would be to use an expert system approach to reduce the burden on the service designer.

For IN CS-1, the existing mechanisms for service logic instance interactions management will have to be used beyond what is described in 4.2.2.6 for IN-IN service logic instance interactions in the SSF/CCF, and 4.2.4.2 c), 4.2.4.2 d), and 4.2.4.3 for IN-non-IN service logic instance interactions in the SSF/CCF. That is, the interactions between service logic instances (both IN and non-IN) will have to be specified as part of the service feature description, with vendor-specific mechanisms to resolve remaining interactions in the specified manner. In addition, it may be possible to adopt a data-driven approach if mechanisms can be incorporated into the service creation environment to prompt the service designer for compatibility and precedence information, then download the appropriate data into the SSF/CCF or SCF. The expert system approach is considered to be beyond the scope of IN CS-1.

c) *IN and non-IN service logic instance interactions*

There are desirable and undesirable IN and non-IN service logic instance interactions in the SSF/CCF. The Table 4-9 identifies these for IN CS-1.

This table classifies IN and non-IN service logic instances first by whether or not they involve connection control (e.g. leg manipulation). Non-IN service logic instances that do not involve connection control are further classified by their involvement in call/service processing. This includes involvement in passing end-to-end information on a call (e.g. user-to-user information, calling number delivery) or using call-related information (e.g. for number translation), and involvement only in terms of receiving notification of call-related events (e.g. answer, disconnect). IN service logic instances are also further classified by their involvement in call/service processing. This includes involvement in terms of receiving requests and providing non-connection control instructions (e.g. Proceed call processing with new information), and involvement only in terms of receiving notification of call-related events. Based on these classifications, a matrix of interaction restrictions for IN CS-1 can be developed, as reflected in Table 4-2.

TABLE 4-9/Q.1214

IN and non-IN service logic instance interactions

<table>
<tr><td colspan="2" rowspan="3"></td><td colspan="4">NON-IN</td></tr>
<tr><td colspan="2" rowspan="2">Connection
Control (CC)</td><td colspan="2">Non-connection control</td></tr>
<tr><td>Passing or using information</td><td>Notification</td></tr>
<tr><td rowspan="3">IN</td><td>CC</td><td colspan="2"></td><td>Cannot be independent</td><td>OK</td></tr>
<tr><td rowspan="2">NON-CC</td><td>Request</td><td>Restricted
(e.g. translation)</td><td>• OK for passing information (e.g. CLID); or
• need precedence if using same information or same DP</td><td>OK</td></tr>
<tr><td>Notification</td><td>OK</td><td>OK</td><td>OK</td></tr>
</table>

From the table, it is evident that IN service logic instances that involve connection control must be completely independent of non-IN service logic instances that involve connection control. This is a consequence of the single point of control constraint for IN CS-1. Further, it is evident that IN and non-IN service logic instances that only involve notification of events can interact with any other type of IN and non-IN service logic instances, since these do not involve any type of control. The remaining interactions are restricted as follows:

- *IN CC vs. Non-IN passing or using information* – In this case, the service logic instances cannot be processed independent of each other since IN service logic instances that involve connection control may prevent passing of end-to-end information by changing or interrupting connections.

- *IN Non-CC Request vs. Non-IN CC* – In this case, IN service logic instances are restricted to those that only manipulate basic call-related information (e.g. for destination number translation), and do not change the flow of basic call processing (e.g. given that basic call processing is suspended while waiting for IN call handling instructions, processing resumes from the point at which it was suspended when instructions are received). In this case, IN service logic instances can be invoked to enhance non-IN connection control [see discussion in 4.2.4.2 d)].

- *IN Non-CC Request vs. Non-IN passing or using information* – In this case, passing end-to-end information should be transparent to IN service logic instances. However, IN and non-IN service logic instances may be competing for the same call-related events or information. Straightforward precedence and exclusion mechanisms can be used to resolve this contention for IN CS-1. These mechanisms are described in 4.2.4.3.

These restrictions are identified as guidelines to assist implementors in managing these types of interactions in a proprietary manner in those cases where mechanisms are not described in this Recommendation.

d) *Applying "Type A" IN technology to "Type B" services*

There are some circumstances in which it will be possible to apply "Type A" IN technology to certain aspects of "Type B" services. This applies to switch-based services in general, whether these services be of "Type A" or "Type B", and to "Type B" services in general, whether these be switch-based or CS-n based.

"Type A" services are characterized as "single-ended" and "single point of control". It also happens that IN CS-1 is limited to "single medium" (as opposed to "multi-media") services. By implication, "Type B" services differ from "Type A" services in at least one of the dimensions: (ends, points of control, media). Of main interest in the shorter term is variation of the number of ends affected. Some examples of "Type A" services are: Freephone, Virtual Private Network (VPN), Universal Personal Telecommunications (UPT), originating and terminating call screening, selective call forward on busy/don't answer, credit card calling, televoting, malicious call identification, and completion of call to busy subscriber. Currently defined "Type B" services are generally available using switch-based technology. It may be expected that equipment vendors will provide support and interworking of "Type A" and "Type B" services in their product portfolios. Such interworking will not necessarily be part of the standards for IN CS-1.

i) *Situations when "Type A" capabilities may be used with "Type B" or switch-based services*

In circumstances where a request for a "Type B" or switch-based service requires a check to see whether such a service may be performed, "Type A" technology may be applied before proceeding with the service.

In circumstances where several variations in a "Type B" or switch-based service are possible, a check to see which variation is to be performed may make use of "Type A" technology.

ii) *Determining when to use "Type A" capabilities*

In the active phase of a call, certain means for gaining the attention of the exchange (e.g. switch-hook flash) are context specific. In these circumstances, the context needs to be considered first to determine whether a "Type A" service request should occur. For example, after receiving call waiting tone, a series of switch-hook flashes may be used to toggle between the two calls. In the absence of call waiting, a switch-hook flash may indicate a desire to add in a third party, with a subsequent switch-hook flash joining the three subscribers.

From these two cases, it can be seen that some care needs to be taken in determining whether or not it is appropriate to launch a "Type A" service query. In the example described, it would not be appropriate once the call waiting tone has been applied, nor after the waiting call has been answered. In the second case, it would be appropriate to see what should be done. Some options that could be indicated to the switch might be: ignore the switch-hook flash, proceed with normal three party call, add-in fixed third party (e.g. supervisor), etc.

Taking full advantage of this approach will require some extension of the SSF/SCF interface to include identification of the specific service and instruction to proceed or not with (standardized) services. The extent to which this can be standardized for IN CS-1 will depend on the time and resources available to do it as the standardization for the base capabilities to support "Type A" services proceeds.

iii) *Examples of services augmented by "Type A" capabilities*

– *Conference dial-in authorization*

In this service, only authorized parties may dial-in to a conference bridge. Conferencing is, in general, a "Type B" service in that more than one end is involved when another subscriber joins the conference.

An SSF supporting a conference capability, on receiving a request to join the conference, may use "Type A" technology to query an SCF for a list of authorized participants. This list would be updated through an OA&M process as conference reservations are made, and would include such things as: conference timings, participant identification, billing to be applied, etc. This list could even be updated in real time as the conference proceeds so that previously excluded subscribers may join in as directed by the conference "owner" or Chairman.

In this way, a substantial degree of security may be added to a conference, especially one that is regularly held and at which sensitive information might be discussed.

– *Selective or distinctive call waiting*

In order to determine whether a call waiting tone should be applied, the terminating exchange may consult an SCF for a screening list (inclusive or exclusive) to determine whether call waiting should be applied or whether alternative treatment should be given to the incoming call. In this way, "Type A" technology can be used to augment this service.

In order to indicate certain special callers, a distinctive call waiting tone may be applied. "Type A" technology may be used to identify when this applies and, when there are several distinctive tones available, which should be applied. In this way, "Type A" technology can be used to augment this service.

4.2.4.3 FIM mechanisms

FIM mechanisms for IN CS-1 include precedence and priority mechanisms to manage the invocation of instances of IN and non-IN service logic, and exclusion mechanisms to manage the invocation of new instances of IN service logic when existing instances of IN service logic are still active. These mechanisms are described below:

a) *Precedence and priority*

Subclause 4.2.2.6 identifies the assumptions that a DP may be armed as both a TDP and EDP, and that a DP may be armed with multiple criteria, each for the invocation of a different instance of IN service logic. In addition, 4.2.4.2 identifies the additional assumption that a DP may be armed for instances of non-IN service logic, in addition to instances of IN service logic. These assumptions, along with the constraints for IN CS-1 identified in clause 2, form the basis of a set of precedence and priority rules that should be used when processing DP criteria. These rules are listed below:

i) when processing criteria for an armed DP, process criteria for a DP-Notification (DP-N) before a DP-Request (DP-R);

ii) when processing criteria for a DP-N or a DP-R, process criteria for EDPs before TDPs;

iii) when processing criteria for EDPs or TDPs, criteria processing rules for IN service logic and non-IN service logic must allow IN and non-IN service logic processing based upon priority of services;

iv) when processing criteria for IN or non-IN service logic, process criteria in priority order, as provisioned through administrative procedures.

Application of these rules may result in the following precedence ordering, with a priority ordering of multiple service logic instances at each level:

– *EDP-N for an instance of IN service logic* – A control or monitor relationship exists with an SCF for an existing IN service logic instance; the event detected at the DP is reported to the SCF in the context of the existing relationship and the next DP criteria is processed immediately. No response is expected from the SCF.

– *EDP-N for an instance of non-IN service logic* – The EDP is for an existing non-IN service logic instance in the SSF/CCF; the event detected at the DP is reported to the non-IN FM and the next DP criteria is processed immediately. No response is expected from the non-IN FM.

– *TDP-N for an instance of IN service logic* – The event detected at the DP is reported to the SCF via a new monitor relationship and the next DP criteria is processed immediately. No response is expected from the SCF.

– *TDP-N for an instance of non-IN service logic* – The TDP is for a non-IN service logic instance in the SSF/CCF; the event detected at the DP is reported to the non-IN FM and the next DP criteria is processed immediately. No response is expected from the non-IN FM.

– *EDP-R for an instance of IN service logic* – A control relationship exists with an SCF for an existing IN service logic instance; the event detected at the DP is reported to the SCF in the context of the existing control relationship. Call processing is suspended and a response is expected from the SCF.

– *EDP-R for an instance of non-IN service logic* – The EDP is for an existing non-IN service logic instance in the SSF/CCF; the event detected at the DP is reported to the non-IN FM. Call processing is suspended and a response is expected from the non-IN FM.

– *TDP-R for an instance of IN service logic* – No control relationship exists with an SCF; the event detected at the DP is reported to the SCF via a new control relationship. Call processing is suspended and a response is expected from the SCF.

– *TDP-R for an instance of non-IN service logic* – The TDP is for a non-IN service logic instance in the SSF/CCF; the event detected at the DP is reported to the non-IN FM. Call processing is suspended and a response is expected from the non-IN FM.

For those cases in which a response is expected and the response indicates that call processing should continue from the point at which it was suspended (i.e. the DP at which criteria were met and the event was reported), then the remaining DP criteria should be processed. If the response indicates that call processing should continue at a new point in call, then any remaining DP criteria at the point of suspension are not processed.

b) *Exclusion*

There is no explicit mechanism in IN CS-1 for managing exclusion of new instances of IN service logic when existing instances of IN service logic are still active. However, there are implicit exclusion mechanisms for IN CS-1 that have already been described. Subclause 4.2.2.6 describes rules that allow only one IN service logic instance at a time to control the same call segment (i.e. to send responses to the SSF/CCF). These rules exclude multiple IN service logic instances simultaneously controlling the same call segment, but do not exclude multiple IN service logic instances from receiving notification of events detected in a call segment that is being controlled by another IN service logic instance. In addition, subclause 4.2.4.3 a) above describes precedence and priority rules for processing DP criteria for service logic instances. These rules identify that service logic instances at a lower precedence level or priority may not be invoked, depending on the disposition of previous service logic instances. This implies that DP criteria for multiple service logic instances at the same DP can be ordered in such a way as to manage this exclusion.

4.2.5 Relationship of SSF/CCF model components

4.2.5.1 General

Subclause 4.2.1 identifies relationships between the major components of the SSF/CCF model. The major relationships are those between the SCF and the IN-SM (via the SCF Access Function), between the IN-SM and the FIM/CM, and between the FIM/CM and the BCM. The relationship between the SCF and IN-SM is external to the SSF/CCF, and is a subject for standardization. The definition of this relationship follows the methodology described in clause 3/Q.1201. The other relationships are internal to the SSF/CCF, and are not subjects for standardization. These latter relationships are assumed to exist for explanatory purposes only, to better understand and describe the SSF/CCF model.

All of these relationships are described by the information flows between components. Information flows in the SSF/CCF model are identified in Figure 4-17, which only shows the relationships in half of Figure 4-1. These information flows are described in Figure 4-18.

a) *Relationship between SCF and IN-SM*

– *SSF information flow* – Information from the IN-SM to the SCF (via the SCF access manager in the SSF) that reports a call/connection processing event, as well as the current state of the call/connection instance in which the event is detected, as identified in clause 6.

– *SCF information flow* – Information from the SCF to the IN-SM (via the SCF access manager in the SSF) that requests the manipulation of the state of a call/service instance, invoking the types of functions identified in clause 6.

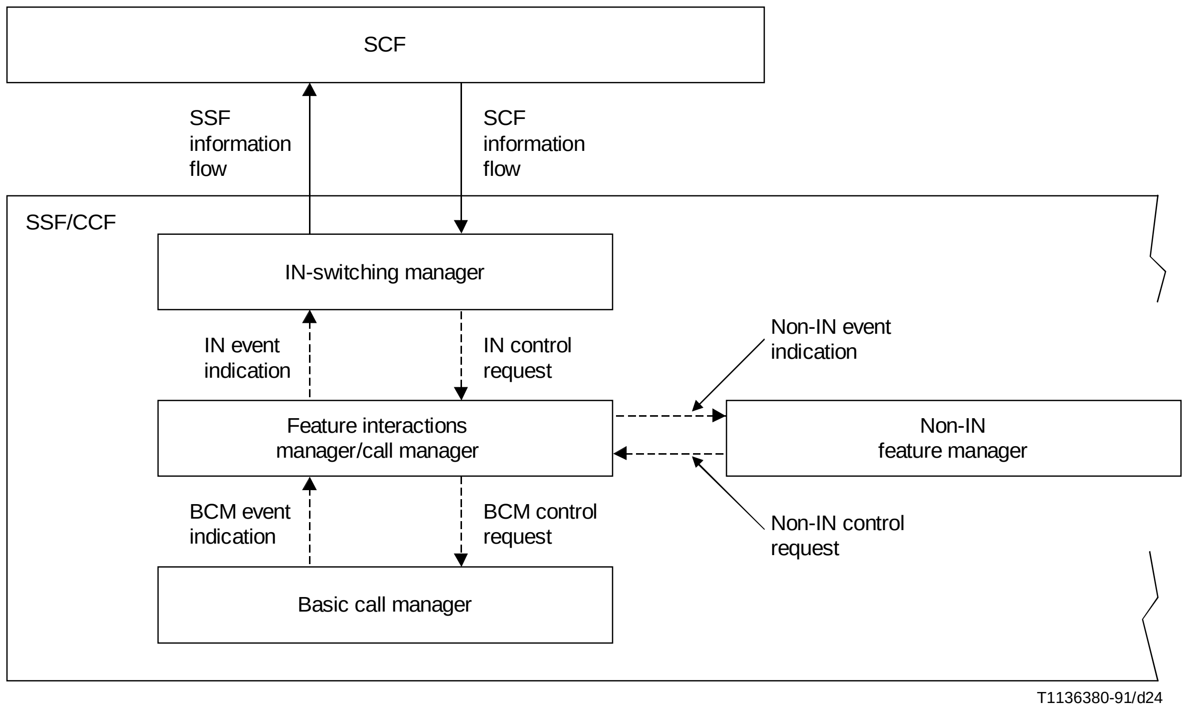


FIGURE 4-18/Q.1214

SSF/CCF model information flows

b) *Relationship between IN-SM and FIM/CM*

– *IN event indication* – Information from the FIM/CM to the IN-SM that reports a call processing event, the current state of the call in which the event is detected, and whether the event is to be handled by a new instance of IN service logic or an existing active instance.

– *IN control request* – Information from the IN-SM to the FIM/CM that indicates call/service processing functions requested by the SCF.

c) *Relationship between FIM/CM and BCM*

– *BCM event indication* – Information from the BCM to the FIM/CM that reports a BCSM event and the current state of the BCSM in which the event is detected.

– *BCM control request* – Information from the FIM/CM to the BCM that requests the manipulation of one or more BCSMs to influence call/service processing.

d) *Relationship between FIM/CM and Non-IN FM*

– *Non-IN event indication* – Information from the FIM/CM to the non-IN FM.

– *Non-IN control request* – Information from the non-IN FM to the FIM/CM.

The use of these information flows is illustrated in the following subclause.

4.2.5.2 Typical sequence of model actions

This subclause describes a typical sequence of actions in the SSF/CCF model to illustrate the roles and relationships of the major model components. This illustration is not intended to imply or reflect any specific implementation. This scenario provides an example in which a new instance of an IN-SSM is invoked to provide an IN service feature to a user. At the start of this scenario, no IN service logic instances or non-IN service logic instances are active, and there is no existing relationship between the SCF and SSF/CCF.

1) A user is interacting with the SSF/CCF via the CCAF to request the set-up of a call. The BCM creates a BCSM to represent the basic call control functions required to establish and maintain this call for the user.

2) In the course of call set-up for the user, an event is detected in the BCSM associated with the user's call. BCSM processing is halted at the DP.

3) The BCM processes the event at a DP in the BCSM to determine if the event should be reported (i.e. it determines if the DP is armed and DP criteria are met). If so, it sends a BCSM event indication reporting the event to the FIM/CM, along with the state of the BCSM at the time the event was detected. If the BCM needs instructions on how to proceed, BCSM processing remains halted at the DP until instructions are received. If not, the BCM continues normal BCSM processing. Thus, three scenarios are possible:

   – the BCM determines that the event should not be reported; BCSM processing continues (e.g. no TDP armed);

   – the BCM determines that the event should be reported, but does not need further instructions; BCSM processing continues (e.g. TDP-N armed);

   – the BCM determines that the event should be reported, and needs further instructions (e.g. TDP-R armed); BCSM processing remains halted and the BCM may continue to detect additional events before receiving instructions (the handling of these additional events is not addressed in this example).

4) The FIM/CM receives and processes the BCM event indication to determine if the event is to be processed by an IN service logic instance or a non-IN service logic instance. It also determines if the event is to be processed by a new instance of a service logic instance or an existing active instance.

5a) Assuming the BCM event is to be processed by a new instance of IN service logic, the FIM/CM sends an IN event indication to the IN-SM reporting the event, the state of the BCSM in which it was detected, and indicating that a new instance of IN service logic is to be invoked. Go to step 6.

5b) Assuming the BCM event is to be processed by a new instance of a non-IN service logic instance, the FIM/CM sends a non-IN event indication reporting the event to the non-IN FM, the state of the BCSM in which it was detected, and indicating that a new instance of non-IN service logic is to be invoked. The non-IN FM receives and processes the non-IN event, and invokes the appropriate non-IN service logic instance. The non-IN FM executes the non-IN service logic instance, sending non-IN control requests to the FIM/CM as necessary to realize the service feature (the handling of subsequent information flows for such a non-IN service logic instance, if any, are not addressed in this example).

6) The IN-SM receives and processes the IN event indication. Given that a new instance of an IN service logic instance is to be invoked, the IN-SM creates a new instance of an IN-SSM to represent the state of the user's call and connection in a manner accessible to Service Logic Processing Programmes (SLPs) in the SCF (e.g. in terms of BCSM events and related information, and objects such as legs and connection points). It then sends an SSF information flow (via the SCF access manager) to the SCF providing a view of the current state of the IN-SSM.

7) The SCF receives and processes the SSF information flow. Given that a new instance of IN service logic is to be invoked, the SCF invokes an SLP Instance (SLPI) that realizes the desired service feature. The SLPI is provided a view of the current state of the IN-SSM, and issues an SCF information flow to the SSF to request the IN-FM to manipulate the state of the IN-SSM as appropriate to realize the service feature. The SCF information flow may also indicate the set of events that should be reported to the SLPI (i.e. it indicates the set of BCSM and IN-SSM EDPs to be armed for this particular service logic instance).

8) The IN-SM receives the SCF information flow (via the SCF access manager) and processes it to manipulate the state of the IN-SSM as requested. In doing so, it generates an IN control request to the FIM/CM. It also monitors the IN-SSM for the IN-SSM events indicated in the request (if any).

9) The FIM/CM receives and processes the IN control request, and determines if it is valid based on other active service logic instances. It then sends a BCM control request to the BCM to notify it of the functions to be performed and of any BCSM events to monitor for.

10) The BCM receives and processes the BCM control request, and manipulates one or more BCSMs to satisfy the request. In manipulating the BCSMs, it performs the appropriate bearer control and resource control functions. The BCM also monitors the BCSMs for the BCSM events indicated in the BCM control request (if any). BCSM processing, if halted, is now resumed.

11) If the BCM detects a BCSM event in a BCSM, it repeats Step 3 to send a BCSM event indication to the FIM/CM.

12) The FIM/CM repeats Step 4 to determine how to process the event. In this case, the event is for an active IN service logic instance. It sends an IN event indication to the IN-SM, indicating that the event is for an existing instance of an IN service logic.

13) The IN-SM receives and processes the IN event indication as in Step 6, with the following difference. Given that the event is for an existing instance of an IN service logic, as represented by an existing IN-SSM instance, it updates the state of the existing IN-SSM to reflect the state of the user's connection(s), and reports the event and current IN-SSM state to the SCF in an SSF information flow. No new IN-SSM instance is created.

14) The SCF receives and processes the SSF information flow as in Step 7, with the following difference. Given that the event is for an existing instance of an IN service logic, as supported by an existing SLPI, it passes the contents of the SSF information flow to the existing SLPI. It does not invoke a new instance of an SLP. The SLPI then repeats its actions in Step 7 to send an SCF information flow to the SSF to request the IN-SM to manipulate the state of the IN-SSM, and to indicate the next set of EDPs of interest, if any.

15) Steps 8-14 are repeated until the IN service logic instance is ended. The IN service logic instance ends when the SLPI is no longer interested in any EDPs, or SSF/CCF processing has progressed beyond the point at which any EDPs can be encountered.

4.2.6 Relationship of SSF/CCF to SCF

This subclause only addresses call associated relationships as supported by a IN CS-1 connection control IN-SSM.

a) An SSF/CCF can have call associated relationships with multiple SCFs, and an SCF can have call associated relationships with multiple SSF/CCFs. Each relationship is treated as a one-to-one relationship.

b) When the SSF/CCF initiates a relationship, it reports the state of the IN-SSM in which the TDP was detected. The state information that is included in the information flows between the SSF/CCF and the SCF is defined by the information elements included in the information flows, based on the analysis of IN CS-1 SIBs and detailed DFP modelling.

c) Once a control relationship is established between the SSF/CCF and the SCF, the SCF can request the SSF/CCF to monitor for and report subsequent events (i.e. arm EDPs), as well as to stop monitoring (i.e. disarm EDPs).

Annex A addresses the nature of the relationship between the SSF/CCF and the SCF. It describes general terminology and possible control and monitor scenarios for both normal and abnormal situations.

4.3 Specialized Resource Function (SRF) model

4.3.1 General

A model of the SRF is shown in Figure 4-19. The purpose of this model is to provide a framework for specialized resource functionality subjects with respect to the SRF.

SRF provides various specialized resources as shown in 4.3.4. The SRF is managed to place resources in or out of service, e.g. for provisioning, administration and maintenance purpose. The SRF management by the SMF is, however, for further study. But in any case, it is activated by a request from another functional entity, and never takes action by itself.

For call/service processing, the SRF has a logical relationship with the SSF/CCF and the SCF. The SCF controls the connection between the SSF/CCF and the SRF, and sends instructions to the SRF.

As part of the process of formulating a response to the SSF, the SCF may need to enter into a dialogue with a calling or a called party. This could, for example, take the form of a prompt and collect digits sequence.

The SCF in IN CS-1 will instruct the SRF to start a dialogue with a user after setting up a path between the SSF/CCF and the SRF. The dialogue between the SRF and the user allows the SRF to play an announcement and if appropriate, collect digits. If digits have been collected, the SRF will pass the digit information to the SCF.

A user, being prompted from the SRF, inputs MF tones, for example, to the SRF so that the collected digits can be reported to the SCF. When the service logic in the SCF does not need the resources anymore, the SCF requests the SSF/CCF to release the connection with the SRF and the resource in the SRF will be released.

4.3.2 SRF components

To provide the functionality defined in the previous subclause, the SRF includes the following functions as illustrated in Figure 4-19.

Functional Entity Access Manager (FEAM)

The FEAM provides the functionality necessary for the SRF to exchange information with other functional entities via messages as follows:

- provide reliable message transfer;
- ensure sequential message delivery;
- allow message request/response pairs to be correlated;
- allow multiple messages to be associated with each other; and
- comply with OSI structures and principles.

SRF Resource Manager (RM)

The SRF RM provides the necessary functionality to manage resources contained in the SRF. This contains the capabilities to hunt for a resource, to manage resource status, e.g. busy/idle/block, etc. and to control resource actions.

Resources

The SRF contains various resources, which are listed in 4.3.4.

4.3.3 SRF and other entity relationships

The SRF has a relationship with the SSF/CCF, SCF, user and SMF as follows:

SSF/CCF

The SRF has a relationship with the SSF/CCF for connection control to specialized resources. In IN CS-1, this relationship is supported by the interface in Recommendation Q.1211.

The SRF may contain functionality similar to the CCF to manage bearer connections to specialized resources, but no call model is specified.

SCF

The SCF sends connection control information to the SSF/CCF. In IN CS-1, this relationship is supported by the interface protocol defined in Recommendation Q.1218.

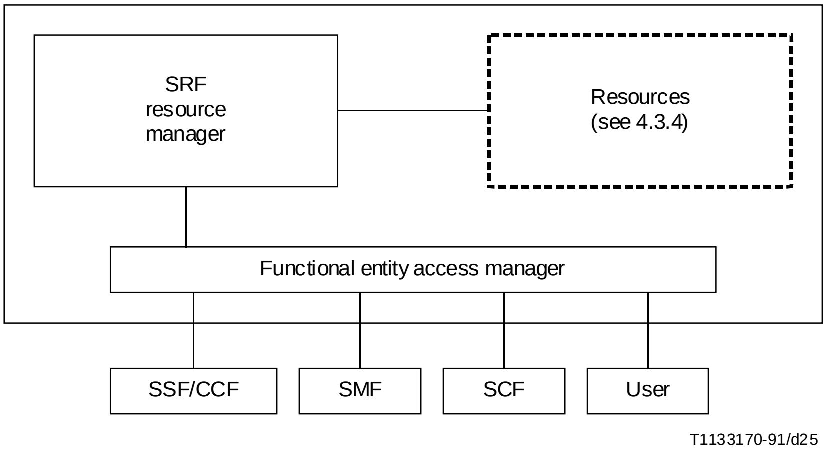
The connection between an SRF and an SSF/CCF is set up by the SSF/CCF according to the control information received from the SCF. Then, the SCF sends instructions to the SRF for resource manipulation.

User

The SRF has an information exchange relationship with the user using, for example, a voice channel, ISDN bearer channel, and SS No. 7 trunk connection. The requirements on this user channel are not affected by connection to the SRF.

SMF

The SRF provides the SMF with management information and actions requested. This relationship is for further study.



NOTE – The relationship between the SRF and the SMF is for further study.

FIGURE 4-19/Q.1214

SRF model

4.3.4 Objects of SRF management

Examples of specialized resources managed by the SRF are as follows:

- DTMF receiver;
- Tone generator;
- Announcements;
- Message sender/receiver;
- Synthesized voice/speech recognition devices with interactive prompting facilities;
- Text to speech synthesis;
- Protocol converters;
- Audio conference bridge;
- Information distribution bridge.

The following four objects are supported in IN CS-1 and defined as follows:

1) *DTMF receiver*

   This resource receives Dual Tone Multi-Frequency (DTMF) from a linked resource, and recognizes it as a standardized signal input.

2) *Tone generator/announcements*

This resource provides in-channel information to the specified virtual resource.

3) *Message sender/receiver*

This resource sends or receives messages, such as electronic messages, voice messages, etc., to/from users.

4) *Synthesized voice/speech recognition device with interactive prompting facilities*

This resource receives in-channel speech information from a linked virtual resource, and recognizes it as a standardized signal input. When the information is input from a user, it is recognized by this resource and this resource converts it to IN perceivable signals. When this resource receives an instruction to send a voice message with source-information, it is converted to voice message. Usually, such action is performed with interactive prompting.

The following four objects are for further study:

5) *Audio conference bridge*

Receiving in-channel audio information from any other linked virtual resources, this resource mixes this information and sends the mixed information to all the linked virtual resources. Another new virtual resource can be joined to or any virtual resources linked to it can be split from this connection resource. It is used as an audio conference bridge.

6) *Information distribution bridge*

Receiving in-channel information from a linked virtual resource, this resource distributes the information to all the other linked virtual resources. Another new virtual resource can be joined to or any virtual resources which receive distributed information can be split from the connection resource. It is used as a broadcasting device.

7) *Text-to-speech synthesis*

8) *Protocol converters*

4.4 Service Control Function (SCF) model

4.4.1 General

A model of the SCF is shown in Figure 4-20. The purpose of this model is to provide a framework for service logic processing subjects with respects to the SCF.

The prime function of the Service Control Function (SCF) is execution of service logic provided in the form of Service Logic Processing Programmes (SLPs) and, accordingly, it includes the SLP execution supporting functions, such as service logic selection/interaction management, functional entity access management, SLP provisioning management, etc.

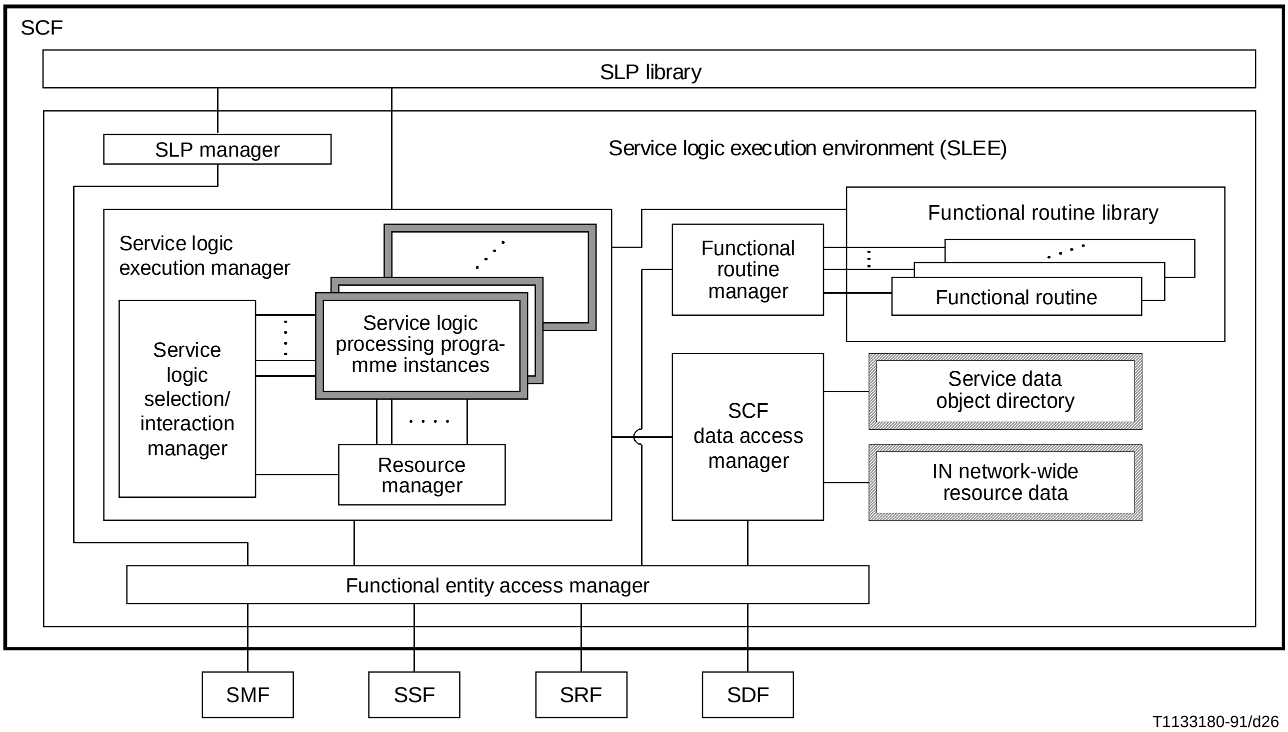
4.4.2 SCF components

4.4.2.1 General

To realize the above defined functionality, the SCF model is shown in Figure 4-20. It is noted that this shows a conceptual model of SCF and is not intended to imply an actual implementation of the SCF.

The SCF platform provides a Service Logic Execution Environment (SLEE) on which a Service Logic Processing Programme (SLP) runs to provide pertinent service processing. An SLP is a service application programme invoked by the SLEE and is used to realize service processing under the control of the SLEE. The simultaneous invocation and execution of multiple SLPs are also managed by the SLEE.

Each of the entities shown in Figure 4-20 will now be described in the successive subclauses.



NOTE – The SCF-SMF relationship is for further study.

FIGURE 4-20/Q.1214

SCF model

4.4.2.2 Service Logic Execution Manager (SLEM)

4.4.2.2.1 General

The SLEM is the functionality that handles and controls the total service logic execution action. The SLEM contains Service Logic Processing Programme Instances (SLPIs), service logic selection/interaction manager, and resource manager. It also interacts with SCF data access manager and functional entity access manager to support SLPI execution. In addition to these aspects, the SLEM needs functionality to:

- execute SLPIs and maintain transient data associated with SLPIs (i.e. information that only persists during the lifetime of the SLPI, such as SLPI state information);
- execute functional routines in support of SLPI execution;
- manage SLPI access to SCF and SDF data via the SCF data access manager (see 4.4.2.3);
- manage the exchange of information between SLPIs and entities in other functional entities via the functional entity access manager (see 4.4.2.5).

4.4.2.2.2 Service Logic Selection/Interaction Manager (SLSIM)

The SLSIM is the entity that selects an SLP for execution and controls the simultaneous execution and/or execution order of multiple SLPs in the same SCF. It is for further study whether or not the SLSIM is explicitly divided into two different entities, i.e. the service logic selection manager and the service logic interaction manager.

As part of the functionality, the SLSIM provides a means to manage service interactions by managing interactions among multiple SLPIs in the same SCF that are simultaneously active on a single call. The relationship between SLSIM and the feature interaction manager/call manager in the SSF/CCF is for further study.

SLP selection is performed via the SLSIM in response to:

- an external event from another functional entity;
- the occurrence of internally recognized conditions (e.g. time of day or other internal events); and
- the execution of a functional routine via an SLPI that requests the execution of another SLP.

In addition, the SLSIM should invoke the execution of the selected SLP and provide for mutual exclusion and precedence during this SLP selection and invocation:

- mutual exclusion prevents the invocation of an SLP whose execution would be incompatible with a currently executing SLPI;
- precedence provides a scheme to select a particular SLP from a set of SLPs which meet the same selection criteria.

4.4.2.2.3 Service Logic Processing Programme Instance (SLPI)

A Service Logic Processing Programme (SLP) is a service application programme invoked by the SLEE and used to realize service processing. It contains logical constructs which, when executed, control the flow of service execution, and statements that, when executed, invoke functional routines in the SCF to access network resources and data needed for service execution. When an SLP is selected and invoked, it is referred to as a Service Logic Processing Programme Instance (SLPI). In contrast to an SLP, a corresponding SLPI is a dynamic entity that actively controls the flow of service execution and invokes SCF functional routines.

Functional routines are the functionality in the SCF that can be invoked by SLPIs to cause a sequence of functional entity actions to be performed in the network in support of service execution. This sequence of functional entity actions provides the functionality defined for a Service Independent Building Block (SIB) on the global functional plane. Therefore, functional routines are considered to be service independent. Potential categories of functional routines are described in 4.4.3.

4.4.2.2.4 Resource manager

The resource manager provides the functionality to control the allocation of local SCF resources and provides access to network resources in support of SLPI execution. The resource manager contains functionality to:

- identify and locate local SCF resources;
- identify and locate network resources via the SCF data access manager and IN network-wide resource data (see 4.4.2.3.3);
- identify one or more local SCF resources requested by a particular SLPI;
- release one or more local SCF resources no longer needed by a particular SLPI; and
- interact with other functional entities via the functional entity access manager to provide for the reservation and release of network resources to be used by SLPIs.

It is noted that SRF selection is not always performed by the SLEM resource manager, in some cases, selection is performed by an SSF, for example, upon assist/hand-off procedure being used.

4.4.2.3 SCF data access manager

4.4.2.3.1 General

The SCF data access manager provides the functionality needed to provide for the storage, management, and access of shared and persistent information in the SCF (i.e. information that persists beyond the lifetime of a SLPI). The SCF data access manager also provides the functionality needed to access remote information in SDFs. The SCF data access manager interacts with the SLEM to provide these functionalities to SLPIs.

Figure 4-20 identifies two structures that contain SCF data. These include:

- the service data object directory; and
- the IN network-wide resource data.

These are described in the following subclauses.

4.4.2.3.2 Service data object directory

Figure 4-20 identifies a service data object directory. It provides a means to address the appropriate SCF for access to a specific data object.

The SLEM interacts with the SCF data access manager to access service data objects in SDFs. The SCF data access manager uses the service data object directory to locate service data objects in the network in a manner transparent to the SLEM (and its SLPI). As such, the SLEM (and its SLPIs) has a global and uniform view of service data objects in the network.

4.4.2.3.3 IN network-wide resource data

This is a structure in which information resides about the location and capabilities of resources in the network accessible to SLPIs. It provides a means to address the appropriate functional entity (e.g. SRF) for access to specific resources with the appropriate capabilities.

The SLEM resource manager interacts with the SCF data access manager to access network resource data. The SLEM resource manager provides SLPIs with access to network resources in a manner transparent to SLPIs. As such, SLPIs have a global and uniform view of resources in the network.

4.4.2.4 Functional routine manager

Functional routine manager will be used for reception and distribution of functional routines to functional routine library via functional entity access manager. This entity also manages the addition, deletion and suspension of a particular functional routine. Such management of functional routines by the SMF is for further study.

Functional routine library is an entity where the actual functional routines are residing.

4.4.2.5 Functional Entity Access Manager (FEAM)

The functional entity access manager provides the functionality needed by the SLEM to exchange information with other functional entities via messages. This message handling functionality should:

- be transparent to SLPIs;
- provide reliable message transfer;
- ensure sequential message delivery;
- allow message request/response pairs to be correlated;
- allow multiple messages to be associated with each other; and
- comply with OSI structures and principles.

4.4.2.6 SLP manager

The SLP manager manages the reception and distribution function of SLPs from other entities. The SLP manager, therefore, interworks with Functional Entity Access Manager (FEAM). This entity also manages addition, deletion and suspension of a particular SLP. Such management of the SLP by the SMF is for further study.

4.4.3 Functional routine categories

The following categories of functional routines are proposed as framework for describing the SCF functionality accessible to SLPIs:

SLPI management functional routines

- Functional routines to facilitate SLPI initialization and termination;
- Functional routines to invoke other SLPs.

SLPI communication functional routines

– Functional routines to support communication between SLPIs.

Timer management functional routines

– Functional routines to retrieve the current time and date;

– Functional routines to manage asynchronous timers in the SCF;

– Functional routines to block the invocation of an SLP for a certain defined period.

Data management interface functional routines

– Functional routines to access and manipulate SCF data (i.e. service data object directory and IN network-wide resource data) and network data (i.e. in an SDF) globally and uniformly via the SCF data access manager.

Asynchronous event handling functional routines

– Functional routines to perform appropriate functions in response to asynchronous events (e.g. events reported by other functional entities, SLPI execution error events, and internal SCF events);

– Functional routines to facilitate termination of a service execution and initialization of related resources.

Connection management functional routines

– Functional routines to manipulate legs and connection points via interaction with the IN-feature manager in the SSF.

Specialized resource management functional routines

– Functional routines to access and use specialized network resources globally and uniformly via the SLEM resource manager (interacting with the SRF).

OAM functional routines

– Functional routines to respond to request for OAM activities and gather OAM-related information (e.g. data collection, traffic management, error handling, charging).

4.5 Service Data Function (SDF) model

4.5.1 General

A model of the SDF is shown in Figure 4-21. The purpose of this model is to provide a framework for service data functionality subjects with respect to the SDF.

Subclause 4.5.2 describes the detailed SDF architecture, and 4.5.3 clarifies and classifies data types which are handled by the SDF.

The SDF contains and manages the data which are related to Service Logic Processing Programmes (SLPs) and accessed in the execution of the SLP Instances (SLPIs). Therefore, data such as SLP selection data and SCF directory, which are accessed before the execution of an SLPI, are not included in the SDF handling data.

4.5.2 SDF components

4.5.2.1 General

To realize the above defined functionality, the recommended SDF model is shown in Figure 4-21. Each of the functional entities shown in Figure 4-21 will be described in the successive subclauses. This is not meant to imply any specific implementation.

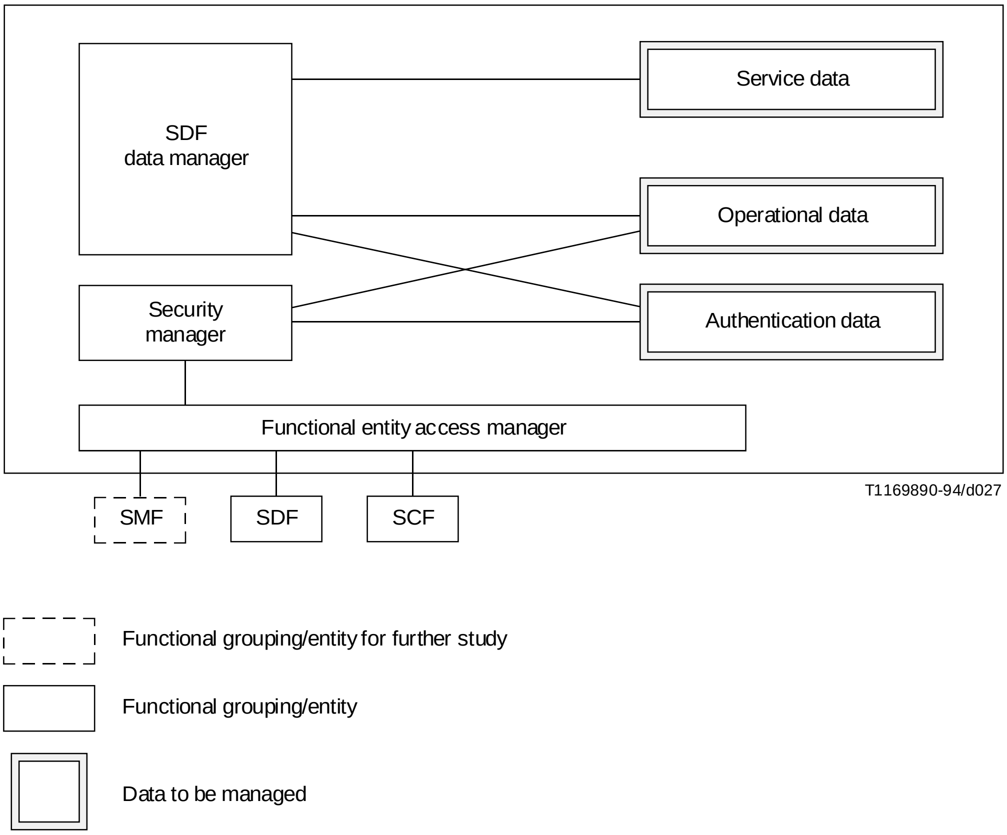


FIGURE 4-21/Q.1214

SDF model

4.5.2.2 SDF data manager

The SDF data manager provides the functionality needed for storing, managing and accessing information in the SDF. If, for example, the data are physically structured as a database, the SDF data manager may also handle database accessing language such as an SQL.

4.5.2.3 Functional entity access manager

The functional entity access manager provides the functionality needed by the SDF data manager to exchange information with other functional entities, i.e. SCF, SDF and SMF, via messages. This message handling functionality should:

– provide reliable message transfer;

– ensure sequential message delivery;

– allow message request/response pairs to be correlated;

– allow multiple messages to be associated with each other; and

– comply with OSI structures and principles.

Here, the functional entity access manager may access other SDFs, because the data distribution in the network can completely be transparent to the SCF. However, this point as well as the functional relationship with the SMF is outside the scope of IN CS-1.

4.5.2.4 Security manager

The security manager provides secure access to the different types of data held in the SDF, for example, denied access to the data for unauthenticated users. This functionality should:

- check the access rights of the SCF;
- authenticate users with provided information;
- count the failed authentication attempts for a given user (whether the implementation of this function can be realized in the SDF or not is for further study);
- block data access;
- assign user's access rights;
- memorize user's access rights during his request;
- control user's right to access specific data.

4.5.3 Data types handled by SDF

The data which are handled by the SDF can be classified into the following types:

1) Authentication data – These data are used to authenticate a user that accesses the database through a SCF, e.g. a PIN code, the value of a counter for failed authentication. The set of authentication data used is associated to a level of access rights.

2) Operational data – These data are not needed by the SLPIs, but are used by the SDF itself for operational and administrative purposes, e.g. references to an object class, access control data.

3) Service data – These data are used for the provision of a service, e.g. a subscriber profile, service provider agreements. These data can be used by several services if necessary.

5 Stage 2 descriptions of Service Independent Building Blocks (SIBs)

This clause provides stage 2 descriptions for Service Independent Building Blocks (SIBs) for the intelligent network that are used in executing supplemented services. The functional entities involved, information flows and functional entity actions required to provide the SIBs are defined. Each SIB, along with other SIBs, can be used and reused as an element of various supplemented services. While SIBs are defined in the global functional plane, their interface requirements may be seen in the distributed functional plane of the intelligent network conceptual model.

5.1 Introduction

An intelligent network has two realms related to call/service processing:

1) basic call processing (network functions that provide basic bearer services); and

2) service control (functions that add service elements to basic calls by modifying and/or otherwise controlling call processing functions, thus creating supplemented services).

Basic call processing functions are defined in Recommendation Q.71 wherein basic bearer service call set-up and release are depicted. The functional entities involved are the Call Control Agent Function (CCAF) and the call control function (CCF).

Service control resides in the Service Control Functional (SCF) entity and it interacts with basic call processing via a Service Switching Functional (SSF) entity associated with the CCF. The responsibilities of the SSF include management of communications with the SCF, adding logic to the CCF to allow it to recognize when bids for IN service control should be initiated, and reacting to instructions or information from service control in order to execute supplemented services.

5.1.1 Functional model

Figure 5-1 depicts the functional entities and their relationships that are used in describing SIBs in the distributed functional plane of the intelligent network. It also shows the relationship of service control to basic call processing functional entities.

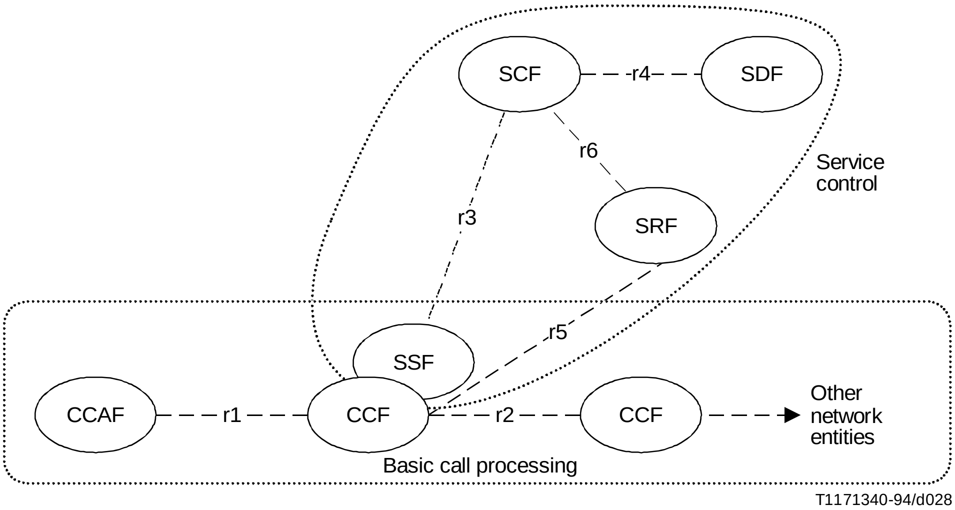


FIGURE 5-1/Q.1214

Functional diagram showing service control for executing SIBs and its relationship to basic call processing

5.1.2 Description of functional entities

Functional entities are described in clause 2.

5.1.3 Numbering of functional entity actions

Functional entity actions are numbered XYYZ, where:

- X represents the functional entity;
- 2 represents the CCF/SSF;
- 3 represents the SRF;
- 4 represents the SDF;
- 9 represents the SCF.

YY represents the section number of the SIB (e.g. ALGORITHM SIB is 01). The YY number for the BASIC CALL PROCESS is 00. The YY numbers descriptions needed for distributed functionality start with the number 41.

Z distinguishes the particular functional entity actions which have a common XYY.

5.1.4 Relationship with clause 6 (information flow descriptions)

Detailed descriptions of the information flows and information elements are provided in clause 6.

Note that both in this subclause and in clause 6, information flows relating to error conditions are not described.

5.1.5 Organization of clause 5

Subclause 5.2 provides the Stage 2 description of the SIBs of 5.3 to 5.16/Q.1213.

Subclause 5.3 provides the Stage 2 description of the BASIC CALL PROCESS described in clause 6/Q.1213.

Subclause 5.4 provides the Stage 2 description of functionality required due to network distribution.

5.1.6 Abbreviations used in clause 5

The following abbreviations for information flow names are used in the diagrams in clause 5:

ARI	Assist Request Instructions
CALLINFORPT	Call Information Report
CALLINFOREQ	Call Information Request
CANC.ANN	Cancel Announcement
CANC.STAT.REP.REQ	Cancel Status Report Request
COLL.UI	Collected User Information
CONN.TO.RES	Connect To Resource
DISC.FWD.CONN	Disconnect Forward Connection
ETC	Establish Temporary Connection
EVT.NOTIF.CHG	Event Notification Charging
EV.REP.BCSM	Event Report BCSM
HOLD.CALL.NET	Hold Call In Network
PLAY.ANN	Play Announcement
P&C	Prompt And Collect User Information
REQ.NOTIF.CHG	Request Notification Charging Event
REQ.REP.BCSM	Request Report BCSM Event
REQ.STAT.RPT	Request Status Report
SR.RPT	Specialized Resource Report
STAT.RPT	Status Report

5.2 SIB stage 2 descriptions

5.2.1 ALGORITHM SIB

5.2.1.1 Description

The ALGORITHM SIB provides the capability to apply a mathematical algorithm to data to produce a data result. This capability is provided, for IN CS-1, in the SCF as a part of the service logic for IN service features. As a result, no information flows are directly associated with this capability.

5.2.1.2 Information flows

No IFs are required for this SIB in CS-1.

5.2.1.3 SDLs

Figure 5-2 presents the SDL diagram for the SCF processing of the ALGORITHM SIB.

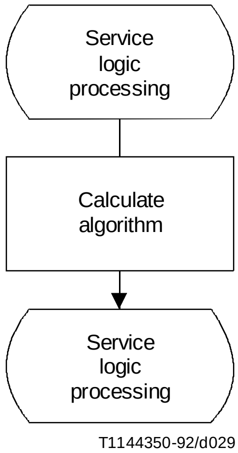


FIGURE 5-2/Q.1214

SCF actions for the ALGORITHM SIB

5.2.1.4 Functional entity actions

Reference number	Action
9011	Perform algorithm

5.2.2 CHARGE SIB

5.2.2.1 Description

The CHARGE SIB determines the special charging characteristics (e.g. special rate, reverse charge, split charging) that apply to calls related to IN-provided service features. Calls that do not request the assistance of IN functions (“non-IN-provided calls”) are not affected by this SIB.

Four types of information flows are specified:

- Type 1 – Supporting billing record generation at the SSF; the SCF is not involved in billing record storage.
- Type 2 – Supporting sending charging information to the network charging functions.
- Type 3 – Requesting notification of charging events detected at the SSF.
- Type 4 – Requesting report of charge data which is generated at the SSF.

The CHARGE SIB also supports special charging treatment at the SCF; however, for this type of charging, all information related to IN-provided service features is available or can be made available to the SCF through other SIBs and no additional information flows or information elements are needed. The four types of information flows support different scenarios and may be used in any combination appropriate for a given service and a given network. Each charging information flow and each combination of charging information flows may be used multiple times during a call.

5.2.2.2 Information flows

5.2.2.2.1 Diagrams

Figure 5-3 depicts the information flows and functional entity actions to support type 1 charging functionality.

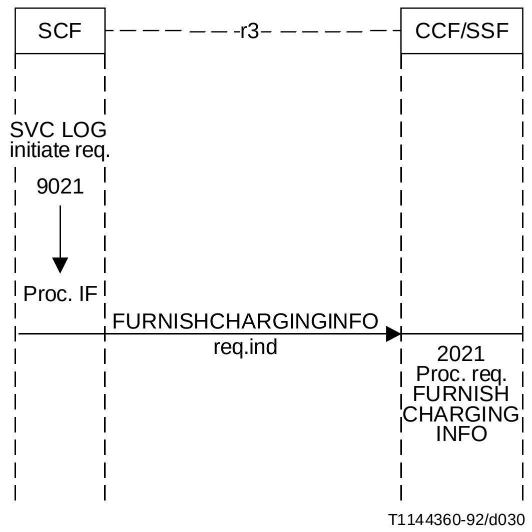


FIGURE 5-3/Q.1214

Information flow diagram CHARGE SIB – Type 1

Figure 5-4 depicts the information flows and functional entity actions to support type 2 charging functionality.

Figure 5-5 depicts the information flows and functional entity actions to support type 3 charging functionality.

Figure 5-6 depicts the information flows and functional entity actions to support type 4 charging functionality.

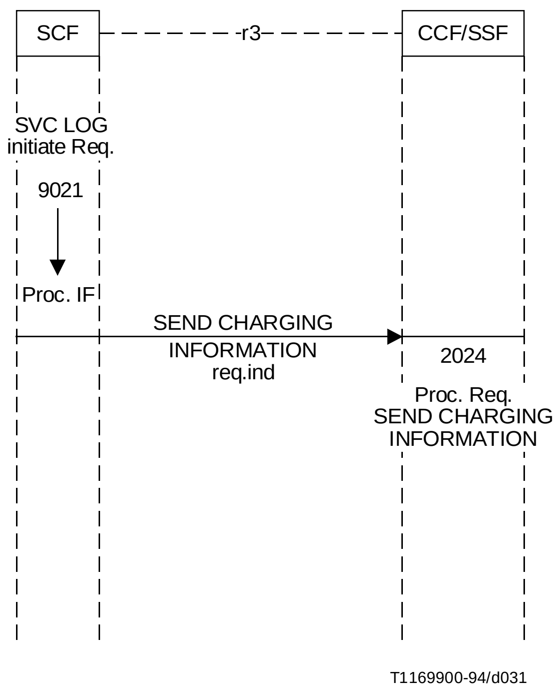


FIGURE 5-4/Q.1214

Information flow diagram CHARGE SIB – Type 2

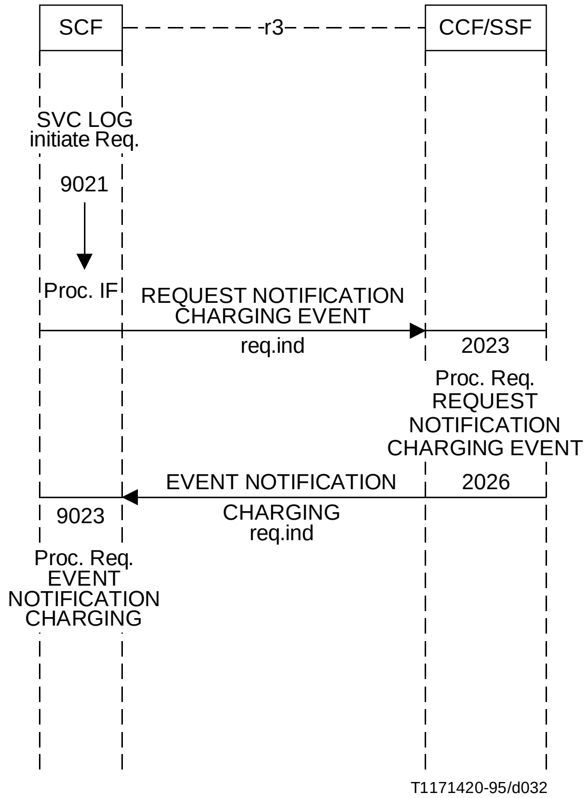


FIGURE 5-5/Q.1214

Information flow diagram CHARGE SIB – Type 3

5.2.2.2.2 Definition of information flows

1) Furnish Charging Information req.ind is an unconfirmed information flow from the SCF to the SSF to enable the SSF to generate an appropriate billing record for the current call.

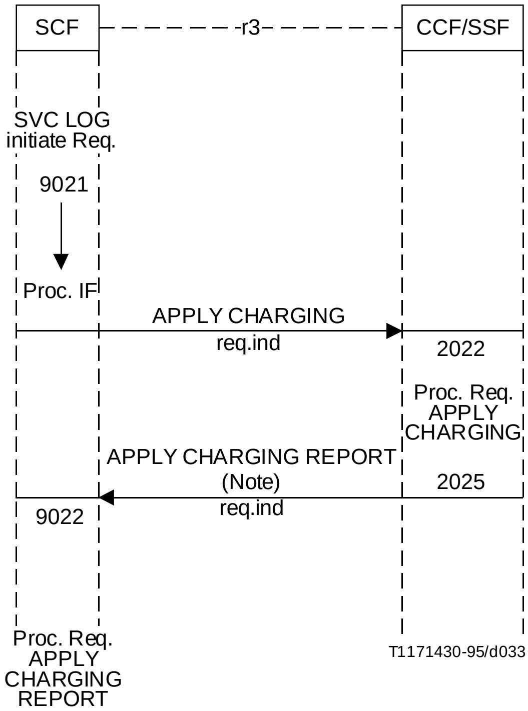
   The following information flow elements may be conveyed by this information flow:

Element	Relationship	Req.ind
Call Id	r3	mandatory
Billing Charging Characteristics	r3	mandatory

2) Apply Charging req.ind is an unconfirmed information flow from the SCF to the SSF to interact with SSF on-line mechanisms used in calculating the current call charge.

   The following information flow elements may be conveyed by this information flow:

Element	Relationship	Req.ind
Call Id	r3	mandatory
Billing Charging Characteristics	r3	mandatory
Party To Charge	r3	optional



NOTE – Multiple Apply Charging Report req.ind can result from one Apply Charging req.ind.

FIGURE 5-6/Q.1214

Information flow diagram CHARGE SIB – Type 4

3) Apply Charging Report req.ind is an unconfirmed information flow from the SSF to the SCF in response to the Apply Charging information flow. More than one Apply Charging Report req.ind may result from one Apply Charging req.ind.

The following information flow elements may be conveyed by this information flow:

Element	Relationship	Req.ind
Call Result	r3	mandatory

4) Request Notification Charging Event (REQ.NOTIF.CHG) req.ind is an unconfirmed information flow from the SCF to the SSF to request the SSF to monitor for a charging-related event, then send notification back to the SCF when the event is detected.

The following information flow elements may be conveyed by this information flow:

Element	Relationship	Req.ind
Sequence Of Charging Event	r3	mandatory

5) Event Notification Charging (EVT.NOTIF.CHG) req.ind is an unconfirmed information flow from the SSF to the SCF to report the occurrence of a specific charging event as requested by the SCF via Request Notification Charging Event.

The following information flow elements may be conveyed by this information flow:

Element	Relationship	Req.ind
Call Id	r3	mandatory
Event Type Charging	r3	mandatory
Monitor Mode	r3	mandatory
Event Specific Information Charging	r3	optional
Leg Id	r3	optional

6) Send Charging Information req.ind is an unconfirmed information flow from the SCF to the SSF to send charging messages to the network charging functions.

The following information flow elements may be conveyed by this information flow:

Element	Relationship	Req.ind
Call Id	r3	mandatory
Billing Charging Characteristics	r3	mandatory
Party To Charge	r3	optional

5.2.2.3 SDLs

Figures 5-7, 5-9, 5-11 and 5-13 present the SDL diagrams for the SCF processing of the CHARGE SIB functionality.

Figures 5-8, 5-10, 5-12 and 5-14 present the SDL diagrams for the CCF/SSF processing of the CHARGE SIB functionality.

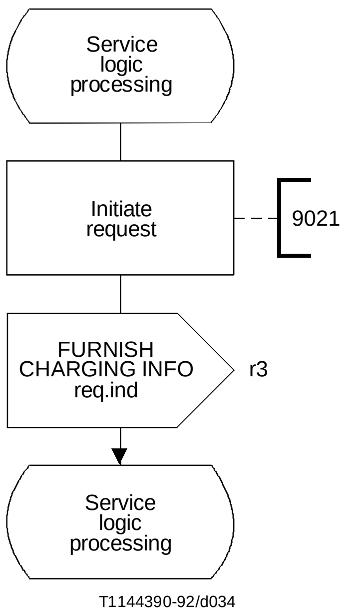


FIGURE 5-7/Q.1214

SCF actions for the CHARGE SIB – Type 1

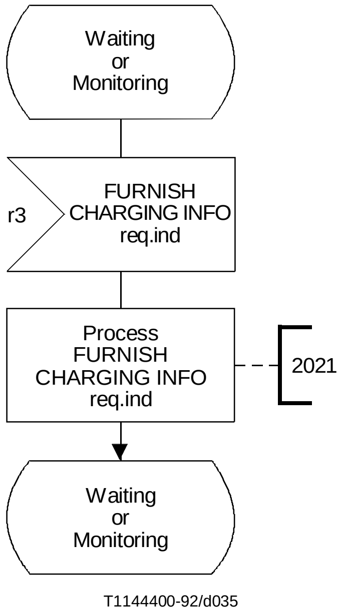


FIGURE 5-8/Q.1214

CCF/SSF actions for the CHARGE SIB – Type 1

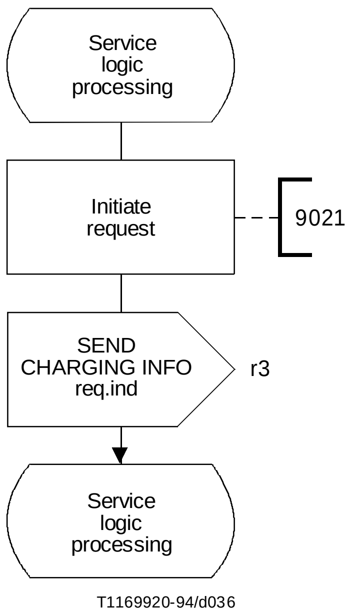


FIGURE 5-9/Q.1214

SCF actions for the CHARGE SIB – Type 2

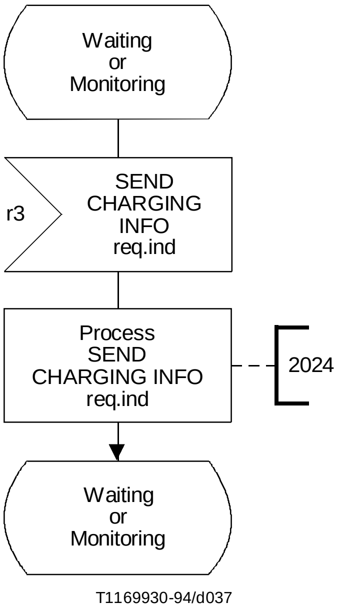


FIGURE 5-10/Q.1214

CCF/SSF actions for the CHARGE SIB – Type 2

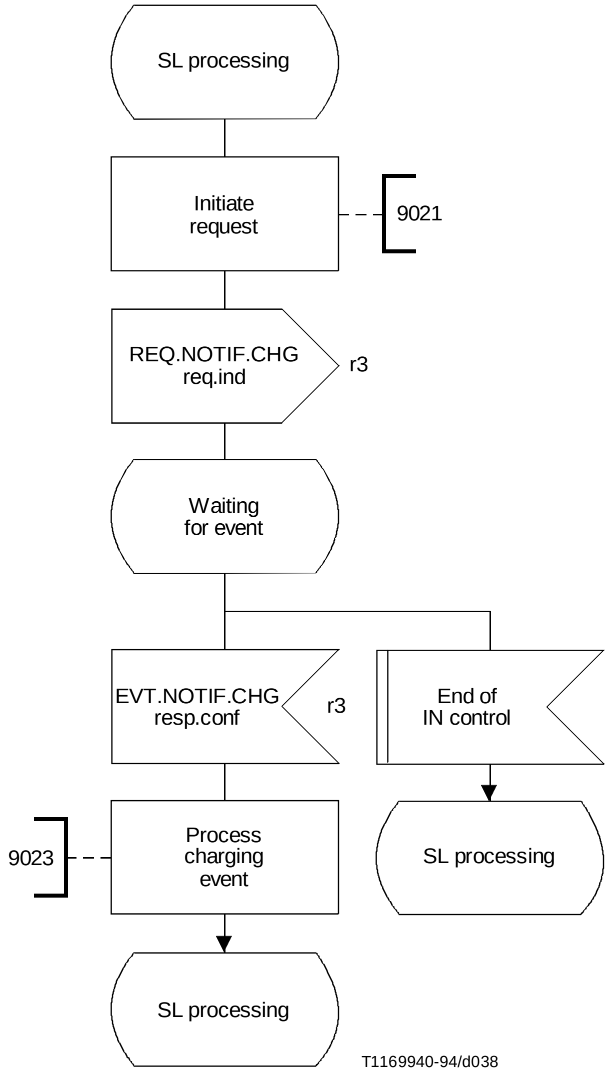


FIGURE 5-11/Q.1214

SCF actions for the CHARGE SIB – Type 3

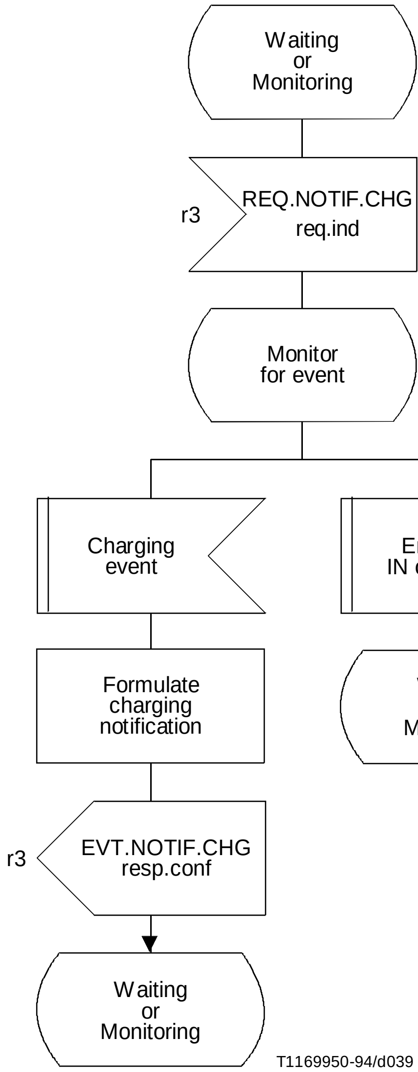


FIGURE 5-12/Q.1214

CCF/SSF actions for the CHARGE SIB – Type 3

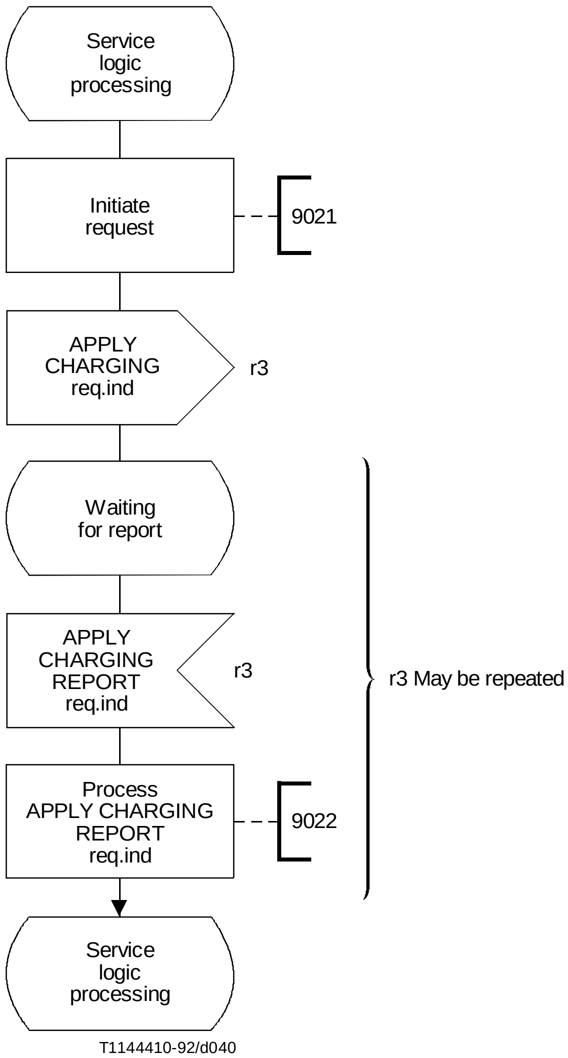


FIGURE 5-13/Q.1214

SCF actions for the CHARGE SIB – Type 4

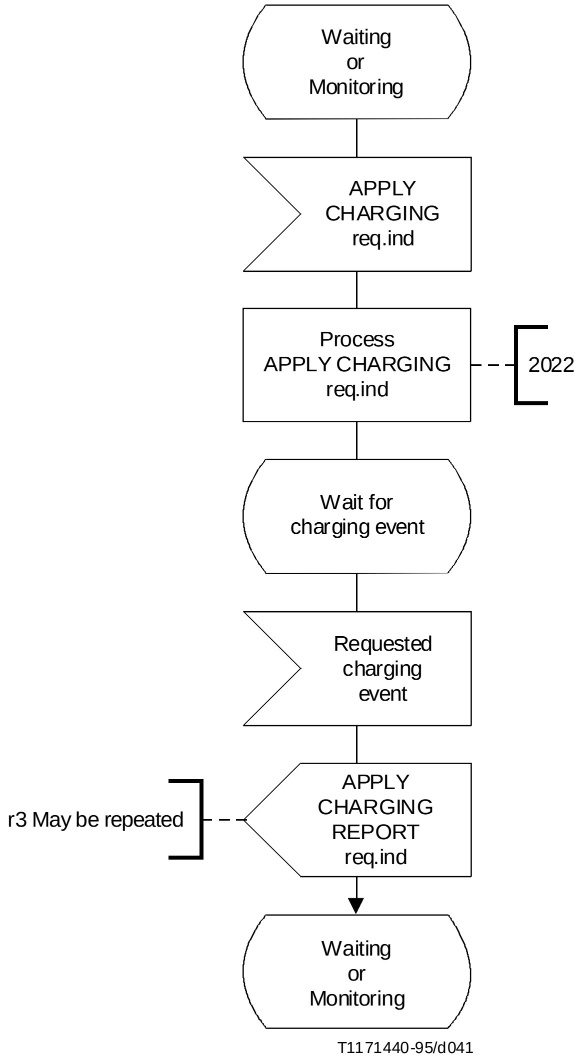


FIGURE 5-14/Q.1214

CCF/SSF actions for the CHARGE SIB – Type 4

5.2.2.4 Functional entity actions

Functional entities are assumed to have the basic capabilities required to properly perform their assigned function in the IN. Only Functional Entity Actions (FEAs) pertinent to the CHARGE SIB are shown in the information flow diagrams.

Reference number	Action
9021	Initiate request: – initiate a Furnish Charging Information req.ind; or – initiate an Apply Charging req.ind and await a response; or – initiate a Request Notification Charging Event req.ind and await a response; or – initiate a Send Charging Information req.ind.

Reference number	Action
2021	Process Furnish Charging Information req.ind:
	– receive and analyse Furnish Charging Information req.ind;
	– apply specified furnish charging information procedures.
2022	Process Apply Charging req.ind:
	– receive and analyse Apply Charging req.ind;
	– apply specified apply charging procedures (e.g. generate pulses).
2025	On detection of specified charging event:
	– return an Apply Charging Report req.ind.
9022	Process Apply Charging Report req.ind
2023	Process Request Notification Charging Event req.ind:
	– receive and analyse Request Notification Charging Event req.ind;
	– apply specified request notification charging event procedures;
	– monitor for specified charging event.
2026	On detection of specified charging event:
	– s.end Event Notification Charging req.ind
9023	Process Event Notification Charging req.ind.
2024	Process Send Charging Information req.ind:
	– receive and analyse Send Charging Information req.ind;
	– apply specified send charging information procedures.

5.2.3 COMPARE SIB

5.2.3.1 Description

The COMPARE SIB provides the capability to compare an identifier against a specified reference value and will return one of three possible solutions, (<, >, or =). This capability is provided, for IN CS-1, in the SCF as a part of the service logic for IN service features. As a result, no information flows are directly associated with this capability.

5.2.3.2 Information flows

No IFs are required for this SIB in IN CS-1.

5.2.3.3 SDLs

Figure 5-15 presents the SDL diagram for the SCF processing of the COMPARE SIB.

5.2.3.4 Functional entity actions

Reference number	Action
9031	Perform compare

5.2.4 DISTRIBUTION SIB

5.2.4.1 Description

The DISTRIBUTION SIB provides the capability to distribute calls to different logical ends dependent on user specified parameters. The results of this SIB will provide one of several predefined logical destinations to which the call should be directed for completion. This capability is provided, for IN CS-1, in the SCF as a part of the service logic for IN service features. As a result, no information flows are directly associated with this capability.

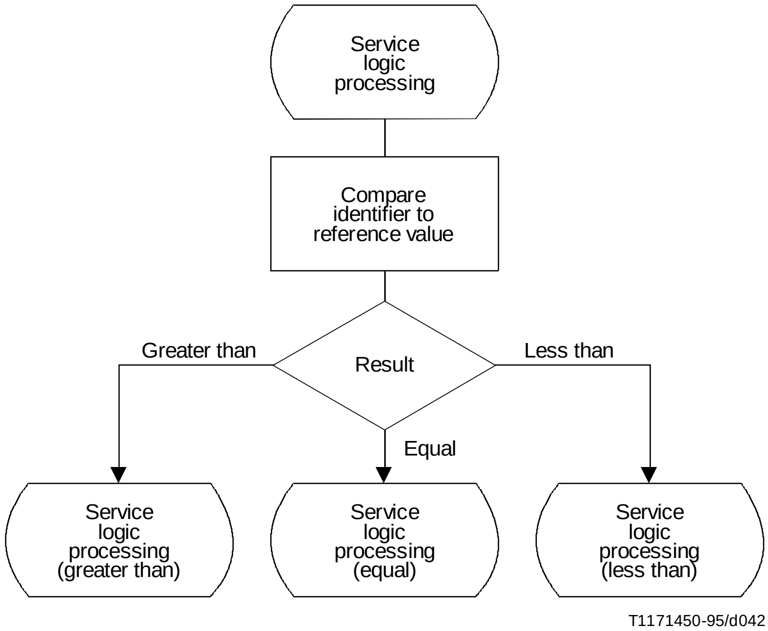


FIGURE 5-15/Q.1214

SCF actions for the COMPARE SIB

5.2.4.2 Information flows

No IFs are required for this SIB in IN CS-1.

5.2.4.3 SDLs

Figure 5-16 presents the SDL diagram for the SCF processing of the DISTRIBUTION SIB.

5.2.4.4 Functional entity actions

Reference number	Action
9041	Perform distribution

5.2.5 LIMIT SIB

5.2.5.1 Description

The LIMIT SIB limits the number of calls that are allowed through an IN-structured network by filtering calls with given characteristics. The filtering is applied only to those calls related to IN-provided service features that request the assistance of IN functions (i.e. applies to all TDPs). Calls are blocked at the SSF and provided treatment for a specified duration (which may be infinite) at specified intervals. Service filtering is subscriber initiated. A service logic programme sends an Activate Service Filtering req.ind information flow. Calls that do not request the assistance of IN functions ("non-IN-provided calls") are not affected by this SIB.

The LIMIT SIB functionality can be supported entirely in the SCF, or distributed between the SCF and the SSF. The former functionality does not require additional information flows beyond those described for other SIBs. The latter functionality is described in this subclause.

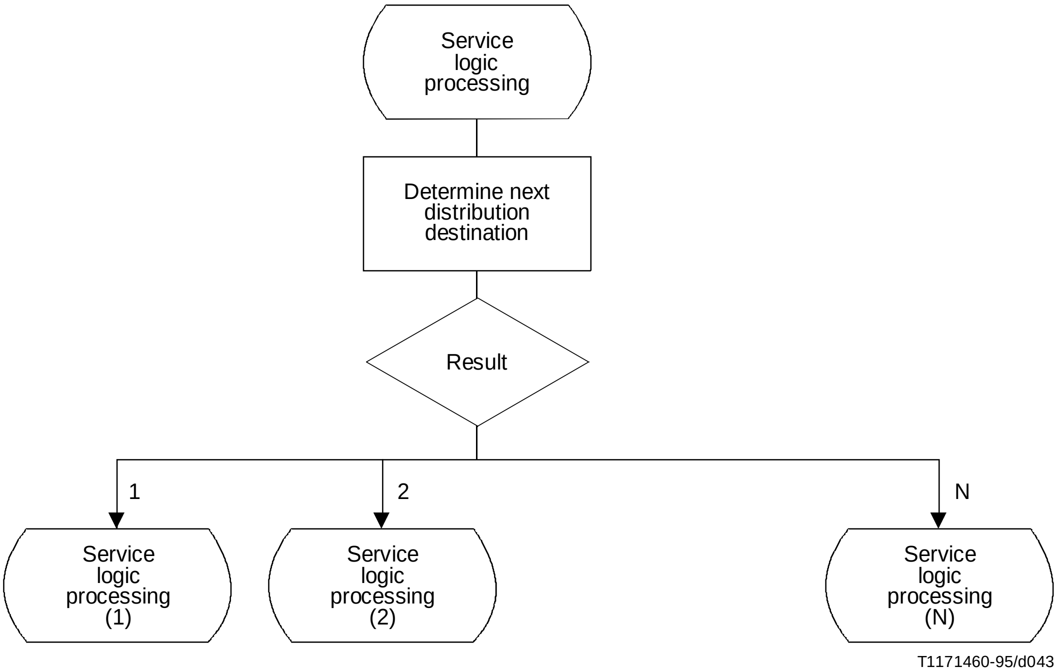


FIGURE 5-16/Q.1214

SCF actions for the DISTRIBUTION SIB

5.2.5.2 Information flows

5.2.5.2.1 Diagrams

Figure 5-17 depicts the information flows and functional entity actions to support service filtering functionality for service execution purposes.

5.2.5.2.2 Definition of information flows

1) Activate Service Filtering req.ind is a confirmed information flow from the SCF to the SSF to deal with requests for a specific service and to count each specific attempt. The counter value is returned to the SCF after a specified interval and when a call is allowed through.

   The following information flow elements may be conveyed by this information flow:

Element	Relationship	Req.ind
Filtering Timeout	r3	mandatory
Filtered Call Treatment	r3	mandatory
Filtering Characteristics	r3	mandatory
Filtering Criteria	r3	optional
Start Time	r3	optional

2) Service Filtering Response resp.conf is sent by the SSF to the SCF in response to Activate Service Filtering at the expiry of the filtering timer and when a call is allowed through. Filtering Timeout defines the maximum duration of the filtering and is a choice of either a duration or a specified stop time.

   The following information flow elements may be conveyed by this information flow:

Element	Relationship	Resp.conf
Counters Value	r3	mandatory
Filtering Criteria	r3	mandatory
Response Condition	r3	optional

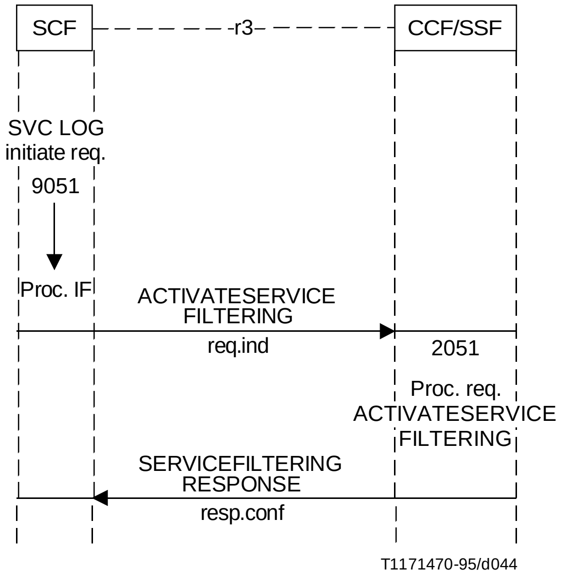


FIGURE 5-17/Q.1214

Information flow diagram LIMIT SIB

5.2.5.3 SDLs

Figure 5-18 presents the SDL diagram for the SCF processing of the LIMIT SIB functionality.

Figure 5-19 presents the SDL diagram for the CCF/SSF processing of the LIMIT SIB functionality.

5.2.5.4 Functional entity actions

Functional entities are assumed to have the basic capabilities required to properly perform their assigned function in the IN. Only Functional Entity Actions (FEAs) pertinent to the LIMIT SIB are shown in the information flow diagrams.

Reference number	Action
9051	Initiate request: – initiate an Activate Service Filtering req.ind
2051	Process Activate Service Filtering req.ind: – receive and analyse Activate Service Filtering req.ind; – apply specified filtering at specified intervals for specified duration; – when required, send Service Filtering Response resp.conf with number of calls filtered with specified characteristics.

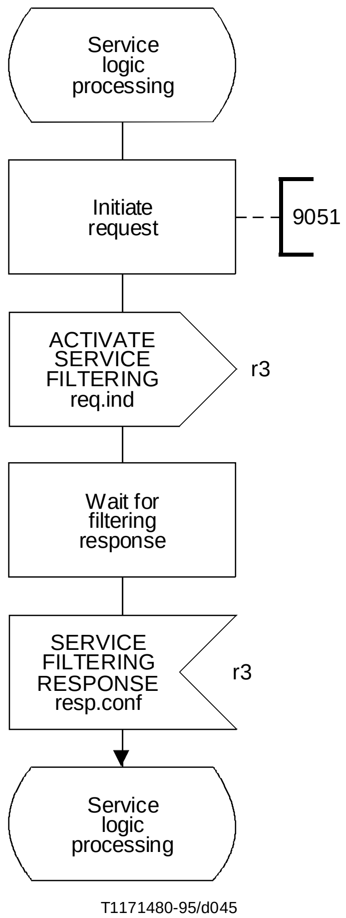


FIGURE 5-18/Q.1214

SCF actions for the LIMIT SIB

5.2.6 LOG CALL INFORMATION SIB

5.2.6.1 Description

The LOG CALL INFORMATION SIB records detailed information for each call. The network logs (or writes) specified information about the call to a specified storage space. Calls that do not request the assistance of IN functions ("non-IN-provided calls") are not affected by this SIB.

5.2.6.2 Information flows

5.2.6.2.1 Diagram

Figure 5-20 depicts the information flows and functional entity actions to support log call information functionality.

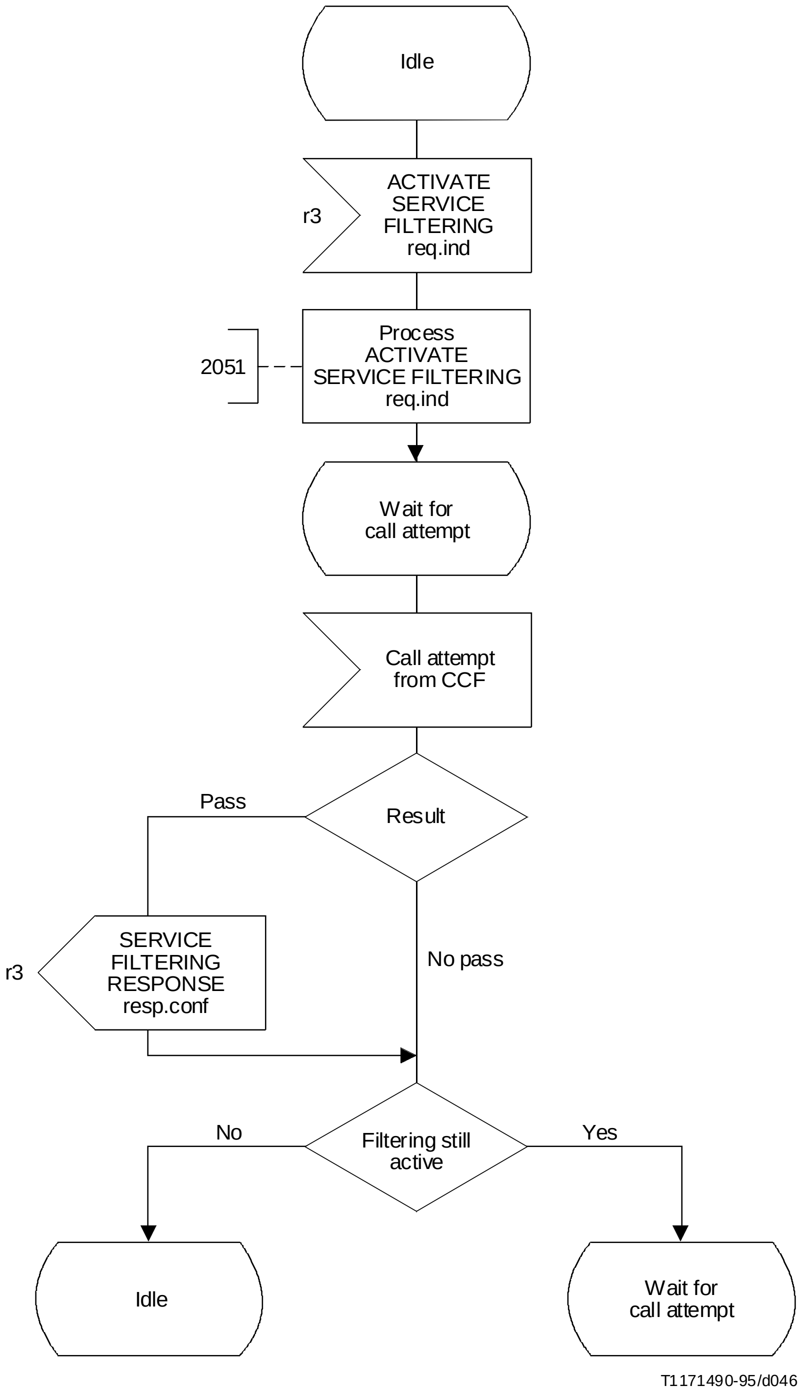


FIGURE 5-19/Q.1214

CCF/SSF actions for the LIMIT SIB

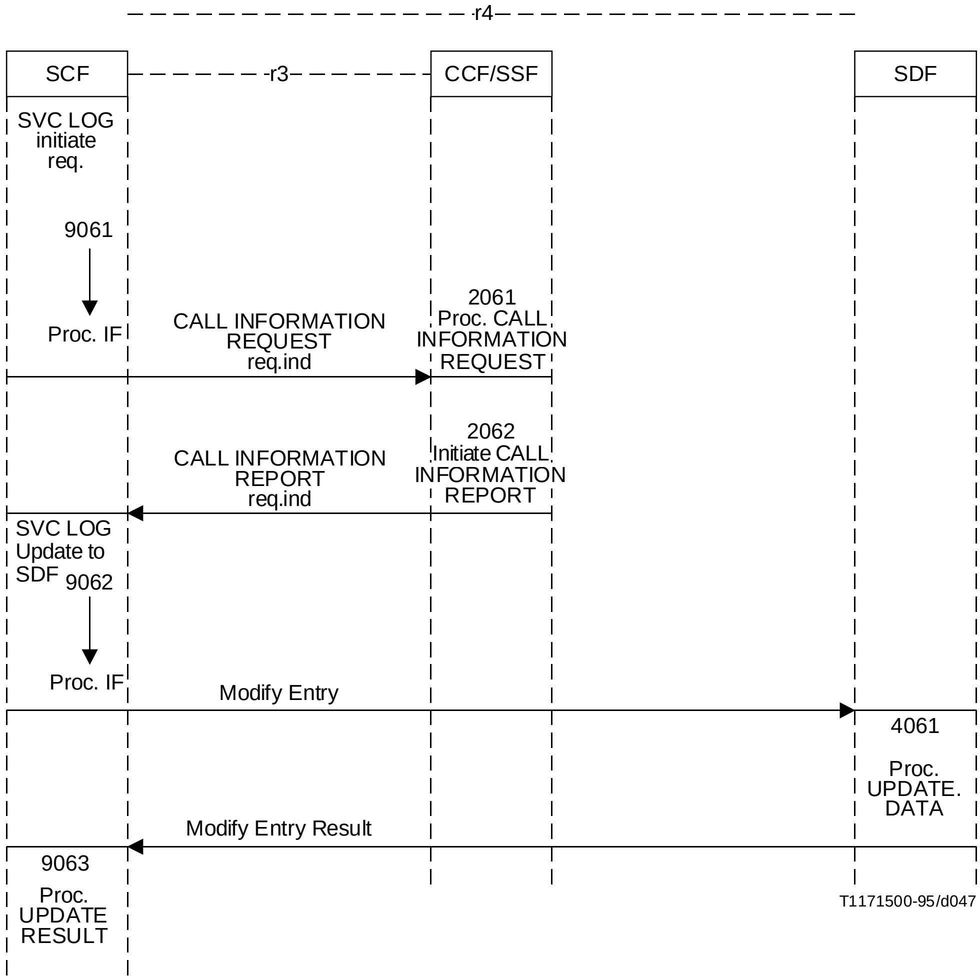


FIGURE 5-20/Q.1214

Information flow diagram "LOG CALL INFORMATION" SIB

5.2.6.2.2 Definition of information flows

1) Call Information Request (CALLINFOREQ) req.ind is an unconfirmed information flow from the SCF to the SSF to request the SSF to save specific information about a single call and report it to the SCF at the end of the call.

   The following information flow elements may be conveyed by this information flow:

Information element	Relationship	Req.ind
Requested Information Type List	r3	mandatory
CorrelationID	r3	optional

2) Call Information Report (CALLINFORPT) req.ind is an unconfirmed information flow from the SSF to the SCF to send information to the SCF requested in a call information request.

   The following information flow elements may be conveyed by this information flow:

Information elements	Relationship	Req.ind
Requested Information List	r3	mandatory
CorrelationID	r3	optional

3) Modify Entry is a confirmed information flow from the SCF to the SDF to update specified data. See the SERVICE DATA MANAGEMENT SIB for more details on update data and related information flows. This is an optional information flow.

4) Modify Entry Result is sent by the SDF to the SCF in response to an update data to provide the result of the specified update.

   The following information flow elements may be conveyed by the Modify Entry and Modify Entry Result information flows:

Information elements	Relationship	Modify Entry	Modify Entry Result
Authorized Relationship ID	r4	mandatory	mandatory
Object	r4	mandatory	
Changes	r4	mandatory	
Selection	r4	optional	
Information	r4		optional

5.2.6.3 SDLs

Figure 5-21 presents the SDL diagram for the SCF processing of the "LOG CALL INFORMATION" SIB functionality.

Figure 5-22 presents the SDL diagram for the CCF/SSF processing of the "LOG CALL INFORMATION" SIB functionality.

Figure 5-23 presents the SDL diagram for the SDF processing of the "LOG CALL INFORMATION" SIB functionality.

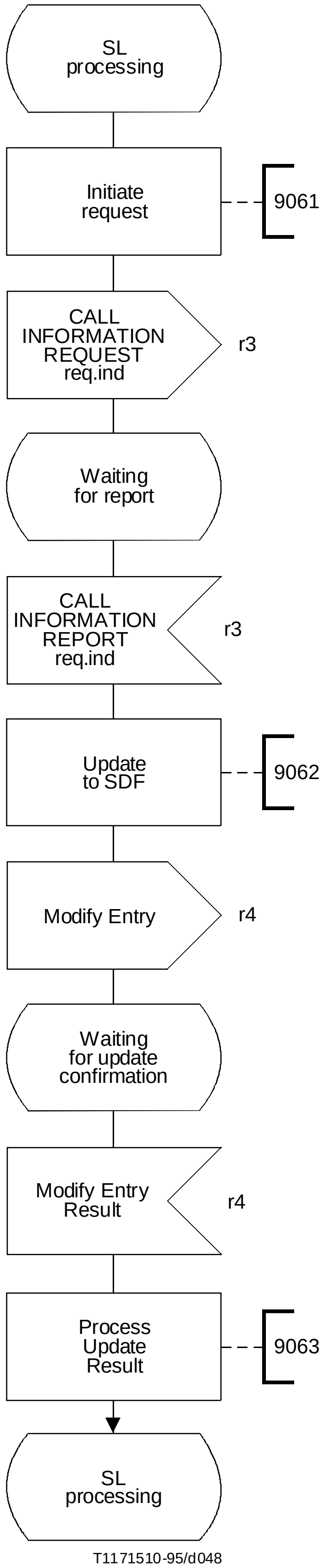


FIGURE 5-21/Q.1214

SCF actions for the "LOG CALL INFORMATION" SIB

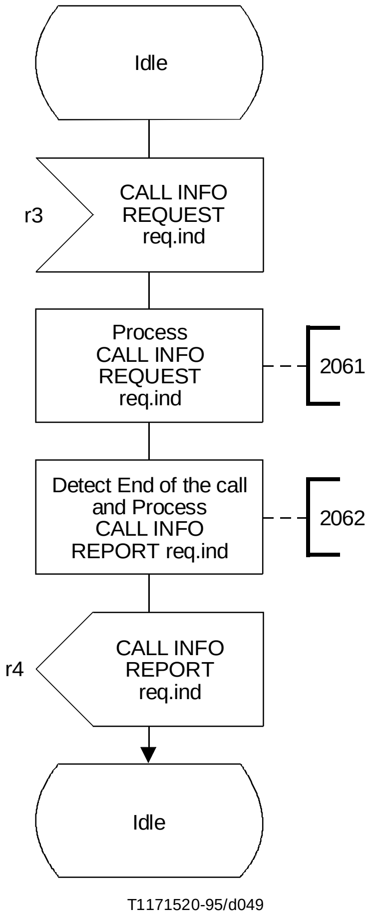


FIGURE 5-22/Q.1214

CCF/SSF actions for the "LOG CALL INFORMATION" SIB

5.2.6.4 Functional entity actions

Functional entities are assumed to have the basic capabilities required to properly perform their assigned function in the IN. Only Functional Entity Actions (FEAs) pertinent to the "LOG CALL INFORMATION" SIB are shown in the information flow diagram. Reference numbers have been arbitrarily assigned to cross-reference the FEAs shown in Figure 5-20 with these descriptions:

Reference number	Action
9061	Initiate request: – initiate Call Information Request req.ind.
9062	Process report and Initiate update: – process Call Information Report req.ind; – initiate Modify Entry.
9063	Process update result: – process Modify Entry Result.
2061	Process Call Information Request req.ind: – receive and analyse call information request req.ind; – apply specified call information request procedures; – save specified call information; then – wait for the end of the call.

Reference number	Action
2062	Detect end of the call: – initiate a Call Information Report req.ind.
4061	Process Modify Entry: – receive and analyse Modify Entry; – apply specified update data procedures; – return Modify Entry Result.

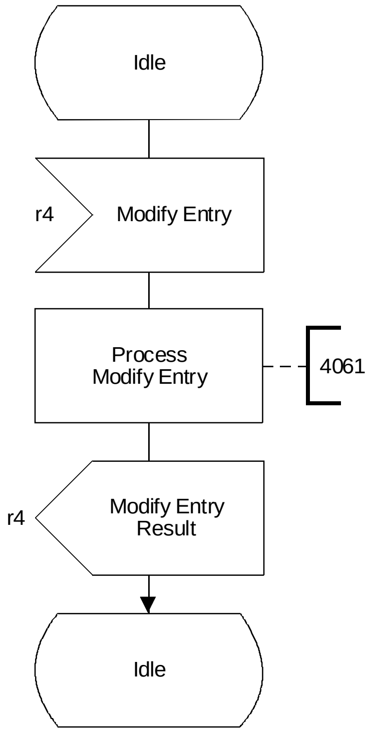


FIGURE 5-23/Q.1214

SDF actions for the "LOG CALL INFORMATION" SIB

5.2.7 QUEUE SIB

5.2.7.1 Description

QUEUE is a SIB that enables the SCF to manage the queueing of call. This includes:

- pass the call if resources are available;
- queue the call;
- play announcements to caller on queue;
- when resource becomes available, dequeue the call.

The status of resources can be determined through status notification capability or by monitoring BCSM events. Only the latter case is addressed in this subclause.

5.2.7.2 Information flow

5.2.7.2.1 Diagrams

See Figures 5-24 and 5-25.

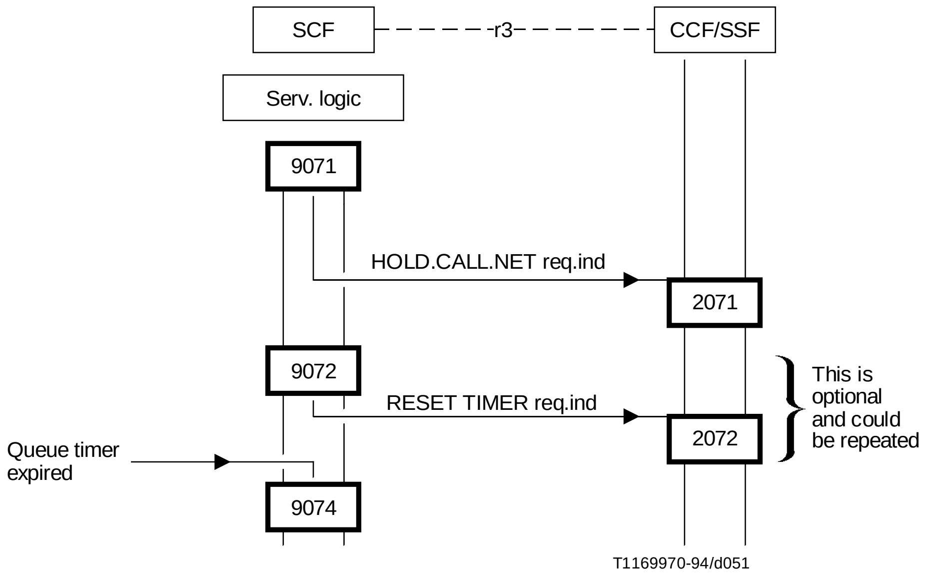
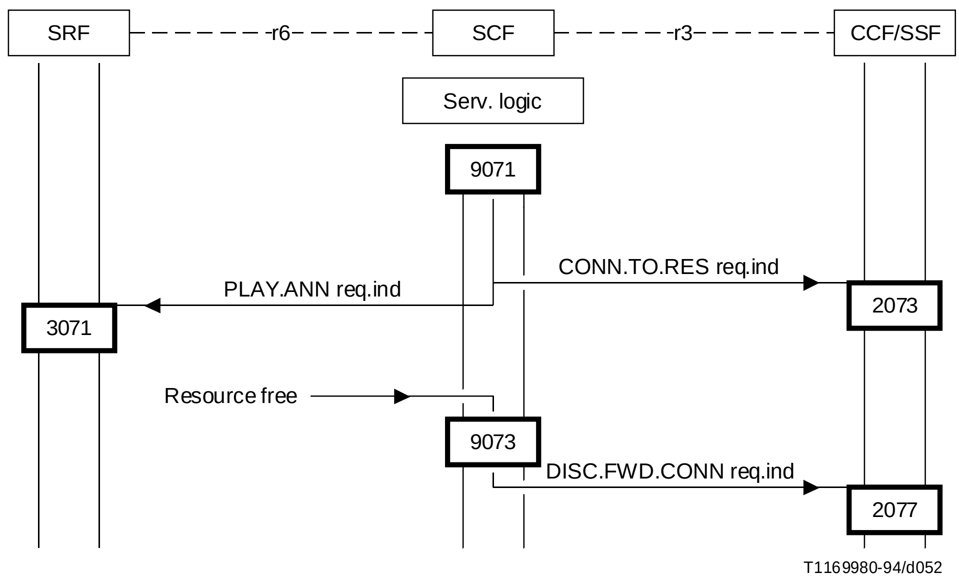


FIGURE 5-24/Q.1214

Information flow for QUEUE SIB (queue without announcement)



NOTES

1 IF Reset Timer may also optionally be sent.

2 User Interaction SIB announcement capabilities (several announcements, assist, etc.) are applicable to these information flows.

3 The indication "resource free" here comes from another service logic instance.

FIGURE 5-25/Q.1214

Information flow for QUEUE SIB (queue with an announcement)

5.2.7.2.2 Definition of information flows

1) Hold Call In Network req.ind (HOLD.CALL.NET) is an unconfirmed information flow between the SCF and the CCF/SSF used to inform the CCF/SSF that the call has been queued and to do all the activities necessary to keep the call waiting in the network.

   It contains the following information elements:

Element	Relationship	Req.ind
Call Id	r3	mandatory
Hold Cause	r3	optional

2) Reset Timer req.ind is an unconfirmed information flow between the SCF and the CCF/SSF used to refresh a timer in CCF/SSF.

   It contains the following information elements:

Element	Relationship	Req.ind
Call Id	r3	mandatory
Timer Id	r3	mandatory
Timer Value	r3	mandatory

3) Event Report BCSM req.ind (EV.REP.BCSM) is an unconfirmed information flow between the CCF/SSF and the SCF used to notify the SCF of a call related event (here a report of resource availability or user abandon) as previously requested by the SCF in a Request Report BCSM Event IF.

   It contains the following elements of information:

Element	Relationship	Req.ind
Call ID	r3	mandatory
Event Type BCSM	r3	mandatory
Misc Call Info	r3	optional
Event Specific Information BCSM	r3	optional
Leg ID	r3	optional
BCSM Event Correlation ID	r3	optional

4) Request Report BCSM Event req.ind (REQ.REP.BCSM) is an unconfirmed information flow between the CCF/SSF and the SCF used to request the CCF/SSF to notify some BCSM event to the SCF.

   It contains the following elements of information:

Element	Relationship	Req.ind
Call ID	r3	mandatory
BCSM Event List	r3	mandatory
BCSM Event Correlation ID	r3	optional

5) Connect To Resource req.ind (CONN.TO.RES) is an unconfirmed information flow between the CCF/SSF and the SCF used to request the CCF/SSF to set up a connection to a SRF. It is defined in USER INTERACTION SIB, 5.2.12.

6) Disconnect Forward Connection req.ind (DISC.FWD.CONN) is an unconfirmed information flow between the CCF/SSF and the SCF used to request the CCF/SSF to disconnect a forward connection. It is defined in USER INTERACTION SIB, 5.2.12.

7) Play Announcement req.ind (PLAY.ANN) is an unconfirmed information flow between the SCF and the SRF used to request the SRF to play an announcement. It is defined in USER INTERACTION SIB, 5.2.12.

NOTE – Other USER INTERACTION SIB announcement capabilities and information flows are available within the QUEUE SIB. This includes the use of advice of end of announcement and SRF-initiated disconnection.

5.2.7.2.3 SDLs

See Figures 5-26 and 5-27.

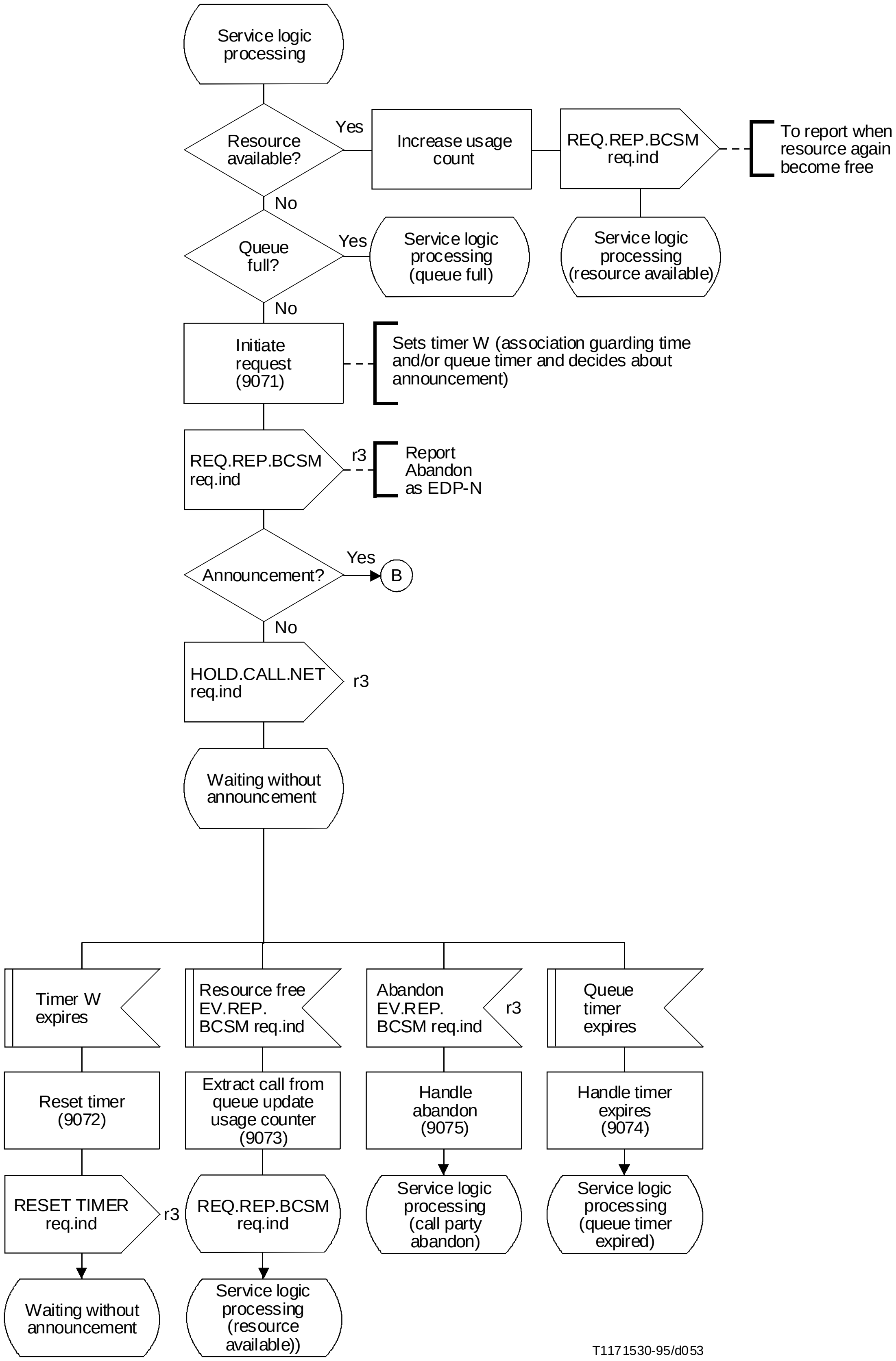
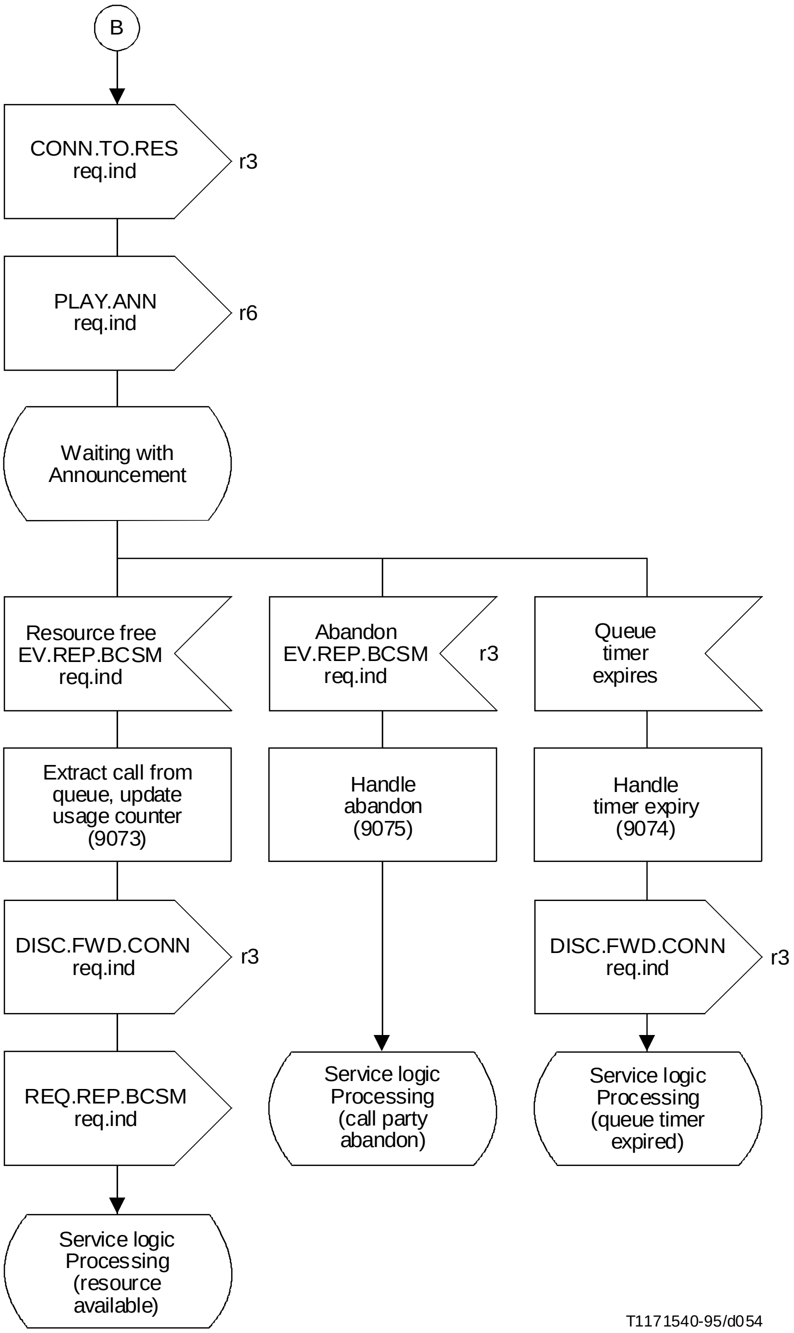


FIGURE 5-26/Q.1214 (sheet 1 of 2)

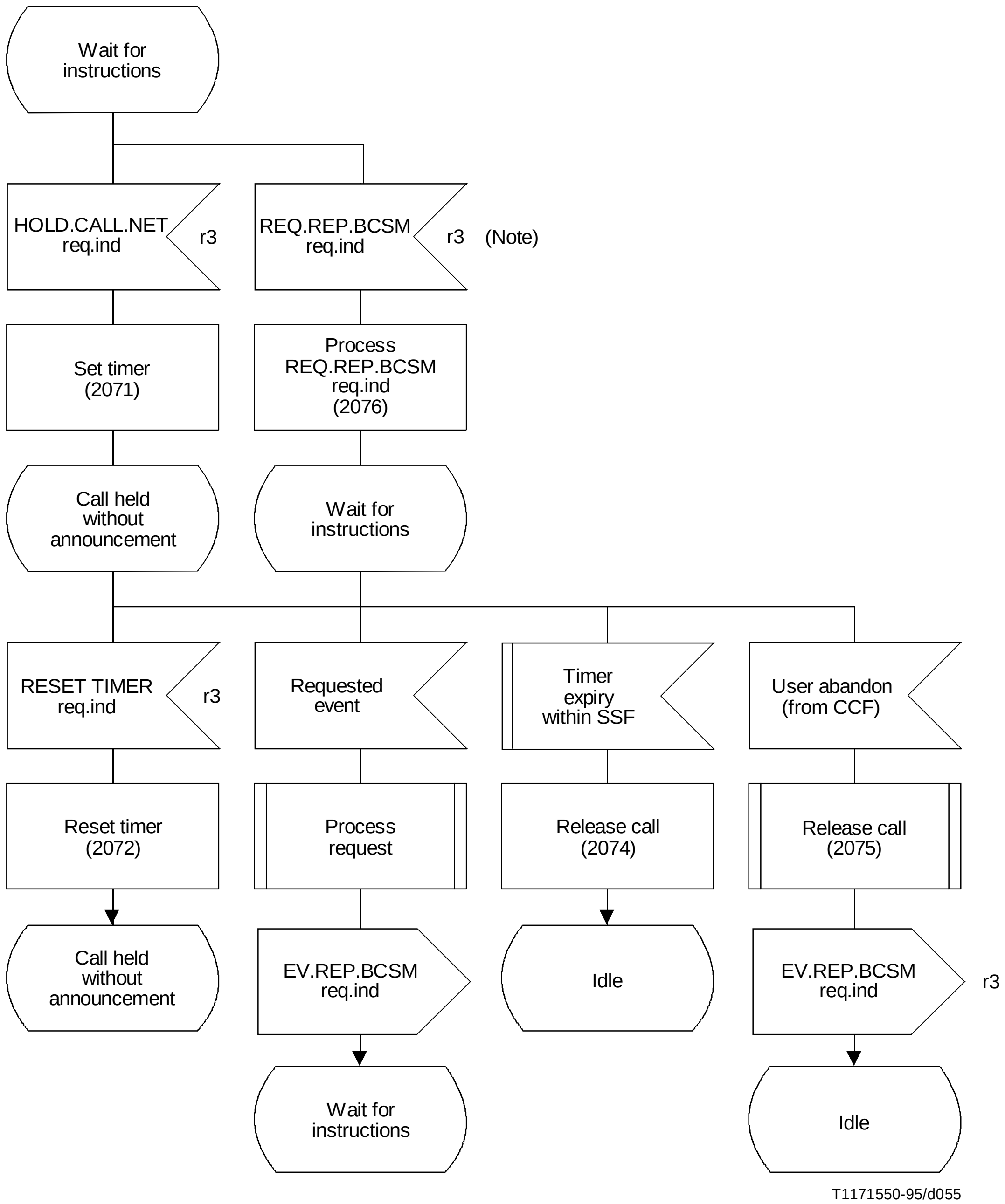
SCF actions for QUEUE SIB



NOTE – Refer to USER INTERACTION SIB for depiction of cancelling a queue announcement.

FIGURE 5-26/Q.1214 (sheet 2 of 2)

SCF actions for QUEUE SIB



NOTE – The REQ.REP.BCSM req.ind should be processed before the HOLD.CALL.NET req.ind for correct processing of this SDL.

FIGURE 5-27/Q.1214 (sheet 1 of 2)

SSF actions for QUEUE SIB

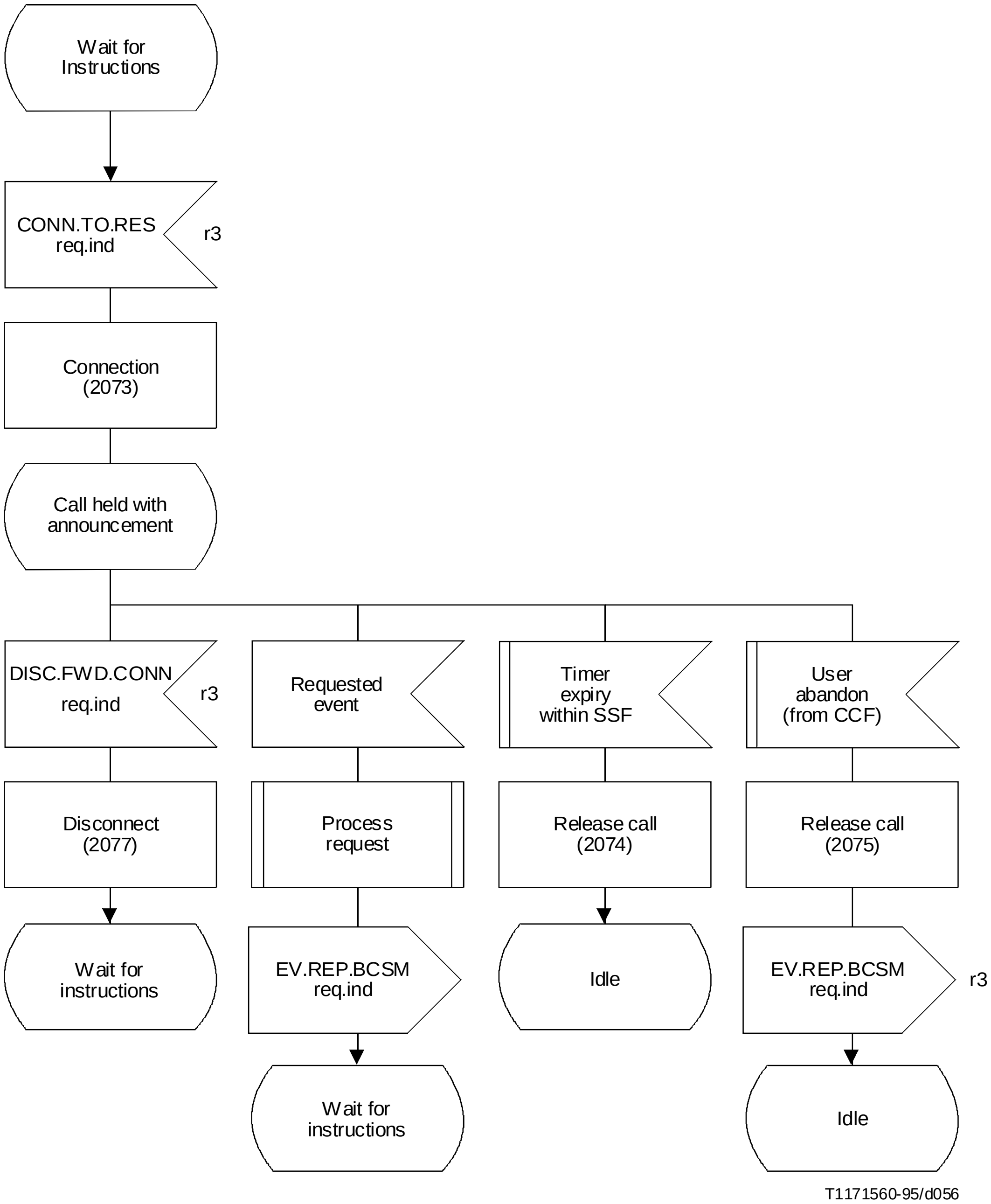


FIGURE 5-27/Q.1214 (sheet 2 of 2)

SSF actions for QUEUE SIB

5.2.7.2.4 Functional Entity Actions (FEAs)

SCF related FEAs

Reference number		Action
9071	–	initiates Request Report BCSM Event req.ind;
	–	initiates Hold Call In Network req.ind or Connect To Resource req.ind and Play Announcement req.ind;
	–	stores the call reference in the appropriate queue;
	–	arms a timer in order to be woken-up to perform FEA 9072.

Reference number	Action
9072	– wakes up from timer set in FEA 9071;
	– initiates Reset Timer req.ind;
	– arms a timer in order to be woken-up to start FEA 9072 again.
9073	– dequeues call attempt based on availability of resource;
	– initiates, when needed, Disconnect Forward Connection req.ind;
	– updates the resource status (e.g. increases the line busy counter related to concerned destination);
	– gives control back to service logic with “resource available”.
9074	– wakes up from application queue timer;
	– gives control back to service logic with “timer expired”.
9075	– receives Event Report BCSM req.ind, indicating user abandon;
	– gives control back to service logic with “call party abandon”.

SSF related FEAs

Reference number	Action
2071	– receives Hold Call in Network req.ind;
	– requests the CCF to do all the activities necessary to keep the call waiting in the network.
2072	– receives Reset Timer req.ind;
	– updates the value of the running timer in the SSF with the received value.
2073	– receives Connect to Resource req.ind;
	– requests the CCF to connect the party to the relevant SRF.
2074	– wakes up from the running timer in the SSF;
	– takes care of the release of all SSF resources on this call.
2075	– receives a user abandon indication from the CCF;
	– checks that Report of user abandon was requested as EDP;
	– sends Even Report BCSM req.ind, indicating user abandon;
	– releases all SSF resources on this call.
2076	– receives Request Report BCSM Event req.ind from the SCF;
	– stores the requested Report.
2077	– receives Disconnect Forward Connection req.ind;
	– requests the CCF to disconnect the party from the SRF.

SRF related FEAs

Reference number	Action
3071	– receives Play Announcement req.ind from the SCF;
	– plays the appropriate announcement.

5.2.8 SCREEN SIB

5.2.8.1 Description

The SCREEN SIB provides the capability for the SCF to initiate a comparison of an identifier against a list located in a specified storage space in the SDF.

5.2.8.2 Information flows

5.2.8.1 Diagrams

Figure 5-28 depicts the information flows and functional entity actions to support screening functionality.

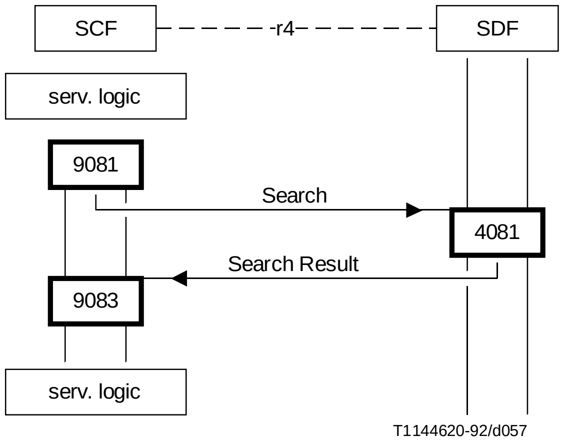


FIGURE 5-28/Q.1214

Information flow diagram "SCREEN" SIB

5.2.8.2.2 Definition of information flows

Search is a confirmed information flow generated by a service control function through service logic and sent to a service data function to screen data against a list.

The Search Result information flow responds to the Search.

These information flows may convey the following elements of information:

Information elements	Relationship	Search	Search Result
Authorized Relationship ID	r4	mandatory	mandatory
Base Object	r4	mandatory	
Subset	r4	optional	
Selection	r4	mandatory	
Search Aliases	r4	mandatory	
Matched Value Only	r4	optional	
Filter	r4	optional	
Search Info	r4		mandatory

NOTE – A more detailed description of the use of the information flows is given in the SERVICE DATA MANAGEMENT SIB.

5.2.8.3 SDLs

See Figures 5-29 and 5-30.

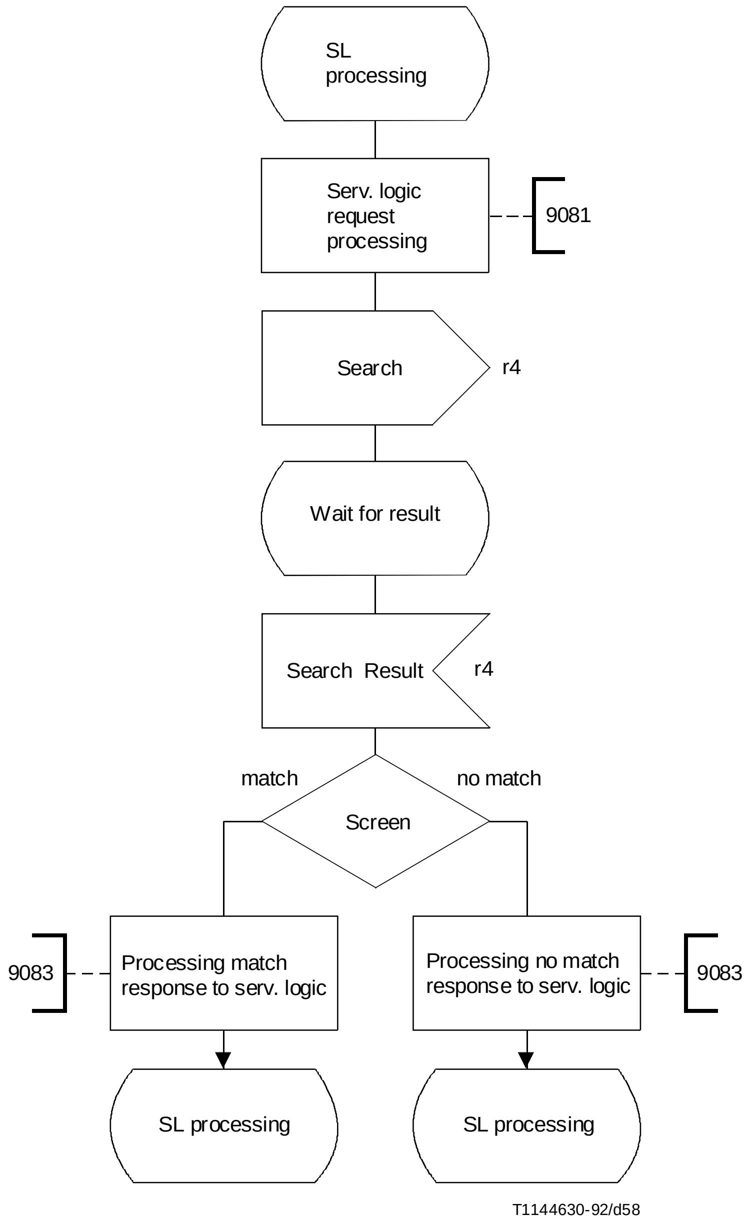


FIGURE 5-29/Q.1214

SCF actions for "SCREEN" SIB

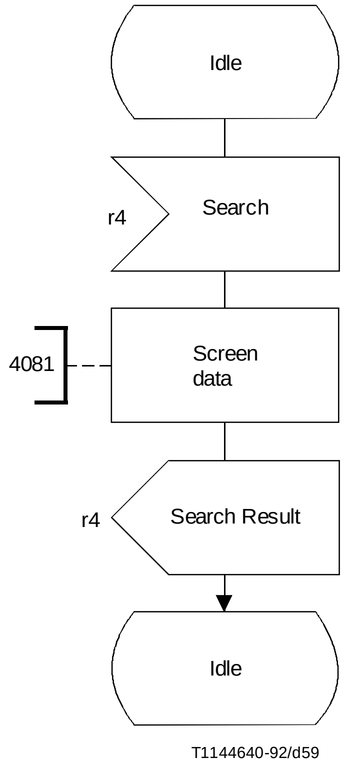


FIGURE 5-30/Q.1214

SDF actions for "SCREEN" SIB

5.2.8.4 Functional entity actions

Reference number	Action
9081	– process request from service logic;
	– generate and send a Search.
4081	– receive and analyse a Search;
	– screen data in the base;
	– generate and send a Search Result.
9083	– receive Search Result;
	– return response (match/no match) to service logic.

5.2.9 SERVICE DATA MANAGEMENT SIB

5.2.9.1 Description

The SERVICE DATA MANAGEMENT SIB provides the capability for the SCF to:

- retrieve;
- replace, increment and decrement data;

in a specified storage space in the SDF.

5.2.9.2 Information flows

5.2.9.2.1 Diagrams

1) Figure 5-31 depicts the information flows and functional entity actions to support service data management functionality to retrieve data.

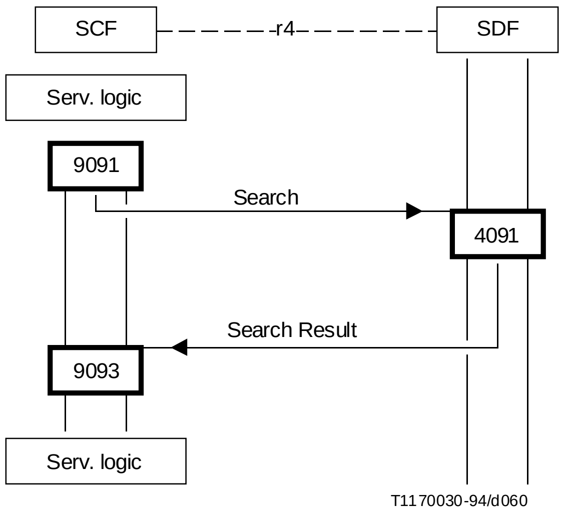


FIGURE 5-31/Q.1214

Information flow diagram
"SERVICE DATA MANAGEMENT" SIB
(retrieve data)

2) Figure 5-32 depicts the information flows and functional entity actions to support service data management functionality to perform an ACTION on the data.

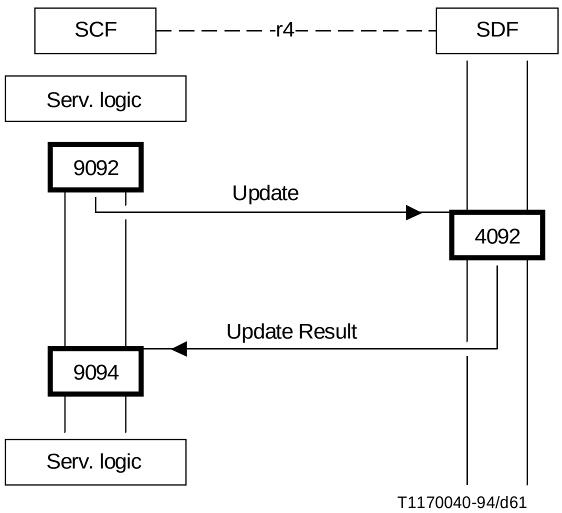


FIGURE 5-32/Q.1214

Information flow diagram
"SERVICE DATA MANAGEMENT" SIB
(action on data)

5.2.9.2.2 Definition of information flows

1) Search is a confirmed information flow generated by a service control function through service logic and sent to a service data function to retrieve data.

The Search Result information flow responds to the Search.

These information flows may convey the following elements of information:

Information elements	Relationship	Search	Search Result
Authorized Relationship ID	r4	mandatory	mandatory
Base Object	r4	mandatory	
Subset	r4	optional	
Selection	r4	mandatory	
Search Aliases	r4	mandatory	
Matched Value Only	r4	optional	
Filter	r4	optional	
Search Info	r4		mandatory

2) Update is a confirmed information flow generated by a service control function through service logic and sent to a service data function to perform a requested action.

The Update Result information flow corresponds to the Update.

A pair of Update and Update Result consists of one of the following pair of information flows:

- Modify Entry and Modify Entry Result;
- Add Entry and Add Entry Result; or
- Remove Entry and Remove Entry Result.

Use of the pair of information flows is dependent on the requested action on data.

These information flows may convey the following elements of information:

Information elements	Relationship	Modify Entry	Modify Entry Result
Authorized Relationship ID	r4	mandatory	mandatory
Object	r4	mandatory	
Changes	r4	mandatory	
Selection	r4	optional	
Information	r4		optional

Information elements	Relationship	Add Entry	Add Entry Result
Authorized Relationship ID	r4	mandatory	mandatory
Object	r4	mandatory	
Entry	r4	mandatory	

Information elements	Relationship	Remove Entry	Remove Entry Result
Authorized Relationship ID	r4	mandatory	mandatory
Object	r4	mandatory	

5.2.9.3 SDLs

1) *Data retrieval*

See Figures 5-33 and 5-34.

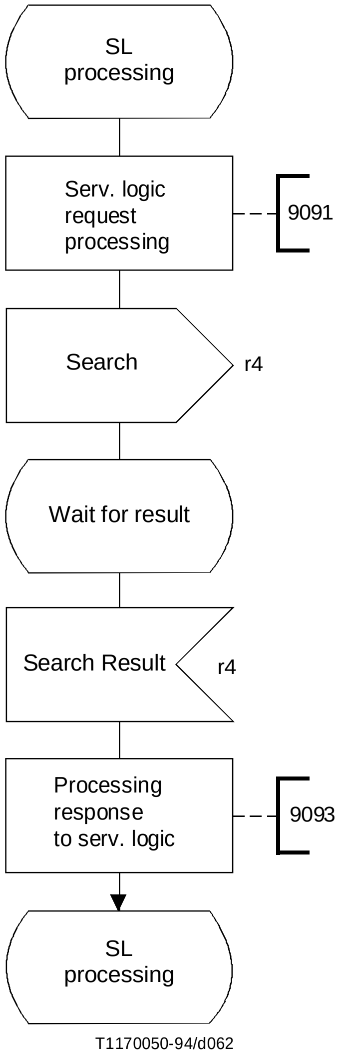


FIGURE 5-33/Q.1214

SCF actions for
"SERVICE DATA MANAGEMENT" SIB

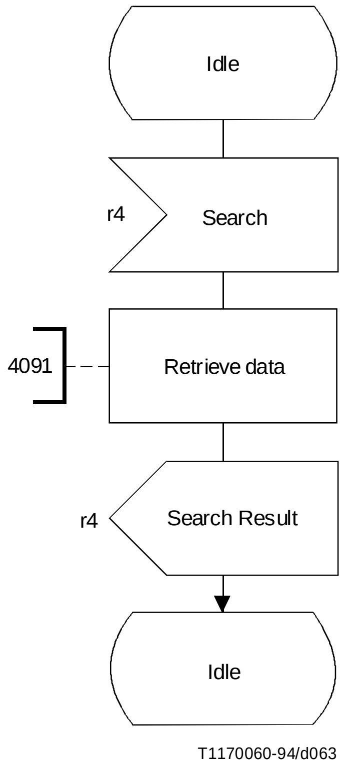
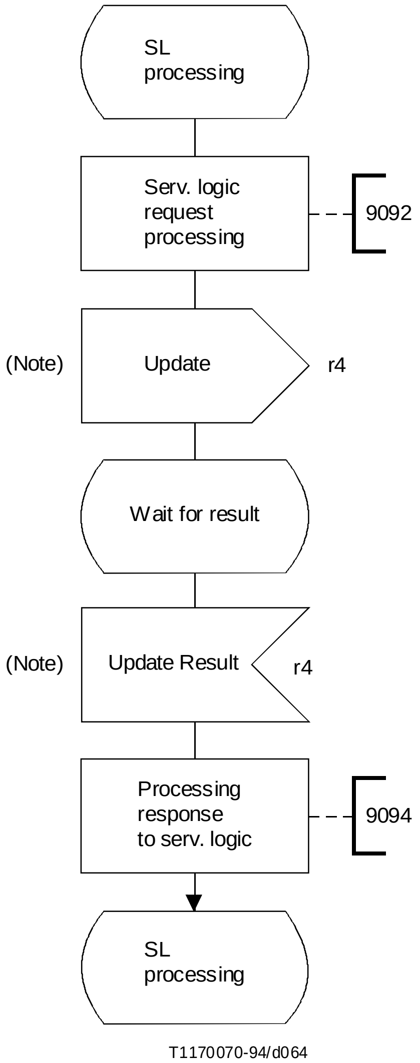


FIGURE 5-34/Q.1214

SDF actions for
"SERVICE DATA MANAGEMENT" SIB

2) *Perform a requested action on data*

See Figures 5-35 and 5-36.



NOTE – A pair of Update and Update Result consists of one of the following pairs of information flows:

– Modify Entry and Modify Entry Result;

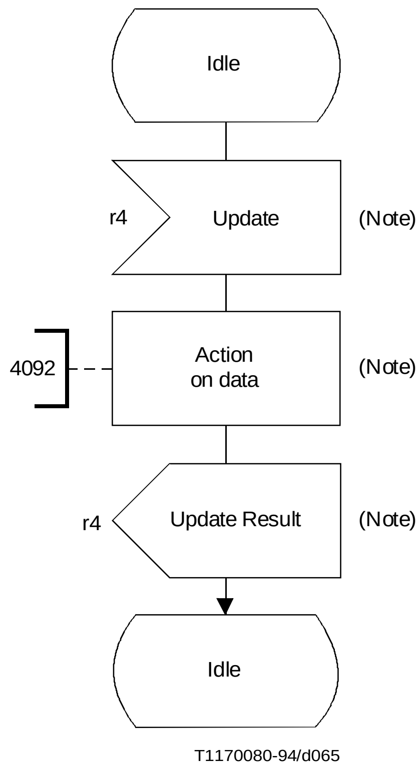
– Add Entry and add Entry Result;

– Remove Entry and Remove Entry Result.

Use of the pair of information flows is dependent on the requested action on data.

FIGURE 5-35/Q.1214

SCF actions for
"SERVICE DATA MANAGEMENT" SIB



NOTE – A pair of Update and Update Result consists of one of the following pairs of information flows:

- – Modify Entry and Modify Entry Result;
- – Add Entry and add Entry Result;
- – Remove Entry and Remove Entry Result.

Use of the pair of information flows is dependent on the requested action on data.

FIGURE 5-36/Q.1214

SDF actions for
"SERVICE DATA MANAGEMENT" SIB

5.2.9.4 Functional entity actions

Reference number	Action
9091	– process request from service logic;
	– generate and send a Search.
9092	– process request from service logic;
	– generate and send an Update.
4091	– receive and analyse Search;
	– retrieve data in the base;
	– generate and send a Search Result.
4092	– receive and analyse Update;
	– execute specified action in the base;
	– process and return result;
	– generate and send an Update Result.
9093	– receive Search Result;
	– return response to service logic.
9094	– receive Update Result;
	– return response to service logic.

5.2.10 STATUS NOTIFICATION SIB

5.2.10.1 Description

The STATUS NOTIFICATION SIB provides the capability for the SCF to keep track of the status of network calls or resources and optionally to store the status in the SDF. For example, this SIB is used to determine the busy/idle status of a line to a called party. The SCF requests the CCF/SSF to notify it of the busy/idle status of a call or resource by sending a Request Status Report req.ind of type “poll resource status”, “monitor for change”, or “continuous monitor”. These types can request the CCF/SSF to return the status immediately, or to wait until the specified resource assumes a particular busy/idle status, or to report each time the resource changes status. The resource can be, for example, a non-ISDN line, a directory number associated with an ISDN interface, a Multi-line Hunt Group (MLHG), or a Trunk Group (TG).

The CCF/SSF sends a status report resp.conf to report the status of the call or resource to the SCF. The SCF then optionally communicates with the SDF to update its busy/idle status information. The request status report req.ind of type “monitor for change”, or “continuous monitor” may include a monitor duration parameter that requests the CCF/SSF to monitor busy/idle status of the resource for a limited time. The SCF may also request the CCF/SSF to end status notification for a resource if the CCF/SSF is waiting for a change in status or reporting all changes. The SCF does this by sending the cancel req.ind to the CCF/SSF.

5.2.10.2 Information flows

5.2.10.2.1 Diagrams

Figure 5-37 depicts the information flows and functional entity actions to support status notification functionality for type “poll resource status”.

Figure 5-38 depicts the information flows and functional entity actions to support status notification functionality for type “monitor for change”.

Figure 5-39 depicts the information flows and functional entity actions to support status notification functionality of type “continuous monitor”.

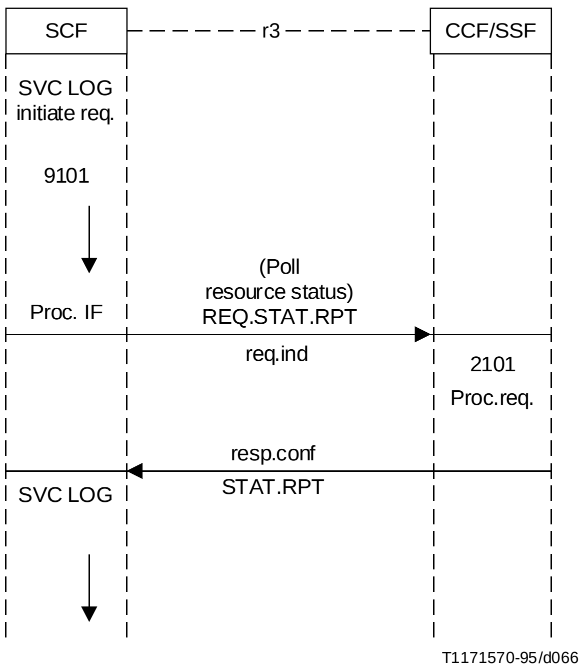


FIGURE 5-37/Q.1214

Information flow diagram
STATUS NOTIFICATION SIB

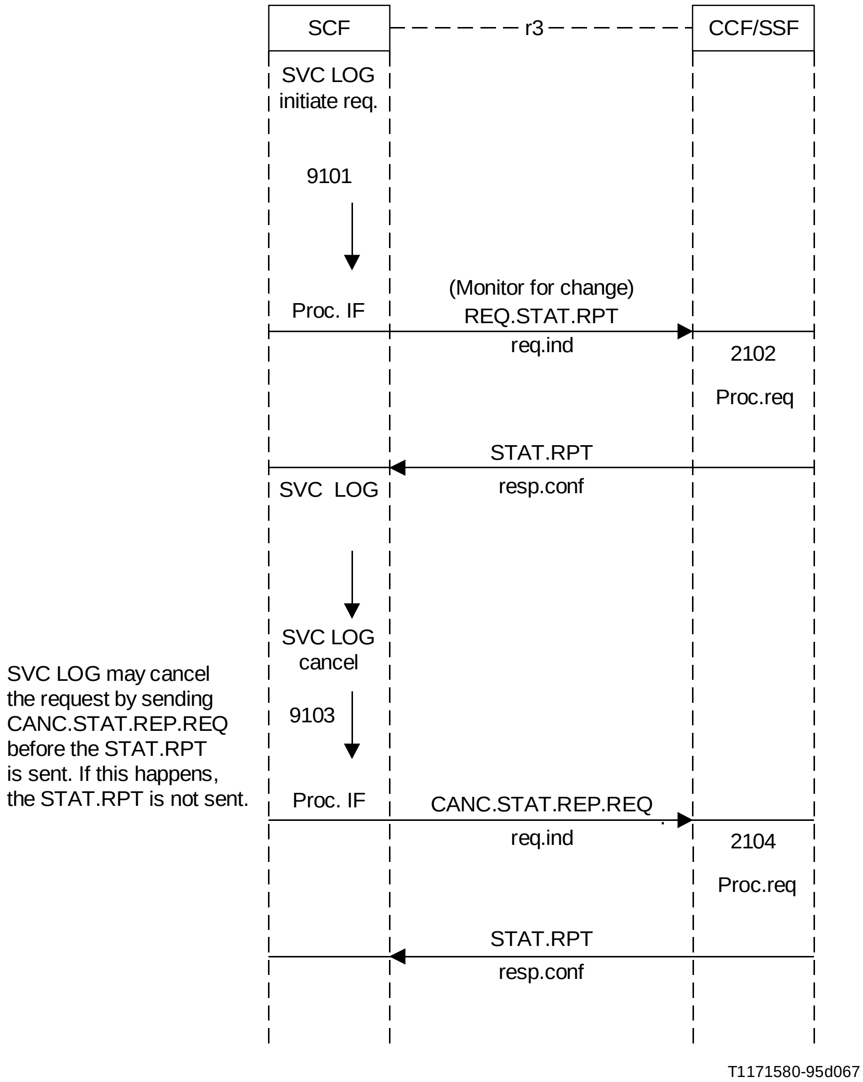


FIGURE 5-38/Q.1214

Information flow diagram
STATUS NOTIFICATION SIB

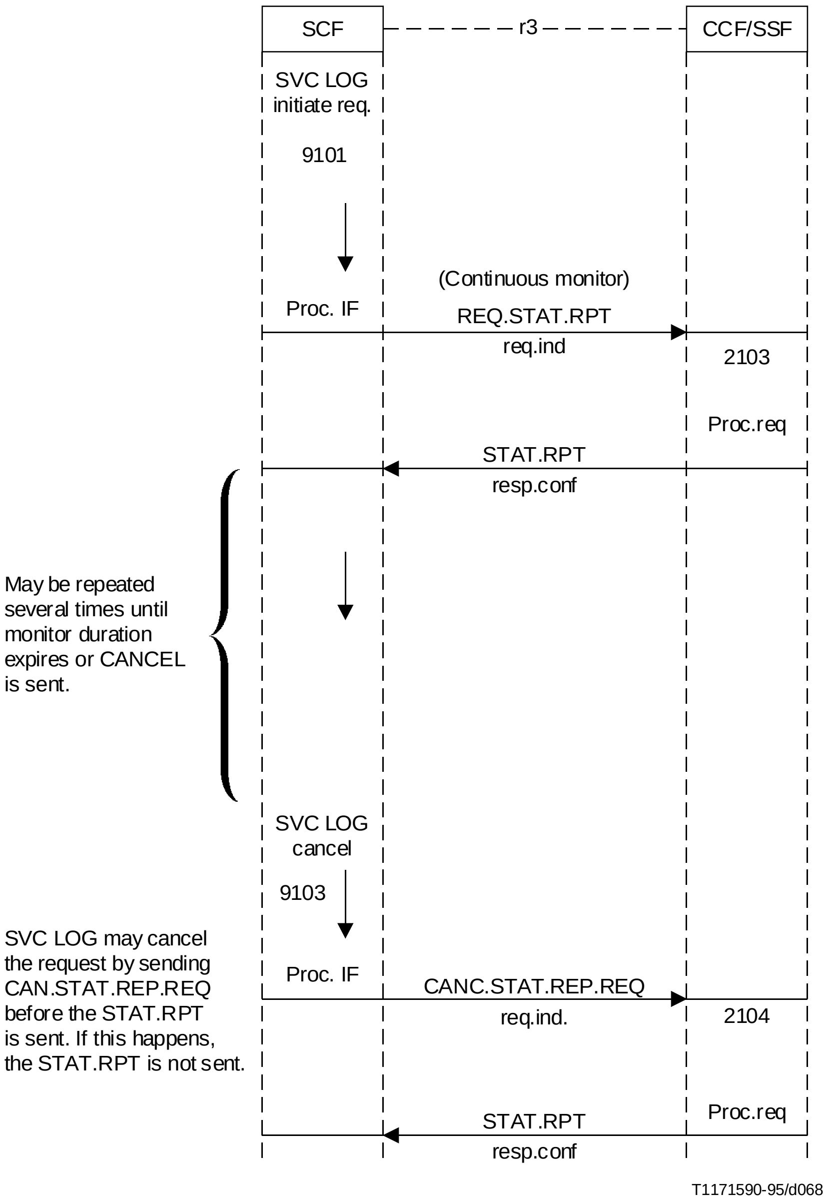


FIGURE 5-39/Q.1214

Information flow diagram
STATUS NOTIFICATION SIB

5.2.10.2.2 Definition of information flows

1) Request Status Report (REQ.STAT.RPT) req.ind is a confirmed information flow from the SCF to the SSF/CCF to monitor the busy/idle status of a physical termination resource.

   The following information flow elements may be conveyed by this information flow:

Information elements	Relationship	Req.ind
Monitor Type	r3	mandatory
Monitor Duration	r3	optional
Resource ID	r3	mandatory
Resource Status	r3	optional
Correlation ID	r3	optional

2) Status Report (STAT.RPT) resp.conf is an information flow that is generated by a CCF/SSF to report the busy/idle status of a resource to the SCF according to the monitor type specified in the Request Status Report req.ind.

   The following information flow elements may be conveyed by this information flow:

Information elements	Relationship	Resp.conf
Resource ID	r3	optional
Resource Status	r3	mandatory
Correlation ID	r3	optional
Report Condition	r3	optional

3) Cancel Status Report Request (CANC.STAT.REP.REQ) req.ind is a confirmed information flow from the SCF to the SSF/CCF to cancel a previous request to monitor the busy/idle status of a physical termination resource.

   The following information flow elements may be conveyed by this information flow:

Information element	Relationship	Req.ind
Resource ID	r3	mandatory

5.2.10.3 SDLs

Figure 5-40 presents the SDL diagram for the SCF processing of the "STATUS NOTIFICATION" SIB functionality.

Figure 5-41 presents the SDL diagram for the CCF/SSF processing of the "STATUS NOTIFICATION" SIB functionality.

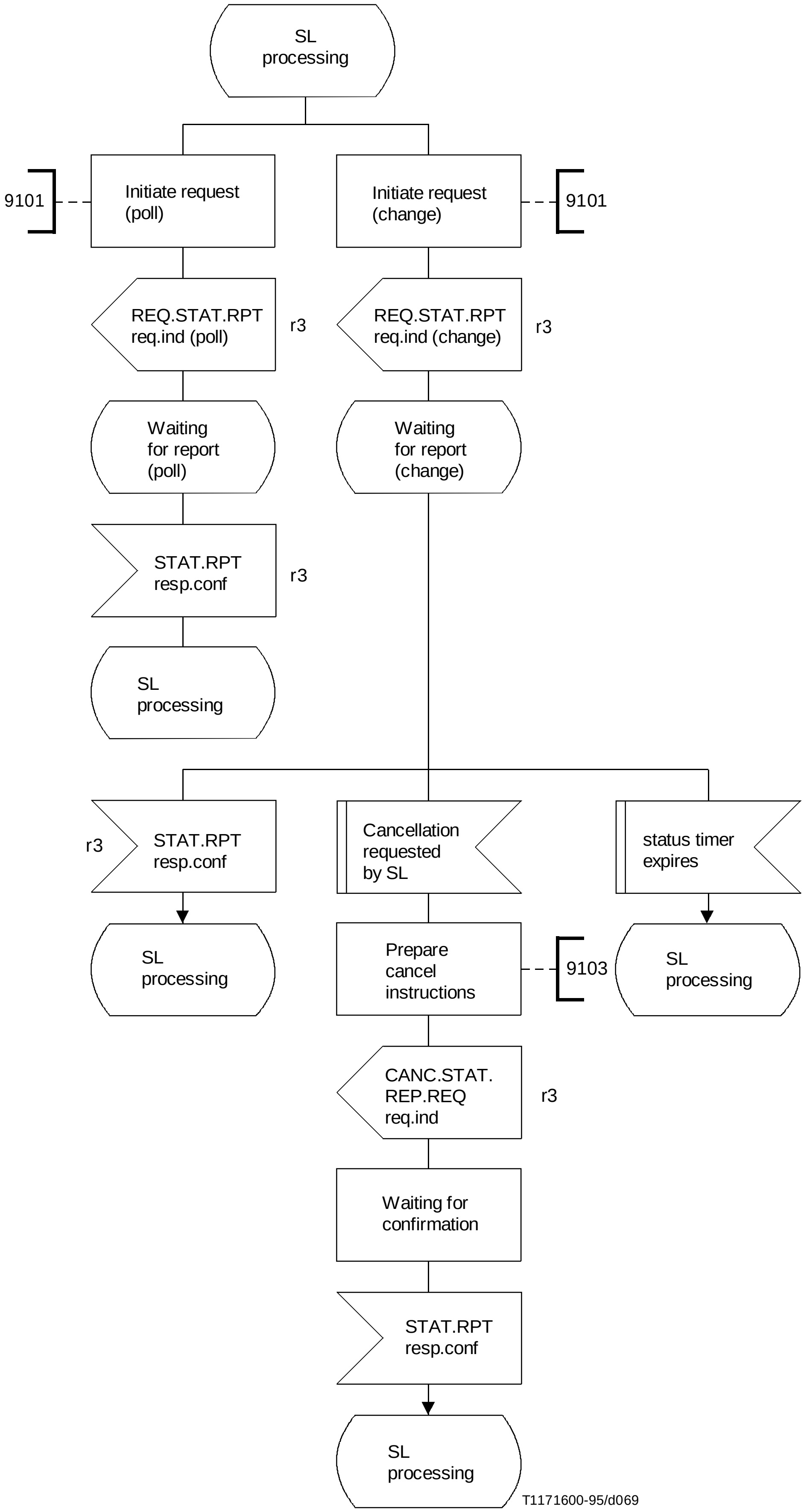


FIGURE 5-40/Q.1214 (sheet 1 of 2)

STATUS NOTIFICATION SIB SCF

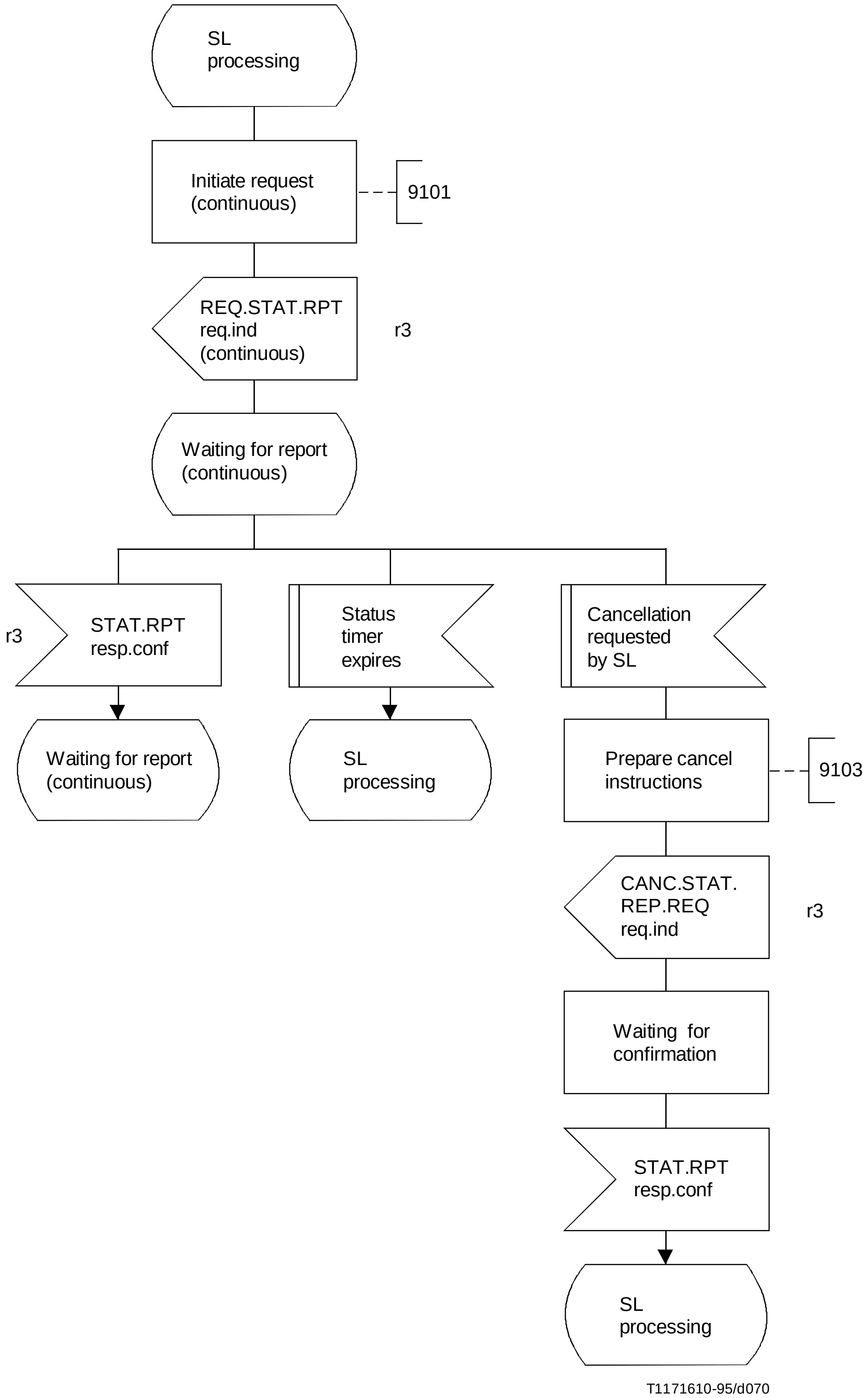


FIGURE 5-40/Q.1214 (sheet 2 of 2)

STATUS NOTIFICATION SIB SCF

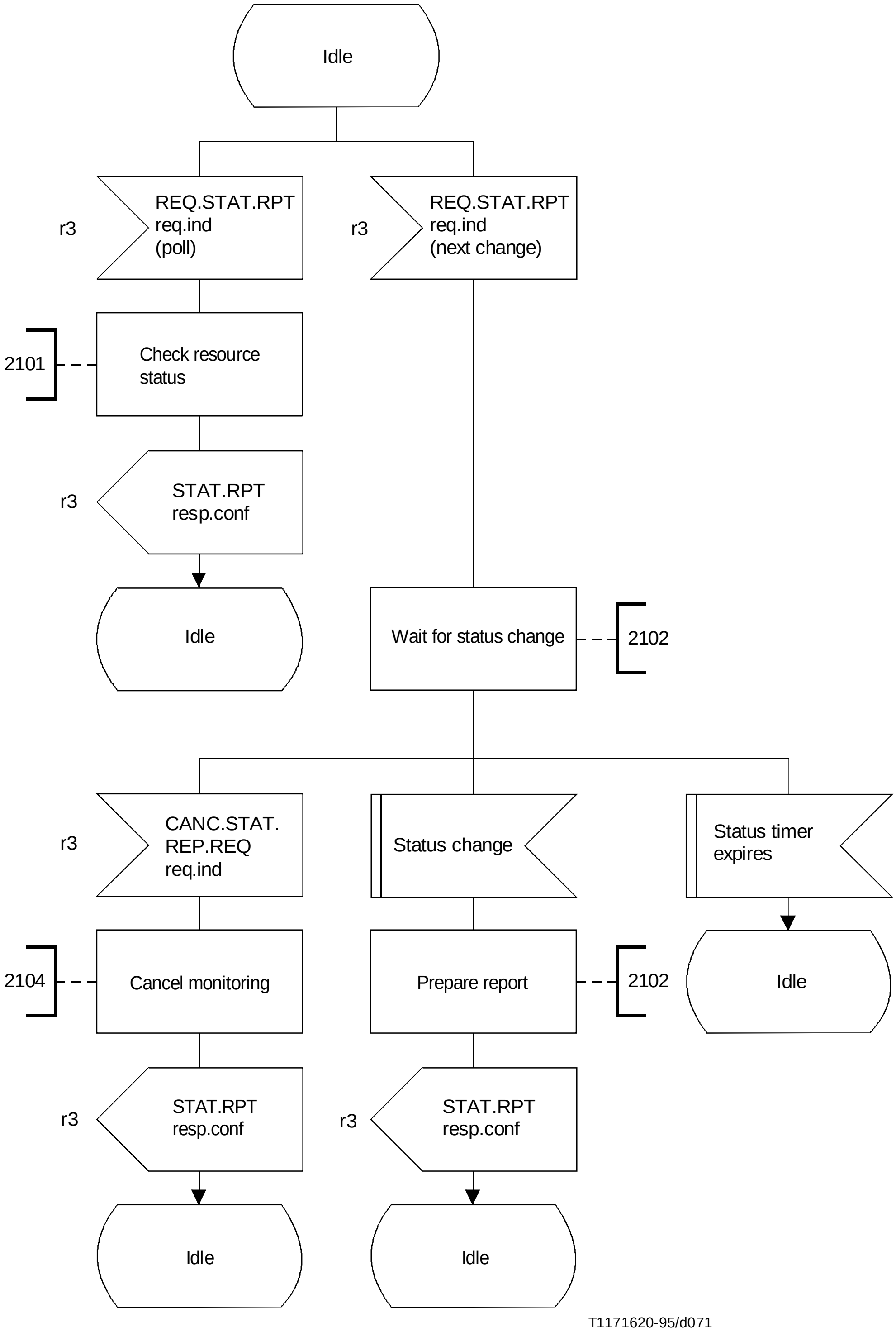


FIGURE 5-41/Q.1214 (sheet 1 of 2)

STATUS NOTIFICATION SIB SSF/CCF

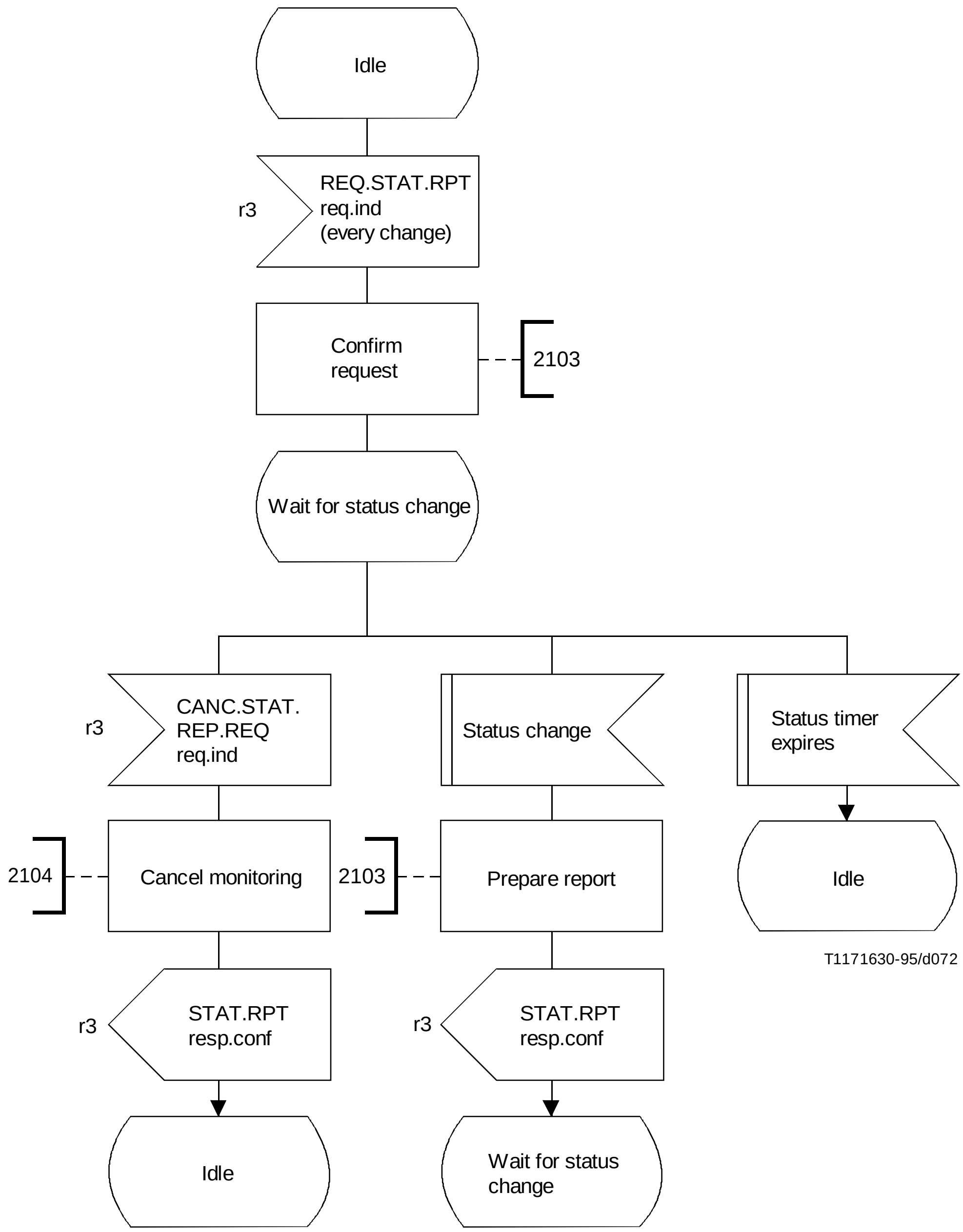


FIGURE 5-41/Q.1214 (sheet 2 of 2)

STATUS NOTIFICATION SIB SSF/CCF

5.2.10.4 Functional entity actions

Functional entities are assumed to have the basic capabilities required to properly perform their assigned function in the IN. Only Functional Entity Actions (FEAs) pertinent to the "STATUS NOTIFICATION" SIB are shown in the information flow diagram. Reference numbers have been arbitrarily assigned to cross-reference the FEAs shown in 5.2.10.2.1 with these descriptions:

Reference number	Action
9101	Initiate request: – initiate a Request Status Report req.ind; – wait for Status Report resp.conf.
9103	Initiate request: – initiate a Cancel Status Report Request req.ind.
2101	Process Request Status Report req.ind of type "poll resource status": – receive and analyse Request Status Report req.ind; – determine current status of resource; – return Status Report resp.conf.
2102	Process Request Status Report req.ind of type "monitor for change": – receive and analyse Request Status Report req.ind; – set monitor duration if specified; – determine if resource is specified status, if so return Status Report resp.conf, and if not wait for resource to change to specified status or duration expires or a Cancel Status Report Request req.ind is received; – when resource changes to specified status, return Status Report resp.conf.
2103	Process Request Status Report req.ind of type "continuous monitor": – receive and analyse Request Status Report req.ind; – set monitor duration if specified; – report changes in status until duration expires or a Cancel Status Report Request req.ind is received; – when status changes, return Status Report resp.conf.
2104	Process Cancel Status Report Request req.ind: – receive and analyse Cancel Status Report Request req.ind; – send Status Report resp.conf to report cancellation.

5.2.11 TRANSLATE SIB

5.2.11.1 Description

TRANSLATE is a SIB that provides a translation capability by an SDF for an SCF. For example, it can be used to modify a functional number into a valid destination address and to provide translations based on other input parameters.

5.2.11.2 Information flows

5.2.11.2.1 Diagram

Figure 5-42 is a diagram that depicts information flows and functional entity actions involved in executing the TRANSLATE SIB.

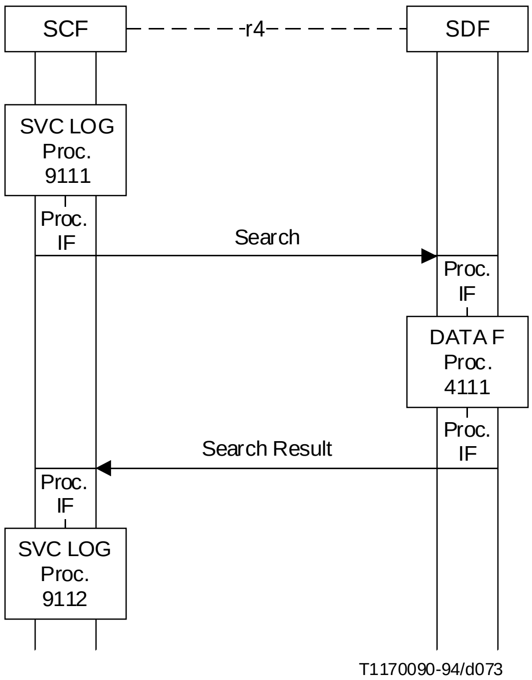


FIGURE 5-42/Q.1214

Information flow diagram "TRANSLATE" SIB

5.2.11.2.2 Definition of information flows

The Search is generated by an SCF when interrogating an SDF to obtain service, network and/or customer data required to perform a translation. It is a confirmed information flow within the r4 relationship and the Search Result information flow is the response to the Search information flow with the appropriate information.

The following items of information may be conveyed by these information flows:

Information elements	Relationship	Search	Search Result
Authorized Relationship ID	r4	mandatory	mandatory
Base Object	r4	mandatory	
Subset	r4	optional	
Selection	r4	mandatory	
Search Aliases	r4	mandatory	
Matched Value Only	r4	optional	
Filter	r4	optional	
Search Info	r4		mandatory

5.2.11.3 SDLs

Figure 5-43 presents the SDL diagram for the SCF processing of a TRANSLATE SIB. Figure 5-44 presents the SDL diagram for the SDF involved in processing a TRANSLATE SIB.

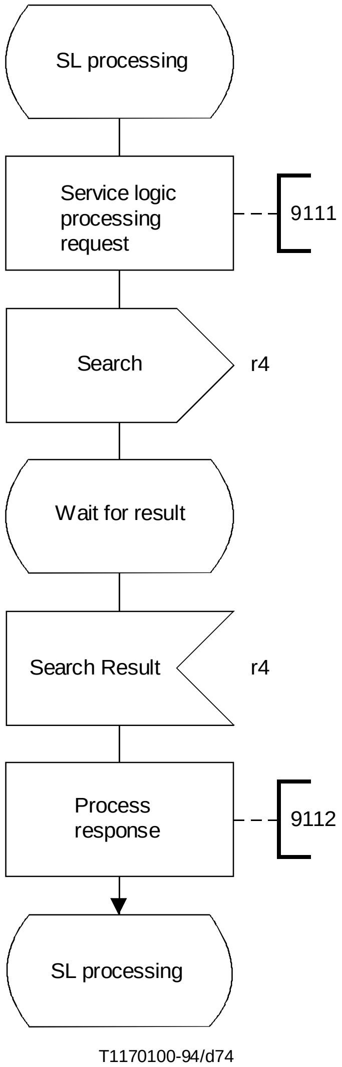


FIGURE 5-43/Q.1214

SCF actions for “TRANSLATE” SIB

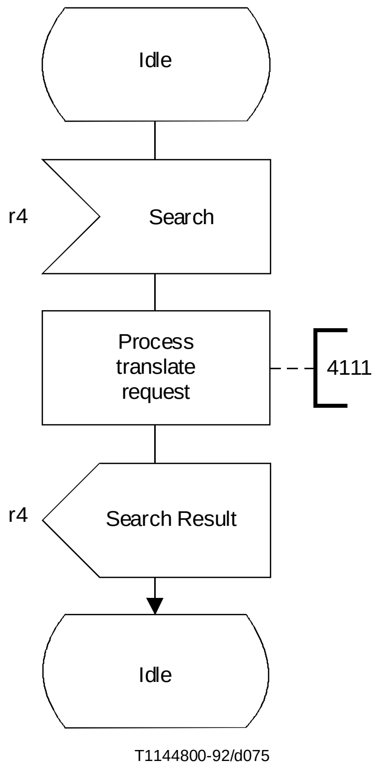


FIGURE 5-44/Q.1214

SDF actions for "TRANSLATE" SIB

5.2.11.4 Functional entity actions

Reference number	Action
All	Process IF: – Formulate and send Search or Search Result; or – Receive Search or Search Result, analyse and pass to processing logic.
9111	SVC LOGIC processing request: – Initiate translation process.
9112	SVC LOGIC Processing Information: – Receive and analyse Search Result; – Process information as required.
4111	DATA FUNCTION process request: – Receive and analyse a Search; – Determine translation based on available reference information; – Process information as required; – Formulate and send Search Result.

5.2.12 USER INTERACTION SIB

5.2.12.1 Description

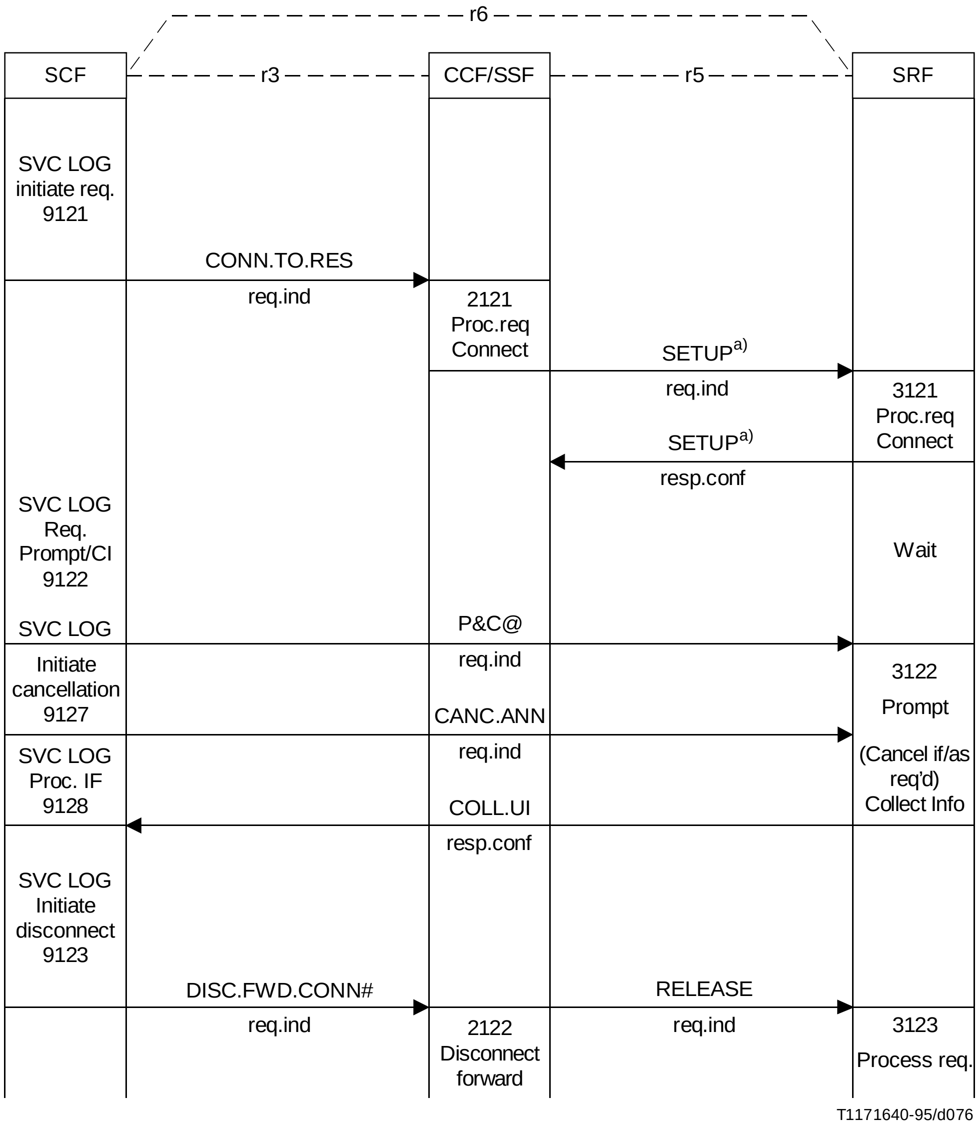
USER INTERACTION is a SIB wherein the SCF directs the connection of a user to a specialized resource (i.e. SRF), the playing of an announcement toward and, in some cases, the collection of information from a user. The announcement and/or collected information can be in the form of audio messages, DTMF tones, etc.

5.2.12.2 Information flows

5.2.12.2.1 Diagrams

Figures 5-45 and 5-46 depict information flows and functional entity actions involved in executing the USER INTERACTION SIB for playing an announcement and/or obtaining additional information from a user over the bearer channel, e.g. 64 kbit/s circuit. Execution of the USER INTERACTION SIB to interact with an ISDN user via the D-channel is for further study.

The information flows, functional entity actions and SDL diagrams are shown here only for the case where the SCF-SRF information flows are relayed via the SSF/CCF. The case where there is direct exchange of information flows between the SCF and the SRF is identical with the assist case (see 5.2.12.5).



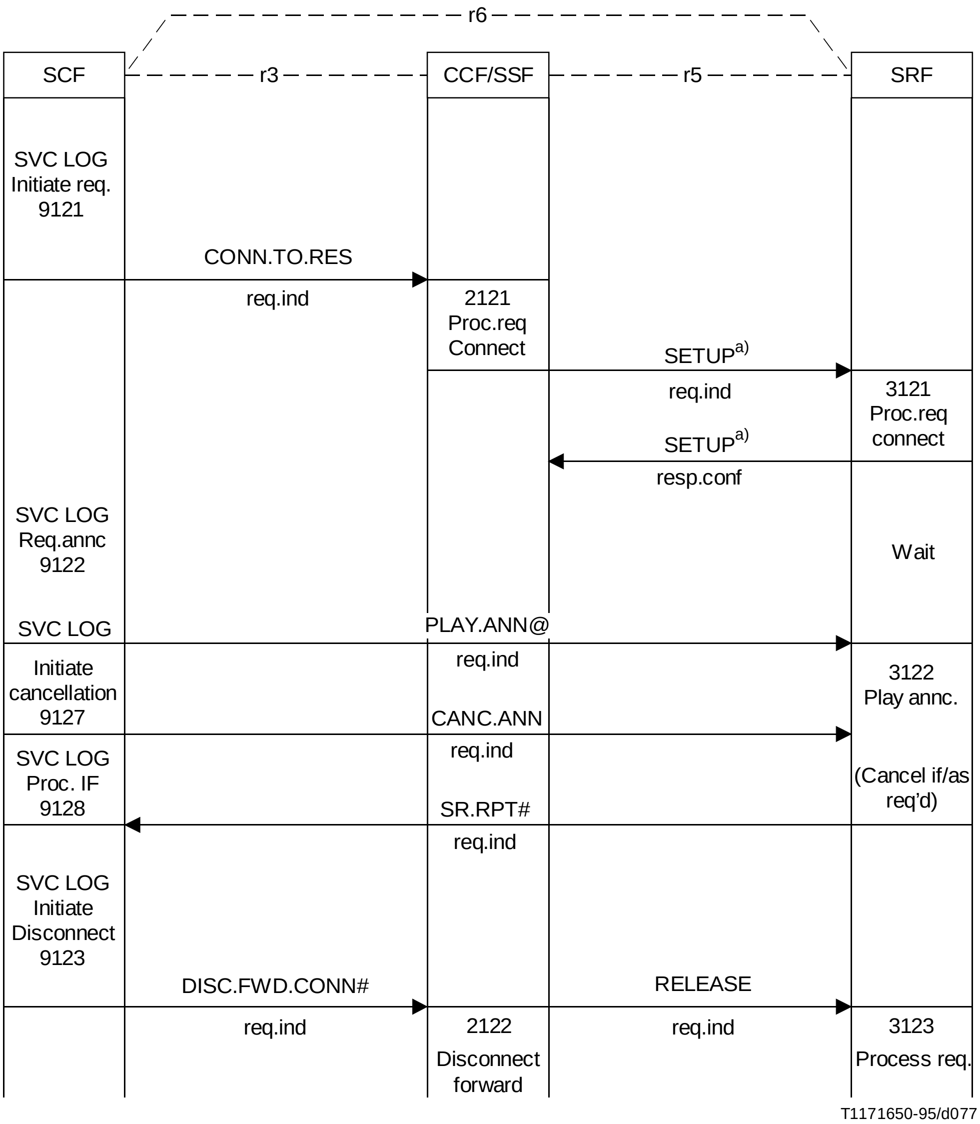
a) Optional information flows (depends on physical configuration).

@ Any number of announcement and/or prompt and collect information flows may be sent before the SRF is disconnected.

\# Optional information flows.

FIGURE 5-45/Q.1214

USER INTERACTION SIB
(as used to collect user information)



a) Optional information flows (depends on physical configuration).

@ Any number of announcement and/or prompt and collect information flows may be sent before the SRF is disconnected.

\# Optional information flows.

FIGURE 5-46/Q.1214

USER INTERACTION SIB
(as used to play announcement toward user)

5.2.12.2.2 Definition of information flows

1) Connect To Resource req.ind (CONN.TO.RES) is an unconfirmed information flow used by the SCF to request that the CCF/SSF extend a connection toward an SRF so that interaction with the end user can take place. This information flow occurs in the r3 relationship and contains the following elements of information:

Element	CONN.TO.RES req.ind
Call ID	mandatory
IP Routing Address	optional
Leg ID	optional
Service Interaction Indicators	optional

2) Setup req.ind is a confirmed information flow that is defined in Recommendation Q.71 for ISDN basic call setup. It occurs in the r5 relationship and carries the elements of information required by the SRF to establish an appropriate connection to the proper SRF termination(s). Setup resp.conf confirms to the CCF/SSF that the SRF has established the required connection(s).

NOTE – Use of the ISDN basic call setup information flow does not imply that the SRF-to-CCF/SSF interface needs to be ISDN.

3) Prompt And Collect User Information req.ind (P&C) is a confirmed information flow initiated by the SCF to an SRF to request that the required prompt/announcement be applied on the connection toward a call party and that information from the call party be received and returned to the SCF. The Collected User Information resp.conf (COLL.UI) conveys this information to the SCF. These information flows occur in the r6 relationship and convey the following elements of information:

Element	P&C req.ind	COLL.UI resp.conf
SRF Connect ID	mandatory	mandatory
Information To Send	optional	
Disconnection From IP Forbidden	mandatory	
Collected Info	mandatory	
Received information		mandatory

4) Play Announcement req.ind (PLAY.ANN) is an optionally confirmed information flow initiated by an SCF to an SRF to direct that a specific announcement be applied on the connection toward the call party. The Specialized Resource Report resp.conf (SR.RPT) is sent from the SRF back to the SCF at the end of playing the announcement. These information flows occur in the r6 relationship and contain the following elements of information:

Element	PLAY.ANN req.ind	SR.RPT resp.conf
SRF Connect ID	mandatory	mandatory
Information To Send	mandatory	
Disconnection From IP Forbidden	mandatory	
Request Announcement Completed Indication	mandatory	

5) Cancel Announcement req.ind (CANC.ANN) is an unconfirmed information flow in the r6 relationship wherein the SCF directs the SRF to discontinue playing an announcement to a call party.

Element	CANC.ANN req.ind
Operation identifier	mandatory

6) Disconnect Forward Connection req.ind (DISC.FWD.CONN) is an information flow in the r3 relationship initiated by the SCF to direct the CCF/SSF to initiate disconnection of the SRF from the connection toward the user. In the case of service assist it is also used to clear the connection between the Assisting SSF and the Initiating SSF.

Element	DISC.FWD.CONN req.ind
SRF Connect ID	mandatory

7) Release req.ind is a confirmed information flow that is defined in Recommendation Q.71 for ISDN basic call setup. It occurs in the r5 relationship and carries the elements of information required by the SRF to release a connection to the specified SRF termination(s).

5.2.12.3 SDLs

Figure 5-47 is an SDL that shows the actions at an SCF involved in executing the USER INTERACTION SIB.

Figure 5-48 is an SDL that shows the actions at a CCF/SSF involved in executing the USER INTERACTION SIB.

Figure 5-49 is an SDL that shows the actions at an SRF involved in executing the USER INTERACTION SIB.

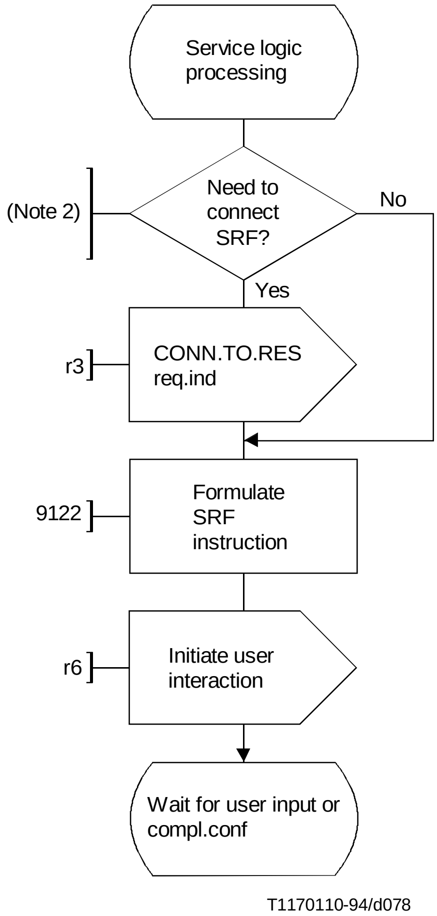
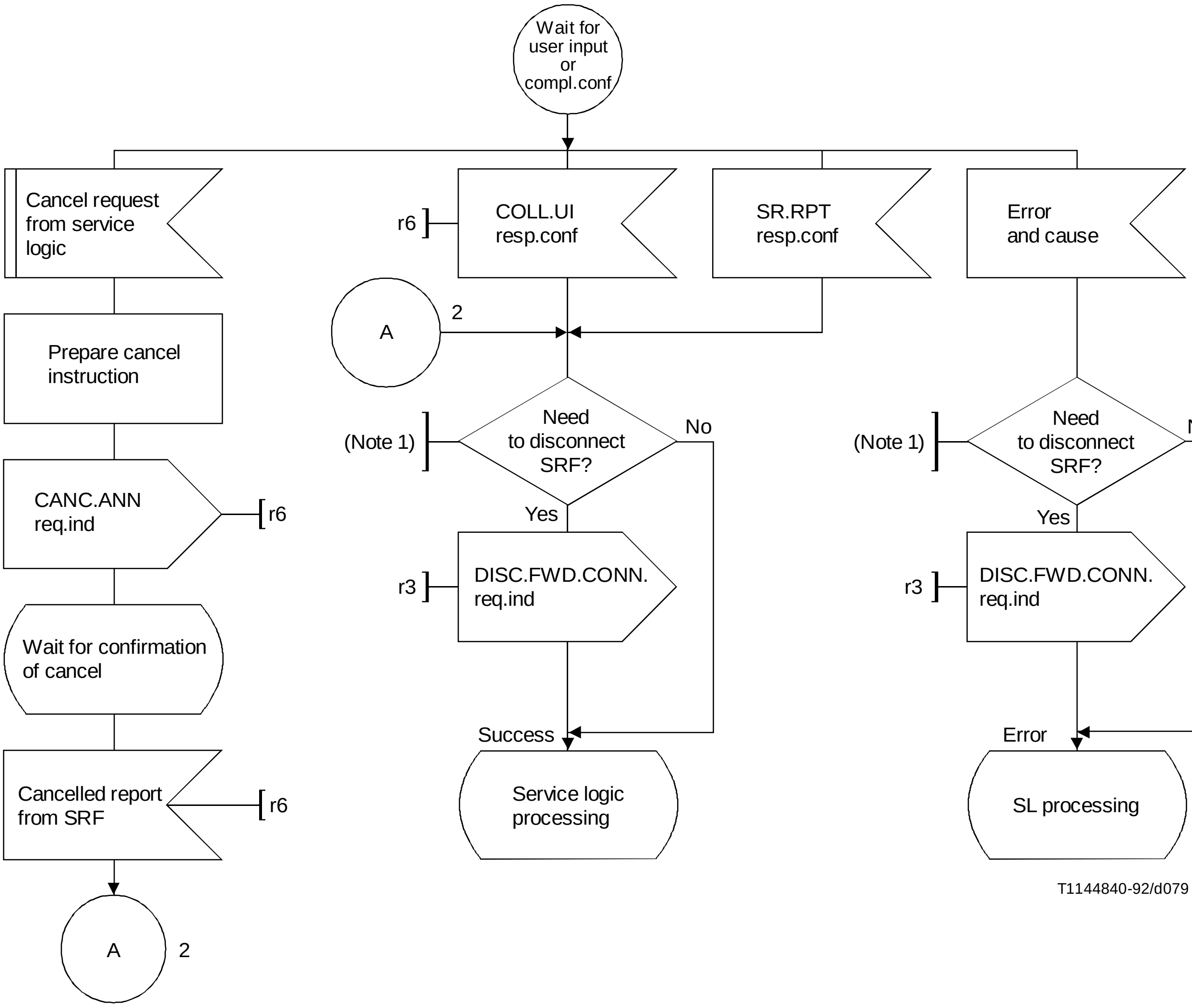


FIGURE 5-47/Q.1214 (sheet 1 of 2)

SCF actions for USER INTERACTION SIB



NOTES

1 User service logic program knowledge of whether an SRF type or capability has been previously connected and SCF knowledge whether next user interaction requires same or different physical entity to decide on connect/disconnect. This is accomplished through datafill provided to the SCF by the service management system when service logic is deployed and commissioned.

2 The particular SRF to connect to is determined from SCF knowledge of which SRF type or capability is required and whether there is a previous connection to an SRF of that type or capability. This is accomplished through datafill provided to the SSF by the service management system when service logic is deployed and commissioned.

FIGURE 5-47/Q.1214 (sheet 2 of 2)

SCF actions for USER INTERACTIONS SIB

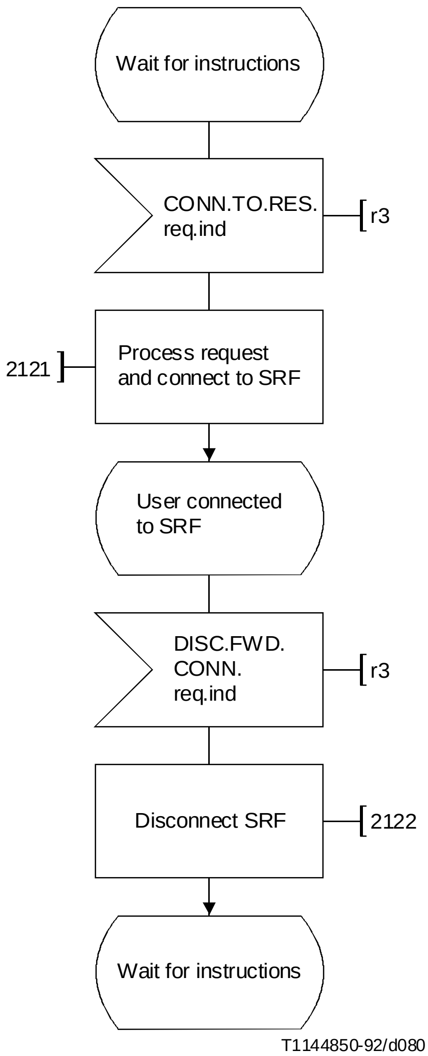


FIGURE 5-48/Q.1214

CCF/SSF actions for USER INTERACTION SIB

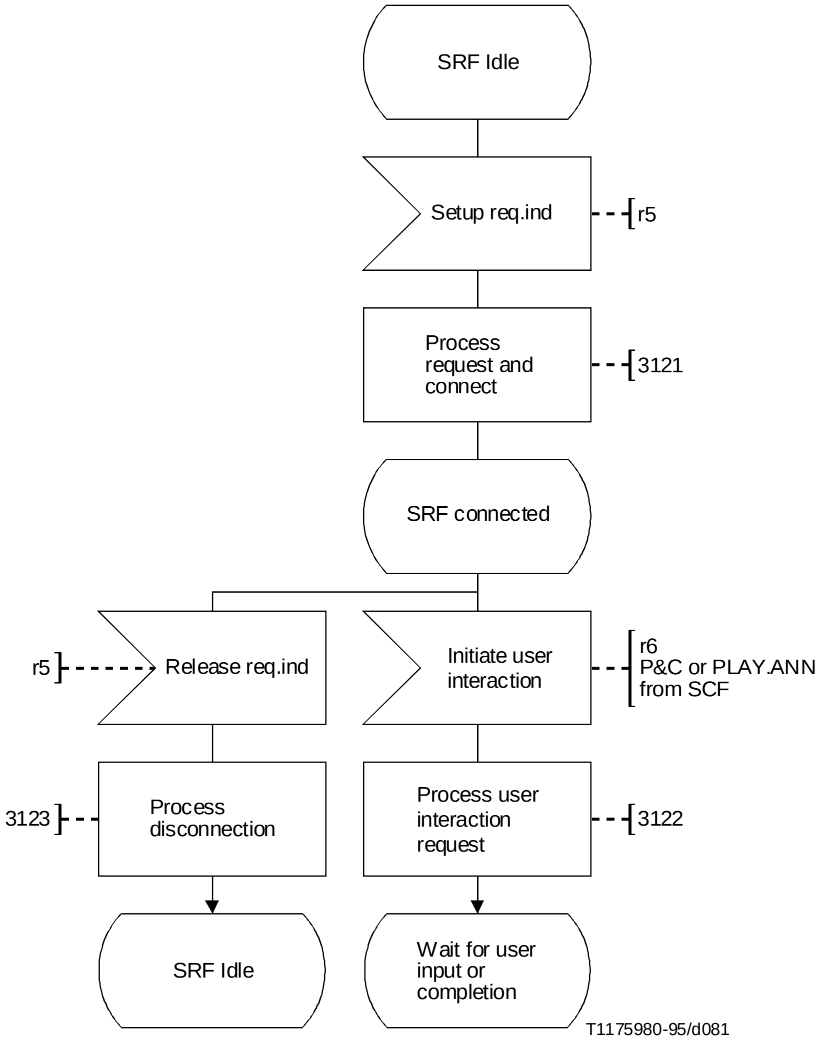


FIGURE 5-49/Q.1214 (sheet 1 of 3)

SRF actions for USER INTERACTION SIB

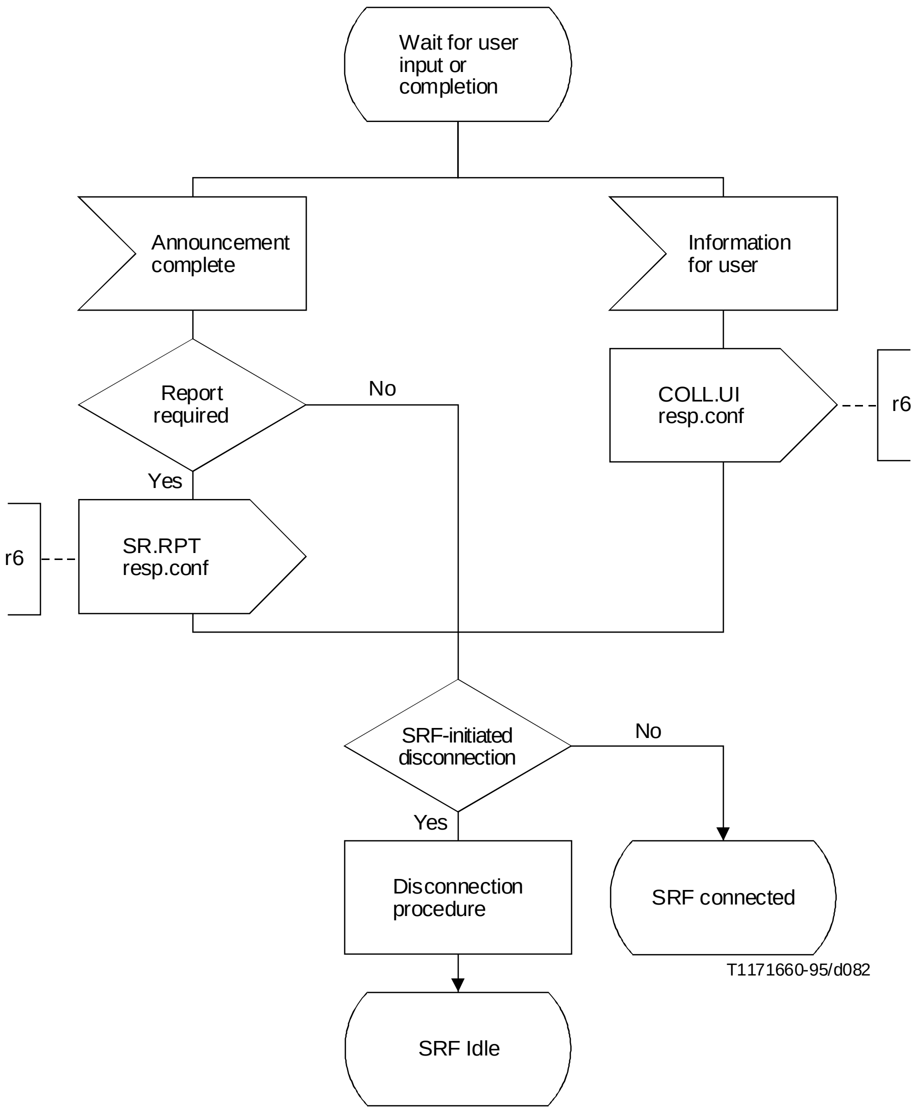


FIGURE 5-49/Q.1214 (sheet 2 of 3)

SRF actions for USER INTERACTION SIB

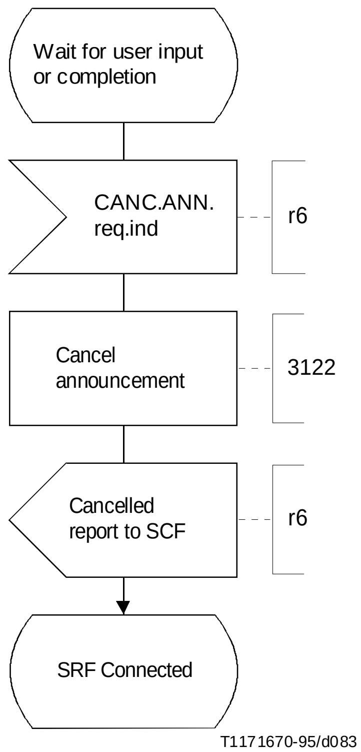


FIGURE 5-49/Q.1214 (sheet 3 of 3)
SRF actions for USER INTERACTION SIB

5.2.12.4 Functional entity actions

Reference number	Action
9121	Initiate request: – initiate a Connect To Resource req.ind.
9122	Request Prompt/Collect Information or Announcement: – initiate a Prompt And Collect User Information or Play Announcement req.ind and send to the SRF.
9123	Initiate disconnection of SRF: – initiate a Disconnect Forward Connection req.ind and send to the CCF/SSF.
9127	Initiate cancellation of pending Prompt/Collect Information or Announcement: – initiate a Cancel Announcement req.ind and send to the SRF.
9128	Process result: – receive Specialized Resource Report resp.conf or Collected User Information resp.conf from SRF; – pass to service logic.
2121	Process request: – receive Connect To Resource req.ind from the SCF; – analyse information (call involved, announcement address, routing requirements, etc.); – formulate and send a Setup req.ind to the SRF (if required). Connect: – establish communications path between user and specialized resource.
2122	Disconnect forward: – receive Disconnect Forward Connection req.ind from the SCF; – formulate and send Release req.ind to SRF.
3121	Process request: – receive and analyse Setup req.ind from CCF/SSF; – select appropriate announcement resource. Connect: – connect incoming resource to specialized resource.
3122	Prompt/play announcement: – receive and analyse Prompt And Collect User Information or Play Announcement req.ind from SCF; – apply prompt/announcement on resource toward user; – return Specialized Resource Report req.ind at conclusion of announcement if requested in Play Announcement req.ind; – disconnect SRF as per Recommendation Q.71 if allowed.

Collect information:

– receive user information;
– formulate and send Collected User Information resp.conf to SCF;
– disconnect SRF as per Recommendation Q.71 if allowed.

Cancel announcement:

– receive and analyse Cancel Announcement req.ind;
– stop playing of announcement if/as required;
– send cancelled report to SCF (in Collected User Information resp.conf or Specialized Resource Report resp.conf).

3123 Process request:

– receive and analyse Release req.ind from CCF/SSF;
– continue disconnection process per Recommendation Q.71.

5.2.12.5 Service assist capability for user interaction

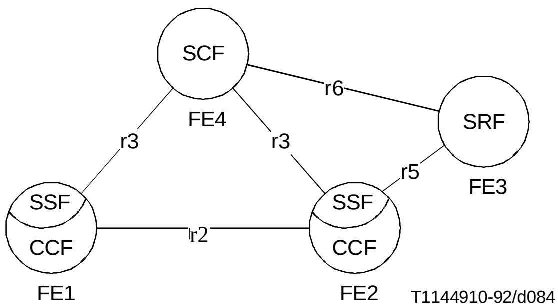
5.2.12.5.1 Description

The service assist procedure is used in cases where an initiating CCF/SSF does not have direct access to a suitable SRF that is required for processing a call/service attempt. The service assist procedure establishes a temporary connection through the network to the SRF. This connection is released at the conclusion of SRF usage and call processing proceeds at the initiating CCF/SSF.

The same information flows, functional entity actions and SDL diagrams apply to the non-assisting case where the SCF and SRF exchange information flows directly.

5.2.12.5.2 Functional model

The FE numbers shown in the functional model (Figure 5-50) are relevant to 5.2.12.5 only. The FE numbers used here do not relate to the FE numbers used in deriving the functional entity action numbers (see 5.1.3).



FE1 is the initiating CCF/SSF. It does not have direct access to the SRF
FE2 is an assisting CCF/SSF with direct access to the SRF
FE3 is an SRF suitable for use in processing the call attempt
FE4 is the SCF that exercises service control for this call/service attempt

FIGURE 5-50/Q.1214

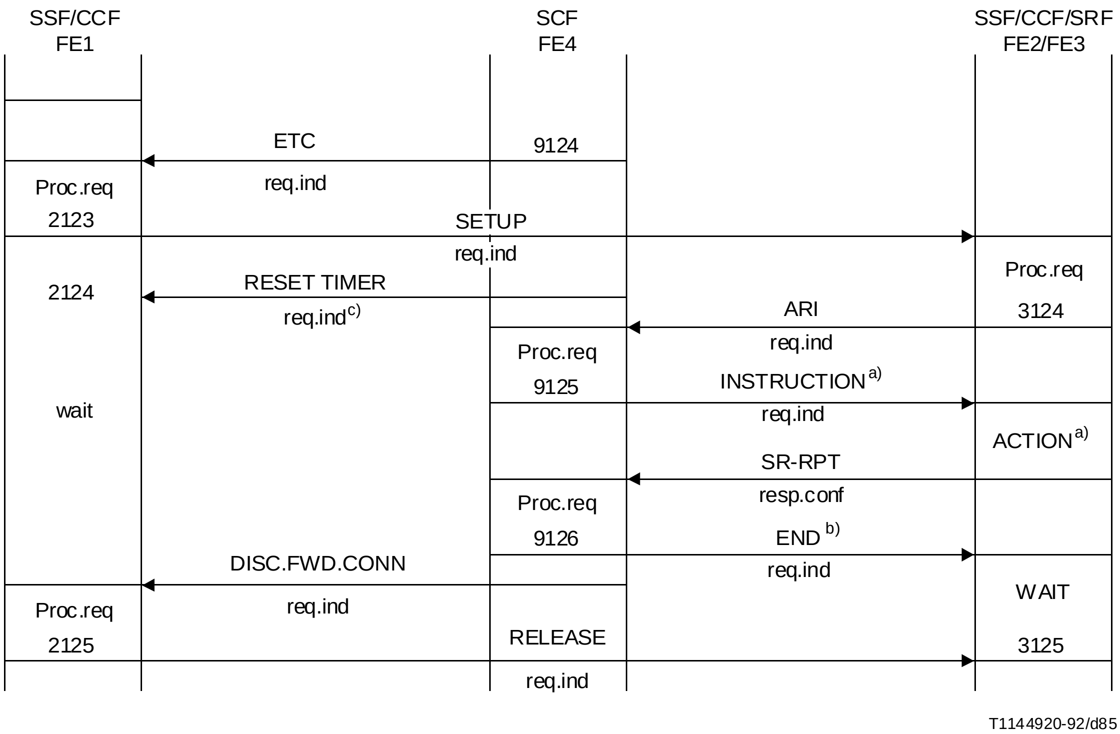
Service assist procedure functional model

5.2.12.5.3 Information flows

5.2.12.5.3.1 Diagram

Figure 5-51 shows the information flows and functional entity actions used to exercise the service assist procedure. For the sake of simplicity, FE2 and FE3 (CCF/SSF and SRF) are shown as an integrated entity. If they are separated, the diagram should be expanded to show the required additional information flows per the USER INTERACTION SIB.

Where there is a direct SCF-SRF exchange of information flows, whether in the assisting or non-assisting cases, it is FE3 (SRF) which is interacting with the initiating SSF/CCF and SCF. Where the SSF is relaying the information flows, it is FE2 (assisting SSF/CCF) which is interacting with the initiating SSF/CCF and SCF.



a) e.g. CONN.TO.RES and P&C.
b) May be explicit or pre-arranged end of the FE4-to-FE2/FE3 relationship.
c) Any number of Reset Timer req.ind could be sent from FE4-FE1.

FIGURE 5-51/Q.1214

Service assist procedure

5.2.12.5.3.2 Definition of information flows

1) Establish Temporary Connection req.ind (ETC) is an unconfirmed information flow sent from the SCF to the initiating CCF/SSF. It includes all information required by the CCF/SSF to set up a temporary connection.

Element	ETC req.ind
Call ID	mandatory
Assisting SSF/SRF Routing Address	mandatory
Correlation ID	optional
Leg ID	optional
SCF ID	optional
Service Interaction Indicators	optional
Carrier	optional

2) Assist Request Instructions req.ind (ARI) is an unconfirmed information flow in the r3 relationship wherein an assisting CCF/SSF or SRF requests user interaction instructions from an SCF.

Element	ARI req.ind
Call ID	mandatory
Correlation ID	mandatory
SRF Available	optional
SSF/SRF Capabilities	optional

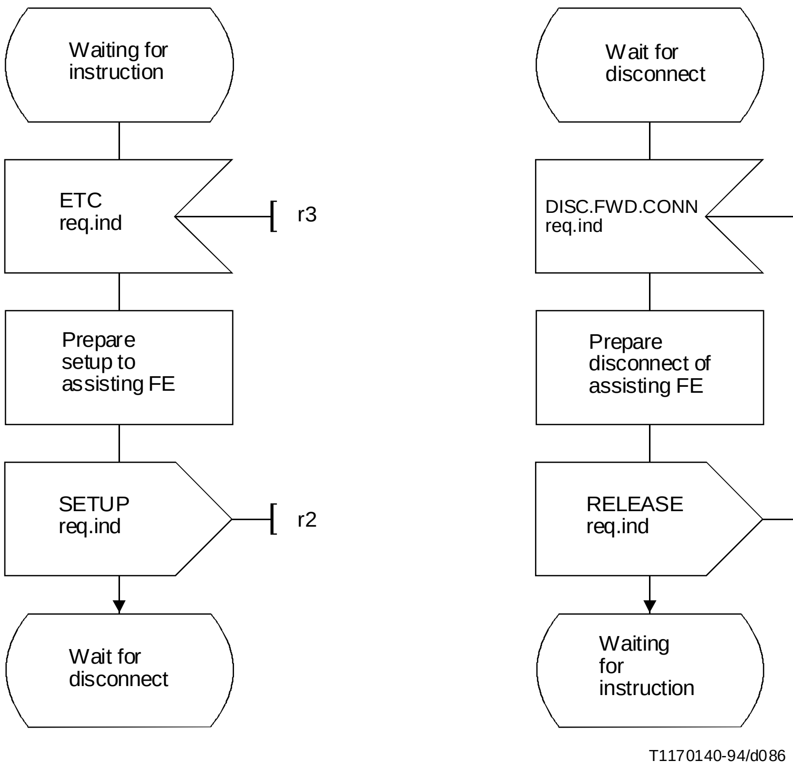
3) Information flows between the SCF and SRF used for controlling and reporting SRF actions (e.g. SR.RPT) are those defined for the USER INTERACTION SIB (see 5.2.12.2).

4) Disconnect Forward Connection req.ind is an information flow wherein the SCF instructs the initiating CCF/SSF to disconnect the temporary connection toward the SRF (see 5.2.12.2).

5) Reset Timer req.ind is an unconfirmed information flow between the SCF and the CCF/SSF used to refresh a timer in the CCF/SSF. It is defined in QUEUE SIB (see 5.2.7).

5.2.12.5.4 Service assist SDLs

See Figures 5-52, 5-53 and 5.54.



NOTE – Reset timer is not depicted here.

FIGURE 5-52/Q.1214

Service assist procedure actions at initiating CCF/SSF (FE1)

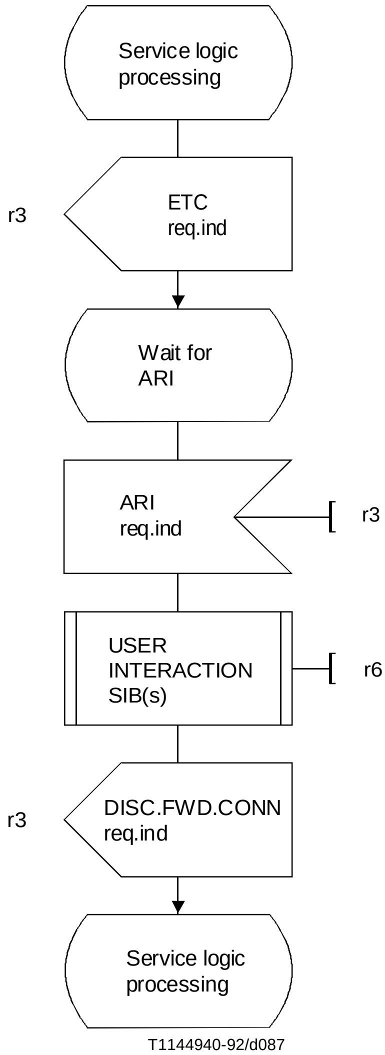


FIGURE 5-53/Q.1214

Service assist procedure actions at SCF (FE4)

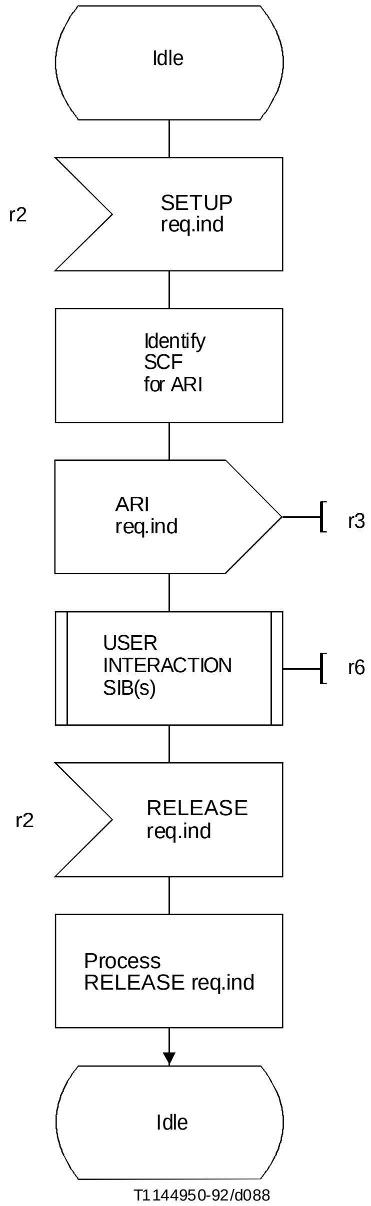


FIGURE 5-54/Q.1214

Service assist procedure
actions at assisting SSF/SRF (FE2/FE3)

5.2.12.5.5 Functional entity actions

Only those functional entity actions used to execute service assist or direct SCF-SRF interaction are included here.

Reference number	Functional entity actions
2123	Process establish temporary connect request: – receive Establish Temporary Connect req.ind from SCF; – send Setup req.ind to assisting SSF/SRF; – set a timer with the appropriate timeout value.

Reference number	Functional entity actions
2124	Reset timer:
	– update the value of the timer with the value received from SCF.
2125	Process forward disconnection:
	– receive Disconnect Forward Connection req.ind from SCF;
	– send Release req.ind to the assisting SSF/SRF.
2126	Detect assist request:
	– detect service assist request from initiating SSF;
	– send Assist Request Instructions req.ind to appropriate SCF;
	– wait for user interaction instructions from SCF.
2127	Receive end assist:
	– receive Release req.ind from initiating SSF;
	– end service assist procedure.
9124	Request temporary connection:
	– send Establish Temporary Connect req.ind to SSF;
	– wait for assisting SSF/SRF.
9125	Process assist request instructions:
	– receive Assist Request Instructions req.ind from assisting SSF;
	– proceed with user interaction information flows.
9126	End assist:
	– send Disconnect Forward Connection req.ind to initiating SSF;
	– proceed with instructions to initiating SSF.
3124	Detect assist request:
	– detect service assist request from initiating SSF;
	– send Assist Request Instructions req.ind to appropriate SCF;
	– wait for user interaction instructions from SCF.
3125	Receive end assist:
	– receive Release req.ind from initiating SSF;
	– end service assist procedure.

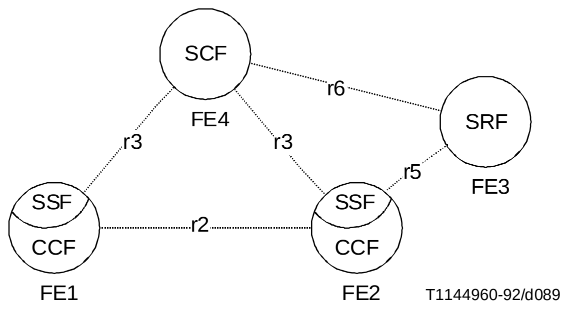
5.2.12.6 Service hand-off capability

5.2.12.6.1 Description

The service hand-off procedure is used where an initiating CCF/SSF does not have direct access to a suitable SRF required for processing a call/service attempt. The service hand-off procedure allows the initiating CCF/SSF to advance the attempt to a CCF/SSF that has direct access to the SRF. At the conclusion of SRF usage, the call attempt is advanced from the latter CCF/SSF.

5.2.12.6.2 Functional model

The FE numbers shown in the functional model (Figure 5-55) are relevant to 5.2.12.6 only. The FE numbers used here do not relate to the FE numbers used in deriving the functional entity action numbers (see 5.1.3).



FE1 is the initiating CCF/SSF. It does not have direct access to the SRF
FE2 is a CCF/SSF with direct access to the SRF
FE3 is an SRF suitable for use in processing the call/service attempt
FE4 is the SCF that exercises service control for this call/service attempt

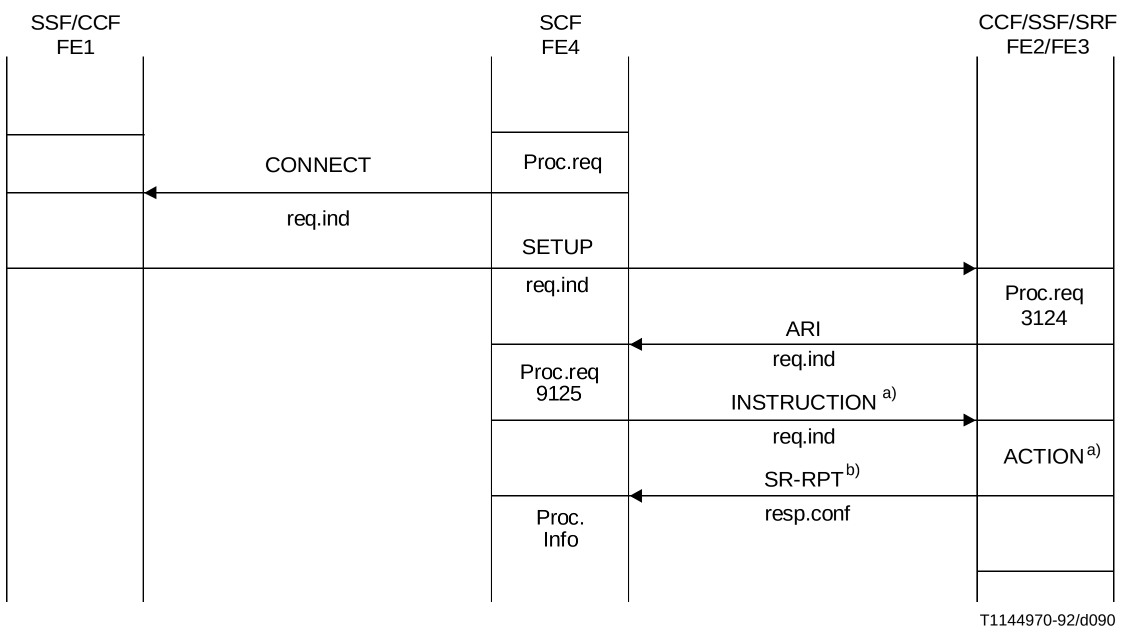
FIGURE 5-55/Q.1214

Service hand-off procedure functional model

5.2.12.6.3 Information flows

5.2.12.6.3.1 Diagram

Figure 5-56 shows the information flows and functional entity actions used to exercise the service hand-off procedure. For the sake of simplicity, FE2 and FE3 (CCF/SSF and SRF) are shown as an integrated entity. If they are separated, the diagram should be expanded to show the required additional information flows per the USER INTERACTION SIB.



a) e.g. CONN.TO.RES and P&C.
b) Only illustrative. See 5.2.12.2. for details.

FIGURE 5-56/Q.1214

Service hand-off procedure

5.2.12.6.3.2 Definition of information flows

1) The Setup req.ind information flows shown in the diagram are basic call processing information flows in the r2 relationship used to establish connections through the network. Information elements are those required for processing the attempt at succeeding functional entities.

2) The Connect req.ind information flow from the SCF to the CCF/SSF contains the information elements required to advance the call/service attempt and is supported by the basic call process SIB.

3) Assist Request Instructions req.ind is an information flow in the r3 relationship wherein an assisting CCF/SSF requests instructions from a SCF. Use of this information flow can be found in 5.2.12.5.

5.2.12.6.4 Service hand-off SDLs

See Figures 5-57, 5-58 and 5-59.

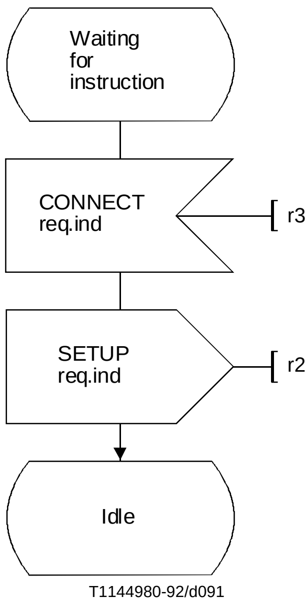


FIGURE 5-57/Q.1214

Service hand-off procedure actions at initiating CCF/SSF (FE)

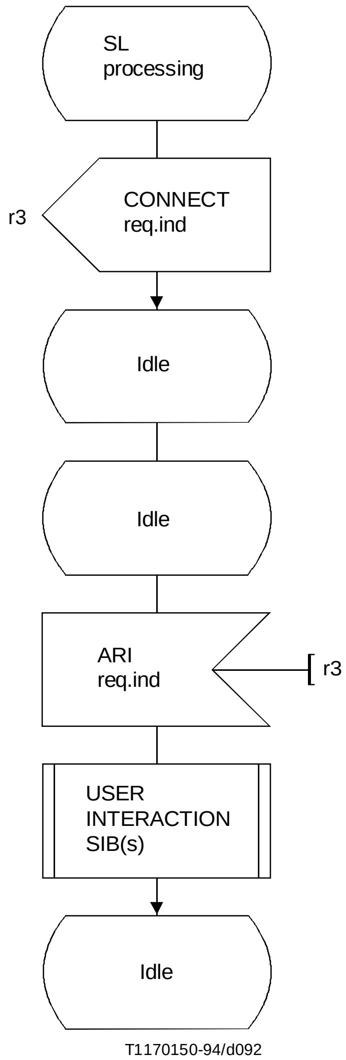


FIGURE 5-58/Q.1214

Service hand-off procedure actions at SCF

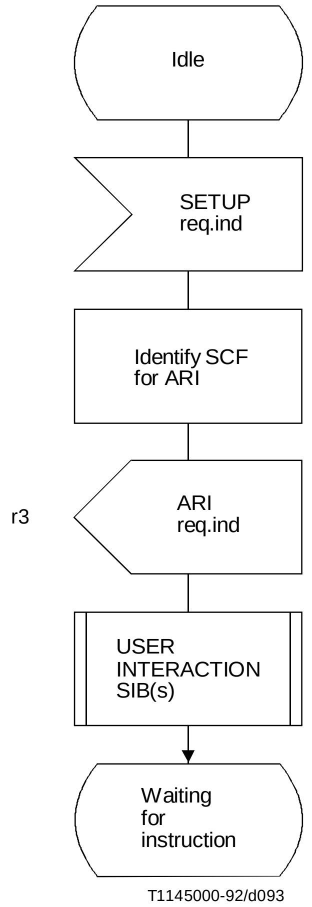


FIGURE 5-59/Q.1214

Service hand-off procedure actions at FE2/FE3

5.2.12.6.5 Functional entity actions

Since functional entity actions used to execute the service hand-off procedures are described in other subclauses of this Recommendation, information about these FEAs is not replicated here.

5.2.13 VERIFY SIB

5.2.13.1 Description

The VERIFY SIB provides the capability to confirm that information received is syntactically consistent with the expected form of such information. This capability is provided, for IN CS-1, in the SCF as a part of the service logic for IN service features. As a result no information flows are directly associated with this capability.

5.2.13.2 Information flows

No IFs are required for this SIB in IN CS-1.

5.2.13.3 SDLs

Figure 5-60 presents the SDL diagram for the SCF processing of the VERIFY SIB.

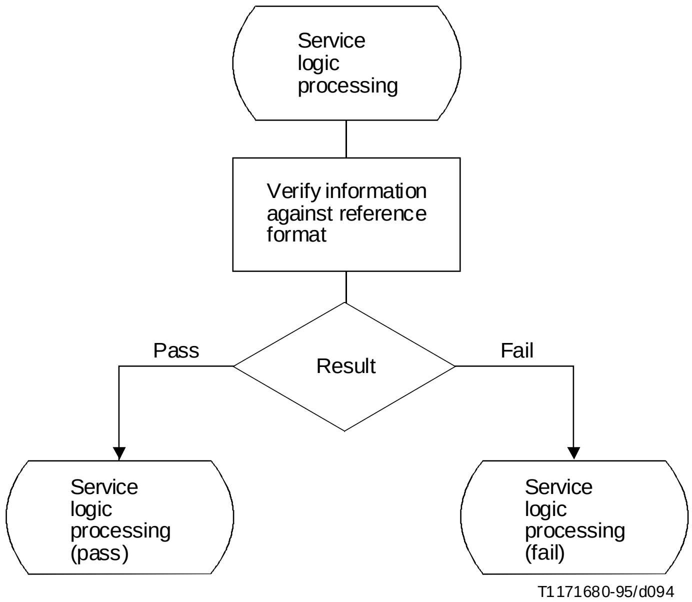


FIGURE 5-60/Q.1214

SCF actions for VERIFY SIB

5.2.13.4 Functional entity actions

Reference number	Action
9131	Perform verify

5.2.14 AUTHENTICATE SIB

5.2.14.1 Description

AUTHENTICATE SIB provides the capability for the SCF to establish an authorized relationship between the service logic and the SDF on behalf of a user by means of a requested authentication mechanism.

5.2.14.2 Information flows

5.2.14.2.1 Diagrams

Figure 5-61 depicts the information flows and functional entity actions to support authentication functionality.

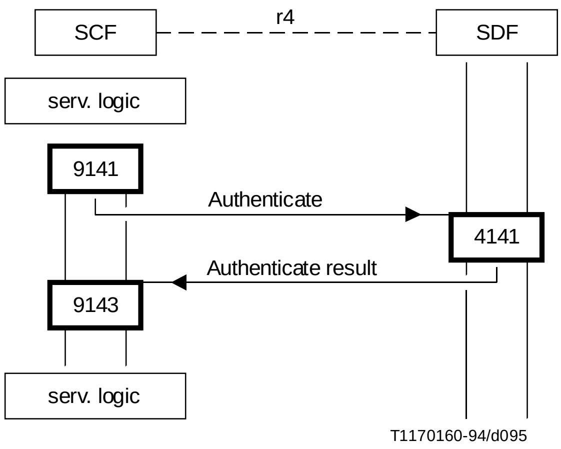


FIGURE 5-61/Q.1214

Information flow diagram "AUTHENTICATE" SIB

5.2.14.2.2 Definition of information flows

Authentication is a confirmed information flow generated by a service control function through service logic and sent to a service data function to establish an authorized relationship.

Authentication Result information flow responds to the Authenticate.

These information flows may convey the following elements of information:

Information elements	Relationship	Authenticate	Authenticate Result
Authentification Information	r4	mandatory	mandatory
Authorized Relationship ID	r4	mandatory	mandatory

5.2.14.3 SDLs

See Figures 5-62 and 5-63.

5.2.14.4 Functional entity actions

Reference number		Action
9141	–	process request from service logic;
	–	generate and send an Authenticate.
4141	–	receive and analyse the Authenticate;
	–	authenticate the service logic;
	–	generate and send an Authenticate Result.
9143	–	receive the Authenticate Result;
	–	return response to service logic.

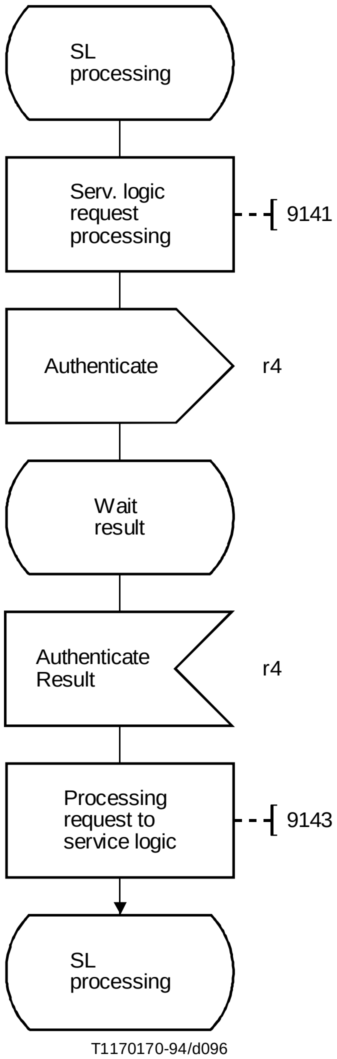


FIGURE 5-62/Q.1214

SCF actions for "AUTHENTICATE" SIB

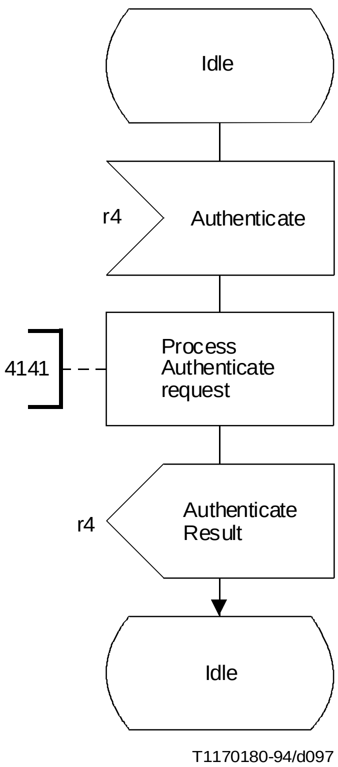


FIGURE 5-63/Q.1214

SDF actions for
"AUTHENTICATE" SIB

5.3 BASIC CALL PROCESS SIB

5.3.1 Description

The BASIC CALL PROCESS (BCP) SIB provides the SCF with access to SSF/CCF call processing capabilities. For IN CS-1, these capabilities include:

- *Call setup capabilities* – Capabilities to influence originating or terminating call setup for two-party calls (e.g. for flexible routing, call queuing, call diversion).
- *Call party handling* – Capabilities to enable handling of individual call parties (e.g. to hold/retrieve parties in a call or add/drop parties from a call). Note that call party handling capabilities are not considered part of the basic call as defined by Recommendation Q.71.
- *Call initiation* – Capabilities to initiate calls between two parties.
- *Call clearing* – Capabilities to release calls.
- *Event reporting* – Capabilities to request the reporting of call processing events (e.g. caller abandon, busy, or no answer) within the context of existing calls by setting Event Detection Points (EDPs).

These capabilities enable the use of other SIBs to provide the desired service capabilities for IN CS-1 (e.g. flexible charging, screening, translation, call party interaction, queuing, etc.).

The SSF/CCF or the SCF can invoke BCP capabilities:

- The SSF/CCF invokes BCP capabilities when it detects a Trigger Detection Point (TDP) during basic call processing that leads to sending to the SCF an Initial DP information flow or one of the family of DP-specific initial information flows (both of these are referred to as "initial information flows"). For a TDP-Request, these information flows establish a control relationship between the SSF/CCF and the SCF, enabling the SCF to return instructions to the SSF/CCF. For a TDP-Notification, these information flows do not establish a control relationship.
- The SCF invokes BCP capabilities when it sends an Initiate Call Attempt information flow to the SSF/CCF outside the context of an existing control relationship (i.e. "out-of-the-blue")[5]. This information flow may or may not establish a new control relationship between the SSF/CCF and the SCF, as dictated by the SCF.

Once a control relationship is established, the SCF can send call processing instructions to the SSF/CCF in the form of one or more information flows (e.g. Connect plus Request Report BCSM Event, as described below). These instructions may directly follow an initial information flow, or may follow a previous call processing instruction. The former is referred to as an "immediate instruction" and the latter as a "subsequent instruction". Additional information on the SSF to SCF relationships is contained in Annex A.

In the context of a control relationship, the SCF can also request the SSF/CCF to report subsequent call processing events. It does so via the Request Report BCSM Event information flow, which arms Event Detection Points (EDPs) in call processing. When the SSF/CCF detects an armed EDP, it reports it to the SCF in the Event Report BCSM information flow or one of the family of DP-specific information flows (both of these are referred to as "report information flows"). For an EDP-Request, the SSF/CCF sends the appropriate report information flow, then waits for additional instructions from the SCF; for an EDP-Notification, the SSF/CCF sends the appropriate report information flow, then continues call processing without waiting for additional instructions. Note that the Request Report BCSM Event information flow may be combined with other call processing information flows.

These SSF/CCF-SCF information flow interactions are illustrated in the information flow diagrams in 5.3.2.1, and the individual information flows are briefly described in 5.3.2.2.

The valid call processing information flows that the SCF can send to the SSF/CCF at a given point in time depend on the context of the call at that time (i.e. the state of the call and call party connections). These information flows can be grouped into those that are valid during two-party call setup and clearing, those that are valid during the active state of a call, and those that are valid for multiparty calls. Subclause 5.3.3 provides information flow SDLs for two-party call setup and clearing. Appendix I provides a starting point for the latter SDLs, which remain for further study.

5.3.2 Information flows

5.3.2.1 Diagrams

Figure 5-64 depicts the general information flows and functional entity actions to support BCP capabilities invoked by the SSF/CCF (left-hand column) or by the SCF (right-hand column).

[5] Initiate_Call Attempt may also be used within the context of an existing control relationship, independent of whether the SSF/CCF or SCF initiated the relationship. This is for further study (see Appendix I).

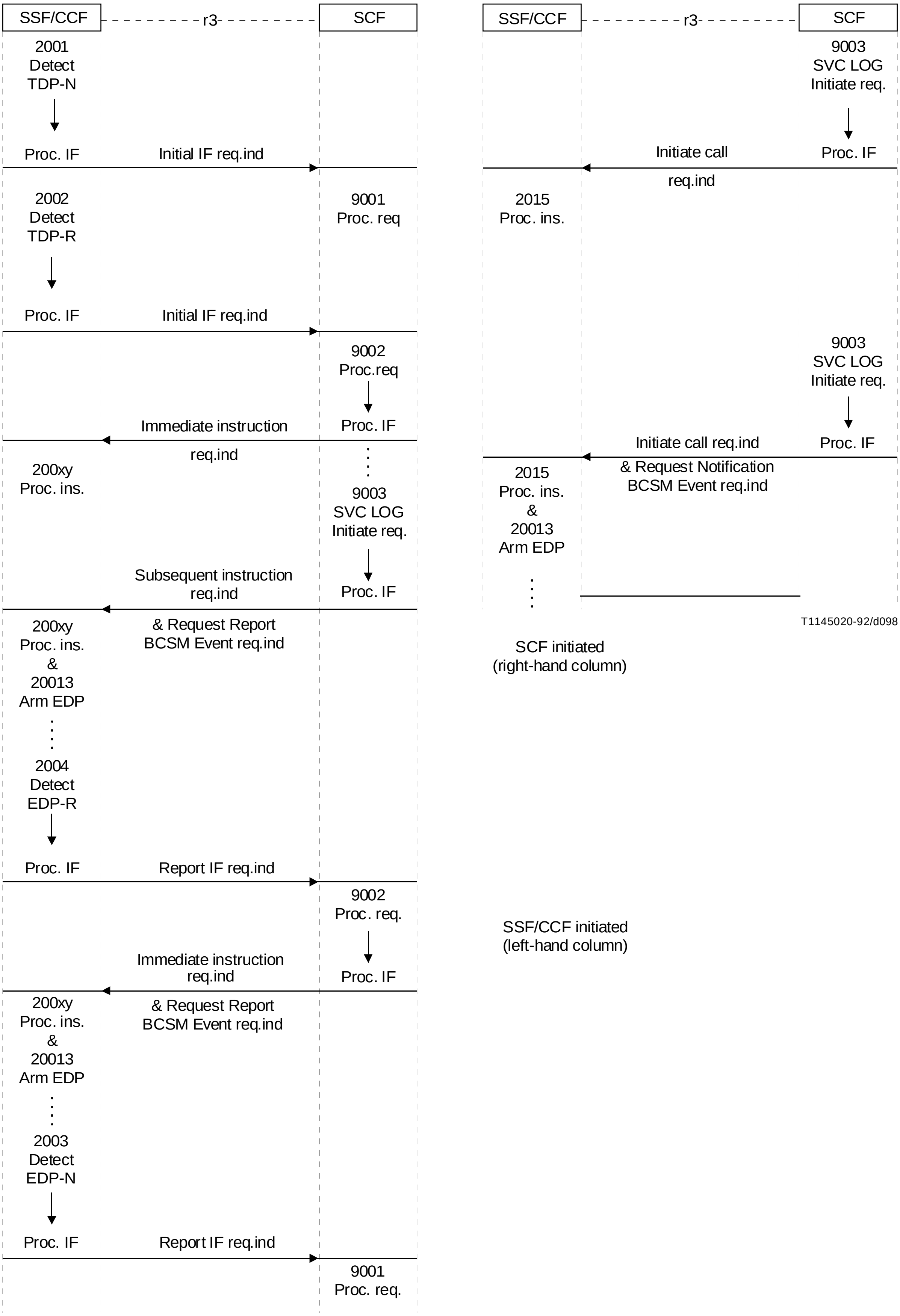


FIGURE 5-64/Q.1214

Information flow diagram BASIC CALL PROCESS SIB

5.3.2.2 Definition of information flows

This subclause briefly defines the BCP information flows. See clause 6 for detailed information flow and information element descriptions.

1) *Initial and report information flows*

   a) Initial DP req.ind – Information flow from the SSF to the SCF to request instructions from the SCF. The SSF generates it when a trigger is detected at any DP in the BCSM.

   b) DP-specific initial information flow family – Family of information flows from the SSF to the SCF to request instructions from the SCF. This family is an alternative to the Initial DP req.ind. When a trigger is detected at a specific DP in the BCSM, the SSF generates the corresponding DP-specific initial information flow. The specific BCSM DP is reflected in the corresponding information flow name.

      – Origination Attempt Authorized req.ind;

      – Collected Information req.ind;

      – Analysed Information req.ind;

      – Route Select Failure req.ind;

      – O_Called_Party_Busy req.ind;

      – O_No_Answer req.ind;

      – O_Answer req.ind;

      – O_MidCall req.ind;

      – O_Disconnect req.ind;

      – Term Attempt Authorized req.ind;

      – T_Called_Party_Busy req.ind;

      – T_No_Answer req.ind;

      – T_Answer req.ind;

      – T_MidCall req.ind;

      – T_Disconnect req.ind.

   c) Event Report BCSM req.ind – Information flow from the SSF to the SCF to notify the SCF that an armed EDP was encountered, as previously requested by the SCF in a Request Report BCSM Event information flow. For an EDP-R, this information flow serves to request instructions from the SCF within the context of an existing control relationship.

   d) DP-specific report information flow family – Family of information flows from the SSF to the SCF to notify the SCF that an armed EDP was encountered, as previously requested by the SCF in a Request Report BCSM Event information flow. This family is an alternative to the Event Report BCSM req.ind. The DP-specific initial information flow family is used for both initial and report information flows.

2) *Call setup and clearing*

   a) Connect req.ind (route to a destination) – Information flow from the SCF to the SSF during the call setup phase to complete a call to a defined destination, or to forward a call to another destination.

   b) Proceed with call processing family – Family of information flows from the SCF to the SSF to resume call processing at a specific Point In Call (PIC) of the BCSM. The specific BCSM PIC is reflected in the name of the corresponding information flow. These information flows are valid when the SSF has suspended call processing at specific DPs, as identified for each information flow.

– Collect Information req.ind – This information flow is valid when call processing is suspended at one of the following DPs:

- Origination_Attempt_Authorized;
- Collected_Info;
- Analysed_Info;
- Route_Select_Failure;
- O_Called_Party_Busy;
- O_No_Answer;
- O_Disconnect (called party disconnect only).

– Analyse Information req.ind – This information flow is valid when call processing is suspended at one of the following DPs:

- Origination_Attempt_Authorized;
- Collected_Info;
- Analysed_Info;
- Route_Select_Failure;
- O_Called_Party_Busy;
- O_No_Answer;
- O_Disconnect (called party disconnect only);

– Select Route req.ind – This information flow is valid when call processing is suspended at one of the following DPs:

- Origination_Attempt_Authorized;
- Collected_Info;
- Analysed_Info;
- Route_Select_Failure;
- O_Called_Party_Busy;
- O_No_Answer;
- O_Disconnect (called party disconnect only).

– Select Facility req.ind – This information flow is valid when call processing is suspended at one of the following DPs:

- Termination_Attempt_Authorized;
- T_Busy;
- T_No_Answer.

c) Continue req.ind – Information flow from the SCF to the SSF requesting the SSF to resume call processing from the DP at which the SSF previously suspended call processing to await SCF instructions.

d) Release Call req.ind – Information flow from the SCF to the SSF to release a call during any phase of call processing.

3) *Call party handling*

The family of information flows related to call party handling are for further study. A starting point for this study is provided in Appendix I.

4) *Call Initiation*

Initiate Call Attempt req.ind – Confirmed information flow from the SCF to the SSF to create a new call to one or more call parties (e.g. wake-up call, predefined conference call).

5) *Event Reporting*

Request Report BCSM Event req.ind – Information flow from the SCF to the SSF to request the reporting of call-related events, then send a report back to the SCF when the requested events are detected [see item 1)]. The SSF monitors events by arming Event Detection Points (EDPs) in the corresponding BCSM(s).

5.3.3 SDLs

The following SDL diagrams are for the SSF/CCF processing of the BASIC CALL PROCESS SIB functionality for TDP-Rs. SDLs for TDP-Ns, SCF processing, and error processing are for further study.

There are three categories of diagrams: processing for two-party call setup and clearing, for two-party and multiparty active calls, and for a pair of associated calls. This subclause provides information flow SDLs for the processing for two-party call setup and clearing. Appendix I provides a starting point for the latter SDLs, which remain for further study. See Figure 5-65.

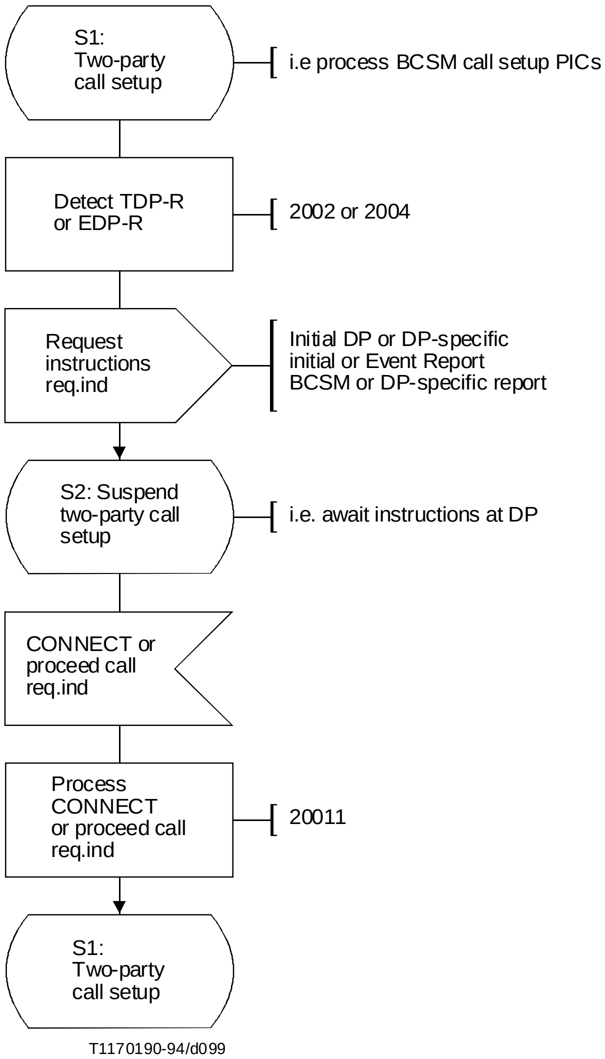
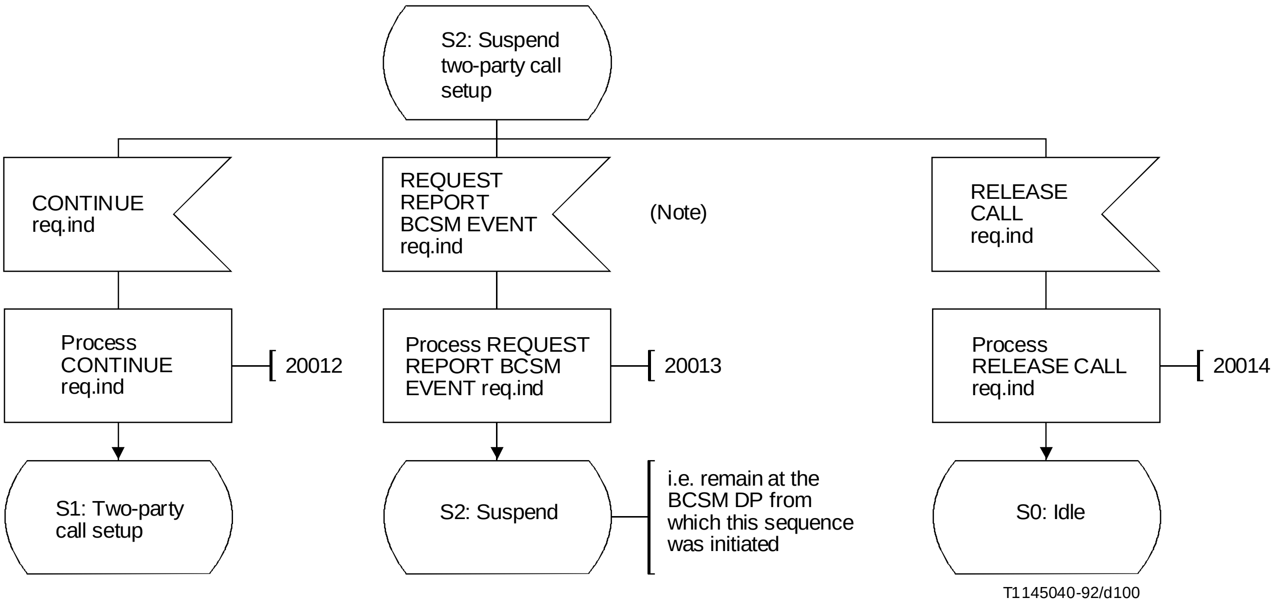


FIGURE 5-65/Q.1214 (sheet 1 of 3)

SSF/CCF actions for BASIC CALL PROCESS SIB (two-party call setup)



NOTE – The Request Report BCSM Event req.ind should be processed before any instruction to proceed with call processing in this SDL.

FIGURE 5-65/Q.1214 (sheet 2 of 3)

SSF/CCF actions for BASIC CALL PROCESS SIB
(continuation of call set-up)

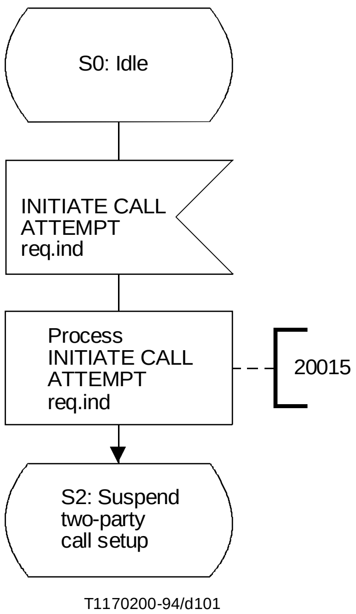


FIGURE 5-65/Q.1214 (sheet 3 of 3)

SSF/CCF actions for
BASIC CALL PROCESS SIB
(call initiation)

5.3.4 Functional entity actions

Functional entities are assumed to have the basic capabilities required to properly perform their assigned function in the IN. Only Functional Entity Actions (FEAs) pertinent to the BASIC CALL PROCESS SIB are shown in the information flow diagram and SDLs.

Reference number	Action
9001	Process request: – process initial information flow (e.g. Initial DP or DP-specific).
9002	Process request requiring response: – process initial or report information flow (e.g. Initial DP, DP-specific, or Event Report BCSM).
9003	Initiate request: – send one or more BCP information flows.
9004	Send response to request: – send one or more BCP information flows in response to request.
2001	Detect trigger detection point – notification: – send Initial DP or DP-specific initial req.ind.
2002	Detect trigger detection point – request: – send initial DP or DP-specific initial req.ind and suspend call processing.
2003	Detect event detection point – notification: – send Event Report BCSM or DP-specific report req.ind.
2004	Detect event detection point – request: – send Event Report BCSM or DP-specific report req.ind and suspend call processing.
200xy	Process one or more BCP information flows from SCF.
20011	Process Connect or proceed with call processing req.ind.
20012	Process Continue req.ind.
20013	Process Request Report BCSM Event req.ind: – arm EDP(s).
20014	Process Release Call req.ind.
20015	Process Initiate Call Attempt req.ind.

5.4 Stage 2 description of other distributed functionality

Due to the mapping of global functionality in the global functional plane, as represented by SIBs, to distributed functionality in the distributed functional plane, as represented by information flows and functional entity actions, there is a need for additional distributed functionality that is not reflected in SIBs (e.g. to protect the network against overload, distributed processing errors, or physical network failures). This functionality exists to manage the information flows between functional entities, which only exist on the distributed functional plane. For IN CS-1, this functionality consists of activity test and call gap functionality, as described in this subclause.

5.4.1 Activity test functionality

5.4.1.1 Description

The activity test functionality provides a way in which the SCF can test for the continued existence of a relationship with the SSF.

5.4.1.2 Information flows

5.4.1.2.1 Diagram

Figure 5-66 depicts the information flows and functional entity actions involved in executing the activity test functionality.

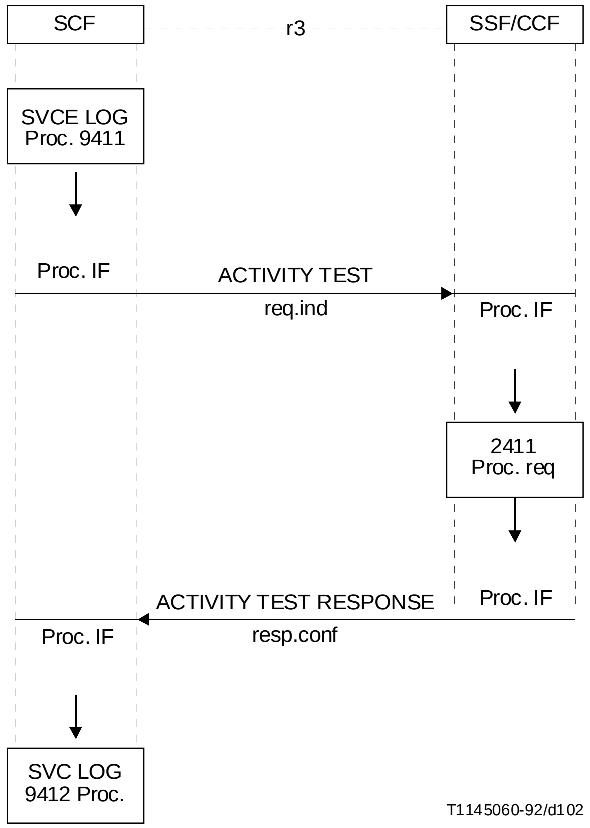


FIGURE 5-66/Q.1214

Information flow diagram activity test functionality

5.4.1.2.2 Definition of information flows

Activity Test req.ind is a confirmed information flow generated by the SCF when it wishes to test for the continued existence of a relationship with the SSF Activity Test Response resp.conf confirms to the SCF that the SSF-SCF relationship still exists.

No information elements are conveyed by these information flows.

5.4.1.3 SDLs

Figure 5-67 presents the SDL diagram for the SCF and SSF/CCF processing of the activity test functionality.

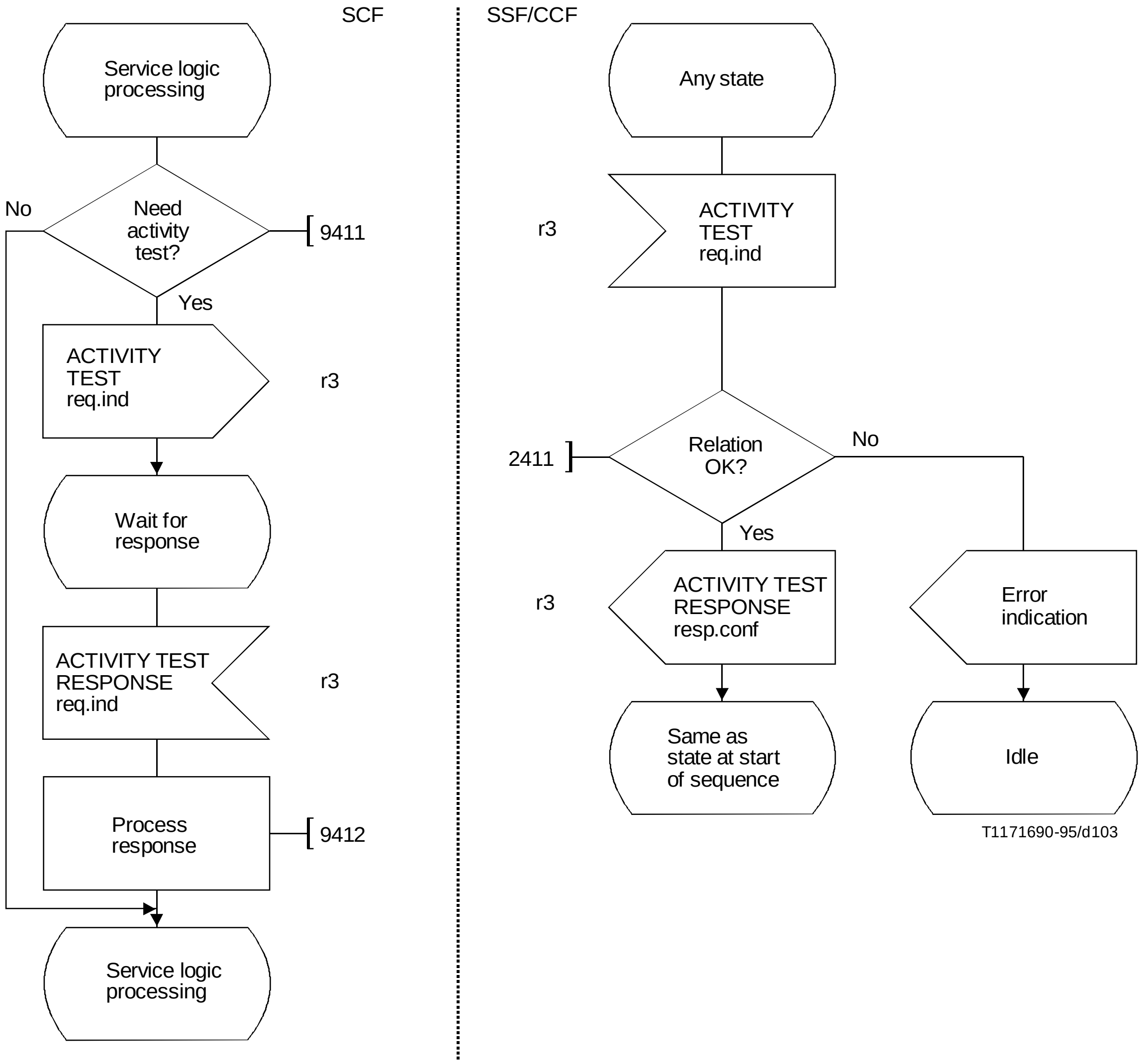


FIGURE 5-67/Q.1214

SDLs for activity test

5.4.1.4 Functional entity actions

The Functional Entity Actions (FEAs) involved in processing the activity test functionality are as follows:

Reference number	Action
All	Process IF: – formulate and send req.ind or resp.conf; or – receive req.ind or resp.conf, analyse and pass to processing logic.
9411	Service logic processing request: – initiate activity test process; – formulate and send Activity Test req.ind.

Reference number	Action
9412	Service logic processing information:
	– receive and analyse Activity Test Response resp.conf;
	– process information as required.
2411	Process request:
	– receive and analyse Activity Test req.ind;
	– check for continued existence of relationship;
	– formulate and send Activity Test Response resp.conf.

5.4.2 Call gap capability

5.4.2.1 Description

A CCF/SSF can offer large volumes of message traffic to an SCF in a relatively short period of time. Congestion can occur within an SCF if traffic is allowed to grow beyond engineered levels, increasing message response times and call failure rates. When congestion is detected, an SCF can activate call gap controls at CCF/SSF, requesting the CCF/SSF to reduce the rate at which service requests are sent to the SCF.

The call gap capability limits the number of calls that are allowed through an IN-structured network by filtering calls with given characteristics. The filtering is applied only to those calls related to IN-provided service features that request the assistance of IN functions (i.e. applies to all TDPs). Calls are blocked for a specified duration at specified intervals. Call gapping is network initiated. The SCF sends Call Gap req.ind asynchronously with the execution of any service logic program. These information flows are sent as part of the response to an SSF query. Calls that do not request the assistance of IN functions (“non IN-provided calls”) are not affected by this capability.

Use of this capability by the SCF to gap queries and updates at the SDF is for further study.

5.4.2.2 Information flows

5.4.2.2.1 Diagrams

Figure 5-68 depicts the information flows and functional entity actions to support call gapping functionality for service management purposes.

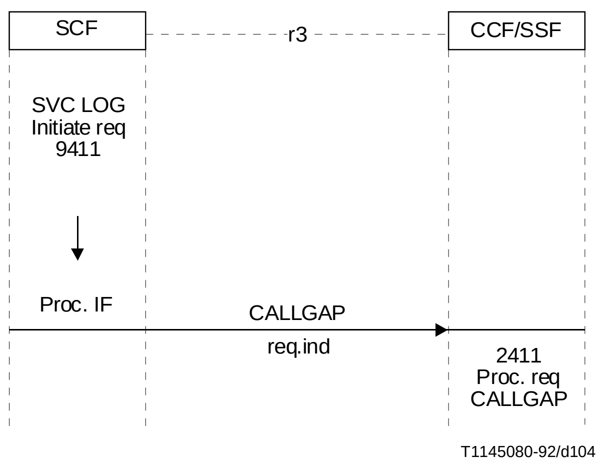


FIGURE 5-68/Q.1214

Information flow diagram
call gap for service management

5.4.2.2.2 Definition of information flows

Call Gap req.ind is an unconfirmed information flow from the SCF to the SSF to reduce the rate at which specific requests are sent to the SCF. It is generated by a service control function through service logic. The service logic could be either network or subscriber initiated.

The following information flow elements may be conveyed by this information flow:

Element	Relationship	Req.ind
Control Type	r3	optional
Gap Indicators	r3	mandatory
Gap Criteria	r3	mandatory
Gap Treatment	r3	optional

5.4.2.3 SDLs

Figure 5-69 presents the SDL diagram for the SCF processing of the call gap functionality.

Figure 5-70 presents the SDL diagram for the CCF/SSF processing of the call gap functionality.

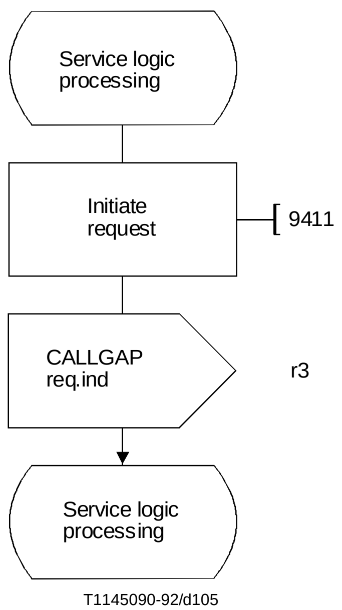


FIGURE 5-69/Q.1214

SCF actions for the call gap capability

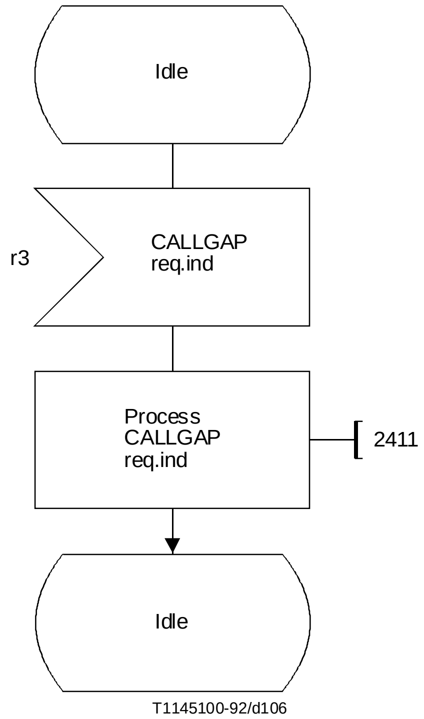


FIGURE 5-70/Q.1214

CCF/SSF actions for the call gap capability

5.4.2.4 Functional entity actions

Functional entities are assumed to have the basic capabilities required to properly perform their assigned function in the IN. Only Functional Entity Actions (FEAs) pertinent to the call gap capability are shown in the information flow diagrams.

Reference number	Action
9411	Initiate request: – initiate a Call Gap req.ind.
2411	Process Call Gap req.ind: – receive and analyse Call Gap req.ind; – apply specified treatment at specified intervals for specified duration.

5.5 Mapping of the global functional plane to the distributed functional plane

The general aspects of GFP to DFP mapping are described in clause 5/Q.1204.

Mapping of the BCP SIB in the GFP to the DFP has been addressed in 5.3.

This subclause relates the Points Of Initiation (POIs) and Points Of Return (PORs) from the GFP to the Trigger Detection Point-Requests (TDP-Rs) and Points In Call (PICs) of the DFP. Mapping from the GFP to TDP-Ns and EDPs is not addressed and is subject for further study.

5.5.1 Mapping of POIs and PORs to DPs and PICs

Figure 5-71 shows a stage 2 SDL representation of a triggering mechanism incorporating stage 1 POIs and PORs. It represents actions of a DP-R and its interaction with SIB-based service logic, as represented in the DFP. TDP-R functionality consists of an initiating message from the SSF to the SCF, whereupon the SSF awaits SCF input. The SCF portion of the TDP-R is an incomplete process, into which SDL process segments representing SIBs are connected to define the service. The type of return message from the SCF determines subsequent activities in the SSF. Note that only the high-priority PORs are shown in the figure.

A one-to-one mapping between the POI/PORs in the GFP and the DPs and PICs in the DFP is not always possible due to the granularity of the GFP. For instance, the “Proceed with new data” POR can be precisely defined in the GFP, but in the DFP it may map to the same DP-R that launched the request for service logic processing. The following list provides insight into the mapping, but precise mapping may only be determined by the actual SIB service logic representation for each IN supported service.

POI	P-R
Call originated	Orig.Attempt_Authorized
Address collected	Collected_Info.
Address analysed	Analysed_Info.
Call arrival	Term_Attempt_Authorized
Busy	O_Called_Party_Busy T_Busy Route_Select_Failure
No answer	O_No_Answer T_No_Answer
Call acceptance	O_Answer T_Answer
Active state	O_Mid_Call T_Mid_Call
End of call	O_Abandon T_Abandon O_Disconnect T_Disconnect

POR	DP/PIC
Continue with existing data	– Several DPs (Return to the same DP from which service logic was launched)
Proceed with new data	– Several PICs (Return to the PIC specified by service logic)
Handle as transit	Analyse_Info or Routing&Alerting PICs
Clear call	O_Null T_Null
Provide call party handling	– Several (Return to the same DP from which service logic was launched)
Initiate call	Analyse_Info or Routing&Alerting PICs in a new BCSM

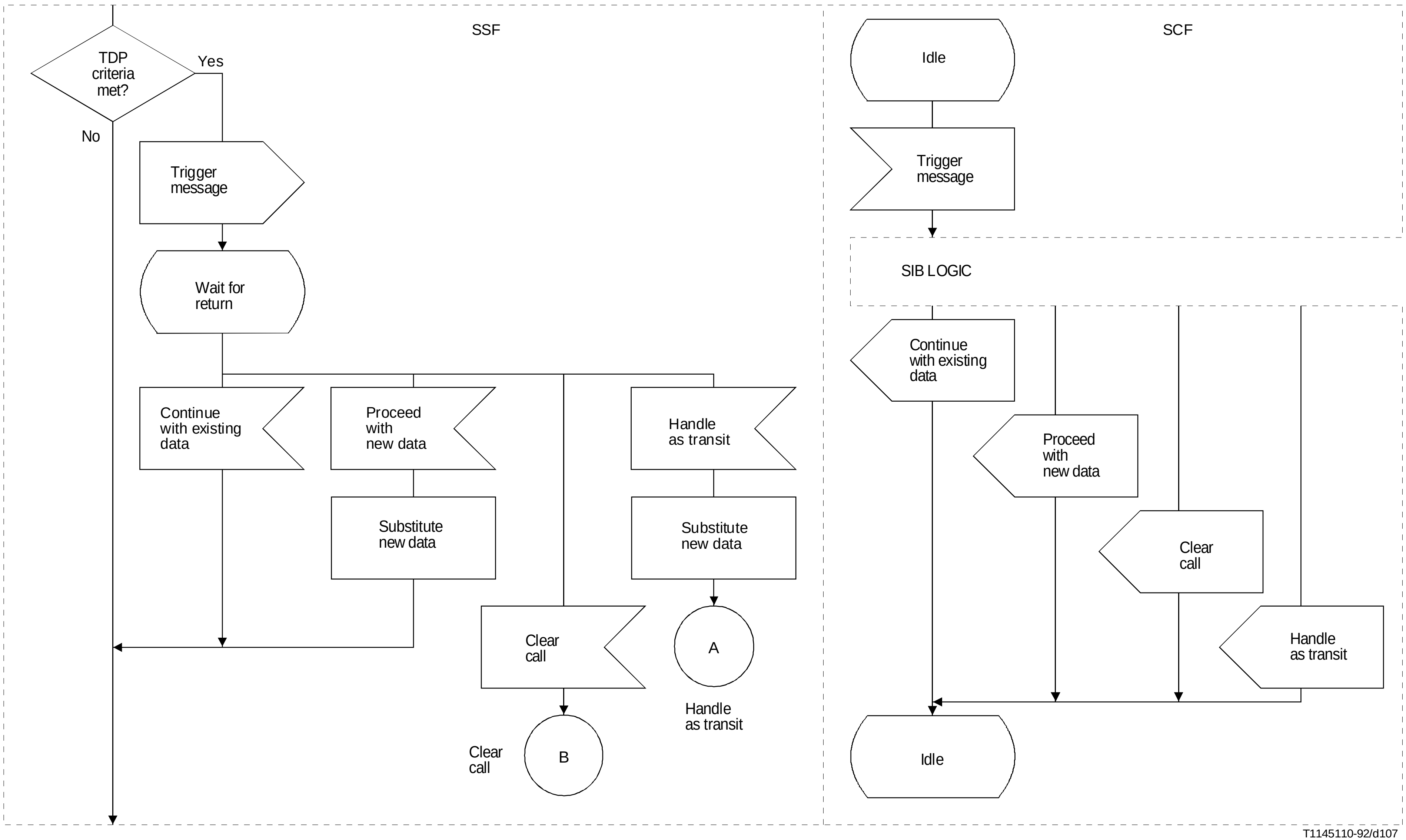


FIGURE 5-71/Q.1214

Stage 2 SDL representation of a triggering mechanism incorporating POIs and PORs

A possible definition of the terminating screening service is shown in Figure 5-72. From the call arrival POI, the SCREEN SIB is used to determine if the calling user is on the list of users allowed to terminate a call at the destination. If on the list, the call is permitted, and the BCP continues call handling with the existing data. If the calling user is not on the list, the USER INTERACTION SIB is used to deliver an appropriate disconnection message to the caller, at which time the BCP clears the call.

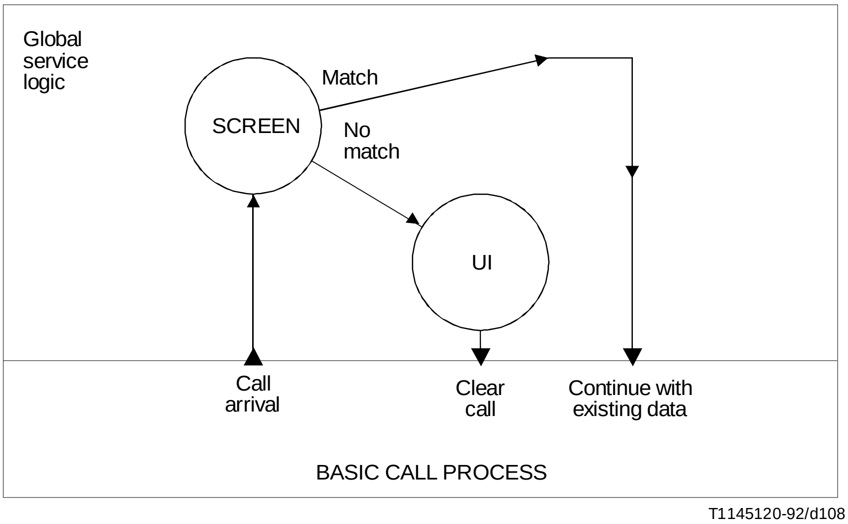


FIGURE 5-72/Q.1214

GFP terminating screening service

Figure 5-73 contains the DFP view of this service in terms of the DFP representations of the SCREEN and USER INTERACTION SIBs and SDL representation of the triggering mechanism.

Note that simplified Stage 1 SDLs are used to represent the SCREEN SIB and the USER INTERACTION SIB. They are used only for illustrative purposes in the figure.

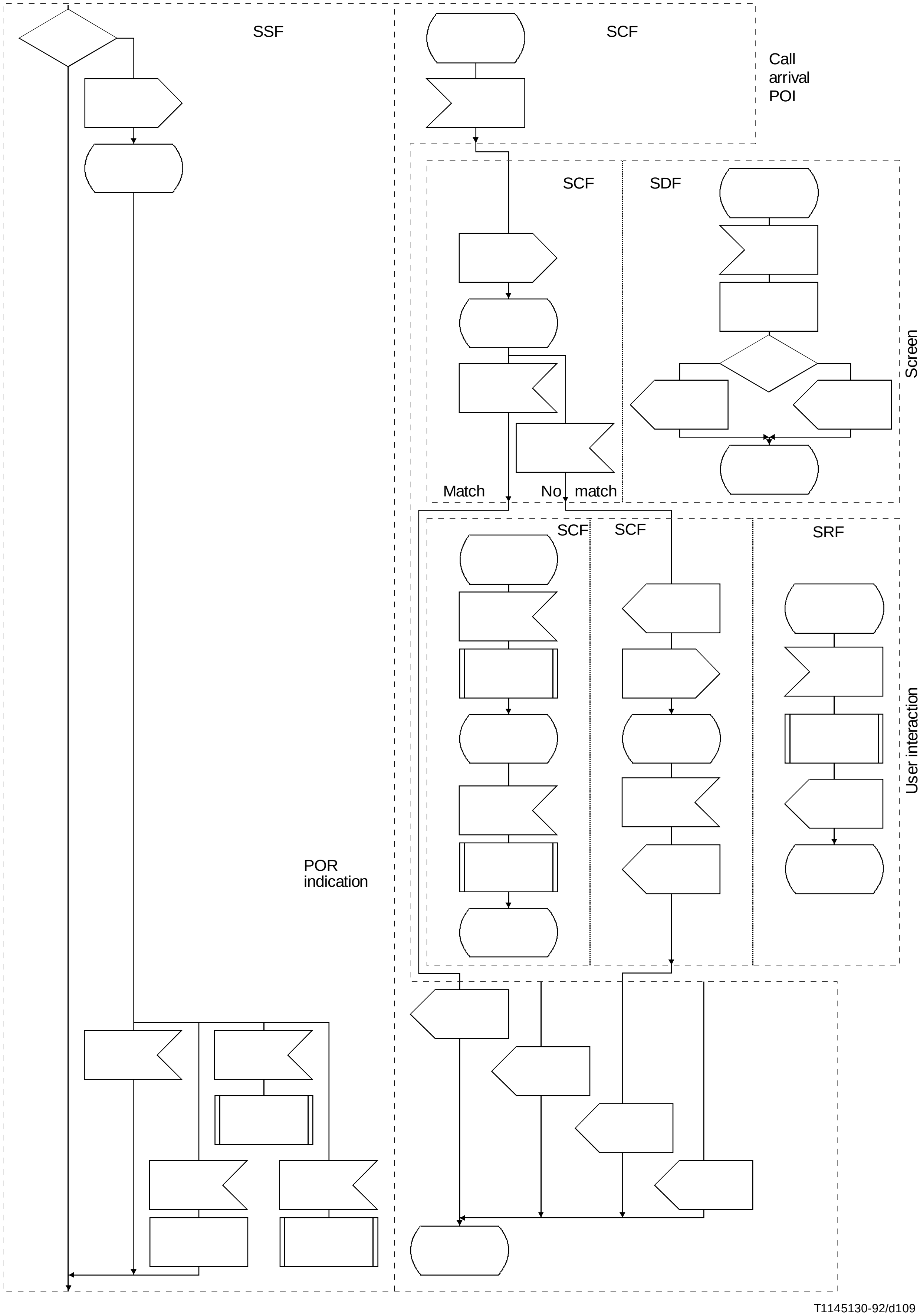


FIGURE 5-73/Q.1214 (sheet 1 of 5)

DFP terminating screening showing DFP SIB representations

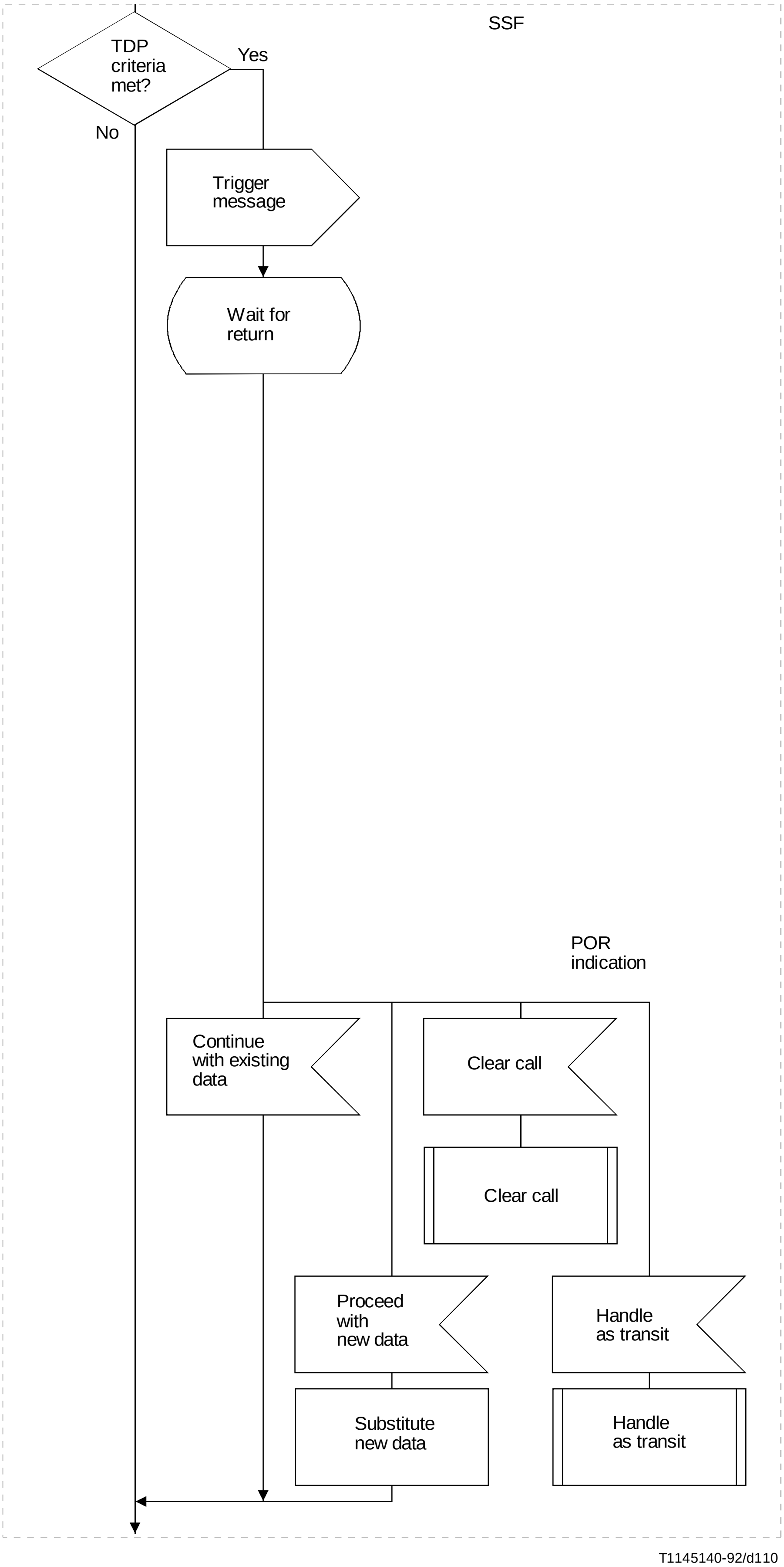


FIGURE 5-73/Q.1214 (sheet 2 of 5)

DFP terminating screening showing DFP SIB representations

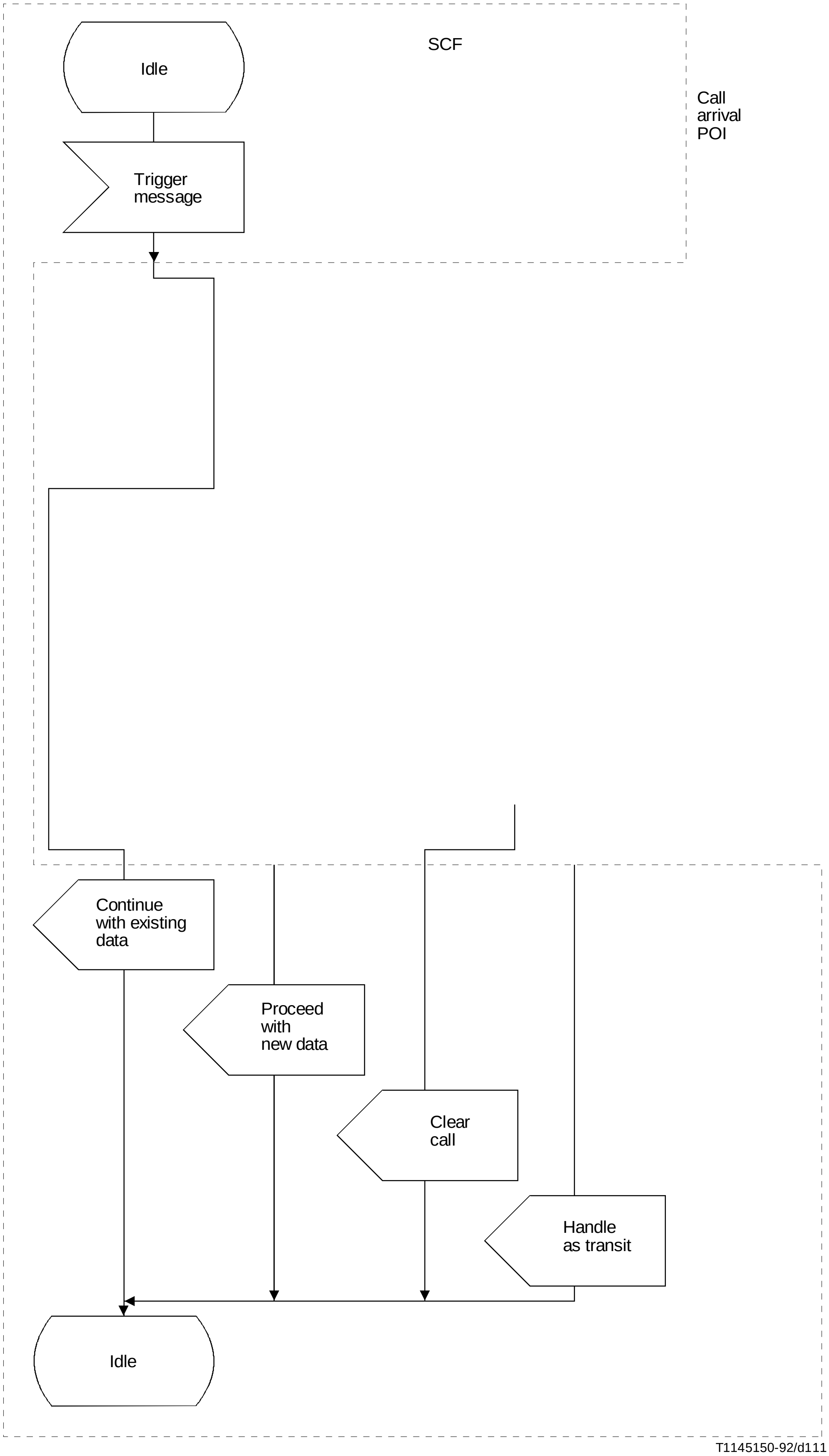


FIGURE 5-73/Q.1214 (sheet 3 of 5)

DFP terminating screening showing DFP SIB representations

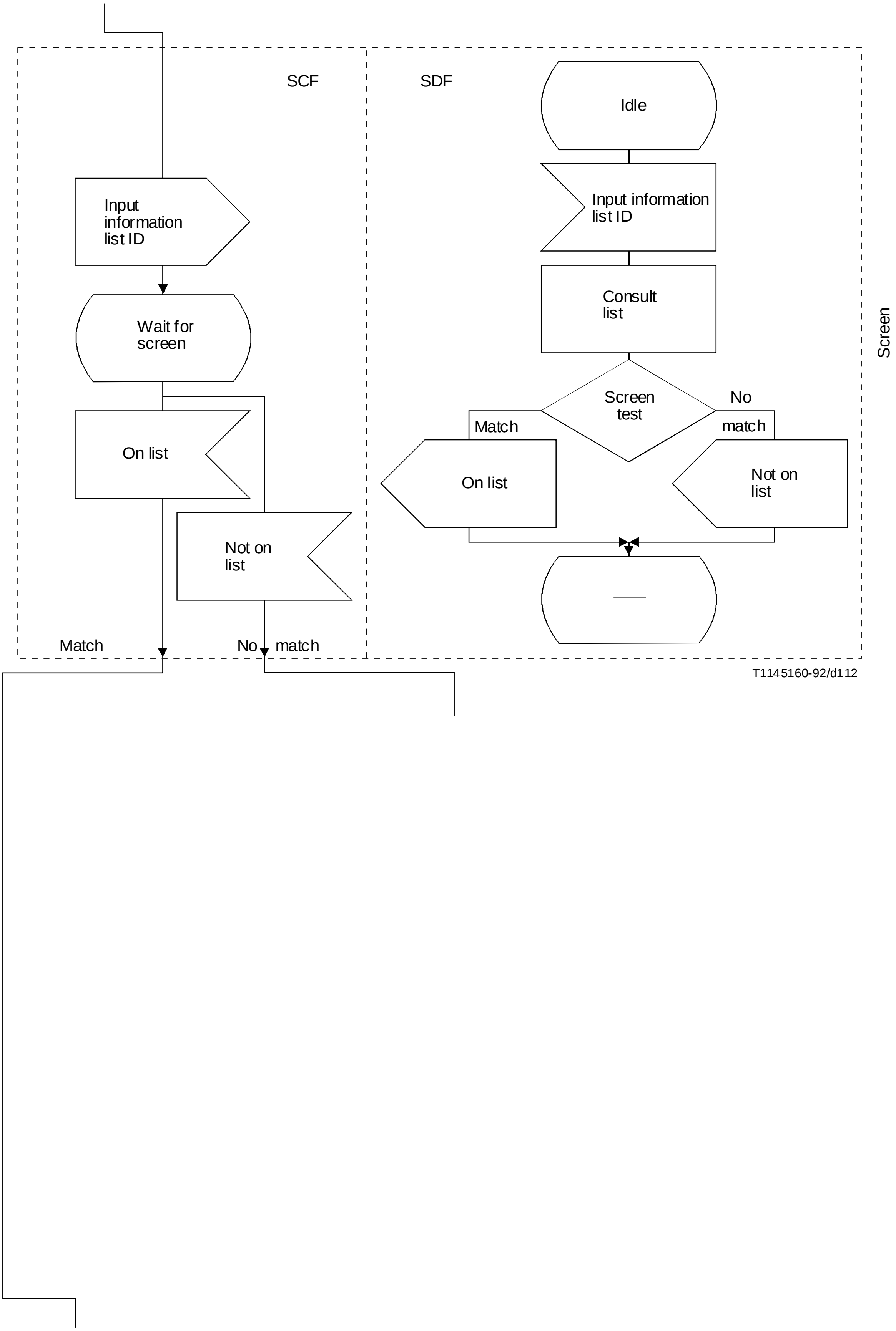


FIGURE 5-73/Q.1214 (sheet 4 of 5)

DFP terminating screening showing DFP SIB representations

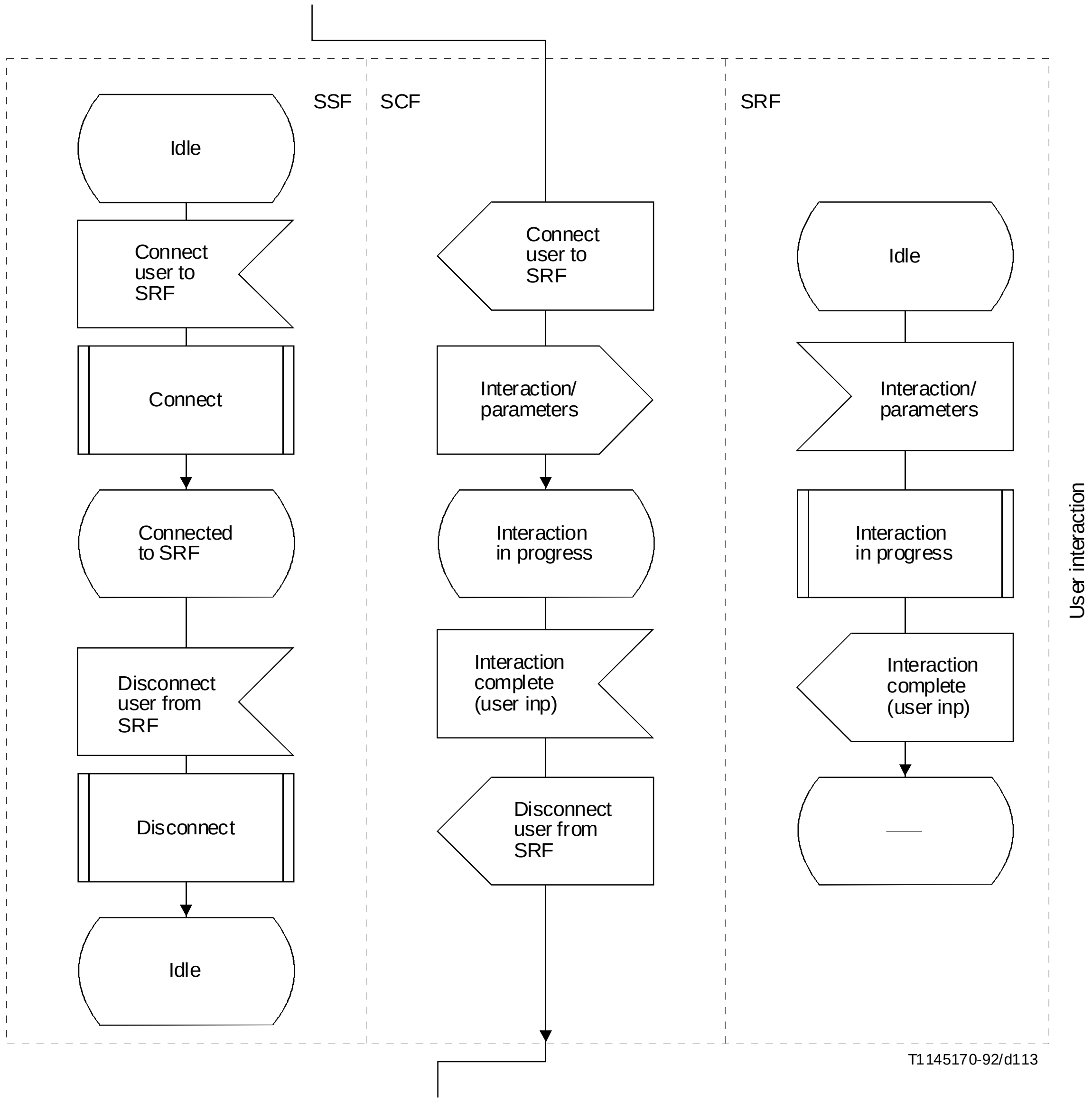


FIGURE 5-73/Q.1214 (sheet 5 of 5)

DFP terminating screening showing DFP SIB representations

5.5.2 Relating the GFP to the DFP

This subclause describes the relationship (mapping) of the elements of the GFP to the DFP. The GFP is divided into Service Independent Building Blocks (SIBs), Global Service Logic (GSL), and the BASIC CALL PROCESS (BCP) SIB. Functions in the GFP are distributed to Functional Entities (FEs) in the DFP. These FEs are related by information flows, which are used to send information between FEs. Table 5-1 lists the IN CS-1 SIBs and indicates the FEs involved for each SIB.

Table 5-2 specifies the information flows in the DFP related to each SIB in the GFP. The information flows are defined by their numbers as identified in clause 6.

TABLE 5-1/Q.1214

SIB/FE mapping

SIB	Functional entities			
	SSF/CCF	SCF	SRF	SDF
ALGORITHM		X		
CHARGE	X	X		
COMPARE		X		
DISTRIBUTION		X		
LIMIT	X	X		
LOG CALL INFORMATION	X	X		X
QUEUE	X	X	X	
SCREEN		X		X
SERVICE DATA MANAGEMENT		X		X
STATUS NOTIFICATION	X	X		
TRANSLATE		X		X
USER INTERACTION	X	X	X	
VERIFY		X		
BASIC CALL PROCESS	X	X		
AUTHENTICATE		X		X

TABLE 5-2/Q.1214

SIB/IF mapping

		Algorithm	Charge	Compare	Distribution	Limit	Log call info	Queue	Screen	SDM	Status notification	Translate	User interaction	Verify	Authenticate
SCF-SSF	Activate service filtering					•									
	Apply charging		•												
	Apply charging report		•												
	Call information request						•								
	Call information report						•								
	Cancel call information request						•								
	Cancel status report request										•				
	Connect to resource							•					•		
	Disconnect forward connection							•					•		
	Establish temporary connection												•		
	Event notification charging		•												
	Event report BCSM							•							
	Furnish charging information		•												
	Hold call in network							•							
	Request notification charging event		•												
	Request report BCSM event							•							
	Request status report										•				
	Reset timer							•					•		
	Send charging information		•												
	Service filtering response					•									
	Status report										•				

TABLE 5-2/Q.1214 *(end)*

SIB/IF mapping

		Algorithm	Charge	Compare	Distribution	Limit	Log call info	Queue	Screen	SDM	Status notification	Translate	User interaction	Verify	Authenticate
SCF-SDF	Authenticate														•
	Authenticate result														•
	Add entry									•					
	Add entry result									•					
	Modify entry						•			•					
	Modify entry result						•			•					
	Search								•	•		•			
	Search result								•	•		•			
	Remove entry									•					
	Remove entry result									•					
SCF-SRF	Assist request inst. from SRF												•		
	Cancel announcement												•		
	Play announcement							•					•		
	Prompt and collect information												•		
	SRF report												•		
	Collected user information												•		

6 Relationships between FEs

6.1 General

Clause 5 describes the information flows between Functional Entities (FEs) necessary to support the execution of a particular SIB. This clause provides a mapping of the information flows on an FE to FE interface basis in a format consistent with the abstract syntax defined in Recommendation Q.1218.

Subclause 4.1/Q.1204 describes architectural aspects of relationships between FEs.

6.2 Relationships

For CS-1, information flows are defined for the following relationships:

- SCF-SSF (D)
- SCF-SRF (E)
- SCF-SDF (F)

Letters in brackets refer to the corresponding functional interfaces as defined in Recommendation Q.1211.

Note that information flows also take place between the SSF and SRF but these are not related to the execution of IN-based service features and are therefore not defined for CS-1.

For each relationship the following information is given:

i) The conditions under which the relationship can be established and terminated.

ii) The information flows between the two entities concerned in the relationship, in alphabetical order.

For each information flow, the following is listed.

a) The name of the information flow.

b) The FE relationship involved (e.g. SSF to SCF, or SCF to SSF).

c) The names of each of the information elements in the information flow. For each IE it is stated whether it is Mandatory (M), i.e. it must be included in the IF, or it is Optional (O), i.e. there are some circumstances in which the IE may be omitted. If the IE is optional, then the precise circumstances under which it is optional, and any default values are given.

d) The description of each of the IEs. The mapping of IEs to parameters in the signalling protocol is given in clause 2/Q.1218.

e) Where appropriate, the mapping between this IF and the corresponding FE model(s). This is described in terms of the conditions involved before (pre-condition) and after (post-condition) the IF concerned is either sent or received. For IFs where this is not appropriate, reference is made to the corresponding SIB description. Note that only mappings to two-party Call Segments are described. Based on appendices, it is FFS whether or not IN CS-1 will provide capabilities to support multi-party Call Segments (e.g. for conferencing). However, it is assumed that CS-1 IN capabilities will interwork with non-IN capabilities (e.g. switch-based conferencing features) that may support multi-party call segments [see 4.2.4.2 d, “Applying Type A IN technology to Type B services”]. As such, IN CS-1 IFs may be applicable to two-party or multi-party Call Segments, even though the scope of control of the IF is limited to a single party in the Call Segment.

A summary of all information elements, information flows and associated SIBs is contained in 6.7.

6.3 Information flows between FEs

Information flows between two FEs either consist of a request/response pair or of a request alone. Note that information flows may not map one to one on to signalling messages between the corresponding physical entities in the physical plane.

The SCF performs coordination of information flows between FEs when required. Implications on the sequencing of certain information flows are noted.

The complete set of IFs between two FEs defines the relationship between those FEs.

Where necessary, specific information flows have been identified to cancel the effect of other information flows.

Note that in both this subclause and clause 5, IFs relating to error conditions are not described.

6.4 SCF-SSF relationship

6.4.1 General

A relationship between the SCF and SSF is established either as a result of the SSF sending a request for instruction to the SCF, or at the request of the SCF for initiation of a call or for some non call-related reason.

A relationship between a SCF and a SSF is normally terminated at the request of the SCF. The SSF may also terminate the relationship (e.g. in error cases).

For IN CS-1, a single SCF may have concurrent relationships with multiple SSFs. A single SSF may only have a relationship with one SCF at a time for any given call. Note that this refers to control as opposed to monitor relationships.

When the SSF receives call-related IEs from the SCF, it substitutes these IEs for the corresponding call information, and retains all other call information. This applies to ALL call processing-related messages.

It is FFS to determine whether additional IEs from signalling messages (e.g. IAM ISUP message) should be included in call processing-related messages.

6.4.2 Information flows between SCF and SSF

6.4.2.1 Activate service filtering

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF activates service filtering, and may only be invoked outside the context of a call. The SCF uses this to instruct the SSF to deal with requests for a specific service and to count each specific attempt. The count of filtered calls will be returned to the SCF after a specified interval.

c) *Information elements*

• Filtering time-out	(M)
• Filtered call treatment	(M)
• Filtering characteristics	(M)
• Filtering criteria	(O)
• Start time	(O)

d) *IE descriptions*

Filtering time-out defines the maximum duration of the filtering. When the timer expires, a service filtering response is sent to the SCF. It is a choice of either a duration or a specified stop time.

Filtered call treatment specifies how filtered calls are to be treated. It includes information about what announcement should be played, how they are to be billed/charged, how many counters should be used for counting filtered calls and what release cause should be applied to filtered calls.

Filtering characteristics defines the severity of the filtering to be applied and the point in time when the service filtering report will be sent. Filtering characteristics are either interval or number of calls. If interval is set then at periodic intervals, a call will be allowed through and a Service Filtering Response will be sent to the SCF. If Number of calls is set, then every Nth call will be allowed through, and a Service Filtering Response will be sent to the SCF.

Filtering criteria is a choice of dialled number, Calling Party Number or service key. It is used to specify those calls which are to be filtered out. This IE is used when this IF is sent outside the context of a specific call.

Start time defines when the filtering is to start. If it is omitted, the SSF will start filtering immediately.

e) *Mapping to FE model(s)*

This information flow applies outside the context of an existing relationship between the SCF and the SSF, or within the context of an existing control relationship for a given two-party Call Segment. In the latter case, it is processed independent of the given Call Segment.

For further details refer to the Stage 2 description of the LIMIT SIB in clause 5.

6.4.2.2 Activity Test

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to check for the continued existence of a relationship between the SCF and SSF. If the relationship is still in existence, then the SSF will respond with Activity Test Response. If no reply is received, then the SCF will assume that the SSF has failed in some way and will take the appropriate action.

c) *Information elements*

None.

d) *IE description*

Not applicable.

e) *Mapping to FE model(s)*

For further details refer to the Stage 2 description of the Activity Test functionality in clause 5.

6.4.2.3 Activity Test Response

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is the response to the Activity Test IF.

c) *Information elements*

None.

d) *IE description*

Not applicable.

e) *Mapping to FE model(s)*

For further details refer to the stage 2 description of the Activity Test functionality in clause 5.

6.4.2.4 Analysed Information

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the Analysed Info DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

- Dialled Digits (O)
- Calling Party Business Group ID (O)
- Calling Party Subaddress (O)

- Calling Facility Group (O)
- Calling Facility Group Member (O)
- Prefix (O)
- Route List (O)
- Original Called Party ID (O)
- Redirecting Party ID (O)
- Redirection Information (O)
- Travelling Class Mark (O)
- Feature Code (O)
- Access Code (O)
- Carrier (O)

d) *IE description*

DP Specific Common Elements

These elements are common to all the DP specific requests for instructions. They have the following form:

- Call ID (M)
- Service Address Information (M)
- Bearer Capability (O)
- Calling Party Number (O)
- Calling Party Category (O)
- SRF/SSF Capabilities (O)
- SRF Available (O)
- Call Gapping Encountered (O)
- Terminal Type (O)
- Service Profile Identifier (O)
- Location Number (O)
- ISDN Access Related Information (O)
- Called Party Number (O)
- Charge Number (O)
- Serving Area ID (O)

Call ID identifies a specific instance of a relationship between a SCF and SSF. At the physical plane for IN CS-1, it is mapped on to a TCAP transaction identity.

Service Address Information:

This IE is a sequence of Trigger Type and Miscellaneous Call Information. It is used by the SCF to select the correct application. The Trigger Type IE indicates to the SCF the type of trigger that caused the SSF to detect a valid trigger condition.

Bearer Capability:

This IE defines the type of the bearer capability connection to the user. This IE contains the value of the DSS 1 Bearer Capability parameter in case the SSF is at local exchange level or the value of the ISUP User Service Information parameter in case the SSF is at transit exchange level. This IE shall only be included in case the DSS 1 Bearer Capability parameter or the ISUP User Service Information parameter is available at the SSP. If this IE is omitted, a default value of “Speech” will be assumed by the SCF.

Calling Party Number:

This IE carries the calling party number to identify the calling party or the origin of the call.

Calling Party Category:

This IE indicates the type of Calling Party (e.g. operator, pay-phone, ordinary subscriber).

SRF/SSF Capabilities:

This IE is used to indicate the capabilities of the SSF and SRF to the SCF. The SCF uses this information to decide if an Assist or Hand-off procedure is to be used. It can also be used to decide if a Connect to Resource IF will be necessary. The usage of this IE is operator dependent. If an operator does use this IE, then it must be included.

SRF Available:

This IE is used to indicate the status of the SRF attached to the SSF (if any). Its use is network operator optional. It indicates whether or not an SRF is attached and available at the SSF.

Call Gapping Encountered:

This IE is used to indicate that this operation has been subject to and passed a call gapping procedure. This IE is network operator optional.

Terminal Type:

NOTE – terminalType will default to "Unknown" if the information is not available.

Service Profile Identifier:

This IE identifies the particular terminal using an ISDN interface.

Location Number:

This IE is used to convey the geographical area address for mobility services. It is used when "callingPartyNumber" does not contain any information about the geographical location of the calling party (e.g. origin dependent routing when the calling party is a mobile subscriber). Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

ISDN Access Related Information:

This IE carries the same information as the protocol element ISUP Access Transport parameter.

Called Party Number:

This IE contains the number used to identify the called party in the forward direction (i.e. it is used to populate the bearer signalling protocol's Called Party Number information element).

Charge Number:

This IE is the automatic number identification of the calling party. It is based on the signalled charge number parameter (network operator specific).

Serving Area ID:

This IE identifies the local serving area where a network provider operates.

The remainder of the DP Specific Common Elements are as defined for the InitialDP IF.

The following IEs are specific to this IF:

Dialled Digits:

This IE contains the actual digits received by the SSF from either the calling party (in the case of the originating local exchange) or the previous SSF handling the call (in all other cases).

Calling Party Business Group ID:

This IE (if available) identifies the business group associated with the calling party. The SCF can use this IE to select SLPs based on the group and for authorization purposes. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

Calling Party Subaddress:

This IE (if available) contains subaddress information for the calling party.

Calling Facility Group:

This IE identifies the facility group for incoming trunks or private facilities. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

Calling Facility Group Member:

This IE (if available) identifies an individual member of a facility group for incoming trunks or private facilities. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

Prefix:

This IE contains any prefix digits input by the calling party.

Route List:

This IE (if available) represents the list of routes which would have been used in order to route the call. It is network operator specific. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

Original Called Party ID:

This IE (if available) is the directory number of the first redirecting party (i.e. the number originally dialled by the caller).

Redirecting Party ID:

This IE (if available) is the directory number of the last redirecting party.

Redirection Information:

This IE (if available) indicates the reason for forwarding the call from the DN of the first and last redirecting party, and indicates the number of forwardings that have occurred.

Travelling Class Mark:

This IE (if available) indicates the physical characteristics of the call, e.g. the usage of echo-cancellers.

Feature Code:

This IE is included when the caller dials a Feature Code (e.g. *XX or 11XX). The * or 11 digits are included, if dialled.

Access Code:

The SSF sends this IE when the originating access uses a customized dialling plan and the caller dials an access code.

Carrier:

This IE consists of two parts, the Carrier Selection indicates whether the primary carrier was presubscribed or dialled and the Carrier ID indicates the presubscribed carrier of the caller. This is useful for networks where the user can select the carrier for the call.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 3 in an originating BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;

2) Called Party Number is available and nature of address is determined;

3) Call gapping or service filtering are not in effect for the Call Segment;

4) DP criteria have been met;

5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 3, and a control relationship has been established;

2) For a TDP-N, basic call processing proceeds at PIC 3, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.5 Analyse Information

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to perform the originating basic call processing actions to analyse destination information that is either collected from a calling party, or provided by the SCF (e.g. for number translation). This includes actions to validate the destination information according to a specified dialling plan, and if valid, to determine call set-up information (e.g. called party address, nature of address, and route index to a list of one or more outgoing trunk groups). No implicit activation or deactivation of DPs occurs as a result of this operation.

c) *Information elements*

• Call ID	(M)
• Destination Routing Address	(O)
• ISDN Access Related Information	(O)
• Alerting Pattern	(O)
• Original Called Party ID	(O)
• Calling Party Number	(O)
• Calling Party Category	(O)
• Called Party Number	(O)
• Travelling Class Mark	(O)
• Carrier	(O)
• Charge Number	(O)

A version of this IF incorporating extra IEs may be found in Appendix I.

d) *IE description*

Destination Routing Address:

This IE contains a list of called party numbers. The SSF uses destinationRoutingAddress to route the call.

ISDN Access Related Information:

As defined previously.

Alerting Pattern:

This IE is the same as the DSS 1 Signal parameter. It is used to specify the type of alerting to be applied. Since present signalling systems do not convey this information, this IE may only apply at the terminating SSF. If the alertingPattern is supplied, the SSF uses this information when it presents the call to the called party.

Original Called Party ID:

This IE contains the identity of the first called party. In some services (e.g. call forwarding), it would be necessary for the SCF to specify this number.

Calling Party Number:

If this IE is supplied, the value is used for all subsequent SSF processing.

Charge Number:

As defined previously.

e) *Mapping to FE model(s)*

This information flow only applies in an originating BCSM for a two-party Call Segment.

Precondition:

1) Call origination attempt has been initiated;

2) Authority/ability to place outgoing call has been verified;

3) Destination information is available in the SSF or provided by the SCF;

4) Basic call processing has been suspended at one of the following DPs:

- Origination_Attempt_Authorized;
- Collected_Info;
- Analysed_Info;
- Route_Select_Failure;
- O_Called_Party_Busy;
- O_No_Answer;
- O_Disconnect (called party disconnect only).

Postcondition:

1) Basic call processing resumes at PIC 3;

2) DP 3, 10, or an exception is encountered.

6.4.2.6 Apply Charging

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is to be used for interacting with the SSF on-line mechanisms that are used in calculating the current call charge. This IF may be invoked several times during a call.

c) *Information elements*

- Call ID (M)
- Billing Charging Characteristics (M)
- Party To Charge (O)

d) *IE description*

Billing Charging Characteristics is network operator specific. It contains any relevant information for calculating the call charge. Examples may be a tariff table that the exchange will apply (taking into account the destination) to calculate the call charge, or a number of pulses to add to the current call charge, or the call tariff itself.

Party To Charge indicates the party in the call to which this procedure should be applied. If it is not present, then it is applied to the A party.

e) *Mapping to FE model(s)*

This information flow applies in the context of an existing control relationship between the SCF and SSF for a given two-party Call Segment.

For further details refer to the Stage 2 description of the CHARGE SIB in clause 5.

6.4.2.7 Apply Charging Report

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is the response to the Apply Charging IF, when the report has been previously requested. This result is sent at the end of the call (that is when the switch decides to stop charging).

c) *Information elements*

- Call Result (M)

d) *IE description*

Call Result is network operator specific. It will contain the result of the charging operation (e.g. number of pulses applied).

e) *Mapping to FE model(s)*

Refer to the Stage 2 description of the CHARGE SIB in clause 5.

6.4.2.8 Assist Request Instructions

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is sent to the SCF by an SSF, which is acting as the Assisting SSF in an Assist or Hand-off procedure. It is generated when the Assisting SSF receives a call from an initiating SSF containing information indicating an Assist or Hand-off procedure.

NOTE – In the INAP, this Information Flow and the Assist Request Instructions from SRF Information Flow are mapped on to a single operation.

c) *Information elements*

- Call ID (M)
- SSF/SRF Capabilities (O)
- SRF Available (O)
- Correlation ID (M)

d) *IE description*

SSF/SRF Capabilities and SRF Available are as defined for Initial DP.

Correlation ID is used by the SCF to associate the Assist Request Instructions from the Assisting SSF with the Initial DP from the initiating SSF. The form of this IE is network operator optional. It may be extracted from the digits received from the initiating SSF or be all of the digits.

e) *Mapping to FE model(s)*

An assisting SSF sends this information flow to the SCF as part of an SSF Service Assist/Hand-off.

For further details refer to the Stage 2 description of the USER INTERACTION SIB in clause 5.

6.4.2.9 Call Gap

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to reduce the rate at which specific service requests are sent to the SCF.

c) *Information elements*

- Control Type (O)
- Gap Indicators (M)
- Gap Criteria (M)
- Gap Treatment (O)

d) *IE description*

Control Type specifies the reason why gapping is invoked. Examples of values: SCF overload (the SCF has started gapping), Manually initiated (through the SMS). This IE allows the SSF to set priorities among gapped traffic, the manually initiated case having greater priority.

Gap Indicators specifies how the gapping is to be applied. The sub-elements are:

- Duration (M)
- Gap Interval (M)

Duration specifies the time for which gapping is to remain in force before being removed by the SSF.

Gap Interval specifies the time allowed between calls being allowed through. An interval of 0 specifies that gapping is to be removed. An interval of -1, specifies that all calls meeting the gap criteria are to be rejected, but only for the time for which call gapping is in force.

Gap Criteria specifies which calls are to be gapped. This is a choice of:

– Called party number;

– Calling party number;

– Service specific.

One and only one of these options must be present:

– Called party number means that calls to a specific called party number will be subject to gapping.

– Calling party number means that calls from a specific calling party will be subject to gapping.

– Service specific means that calls resulting in a request for a specific service key and at a specific DP will be subject to gapping.

Gap Treatment specifies how gapped calls are to be treated. It consists of two sub-elements, announcement ID and release cause. If omitted, a default, network operator specific treatment will be assumed.

e) *Mapping to FE model(s)*

This information flow applies outside the context of an existing relationship between the SCF and the SSF, or within the context of an existing control relationship for a given two-party Call Segment. In the latter case, it is processed independent of the given Call Segment.

For further details refer to the stage 2 description of the Call Gap capability in clause 5.

6.4.2.10 Call Information Report

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is used to send specific call information for a single call to the SCF as requested by the SCF in a previous Call Information Request IF. This IF is sent at the end of the call.

c) *Information elements*

- Requested Information (M)
- Correlation ID (O)

d) *IE description*

As for Call Information Request (Requested Information provides values for Requested Information Type).

e) *Mapping to FE model(s)*

This information flow applies in the context of an existing control relationship for a two-party Call Segment. The SSF sends this information flow to the SCF when a call party disconnects or if call set-up is not completed.

SSF Precondition:

1) Call origination attempt has been initiated;

2) Requested call information has been collected.

SSF Postcondition:

None.

SCF Precondition:

– A Call Information Request IF has been sent at the request of an SLPI and the SLPI is expecting a call information report from the SSF.

SCF Postcondition:

None.

For further details refer to the Stage 2 description of the LOG CALL INFORMATION SIB in clause 5.

6.4.2.11 Call Information Request

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to request the SSF to save specific information about a single call and report it to the SCF at the end of the call (see Call Information Report IF).

c) *Information elements*

• Requested Information Type	(M)
• Correlation ID	(O)

d) *IE description*

Requested Information Type is a list of specific items of information which can be requested. The list is:

- Call attempt elapsed time;
- Call stop time;
- Call connected elapsed time;
- Called address;
- Calling address;
- Bearer capability.

Any set of these items can be requested.

Correlation ID is network operator optional, and is used to correlate the Call Information Report with a previously issued Call Information Request.

e) *Mapping to FE model(s)*

This information flow applies in the context of an existing control relationship between the SCF and SSF for a given two-party Call Segment.

SCF Precondition:

1) A control relationship exists between the SCF and the SSF;

2) The SLPI has determined that a Call Information Request IF should be sent.

SCF Postcondition:

– The SLPI is expecting a call information report from the SSF.

SSF Precondition:

– Call origination attempt has been initiated.

SSF Postcondition:

1) Requested call information is retained by the SSF, as specified;

2) If basic call processing is suspended at a DP, the SSF is waiting for further instructions from the SCF.

For further details refer to the Stage 2 description of the LOG CALL INFORMATION SIB in clause 5.

6.4.2.12 Cancel Call Information Request

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to cancel a previous Call Information Request. Note that in the INAP this IF is mapped on to a generic cancel operation.

c) *Information elements*

- Operation Identifier (M)

d) *IE description*

Operation Identifier identifies the specific Call Information Request to be cancelled. This will be mapped on to an Invoke Id in the physical plane.

e) *Mapping to FE model(s)*

This information flow applies in the context of an existing control relationship for a two-party Call Segment.

For further details refer to the Stage 2 description of the LOG CALL INFORMATION SIB in clause 5.

6.4.2.13 Cancel Status Report Request

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to request the SSF to cancel a previous request to monitor the busy/idle status of a physical termination resource (see Request Status Report IF).

c) *Information elements*

- Resource ID (M)

d) *IE description*

Resource ID:

This IE is used by the SSF to cancel the previous status report request against this resource. Resource ID specifies the particular resource. It is a choice of DN (ID for line), facility group ID (ID for hunt group), facility group member (ID for hunt group member), or trunk group ID (ID trunk group).

e) *Mapping to FE model(s)*

This information flow applies outside the context of an existing relationship between the SCF and the SSF, or within the context of an existing control relationship for a given two-party Call Segment. In the latter case, it is processed independent of the given Call Segment.

For further details refer to the Stage 2 description of the STATUS NOTIFICATION SIB in clause 5.

6.4.2.14 Collected Information

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the Collected Information DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

- Calling Party Business Group ID (O)
- Calling Party Subaddress (O)
- Calling Facility Group (O)
- Calling Facility Group Member (O)
- Prefix (O)

- Original Called Party ID (O)
- Redirecting Party ID (O)
- Redirection Information (O)
- Travelling Class Mark (O)
- Dialled Digits (O)
- Feature Code (O)
- Access Code (O)
- Carrier (O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Calling Party Business Group ID:

As defined previously.

Calling Party Subaddress:

As defined previously.

Calling Facility Group:

This IE (if available) identifies the facility group for trunks or private facilities from which the call has originated. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

Calling Facility Group Member:

This IE (if available) identifies an individual member of a calling facility group. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

Prefix:

As defined previously.

Original Called Party ID:

As defined previously.

Redirecting Party ID:

As defined previously.

Redirection Information:

As defined previously.

Travelling Class Mark:

As defined previously.

Dialled Digits:

As defined previously.

Feature Code:

As defined previously.

Access Code:

As defined previously.

Carrier:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 2 in an originating BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;

2) Authority/ability to place outgoing call has been verified;

3) Complete initial information package/dialling string is available from the originating party;

4) Call gapping or service filtering are not in effect for the Call Segment;

5) DP criteria are met;

6) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 2 and a control relationship has been established;

2) For a TDP-N, basic call processing proceeds at PIC 3 and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.15 Collect Information

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to perform the originating basic call processing actions to prompt a calling party for destination information, then collect destination information from the calling party according to a specified Numbering Plan Indicator (e.g. for virtual private networks).

c) *Information elements*

• Call ID	(M)
• Numbering Plan	(O)
• Alerting Pattern	(O)
• Travelling Class Mark	(O)
• Original Called Party ID	(O)
• Calling Party Number	(O)
• Dialled Digits	(O)

d) *IE description*

As previously defined with the following additions.

Numbering plan is used to indicate the numbering plan to be used when decoding destination information. If omitted a default value of E.164 numbering will be assumed.

e) *Mapping to FE model(s)*

This information flow only applies during call setup in an originating BCSM for a two-party Call Segment, in an SSF which can directly communicate with the calling party.

Precondition:

1) Call origination attempt has been initiated;

2) Authority/ability to place outgoing call has been verified;

3) Basic call processing has been suspended at DP 1, 2, 3, 4, 5, or 6 (i.e. the call setup phase).

Postcondition:

1) Basic call processing resumes at PIC 2;

2) DP 2, 10, or an exception is encountered.

6.4.2.16 Connect

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to create a call to a defined destination, in the case of an existing call in the setup phase, or to forward a call to another destination.

c) *Information elements*

• Call ID	(M)
• Destination Routing Address	(M)
• Alerting Pattern	(O)
• ISDN Access Related Information	(O)
• Forwarding Condition	(O)
• Route List	(O)
• Travelling Class Mark	(O)
• Correlation ID	(O)
• SCF ID	(O)
• Cut and paste	(O)
• Original Called Party ID	(O)
• Carrier	(O)
• Service Interaction Indicators	(O)
• Calling Party Number	(O)
• Calling Party Category	(O)
• Redirecting Party ID	(O)
• Redirection Information	(O)

A version of this IF incorporating extra IEs may be found in Appendix I.

d) *IE description*

As previously defined, with the following additions:

Destination Routing address is a list of possible routing addresses. If connect is being used in the context of a hand-off procedure, this IE may contain embedded within it, a Correlation ID and SCF ID, but ONLY if Correlation ID and SCF ID are not specified separately. In this case, the list only has one address.

Forwarding condition specifies a condition upon which an alternate Destination Routing Address would apply. It has values of “Busy”, “No Answer”, and “Any”.

Route List specifies a list of routes to be used by the SSF.

Correlation ID is used ONLY if connect is being used in the context of a hand-off procedure, AND the Correlation ID is not embedded in the destination routing address. The Correlation ID will be passed to the SCF by the SSF which the call is handed off to.

SCF ID is used ONLY if connect is being used in the context of a hand-off procedure, AND the SCF ID is not embedded in the destination routing address. It enables the SSF to which the call is handed off to identify which SCF the Assist Request Instructions should be sent to.

Cut and Paste is used by the SCF to instruct the SSF to delete(cut) a specified number of the digits it has received from the calling party and paste the remaining dialled digits on to the end of the digits supplied by the SCF in the destination routing address. As an example if the user dials XXX - YYYY, the SSF will trigger on XXX and query the SCF. (Note that the SSF will treat the YYYY digits as normal). The SCF will send back new ZZZZ digits and a cut and paste of 3. The SSF will replace XXX with ZZZZ and paste it to YYYY.

Service Interaction Indicators contains indicators for control of the network based services.

e) *Mapping to FE model(s)*

This information flow only applies before the Active PIC in an originating or terminating BCSM for a two-party Call Segment.

SCF Precondition:

1) A control relationship exists between the SCF and the SSF;

2) An SLPI has determined that a Connect IF should be sent by the SCF.

SCF Postcondition:

– SLPI execution may continue.

SSF Precondition:

1) Call origination attempt has been initiated;

2) Basic call processing has been suspended at a DP;

3) The call has not yet been answered;

4) Destination information and optional call setup information is provided by the SCF.

SSF Postcondition:

1) The SSF performs the call processing actions to route or forward the call to the specified destination;

2) DP 3-7 or 10, or 13-15 or 18, or an exception is encountered.

6.4.2.17 Connect to Resource

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to create a connection between the SSF and the SRF, so that interaction with the end user can take place.

c) *Information elements*

- Call ID (M)
- IP routing address (O)
- Leg ID (O)
- Service Interaction Indicators (O)

d) *IE description*

As previously defined, with the following additions:

IP routing address gives information to enable the SSF to establish a connection to the SRF.

Leg ID identifies the party which is to be connected to the SRF.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SSF to establish a connection to an SRF for a two-party Call Segment.

For further details refer to the Stage 2 description of the USER INTERACTION SIB in clause 5.

6.4.2.18 Continue

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to proceed with call processing at the DP at which it previously suspended call processing to await SCF instructions. The SSF completes DP processing, and continues basic call processing (i.e. proceeds to the next point in call in the BCSM) without substituting new data from the SCF.

c) *Information elements*

- Call ID (M)

d) *IE description*

As previously defined.

e) *Mapping to FE model(s)*

This information flow applies to all BCSMs in a Call Segment and associated Call Segment, if any. It is equally applicable in originating and terminating BCSMs, and at any phase of call processing.

Precondition:

1) Call origination attempt has been initiated;

2) Basic call processing has been suspended at any DP.

Postcondition:

– Basic call processing resumes at the current DP and transitions to the next PIC if no other TDPs or EDPs are detected.

6.4.2.19 Disconnect Forward Connection

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is sent to the non-assisting SSF of a pair of SSFs involved in an Assist Procedure. It is used to disconnect the connection between the Initiating SSF and the Assisting SSF, and the Assisting SSF and its associated SRF. (These were set-up by the use of the Establish temporary connection and Connect to Resource information flows as appropriate.) This IF can also be used to clear the connection between an SSF and SRF established as the result of using the Connect to Resource IF.

c) *Information elements*

- Call ID (M)

d) *IE description*

As previously defined.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SSF to terminate a Service Assist or interaction with an end user for a two-party Call Segment.

For further details refer to the Stage 2 description of the USER INTERACTION SIB in clause 5.

6.4.2.20 Establish Temporary Connection

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This is used to create a connection between an initiating SSF and an Assisting SSF as part of a service assist procedure. It can also be used to create a connection between an SSF and an SRF, for the case where the SRF exists in a separately addressable physical entity.

c) *Information elements*

- Call ID (M)
- Assisting SSF/SRF Routing Address (M)
- Correlation ID (O)
- Leg ID (O)

- SCF ID (O)
- Carrier (O)
- Service Interaction Indicators (O)

d) *IE description*

Assisting SSF/SRF Routing Address may contain embedded within it, a Correlation ID and SCF ID, but ONLY if Correlation ID and SCF ID are not specified separately.

Correlation ID is used ONLY if the Correlation ID is not embedded in the Assisting SSF/SRF Routing Address. The Correlation ID will be passed to the SCF by the assisting SSF.

Leg ID Identifies the party to be connected to the SRF.

SCF ID is used ONLY if the SCF ID is not embedded in the Assisting SSF/SRF routing address. It enables the assisting SSF to identify which SCF the Assist Request Instructions should be sent to.

Carrier:

As defined previously.

Service Interaction Indicators:

As defined previously.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SSF to initiate a Service Assist or to create a connection between an SSF and an SRF for a two-party Call Segment.

For further details refer to the Stage 2 description of the USER INTERACTION SIB in clause 5.

6.4.2.21 Event Notification Charging

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is used to report the occurrence of a specific charging event as requested by the SCF using the Request Notification Charging Event IF.

c) *Information elements*

- Call ID (M)
- Event Type Charging (M)
- Event Specific Information Charging (O)
- Leg ID (O)
- Monitor Mode (O)

d) *IE description*

Leg ID is used to identify an individual party in a call. This is needed in two-party calls for reporting charging events specific to a particular party.

Monitor mode is either “Notify and Continue”, “Transparent”, or “Interrupted”. When the monitor mode is “Interrupted”, the SSF has to send a report to the SCF using the Event Notification Charging IF, and await further instructions.

The remainder of the IEs are network operator specific.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a charging event for a two-party Call Segment.

For further details refer to the Stage 2 description of the CHARGE SIB in clause 5.

6.4.2.22 Event Report BCSM

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is used to notify the SCF of a call-related event (e.g. BCSM events such as busy or no answer) previously requested by the SCF in a Request Report BCSM Event IF.

c) *Information elements*

• Call ID	(M)
• Event type BCSM	(M)
• Misc Call Info	(O)
• Event specific information BCSM	(O)
• Leg ID	(O)
• BCSM Event Correlation ID	(O)

d) *IE description*

Event Type BCSM denotes a specific BCSM DP (e.g. Origination Attempt Authorized).

Miscellaneous Call Information is as defined for the Initial DP IF.

Event specific information BCSM contains call-related information specific to the event (e.g. EDP-specific information).

Leg ID is used to identify an individual party in a call. Needed in two (or more) party calls for reporting events specific to a particular party (e.g. monitor for disconnect from one party or the other). When not present, a default value of A party is assumed.

BCSM Event Correlation ID is used by the SCF to correlate this response with the original request.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting an EDP in a BCSM, for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;

2) An event has been detected at a DP that is armed as an EDP.

SSF Postcondition:

1) For an EDP-R, basic call processing has been suspended at the DP, and the control relationship persists;

2) For an EDP-N, basic call processing continues, and if there are no more EDP-Rs armed and > = 1 EDP-Ns armed, a non-control relationship persists.

SCF Precondition:

1) An SLPI has been invoked;

2) A Request Report BCSM Event IF has been sent at the request of an SLPI and the SLPI is expecting an event report from the SSF.

SCF Postcondition:

1) The SLPI expecting the report can continue;

2) For an EDP-R, an SSF instruction is being prepared.

6.4.2.23 Furnish Charging Information

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is to be used for interacting with offline operations. It gives some charging information to the SSF, to enable it to generate an appropriate billing record for the current call. The generated record at the end of the call may be sent by the SSF to some OA&M system. This IF may be invoked several times during a call.

c) *Information elements*

- Call ID (M)
- Billing Charging Characteristics (M)

d) *IE description*

As previously defined with the following additions.

Billing Charging characteristics contains information to be inserted in the billing record. Its content is network operator specific.[6)]

e) *Mapping to FE model(s)*

This information flow applies in the context of an existing control relationship between the SCF and SSF for a given two-party Call Segment.

SCF Precondition:

1) A control relationship exists between the SCF and the SSF;

2) An SLPI has determined that a Furnish Charging IF should be sent to the SSF.

SCF Postcondition:

– SLPI execution may continue.

SSF Precondition:

– Call origination attempt has been initiated.

SSF Postcondition:

1) Billing information is retained by the SSF, as specified;

2) If basic call processing was suspended at a DP, the SSF is waiting for further instructions from the SCF.

6.4.2.24 Hold Call In Network

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to provide the capability of queuing a call during the setup phase. This IF informs the SSF that the call has been queued. The actions carried out by the SSF on receipt of this IF are:

– fill the hold cause field in a record (for billing purposes, or statistics) with the instant of receipt of the IF;

– do all the activities necessary to keep the call waiting in the network (e.g. management of signalling message like ACM/ANM, managing network timers, possible interaction with the specific charging mechanism). This is done by the switch and not seen from the SCF.

[6)] For instance, in North America, the Billing Charging Characteristics IE would allow the SSF to generate an AMA record. Examples of possible information that may be included in the billing record are: billable number, additional identities of the users to be billed, percentage to be borne by each user, etc.

c) *Information elements*

- Call ID (M)
- Hold Cause (O)

d) *IE description*

Hold cause specifies the reason for the hold (e.g. queuing). A default value will be assumed if none is supplied. The use of this IE is network operator specific.

e) *Mapping to FE model(s)*

This information flow only applies before the Active PIC in an originating or terminating BCSM for a two-party Call Segment.

For further details refer to the Stage 2 description of the QUEUE SIB in clause 5.

SSF Precondition:

1) Call origination attempt has been initiated;

2) Basic call processing has been suspended at a DP;

3) The call has not yet been answered.

SSF Postcondition:

– The SSF is waiting for further instructions from the SCF.

6.4.2.25 Initial DP

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is generated by the SSF when a trigger is detected at any DP in the BCSM, to request instructions from the SCF. DP specific requests for Instructions may also be issued by the SSF. Which version is issued for any specific DP is determined by data held within the SSF.

c) Information elements

- Call ID (M)
- Service Key (O)
- Trigger Type (O)
- Call Gapping encountered (O)
- Dialled digits (O)
- Called Party Number (O)
- Calling Party Number (O)
- Calling Party Category (O)
- SSF/SRF capabilities (O)
- SRF Available (O)
- Misc Call Info (O)
- Terminal Type (O)
- Service Profile Identifier (O)
- Location Number (O)
- Calling Party Business Group ID (O)
- Calling Party Subaddress (O)
- Original Called Party ID (O)
- Forward Call Indicators (O)
- Bearer Capability (O)
- Event Type BCSM (O)
- Redirecting Party ID (O)
- Redirection Information (O)
- Additional Calling Party Number (O)
- Service Interaction Indicators (O)

d) *IE description*

As previously defined with the following additions.

Service Key is used to address the correct application/SLP within the SCF (not for SCP addressing).[7)]

Trigger Type indicates to the SCF the particular event that caused the detection of a valid trigger condition.

Call Gapping encountered is used to indicate that this Request Instructions has been subject to a call gapping procedure. This IE is network operator optional.

Dialled Digits is as defined for Analysed Information.

Called Party Number is the number used to identify the called party in the forward direction (i.e. it is used to populate the bearer signalling protocol's Called Party Number information element).

Calling Party Category indicates the type of Calling Party (e.g. operator, pay-phone, ordinary subscriber).

SSF and SRF capabilities is used to indicate the capabilities of the SSF and SRF to the SCF. The SCF uses this information to decide if an Assist or Hand-off procedure is to be used. It can also be used to decide if a Connect to Resource IF will be necessary. The usage of this IE is operator dependent. If an operator does use this IE, then it must be included.

SRF Available indicates the status of the SRF attached to the SSF (if any). Its use is network operator optional.

Miscellaneous Call Info is a sequence of DP type (Notification or Request) and DP Assignment (Individual Line, Group Based, or Office Based). DP type and DP Assignment is network operator optional.

Terminal Type indicates the type of terminal to the SCF (e.g. DTMF phone, ISDN terminal). The SCF uses this to determine the most appropriate form of user-interaction to use (e.g. in-band announcements). If the information is not available then "unknown" will be sent. "Optional" for terminal type indicates that this IE only applies if the SSF has this information available.

Service Profile Identifier identifies the particular terminal using an ISDN interface.

Location number is used if the calling party is a mobile subscriber. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

Calling party business group ID is as previously defined.

Calling party subaddress is as previously defined.

Original Called Party ID is used when forwarding has occurred to indicate the identity of the first called party.

Forward Call Indicators indicates if the call shall be treated as a national or international call. It also indicates the signalling capabilities of the network access, preceding network connection and the preferred signalling capabilities of the succeeding network connection. The network access capabilities does not indicate the terminal type. For example, an ISPBX will have an ISDN type of access, but the end user terminal behind the ISPBX may be ISDN or non-ISDN.

[7)] For example, it can be used to notify the SCF directly the service, or which other parameters should be examined to determine the service (e.g. dialled digits, calling line identity, terminal service profile identifier). This IE must be datafilled at each SSP for every desired trigger criteria. This value should be defined by and be under the control of the network operator.

Bearer Capability indicates the type of the bearer capability connection to the user. This IE contains the value of the DSS 1 Bearer Capability parameter in case the SSF is at local exchange level or the value of the ISUP User Service Information parameter in case the SSF is at transit exchange level. This IE shall only be included in the "InitialDP" operation in case the DSS 1 Bearer Capability parameter or the ISUP User Service Information parameter is available at the SSP.

Event Type BCSM indicates the armed BCSM detection point event, resulting in the "InitialDP" operation.

Redirecting Party ID indicates the directory number the call was redirected from.

Redirection Information contains forwarding related information, such as redirecting counter.

Additional Calling Party Number contains the calling party number provided by the access signalling system of the calling user.

Service Interaction Indicators contains indicators sent from the SSP to the SCP for control of the network based services at the originating exchange and the destination exchange.

High layer compatibility indicates the type of the high layer compatibility, which will be used to determine the ISDN - teleservice of a connected ISDN terminal. For encoding DSS 1 (Recommendation Q.931) is used.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP in a BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;

2) An event has been detected at a DP;

3) Call gapping or service filtering are not in effect for the Call Segment;

4) DP criteria have been met;

5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at the DP, and a control relationship has been established;

2) For a TDP-N, basic call processing continues, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.26 Initiate Call Attempt

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to request the SSF to create a new call to one call party using address information provided by the SCF (e.g. wake-up call). An EDP-R must be set on Answer or No Answer, in order to have the SCF treat this call segment appropriately when either of these two conditions is encountered. Refer to Appendix I for information on how this IF (using additional IEs) may be used to create calls to two or more parties.

c) *Information elements*

- Call ID (M)
- Destination Routing Address (O)
- ISDN Access Related Information (O)
- Alerting pattern (O)
- Travelling Class Mark (O)
- Calling Party Number (O)
- Service Interaction Indicators (O)

d) *IE description*

As previously defined. Note that in this case Destination Routing Address only contains one number.

e) *Mapping to FE model(s)*

This information flow applies outside the context of an existing relationship between the SCF and the SSF.

SCF Precondition:

1) An SLPI has been invoked;

2) The SLPI has determined that an Initiate Call Attempt IF should be sent by the SCF.

SCF Postcondition:

– SLPI execution may continue.

SSF Precondition:

None.

SSF Postcondition:

1) A new originating Call Segment has been initiated;

2) DP 3-7, or an exception has been encountered.

6.4.2.27 O_Answer

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the O_Answer DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

- Calling Party Business Group ID (O)
- Calling Party Subaddress (O)
- Calling Facility Group (O)
- Calling Facility Group Member (O)
- Route List (O)
- Original Called Party ID (O)
- Redirecting Party ID (O)
- Redirection Information (O)
- Travelling Class Mark (O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Calling Party Business Group ID:

As defined previously.

Calling Party Subaddress:

As defined previously.

Calling Facility Group:

As defined previously.

Calling Facility Group Member:

As defined previously.

Route List:

Route List specifies the route used. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available. The utility of this IE is for further study.

Original Called Party ID:

As defined previously.

Redirecting Party ID:

As defined previously.

Redirection Information:

As defined previously.

Travelling Class Mark:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 7 in an originating BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;
2) Indication received from terminating BCSM that the call has been accepted and the terminating party has answered;
3) Call gapping or service filtering are not in effect for the Call Segment;
4) DP criteria have been met;
5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 7, and a control relationship has been established;
2) For a TDP-N, basic call processing proceeds at PIC 5, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;
2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.28 O_Called_Party_Busy

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the O_Called_Party_Busy DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

• Busy Cause	(O)
• Calling Party Business Group ID	(O)
• Calling Party Subaddress	(O)

- Calling Facility Group (O)
- Calling Facility Group Member (O)
- Prefix (O)
- Route List (O)
- Original Called Party ID (O)
- Redirecting Party ID (O)
- Redirection Information (O)
- Travelling Class Mark (O)
- Carrier (O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Busy Cause:

Busy Cause identifies the reason why the called party was busy.

Calling Party Business Group ID:

As defined previously.

Calling Party Subaddress:

As defined previously.

Calling Facility Group:

As defined previously.

Calling Facility Group Member:

As defined previously.

Prefix:

As defined previously.

Route List:

As defined previously.

Original Called Party ID:

As defined previously.

Redirecting Party ID:

As defined previously.

Redirection Information:

As defined previously.

Travelling Class Mark:

As defined previously.

Carrier:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 5 in an originating BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;
2) Indication received from terminating BCSM that the terminating party is busy;
3) Call gapping or service filtering are not in effect for the Call Segment;
4) DP criteria have been met;
5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 5, and a control relationship has been established;

2) For a TDP-N, default exception handling has been provided, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.29 O_Disconnect

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the O_Disconnect DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

• Calling Party Business Group ID	(O)
• Calling Party Subaddress	(O)
• Calling Facility Group	(O)
• Calling Facility Group Member	(O)
• Release Cause	(O)
• Route List	(O)
• Carrier	(O)
• Connect Time	(O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Calling Party Business Group ID:

As defined previously.

Calling Party Subaddress:

As defined previously.

Calling Facility Group:

As defined previously.

Calling Facility Group Member:

As defined previously.

Release Cause:

Release Cause indicates the cause of the disconnect.

Route List:

As defined previously.

Carrier:

As defined previously.

Connect Time:

Connect Time indicates the duration between the received answer indication from the called party side and the release of the connection.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 9 in an originating BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;

2) Indication received from terminating BCSM that the call is accepted and the terminating party has answered;

3) Disconnect indication received from an originating party, or received from a terminating party via the terminating BCSM;

4) Call gapping or service filtering are not in effect for the Call Segment;

5) DP criteria have been met;

6) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 9, and a control relationship has been established;

2) For a TDP-N, basic call processing proceeds at PIC 1, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.30 O_MidCall

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the O_Midcall DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation. This IF can only be sent when the SSF is capable of detecting this trigger.

c) *Information elements*

DP Specific Common Elements plus:

• Called Party Business Group ID	(O)
• Called Party Subaddress	(O)
• Calling Party Business Group ID	(O)
• Calling Party Subaddress	(O)
• Feature Request Indicator	(O)
• Carrier	(O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Called Party Business Group ID:

This IE identifies the Business Group associated with the called party. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

Called Party Subaddress:

This IE (if available) contains subaddress information for the called party.

Calling Party Business Group ID:

This IE identifies the Business Group associated with the calling party. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has the information available.

Calling Party Subaddress:

This IE (if available) contains subaddress information for the calling party.

Feature Request Indicator:

Feature Request Indicator indicates the type of feature requested.

Carrier:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 8 in an originating BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;
2) Indication received from terminating BCSM that the call is accepted and the terminating party has answered;
3) Feature request received from originating party;
4) Call gapping or service filtering are not in effect for the Call Segment;
5) DP criteria have been met;
6) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 8, and a control relationship has been established;
2) For a TDP-N, basic call processing proceeds at PIC 5, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;
2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.31 O_No_Answer

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the O_No_Answer DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

• Calling Party Business Group ID	(O)
• Calling Party Subaddress	(O)
• Calling Facility Group	(O)
• Calling Facility Group Member	(O)
• Prefix	(O)
• Route List	(O)

- Original Called Party ID (O)
- Redirecting Party ID (O)
- Redirection Information (O)
- Travelling Class Mark (O)
- Carrier (O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Calling Party Business Group ID:

As defined previously.

Calling Party Subaddress:

As defined previously.

Calling Facility Group:

As defined previously.

Calling Facility Group Member:

As defined previously.

Prefix:

As defined previously.

Route List:

As defined previously.

Original Called Party ID:

As defined previously.

Redirecting Party ID:

As defined previously.

Redirection Information:

As defined previously.

Travelling Class Mark:

As defined previously.

Carrier:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 6 in an originating BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;

2) Indication received from terminating BCSM that the terminating party has not answered within a specified time period (this indication is not mapped to an explicit Information Flow);

3) Call gapping or service filtering are not in effect for the Call Segment;

4) DP criteria have been met;

5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 6, and a control relationship has been established;

2) For a TDP-N, default exception handling has been provided, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.32 Origination Attempt Authorized

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the Origination Attempt Authorized DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

• Calling Party Business Group ID	(O)
• Calling Party Subaddress	(O)
• Calling Facility Group	(O)
• Calling Facility Group Member	(O)
• Travelling Class Mark	(O)
• Dialled Digits	(O)
• Carrier	(O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Dialled Digits:

As defined previously.

Calling Party Business Group ID:

As defined previously.

Calling Party Subaddress:

As defined previously.

Calling Facility Group:

As defined previously.

Calling Facility Group Member:

As defined previously.

Travelling Class Mark:

As defined previously.

Carrier:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 1 in an originating BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;

2) Authority/ability to place outgoing call has been verified;

3) Call gapping or service filtering are not in effect for the Call Segment;

4) DP criteria have been met;

5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 1, and a control relationship has been established;

2) For a TDP-N, basic call processing proceeds at PIC 2, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.33 Release Call

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to kill an existing call at any phase of the call.

c) *Information elements*

• Call ID	(M)
• Cause	(M)

d) *IE description*

As previously defined with the following additions.

Cause is used to define the clearing method to be used. If omitted a default value of normal clearing will be assumed.

NOTE – Some treatment (other than BCSM interaction) could be done with this IF (such as user interaction or charging). For instance, for a terminating treatment: give a specific tone.

e) *Mapping to FE model(s)*

This information flow applies during any phase of originating or terminating call processing for a two-party Call Segment.

SCF Precondition:

1) An SLPI has been invoked;

2) A control relationship exists between the SCF and the SSF;

3) The SLPI has determined that a Release Call IF should be sent by the SCF.

SCF Postcondition:

– SLPI execution may continue.

SSF Precondition:

– Call origination attempt has been initiated.

SSF Postcondition:

1) All BCSMs in the Call Segment transition to PIC 1 for originating BCSMs, or to PIC 7 for terminating BCSMs;

2) The Call Segment has been cleared.

6.4.2.34 Request Notification Charging Event

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This operation is used to request the SSF to monitor for a charging related event, then send a notification back to the SCF when the event is detected. Charging events are specific events defined by network operators, and as such were not defined in the call model.

c) *Information elements*

- Sequence Of Charging Event (M)

d) *IE description*

Sequence of Charging event is similar in structure to the IE in the Request Report BCSM Event. That is a sequence of the following structure:

– Event Type Charging (M)
– Monitor Mode (M)
– Leg ID (O)

Event Type Charging is Network operator specific. Some examples of charging events which might be reported are:

– Receipt of charging information from the network, (called party side). This charging information may be:

i) Call Tariff;

ii) Tariff change and time of change;

iii) Number of Pulses.

– Receipt of charging information from the network (calling party side). The charging information may be an acknowledgement message.

Monitor mode is either "Notify and Continue", "Transparent", or "Interrupted". When the monitor mode is "Interrupted", the SSF has to send a report to the SCF using the Event Notification Charging IF, and await further instructions.

Leg ID is used to identify an individual party in a call. This is needed in a two-party call for requesting the reporting of charging events specific to one party.

e) *Mapping to FE model(s)*

The SCF sends this IF to the SSF to request the SSF to monitor for a specified charging event, for a two-party Call Segment.

For further details refer to the Stage 2 description of the CHARGE SIB in clause 5.

6.4.2.35 Request Report BCSM Event

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to request the SSF to monitor for a call-related event (e.g. BCSM events such as busy or no answer), then send a notification back to the SCF when the event is detected (see Event Report BCSM).

c) *Information elements*

- Call ID (M)
- BCSM Event list (M)
- BCSM Event Correlation ID (O)

d) *IE description*

As previously defined with the following additions.

BCSM Event list structure is a list containing one or more sets of the following information:

- Event type (M)
- Monitor Mode (M)
- Leg ID (O)
- DP Specific Criteria (O)

Event type indicates a specific BCSM DP (e.g. Collected Info, O_Called_Party_Busy, etc). Note that this IF can only be used to request BCSM events in either an originating or Terminating BCSM.

Monitor Mode specifies whether call processing should be suspended when the event is detected and how the event is to be reported. The value of this IE is interrupted, notify & continue, or transparent. Interrupted (i.e. intercept) means that the SSF notifies the SCF of the event, does not process the event or propagate the signal, and waits for SCF instructions (e.g. handled as EDP-R for BCSM events). Notify & continue (i.e. duplicate) means that the SSF notifies the SCF of the event, and continues processing the event or signal without waiting for SCF instructions (e.g. handled as EDP-N for BCSM events). Transparent means that the SSF does not notify the SCF of the event. This value is used to end monitoring of a previously requested event (e.g. disarm an EDP). Previously requested events are monitored until ended by a transparent monitor mode, or in the case of BCSM events, until the end of the call.

Leg ID is needed in two (or more) party calls for monitoring events specific to a particular party (e.g. monitor for disconnect from one party or the other). When not present, a default value is assumed.

The DP Specific Criteria indicates information specific to the EDP to be armed. It specifies the application timer or the Number of digits.

Application timer is used only when the event type is "no answer". It is used to specify how long the SSF should monitor for the answer signal before reporting the no answer event. The value of this timer should be less than the network no answer timer, except in the originating local exchange. If this timer expires, the SSF automatically tears down the forward connection to the B-party to avoid synchronization problems, then notifies the SCF.

Number of digits is only used when the event type is "collected info". It indicates the number of digits to be collected by the SSF before the Collected Info event is reported to the SCF.

NOTE – Generic call record building is provided by Call Information Request. If the SCF wants more specific call details, the SCF should use this IF. Statistics for multiple calls can be built by the SCF using Call Information Request for each call; otherwise such statistics should be provided by a TMN interface, rather than by SSF-SCF information flows.

BCSM Event Correlation ID is used by the SCF to correlate the Event Report BCSM response with the original request.

e) *Mapping to FE model(s)*

This information flow applies to all BCSMs in a Call Segment and associated Call Segment, if any. It is equally applicable in originating and terminating BCSMs, and at any phase of call processing.

SCF Precondition:

1) An SLPI has been invoked;

2) A control relationship exists between the SCF and the SSF;

3) The SLPI has determined that a Request Report BCSM Event IF should be sent by the SCF.

SCF Postcondition:

1) In the case where Monitor mode has the values of Interrupted or Notify & Continue, the SLPI is expecting an event report from the SSF;

2) SLPI execution may continue.

SSF Precondition:

– Call origination attempt has been initiated.

SSF Postcondition:

1) Specified EDPs have been armed or disarmed, as identified;

2) If all EDP-Rs are disarmed, then the relationship becomes a non-control relationship;

3) If basic call processing is suspended at a DP, the SSF waits for further instructions from the SCF.

6.4.2.36 Request Status Report

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to request the SSF to monitor the busy/idle status of a physical termination resource (e.g. line, trunk group, hunt group). This information may be requested immediately (poll resource status), or when the resource changes status (monitor for change or continuous monitor). For poll resource status (RequestCurrentStatusReport operation) this information is requested immediately; the SSF responds with the Status Report IF. For monitor change (RequestFirstStatusMatchReport operation), the SSF reports to the SCF when the resource reaches the indicated busy/idle status. For continuous monitor (RequestEveryStatusChangeReport operation) the SSF reports to the SCF each time the resource changes busy/idle status.

NOTE – This IF is monitoring physical resources, NOT the BCSM; Request Report BCSM event is used to monitor for BCSM events. Note that in the INAP, this IF is mapped on to three different operations, one for each type of monitoring which can be requested.

c) *Information elements*

• Monitor type	(M)
• Monitor duration	(O)
• Resource ID	(M)
• Resource status	(O)
• Correlation ID	(O)

d) *IE description*

Monitor type specifies the type of monitoring to be applied. Values include: poll resource status (i.e. what is the current status?), monitor for change (i.e. send a report when the status changes to the desired status, then end the operation), and continuous monitor (i.e. send a report every time the status changes). See the STATUS NOTIFICATION SIB Stage 2 for applicable procedures.

Monitor duration:

Monitor duration is used for monitor for change (RequestFirstStatusMatchReport) or continuous monitor (RequestEveryStatusChangeReport) only. For monitor for change the SSF will monitor the specified resource until the state change requested occurs, the timeout expires, or a Cancel Status Report Request is received. For continuous monitor the SSF will monitor the specified resource and report all state changes until the timer expires or a Cancel Status Report Request is received.

Resource ID:

Resource ID specifies the particular resource whose status the SSF is being requested to report. It is a choice of DN (ID for line), facility group ID (ID for hunt group), facility group member (ID for hunt group member), or trunk group ID (ID trunk group). The SSF responds with a RequestCurrentStatusReportResult operation.

Resource status:

Resource status applies only to monitor for change (RequestFirstStatusMatchReport) to indicate the desired status to report. Values include busy or idle.

Correlation ID:

Correlation ID is network operator optional. It is used to associate a Status Report with a previously issued Request Status Report. Inclusion of this IE in other Status Reporting IF is for further study.

e) *Mapping to FE model(s)*

This information flow applies outside the context of an existing relationship between the SCF and the SSF, or within the context of an existing control relationship for a given two-party Call Segment. In the latter case, it is processed independent of the given Call Segment.

For further details refer to the Stage 2 description of the STATUS NOTIFICATION SIB in clause 5.

6.4.2.37 Reset Timer

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to request the SSF to refresh an application timer in the SSF set by a previous IF. The purpose is to prevent the SSF from timing out the dialogue with the SCF while waiting for the SCF to provide further disposition of a call. It should not be used during the active phase of a call. Activity test should be used instead.

NOTE – There are TCAP timers (e.g. response/error, linked operation), network timers (e.g. no answer, ACM), and application timers. This IF only applies to application timers. The general rule for the use of this IF is that an application timer is set in the SSF on receipt of a previous IF. The SCF can then use this IF to reset the timer if need be before it expires.

c) *Information elements*

• Call ID	(M)
• Timer ID	(M)
• Timer value	(M)

d) *IE description*

Timer ID identifies the specific timer to be reset. For IN CS-1 it is only possible to reset the inter-operation time-out in the SSF (T_{SSF}). This will have been set on receipt of a previous IF from the SCF.

Timer value specifies the new value that the timer is to be set to.

e) *Mapping to FE model(s)*

This information flow applies to an application timer set in the context of an existing control relationship between the SCF and SSF for a given two-party Call Segment.

SCF Precondition:

1) An SLPI has been invoked;

2) A control relationship exists between the SCF and the SSF;

3) The SLPI has determined that a Reset Timer IF should be sent by the SCF.

SCF Postcondition:

None.

SSF Precondition:

1) Call origination attempt has been initiated;

2) An application timer is running in the SSF.

SSF Postcondition:

1) The application timer has been reset, as specified;

2) If basic call processing has been suspended at a DP, the SSF is waiting for further instructions from the SCF.

6.4.2.38 Route Select Failure

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the Route Select Failure DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

• Calling Party Business Group ID	(O)
• Calling Party Subaddress	(O)
• Calling Facility Group	(O)
• Calling Facility Group Member	(O)
• Failure Cause	(O)
• Prefix	(O)
• Route List	(O)
• Original Called Party ID	(O)
• Redirecting Party ID	(O)
• Redirection Information	(O)
• Travelling Class Mark	(O)
• Dialled Digits	(O)
• Carrier	(O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Dialled Digits:

As defined previously.

Calling Party Business Group ID:

As defined previously.

Calling Party Subaddress:

As defined previously.

Calling Facility Group:

As defined previously.

Calling Facility Group Member:

As defined previously.

Failure cause:

Failure cause identifies the reason for the failure to select a route (e.g. network congestion).

Prefix:

As defined previously.

Route List:

Route List represents the list of routes tried by the SSF when trying to route the call.

Original Called Party ID:

As defined previously.

Redirecting Party ID:

As defined previously.

Redirection Information:

As defined previously.

Travelling Class Mark:

As defined previously.

Carrier:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 4 in an originating BCSM for a two-party Call Segment.

SSF Precondition:

1) Call origination attempt has been initiated;

2) Routing address available and nature of address is determined;

3) Unable to select route, or indication received from terminating BCSM that call cannot be presented to terminating party, due to network congestion;

4) Call gapping or service filtering are not in effect for the Call Segment;

5) DP criteria have been met;

6) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 4, and a control relationship has been established;

2) For a TDP-N, default exception handling has been provided, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.39 Select Facility

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to perform the terminating basic call processing actions to select the terminating line if it is idle, or selects an idle line from a multi-line hunt group, or select an idle trunk from a trunk group, as appropriate. If no idle line or trunk is available, the SSF determines that the terminating facility is busy.

c) *Information elements*

- Call ID (M)
- ISDN Access Related Information (O)
- Destination Routing Address (O)
- Called Facility Group (O)
- Called Facility Group Member (O)
- Alerting Pattern (O)
- Original Called Party ID (O)

A version of this IF incorporating extra IEs may be found in Appendix I.

d) *IE description*

ISDN Access Related Information:

As defined previously.

Destination Routing address:

This IE contains the called party number towards which the call is to be routed. The encoding of the parameter is defined in Recommendation Q.763. The Destination Routing address may include the Correlation ID and SCF ID if used in the context of a hand-off procedure.

Called Facility Group:

Called Facility Group identifies the facility group for trunks or private facilities to which the call is being terminated. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has this information available.

Called Facility Group Member:

Called Facility Group Member identifies an individual member of a called facility group. Note that "Optional" in this case means that network operators can specify that this IE should be used if their particular network has this information available.

Alerting Pattern:

As defined previously.

Original Called Party ID:

As defined previously.

e) *Mapping to FE model(s)*

This information flow only applies during call set-up in a terminating BCSM for a two-party Call Segment.

Precondition:

1) Incoming call received from originating BCSM;
2) Authority/ability to route the call to a specified terminating resource (or group) has been verified;
3) Facility information is available in the SSF or provided by the SCF;
4) Basic call processing has been suspended at DP 12, 13, or 14 (i.e. the call setup phase).

Postcondition:

1) Basic call processing resumes at PIC 8;
2) DP 13, 14, 15, 18, or an exception is encountered.

6.4.2.40 Select Route

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to perform the originating basic call processing actions to determine routing information and select a route for a call, based on call setup information that is either available in the SSF, or provided by the SCF (e.g. for alternate routing). This includes actions to select a primary route for the call, and if the route is busy, to select an alternate route.

c) *Information elements*

- Call ID (M)
- Destination Routing Address (O)
- ISDN Access Related Information (O)
- Route List (O)
- Alerting Pattern (O)
- Travelling Class Mark (O)
- Correlation ID (O)
- SCF ID (O)
- Original Called Party ID (O)
- Carrier (O)

A version of this IF incorporating extra IEs can be found in Appendix 1.

d) *IE description*

Destination Routing address:

Destination Routing address, if select route is being used in the context of a hand-off procedure, may contain embedded within it, a Correlation ID and SCF ID, but ONLY if Correlation ID and SCF ID are not specified separately.

ISDN Access Related Information:

As defined previously.

Route List:

Route List contains a list of routes to be used by the SSF when selecting the outgoing route.

Alerting Pattern:

As defined previously.

Travelling Class Mark:

As defined previously.

CorrelationL ID:

Correlation ID is used ONLY if select route is being used in the context of a hand-off procedure, AND the Correlation ID is not embedded in the destination routing address. The Correlation ID will be passed to the SCF by the SSF which the call is handed off to.

SCF ID:

SCF ID is used ONLY if select route is being used in the context of a hand-off procedure, AND the SCF ID is not embedded in the destination routing address. It enables the SSF to which the call is handed off to identify which SCF the Assist Request Instructions should be sent to.

Original Called Party ID:

As defined previously.

Carrier:

As defined previously.

e) *Mapping to FE model(s)*

This information flow only applies during call setup in an originating BCSM for a two-party Call Segment.

Precondition:

1) Call origination attempt has been initiated;

2) Authority/ability to place outgoing call has been verified;

3) Call setup information is available in the SSF or provided by the SCF;

4) Basic call processing has been suspended at DP 1, 2, 3, 4, 5, or 6 (i.e. the call setup phase).

Postcondition:

1) Basic call processing resumes at PIC 4;

2) DP 4, 5, 6, 7, 10, or an exception is encountered.

6.4.2.41 Send Charging Information

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used when the SSF is able to handle network specific SS No. 7 tariff messages (but may not have the capability of calculating the call charge or the capability of generating a billing record). This may be used for two purposes:

– It allows the SSF, when it is a local exchange, to act as if it has received a number of pulses or some SS No. 7 tariff messages, and when the SSF is a transit exchange, to send a number of pulses or some SS No. 7 tariff messages to the A party local exchange.

– It is also used when SS No. 7 tariff messages considered as charging events are requested as EDP-R (intercepted). The result of this IF may be either to continue normal SS No. 7 tariff message processing (that is forward the SS No. 7 tariff message), possibly with some parameter changes, or to acknowledge the receipt of SS No. 7 tariff messages (that is, send back an SS No. 7 ACK message). It should be stressed that no charging related event DP has been defined in the call model.

NOTE – This IF is used when network specific charging mechanisms are to be used. For instance, when this IF indicates that charging must be started, and if the SSF is a gateway or a transit exchange, it may imply the sending of an answer message to indicate the start of the charging.

c) *Information elements*

• Call ID	(M)
• Billing Charging Characteristics	(M)
• Leg ID	(O)
• Party To Charge	(O)

d) *IE description*

As previously defined with the following additions.

Billing Charging Characteristics is network operator specific. It may contain the type of information to be sent and the parameters to be changed.

Leg ID is used to identify an individual party in a call. This is needed in two-party calls for specifying to which party the charging information should be sent.

Party To Charge:

As defined previously.

e) *Mapping to FE model(s)*

This information flow applies in the context of an existing control relationship between the SCF and SSF for a given two-party Call Segment.

For further details refer to the Stage 2 description of the CHARGE SIB in clause 5.

6.4.2.42 Service Filtering Response

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is sent at the expiry of the timeout contained in the Activate Service Filtering IF, and when a call is allowed through.

c) *Information elements*

• Counters Value	(M)
• Filtering Criteria	(M)
• Response Condition	(O)

d) *IE description*

Counters value contains the count of calls filtered during the filtering period. It is a list of counter identities and their values.

Filtering criteria is used to correlate the response with a previously issued Activate Service Filtering.

Response condition is used to identify the reason (service filtering is running and the interval time is expired and a call is received, service filtering is running and the threshold value is reached, the duration time is expired and service filtering has been finished, or the stop time has been met and service filtering has been finished) why this IF is sent.

e) *Mapping to FE model(s)*

This information flow applies outside the context of an existing relationship between the SCF and the SSF, or within the context of an existing control relationship for a given two-party Call Segment. In the latter case, it is processed independent of the given Call Segment.

For further details refer to the Stage 2 description of the LIMIT SIB in clause 5.

6.4.2.43 Status Report

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is used to notify the SCF of the busy/idle status of a physical termination resource (e.g. line, trunk group, hunt group) previously requested by the SCF in a Request Status Report IF.

c) *Information elements*

• Resource status	(M)
• Correlation ID	(O)
• Resource ID	(O)
• Report Condition	(O)

d) *IE description*

Resource status:

Resource status describes the busy or idle status of the resource identified by Resource ID.

Correlation ID:

As defined previously.

Resource ID:

Resource ID specifies the particular resource whose status the SSF is reporting. It is a choice of DN (ID for line), facility group ID (ID for hunt group), facility group member (ID for hunt group member), or trunk group ID (ID trunk group).

Report Condition:

Report Condition specifies the cause of sending Status Report (may be status reported, timer expired, or cancelled).

e) Mapping to FE model(s)

This information flow applies outside the context of an existing relationship between the SCF and the SSF, or within the context of an existing control relationship for a given two-party Call Segment. In the latter case, it is processed independent of the given Call Segment.

For further details refer to the Stage 2 description of the STATUS NOTIFICATION SIB in clause 5.

6.4.2.44 T_Answer

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the T_Answer DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

- Called Party Business Group ID (O)
- Called Party Subaddress (O)
- Called Facility Group (O)
- Called Facility Group Member (O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Called Party Business Group ID:

As defined previously.

Called Party Subaddress:

As defined previously.

Called Facility Group:

As defined previously.

Called Facility Group Member:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 15 in a terminating BCSM for a two-party Call Segment.

SSF Precondition:

1) Incoming call received from originating BCSM;

2) Call has been accepted and the terminating party has answered;

3) For TDP, call gapping or service filtering are not in effect for the Call Segment;

4) DP criteria have been met;

5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 15, and a control relationship has been established;

2) For a TDP-N, basic call processing proceeds at PIC 10, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.45 T_Busy

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the T_Busy DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

• Busy Cause	(O)
• Called Party Business Group ID	(O)
• Called Party Subaddress	(O)
• Route List	(O)
• Original Called Party ID	(O)
• Redirecting Party ID	(O)
• Redirection Information	(O)
• Travelling Class Mark	(O)
• Calling Party Number	(O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Busy Cause:

As defined previously.

Called Party Business Group ID:

As defined previously.

Called Party Subaddress:

As defined previously.

Route List:

Route List represents the incoming route used from the previous SSF. The utility of this parameter is for further study.

Original Called Party ID:

As defined previously.

Redirecting Party ID:

As defined previously.

Redirection Information:

As defined previously.

Travelling Class Mark:

As defined previously.

Calling Party Number:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 13 in a terminating BCSM for a two-party Call Segment.

SSF Precondition:

1) Incoming call received from originating BCSM;

2) All resources in specified terminating group busy;

3) Call gapping or service filtering are not in effect for the Call Segment;

4) DP criteria have been met;

5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 13, and a control relationship has been established;

2) For a TDP-N, default exception handling has been provided, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.46 T_Disconnect

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the T_Disconnect DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

• Called Party Business Group ID	(O)
• Called Party Subaddress	(O)
• Called Facility Group	(O)
• Called Facility Group Member	(O)
• Release Cause	(O)
• Connect Time	(O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Called Party Business Group ID:

As defined previously.

Called Party Subaddress:

As defined previously.

Called Facility Group:

As defined previously.

Called Facility Group Member:

As defined previously.

Release Cause:

Release Cause indicates the cause of the disconnect.

Connect Time:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 17 in a terminating BCSM for a two-party Call Segment.

SSF Precondition:

1) Incoming call received from originating BCSM;

2) Call has been accepted and the terminating party has answered;

3) Disconnect indication received from terminating party, or received from originating party via the originating BCSM;

4) Call gapping or service filtering are not in effect for the Call Segment;

5) DP criteria have been met;

6) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 17, and a control relationship has been established;

2) For a TDP-N, basic call processing proceeds at PIC 7, and no control relationship is established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.47 Term Attempt Authorized

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the Term Attempt Authorized DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

• Called Party Business Group ID	(O)
• Called Party Subaddress	(O)
• Calling Party Business Group ID	(O)
• Calling Party Number	(O)
• Route List	(O)
• Original Called Party ID	(O)
• Redirecting Party ID	(O)
• Redirection Information	(O)
• Travelling Class Mark	(O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Called Party Business Group ID:

As defined previously.

Called Party Subaddress:

As defined previously.

Calling Party Business Group ID:

As defined previously.

Calling Party Number:

As defined previously.

Route List:

As defined previously.

Original Called Party ID:

As defined previously.

Redirecting Party ID:

As defined previously.

Redirection Information:

As defined previously.

Travelling Class Mark:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 12 in a terminating BCSM for a two-party Call Segment.

SSF Precondition:

1) Incoming call received from originating BCSM;

2) Authority to route call to specified terminating resource/group verified;

3) Call gapping or service filtering are not in effect for the Call Segment;

4) TDP criteria have been met;

5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 12, and a control relationship has been established;

2) For a TDP-N, basic call processing proceeds at PIC 8, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.48 T_MidCall

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the T_Midcall DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation. This IF can only be sent when the SSF has the ability to detect this trigger.

c) *Information elements*

As for O_Mid Call.

d) *IE description*

The following IEs are as defined for T_MidCall:

– DP Specific Common Elements;

– Called Party Business Group ID;

– Called Party Subaddress;

– Calling Party Business Group ID;

– Calling Party Subaddress;

– Feature Request Indicator.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 16 in a terminating BCSM for a two-party Call Segment.

SSF Precondition:

1) Incoming call received from originating BCSM;

2) Call has been accepted and the terminating party has answered;

3) Feature request received from terminating party;

4) Call gapping or service filtering are not in effect for the Call Segment;

5) DP criteria have been met;

6) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 16, and a control relationship has been established;

2) For a TDP-N, basic call processing proceeds at PIC 10, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.2.49 T_No_Answer

a) *FE relationship:* SSF to SCF.

b) *Synopsis*

This IF is issued by the SSF after detecting a valid trigger condition at the T_No_Answer DP in the BCSM or to report an event requested by the RequestReportBCSMEvent operation.

c) *Information elements*

DP Specific Common Elements plus:

• Called Party Business Group ID	(O)
• Called Party Subaddress	(O)
• Called Facility Group	(O)
• Called Facility Group Member	(O)
• Original Called Party ID	(O)
• Redirecting Party ID	(O)
• Redirection Information	(O)
• Travelling Class Mark	(O)

d) *IE description*

DP Specific Common Elements:

As defined previously.

Called Party Business Group ID:

As defined previously.

Called Party Subaddress:

As defined previously.

Called Facility Group:

As defined previously.

Called Facility Group Member:

As defined previously.

Original Called Party ID:

As defined previously.

Redirecting Party ID:

As defined previously.

Redirection Information:

As defined previously.

Travelling Class Mark:

As defined previously.

e) *Mapping to FE model(s)*

The SSF sends this information flow to the SCF upon detecting a DP at DP 14 in a terminating BCSM for a two-party Call Segment.

SSF Precondition:

1) Incoming call received from originating BCSM;

2) The terminating party has not answered within a specified time period;

3) Call gapping or service filtering are not in effect for the Call Segment;

4) DP criteria have been met;

5) For a TDP-R, there is no existing control relationship influencing the Call Segment.

SSF Postcondition:

1) For a TDP-R, basic call processing has been suspended at DP 13, and a control relationship has been established;

2) For a TDP-N, default exception handling has been provided, and no control relationship has been established.

SCF Precondition:

None.

SCF Postcondition:

1) An SLPI has been invoked;

2) For a TDP-R, or EDP-R, an SSF instruction is being prepared.

6.4.3 Call Party Handling Information Flows

During the work on IN CS-1, the following IFs were identified to do with call party handling.

- Add Party;
- Hold Call Party Connection;
- Reconnect;
- Release Call Party Connection;
- Attach;
- Detach.

However, their definition could not be completed. For information and possible use as a trial implementation incomplete descriptions of these IFs can be found in Appendix I.

6.4.4 IE population rules for SSF/CCF to SCF Information Flows

Following are the initial IN CS-1 population rules for the IFs listed in Table 6-1. The IEs are declared in the Sequence order which they are defined in Recommendation Q.1218. IEs which are reported only for TDPs are indicated with (TDP), all other IEs are reported for both TDPs and EDPs. Only those IEs which are impacted by the PIC preceding the DP are reported for EDPs. Population rules for other IFs are for further study. The exact interworking with ISUP/DSS 1 is for further study.

TABLE 6-1/Q.1214

Reference	Information flow	Information element
6.4.4.1	Analysed Information	Access Code Bearer Capability Called Party Number Calling Facility Group Calling Facility Group Member Calling Party Business Group ID Calling Party Number Calling Party Category Calling Party Subaddress Carrier Call Gapping Encountered Charge Number Dialled Digits Extensions Extensions (Specific to the DP) Feature Code ISDN Access Related Information Location Number Original Called Party ID Prefix Redirecting Party ID Redirection Information Route List Service Address Information Service Profile Identifier Serving Area Id SRF Available SRF/SSF Capabilities Terminal Type Travelling Class Mark
6.4.4.2	Collected Information	Extensions (specific to the DP) Service Address Information (specific to the DP)
6.4.4.3	O Answer	Extensions (specific to the DP) Service Address Information (specific to the DP)
6.4.4.4	O Called Party Busy	Busy Cause Extensions (specific to the DP) Service Address Information (specific to the DP)
6.4.4.5	O Disconnect	Connect Time Extensions (specific to the DP) Release Cause Service Address Information (specific to the DP)
6.4.4.6	O No Answer	Extensions (specific to the DP) Service Address Information (specific to the DP)
6.4.4.7	Origination Attempt Authorized	Extensions (specific to the DP) Service Address Information (specific to the DP)
6.4.4.8	Route Select Failure	Failure Cause Extensions (specific to the DP) Service Address Information (specific to the DP)

TABLE 6-1/Q.1214 (*end*)

Reference	Information flow	Information element
6.4.4.9	T Answer	Called Facility Group Called Facility Group Member Called Party Business Group ID Called Party Subaddress Extensions (specific to the DP) Service Address Information (specific to the DP)
6.4.4.10	T Busy	Extensions (specific to the DP) Service Address Information (specific to the DP)
6.4.4.11	T Disconnect	Extensions (specific to the DP) Service Address Information (specific to the DP)
6.4.4.12	Term Attempt Authorized	Extensions (specific to the DP) Service Address Information (specific to the DP)
6.4.4.13	T No Answer	Extensions (specific to the DP) Service Address Information (specific to the DP)

6.4.4.1 Analysed Information

For the Analysed Information IF, the EDP IEs are those related to the dialling phase of the call.

DP Common IEs

1) Service Address Information – This IE consists of three additional IEs:

   a) serviceKey (TDP) – This IE optionally specifies a pointer to the SCF-based service logic and is populated based on analysis of either the Called Party Number, or the Calling Party Number, or the Charge Number as specified by information associated with the trigger type assignment for the numbering plan (network operator defined).

   b) miscCallInfo – The miscCallInfo IE indicates whether the IF is expecting a response (i.e. request) or not (i.e. notify). For TDPs, this IE is populated based on information in the SSF/CCF associated with the trigger type assignment. For EDPs, this IE is populated with "requested" if the bcsmEvent monitorMode indicates interrupted, else the IE is populated with "notification" if the bcsmEvent monitorMode indicates notifyAndContinue. This IE also optionally indicates whether the triggering condition encountered is line, group, or office based (network operator specific).

   c) triggerType (TDP) – Depending on the trigger encountered in the numbering plan, the applicable triggerType shall be populated:

Trigger Encountered	Trigger Type
BRI_Feature_Activation_Indicator	featureActivator
Public_Feature_Code	verticalServiceCode
Specific_Feature_Code	specificFeatureCode
Customized_Dialling_Plan	customizedAccess, customizedIntercom
Specific_Digit_String	as per numbering plan
Emergency_Service	emergencyService

2) Bearer Capability (TDP) – This IE contains the bearer capability of the call that encountered the trigger. The SSF/CCF shall include the Bearer Capability IE in the IF regardless of the originating access type, according to:

   - If the originating UNI is a DSS 1 interface, the Bearer Capability shall be populated from the information received in the Bearer Capability IE defined in Recommendation Q.931.

- If the originating NNI is an SS7 interface, the Bearer Capability shall be all included from the information received as the User Service Information, User Service Information Prime, Transmission Medium Requirement, or Transmission Medium Requirement Prime parameter (choice is network operator specific) as defined in Recommendation Q.762.

- If the originating UNI is a non-ISDN interface, the Bearer Capability should be populated with a network operator specific value (e.g. 3.1 kHz audio).

- If the originating NNI is a non-SS7 interface, the Bearer Capability should be populated with a network operator specific value (e.g. 3.1 kHz audio).

3) Called Party Number – This IE contains the address of the called party and shall be included in the IF when routing digits are received from the originating facility.

   Depending on the numbering plan, the trigger type, and the information provided by the originating facility, this IE may or may not be populated:

   a) For the trigger types of featureActivator, verticalServiceCode and customizedAccess for which the numbering plan requires either a variable number of digits or no additional digits, the Called Party Number IE shall not be provided.

   b) For all other trigger types and numbering plan requirements, the Called Party Number shall be populated as follows:

      - If the originating UNI is a DSS 1 interface, the Called Party Number shall be populated from the information received as the Called Party Number IE as defined in Recommendation Q.931.

      - If the originating NNI is an SS7 interface, the Called Party Number shall be populated from the information received as the Called Party Number parameter as defined in Recommendation Q.762.

      - If the originating UNI is a non-ISDN interface, the Called Party Number shall be populated as a result of digit analysis.

      - If the originating NNI is a non-SS7 interface, the Called Party Number shall be populated as a result of digit analysis.

4) Calling Party Number (TDP) – This IE contains the address of the calling party. The Calling Party Number shall be populated as follows:

   - If the originating UNI is a DSS 1 interface, the Calling Party Number shall be populated in the same manner that the ISDN-UP Calling Party Number parameter is determined as defined in DSS 1.

   - If the originating NNI is an SS7 interface, the Calling Party Number shall be populated from the information received as the Calling Party Number parameter as defined in Recommendation Q.762.

   - If the originating UNI is a non-ISDN interface, the Calling Party Number shall be populated as a result of SSF/CCF processing.

   - If the originating NNI is a non-SS7 interface, the Calling Party Number shall be populated as a result of SSF/CCF processing, if available.

5) Calling Partys Category (TDP) – This IE contains the subscriber category of the calling party. The Calling Partys Category shall be populated as follows:

   - If the originating UNI is a DSS 1 or non-ISDN interface, the Calling Partys Category should be populated using the internal data of the SSF/CCF (network operator specific).

   - If the originating NNI is an SS7 interface, the Calling Partys Category shall be included from the information received as the Calling Party's Category parameter as defined in Recommendation Q.762. Additional mappings are network operator specific.

   - If the originating NNI is a non-SS7 interface, the Calling Partys Category should be populated using the information received (network operator specific).

6) SRF/SSF Capabilities (TDP) – This IE is network operator specific. If used, it should be populated from SSF/CCF information which indicates the IP functionality available on the SSF/CCF.

7) SRF Available (TDP) – This IE is network operator specific. If used, it should be populated with the status of the SRF if the SSF/CCF has SRF capabilities.

8) ISDN Access Related Information (TDP) – The ISDN Access Related Information shall be populated as follows:

- If the originating UNI is a DSS 1 interface, the ISDN Access Related Information shall be populated from the information received as Bearer Capability IE as defined in Recommendation Q.931.

- If the originating NNI is an SS7 trunk, the ISDN Access Related Information shall be included from the information received as the Access Transport parameter as defined in Recommendation Q.762. This IE contains information that may not have been checked by the network for coding errors.

- If the originating NNI is a non-SS7 interface or the UNI is a non-ISDN interface, this IE shall not be included.

9) Call Gapping Encountered (TDP) – When the gap criteria associated with the detected TDP has call gapping active and the TDP is allowed to be sent, this IE shall be populated depending on the control type.

10) Location Number (TDP) – This IE shall be populated if it is available.

11) Service Profile Identifier (TDP) – This IE shall be populated when a Service Profile Identifier information element is received in the SETUP message from a DSS 1 interface.

12) Terminal Type (TDP) – This IE reflects the characteristics of the originating facility. This IE reflects the terminal signalling capabilities if known as defined by the network operator.

13) Extensions – If used, it is populated as defined by the network operator.

14) Charge Number (TDP) – This IE contains the charge number for the calling party. Population and/or mapping of this IE is network operator specific.

15) Serving Area ID (TDP) – This IE contains the serving area of the originating facility and should be included if available. Population of this IE is network operator specific.

Analysed Information Specific IEs

16) Dialled Digits – This IE contains the routing digits provided by the originating facility and shall be included in the IF when routing digits are received from the originating facility. The contents of the IE are dependent on the trigger type encountered and the numbering plan:

    a) For the trigger types of featureCode or accessCode for which the numbering plan required no additional digits following the code, the Dialled Digits IE shall not be reported.

    b) For the trigger types of featureCode or accessCode for which the numbering plan required a variable number of digits to be collected following the code (e.g. PIN), the Dialled Digits IE shall be populated with the collected digits, Nature Of Address Indicator = unknown, Numbering Plan = network operator specific.

    c) For Customized Dialling Plan triggers, the Dialled Digit IE shall be populated with: Nature Of Address Indicator = unknown, Numbering Plan = network operator specific, digits populated with the collected digits.

    d) For all other cases, the Dialled Digits IE should be populated in the same manner as the Called Party Number. Other cases may be network operator specific.

17) Calling Party Business Group ID (TDP) – Population and/or mapping of this IE is network operator specific.

18) Calling Party Subaddress (TDP) – The information contained in this IE is available either as a result of DSS 1 or ISDN-UP signalling and shall be populated if available, according to the following:

- If the originating UNI is a DSS 1 interface, the Calling Party Subaddress shall be included from the information received in the Calling Party Subaddress IE of the SETUP message, as defined in Recommendation Q.931.

- If the originating NNI is an SS7 trunk, the Calling Party Subaddress shall be included from the information received as the Access Transport parameter calling party subaddress of the IAM message, as defined in Recommendation Q.762. This IE contains information that may not have been checked by the network for coding errors.

19) Calling Facility Group (TDP) – For group related SSF/CCF originating facilities, this IE identifies the type of group and group number. Population and/or mapping of this IE is network operator specific. For example, depending on the originating facility type the following procedures may apply:

    a) Public trunk group – The trunkGroupID choice should be populated with the trunk group number.

    b) Private trunk group – The privateFacilityID choice should be populated with the trunk group number of that facility.

    c) Multi-line hunt group – The huntGroup choice should be populated with the hunt group number of the facility.

20) Calling Facility Group Member (TDP) – Population and/or mapping of this IE is network operator specific. For example, for group related SSF/CCF originating facilities which meet the example three types defined for Calling Facility Group, this IE should be populated with the specific member number of the originating facility.

21) Original Called Party ID (TDP) – This IE is the address of the first party that redirected the call. This number is encoded as per the numbering plan in the corresponding parameter.

    - When available as a result of call forwarding, the SSF/CCF shall populate the Original Called Party lD IE, if this information is available. This information would only be necessary when the call has been forwarded at least twice (Redirecting Party ID is used if the call is forwarded only once).

    - When the originating access is an SS7 trunk and the received IAM contains the original called number parameter, the SSF/CCF shall use this information to populate the Original Called Party lD IE.

22) Prefix – This IE shall be populated whenever the calling party dials any prefix digits (as administered by the network operator). The method of extracting the prefix is network operator specific.

23) Redirecting Party ID (TDP) – This IE is the address of the last party that redirected the call. This value is encoded as per the numbering plan.

    - When available as a result of call forwarding, the SSF/CCF shall include the Redirecting Party ID IE. This information would only be available when the call has been forwarded at least once.

    - When the originating access is an SS7 trunk and the received IAM contains the redirecting number parameter, the SSF/CCF shall use this information to populate the Redirecting Party ID IE.

24) Redirection Information (TDP) – This IE contains the original redirecting reason (i.e. the reason for the first redirection of the call), the redirecting reason (i.e. the reason for the last redirection of the call), and the ISDN-UP redirection counter.

    - When available as a result of call forwarding, the SSF/CCF shall include the Redirection Information IE.

    - When the originating access is an SS7 trunk and the received IAM contains the redirection information parameter, the SSF/CCF shall use this information to populate the Redirection Information IE.

25) Route List – This IE provides a pointer to a list of routes associated with the dialled digits. It should be populated whenever the dialled digit string identifies outgoing trunk routes. The value of the IE is network operator administered.

26) Travelling Class Mark (TDP) – This IE contains the travelling class mark of the calling party. Population and/or mapping of this IE is network operator specific.

27) Extensions – If used, it is populated as defined by the network operator.

28) Feature Code – This IE should be populated when the originating access is a non-ISDN line or a DSS 1 interface and the SSF/CCF receives information that can be mapped to a feature code. Population and/or mapping of this IE is network operator specific.

29) Access Code – This IE should be populated when the originating access uses a customized numbering plan and the SSF/CCF receives an access code. The received access code should populate the digits field of the Access Code IE. Population and/or mapping of this IE is network operator specific.

30) Carrier – Population and/or mapping of this IE is network operator specific. This IE consists of two fields:

- The Carrier Selection field indicates whether the carrier was presubscribed or dialled. If presubscribed, the IE should be populated only for TDPs.
- The Carrier ID field indicates the presubscribed carrier of the originating facility, the carrier specified by a dialled code as per the numbering plan, or the carrier specified in signalling (network operator specific).

Carrier is of local significance and carrying its value through the ISDN-UP is for further study.

6.4.4.2 Collected Information

For the Collected Information IF, the EDP IEs are those related to the dialling phase of the call.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IE:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated based on the criteria defined:

Trigger Encountered	Trigger Type
Offhook-Delay	offhookDelay
Channel Set-up PRI	channelSetupPRI
Shared Interoffice Trunk	sharedInterofficeTrunk

Collected Information Specific IEs

2) Dialled Digits – See 6.4.4.1.

3) Calling Party Business Group ID (TDP) – See 6.4.4.1.

4) Calling Party Subaddress (TDP) – See 6.4.4.1.

5) Calling Facility Group (TDP) – See 6.4.4.1.

6) Calling Facility Group Member (TDP) – See 6.4.4.1.

7) Original Called Party ID (TDP) – See 6.4.4.1.

8) Prefix – See 6.4.4.1.

9) Redirecting Party ID (TDP) – See 6.4.4.1.

10) Redirection Information (TDP) – See 6.4.4.1.

11) Travelling Class Mark (TDP) – See 6.4.4.1.

12) Extensions – If used, it is populated as defined by the network operator.

13) Feature Code – See 6.4.4.1.

14) Access Code – See 6.4.4.1.

15) Carrier – See 6.4.4.1.

6.4.4.3 O Answer

For the O Answer IF, the EDP IEs are those related to answered condition.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of oAnswer.
2) Called Party Number (TDP) – See 6.4.4.1.

O Answer Specific IEs

3) Calling Party Business Group ID (TDP) – See 6.4.4.1.
4) Calling Party Subaddress (TDP) – See 6.4.4.1.
5) Calling Facility Group (TDP) – See 6.4.4.1.
6) Calling Facility Group Member (TDP) – See 6.4.4.1.
7) Original Called Party ID (TDP) – See 6.4.4.1.
8) Redirecting Party ID (TDP) – See 6.4.4.1.
9) Redirection Information (TDP) – See 6.4.4.1.
10) Route List (TDP) – See 6.4.4.1.
11) Travelling Class Mark (TDP) – See 6.4.4.1.
12) Extensions – If used, it is populated as defined by the network operator.

6.4.4.4 O Called Party Busy

For the O Called Party Busy IF, the EDP IEs are those related to busy condition.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of oCalledPartyBusy.
2) Called Party Number (TDP) – See 6.4.4.1.

O Called Party Busy Specific IEs

3) Busy Cause – This IE reflects the cause of the busy condition for the terminating party. This IE shall be populated as described in Recommendation Q.763. The cause/location values can be found in Recommendation Q.850. This IE shall be populated as follows:
   a) For network-determined user busy of non-ISDN lines:
      – Coding Standard = CCITT-standard;
      – General Location = public network serving the remote user;
      – Cause = user busy.
   b) For DSS 1 interfaces, the Cause IE as defined in Recommendations Q.931, Q.762, and Q.850 shall be mapped to the Busy Cause IE.
   c) For outgoing SS7 trunks, the received cause parameter as defined in Recommendation Q.763 for the ISDN-UP REL message shall be mapped to the Busy Cause IE.
   d) For other conditions causing the TDP to be encountered, the cause should be mapped as follows (network operator specific). Examples include:
      – Number not assigned to office equipment: cause = no route to destination;
      – Call rejected event not specifying user busy: cause = call rejected.
4) Calling Party Business Group ID (TDP) – See 6.4.4.1.
5) Calling Party Subaddress (TDP) – See 6.4.4.1.
6) Calling Facility Group (TDP) – See 6.4.4.1.
7) Calling Facility Group Member (TDP) – See 6.4.4.1.
8) Original Called Party ID (TDP) – See 6.4.4.1.
9) Prefix (TDP) – See 6.4.4.1.

10) Redirecting Party ID (TDP) – See 6.4.4.1.

11) Redirection Information (TDP) – See 6.4.4.1.

12) Route List (TDP) – See 6.4.4.1.

13) Travelling Class Mark (TDP) – See 6.4.4.1.

14) Extensions – If used, it is populated as defined by the network operator.

6.4.4.5 O Disconnect

For the O Disconnect IF, the EDP IEs are those related to disconnect condition.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of oDisconnect.

2) Called Party Number (TDP) – See 6.4.4.1.

O Disconnect Specific IEs

3) Calling Party Business Group ID (TDP) – See 6.4.4.1.

4) Calling Party Subaddress (TDP) – See 6.4.4.1.

5) Calling Facility Group (TDP) – See 6.4.4.1.

6) Calling Facility Group Member (TDP) – See 6.4.4.1.

7) Release Cause – This IE reflects the cause of the disconnect event received from the terminating party. This IE shall be populated as described in Recommendation Q.763. The cause/location values can be found in Recommendation Q.850. This IE shall be populated as follows:

   a) For call clearing of non-ISDN lines:

      – Coding Standard = CCITT-standard;

      – General Location = public network serving the remote user;

      – Cause = normal clearing.

   b) For DSS 1 interfaces, the Cause IE as defined in Recommendations Q.931, Q.762 and Q.850 shall be mapped to the Release Cause IE.

   c) For outgoing SS7 trunks, the received cause parameter as defined in Recommendation Q.763 for the ISDN-UP REL message shall be mapped to the Release Cause IE.

   d) Other conditions are for further study.

8) Route List (TDP) – See 6.4.4.1.

9) Extensions – If used, it is populated as defined by the network operator.

10) Carrier (TDP) – See 6.4.4.1.

11) Connect Time – This IE shall be populated with the amount of time which has elapsed between the processing of the answered event from the terminating party and the disconnect event.

6.4.4.6 O No Answer

For the O No Answer IF, the EDP IEs are those related to the no answer condition.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of oNoAnswer.

2) Called Party Number (TDP) – See 6.4.4.1.

O No Answer Specific IEs

3) Calling Party Business Group ID (TDP) – See 6.4.4.1.

4) Calling Party Subaddress (TDP) – See 6.4.4.1.

5) Calling Facility Group (TDP) – See 6.4.4.1.

6) Calling Facility Group Member (TDP) – See 6.4.4.1.

7) Original Called Party ID (TDP) – See 6.4.4.1.

8) Prefix (TDP) – See 6.4.4.1.

9) Redirecting Party ID (TDP) – See 6.4.4.1.

10) Redirection Information (TDP) – See 6.4.4.1.

11) Route List (TDP) – See 6.4.4.1.

12) Travelling Class Mark (TDP) – See 6.4.4.1.

13) Extensions – If used, it is populated as defined by the network operator.

14) Carrier (TDP) – See 6.4.4.1.

6.4.4.7 Origination Attempt Authorized

Since this is the first DP encountered in the originating call model, it cannot be reported as an EDP.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of originationAttemptAuthorized.

Orig Attempt Authorized Specific IEs

2) Dialled Digits (TDP) – See 6.4.4.1.

3) Calling Party Business Group ID (TDP) – See 6.4.4.1.

4) Calling Party Subaddress (TDP) – See 6.4.4.1.

5) Calling Facility Group (TDP) – See 6.4.4.1.

6) Calling Facility Group Member (TDP) – See 6.4.4.1.

7) Travelling Class Mark (TDP) – See 6.4.4.1.

8) Extensions – If used, it is populated as defined by the network operator.

9) Carrier (TDP) – See 6.4.4.1.

6.4.4.8 Route Select Failure

For the Route Select Failure IF, the EDP IEs are those related to the routing phase of the call.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of routeSelectFailure.

2) Called Party Number (TDP) – See 6.4.4.1.

Route Select Failure Specific IEs

3) Dialled Digits (TDP) – See 6.4.4.1.

4) Calling Party Business Group ID (TDP) – See 6.4.4.1.

5) Calling Party Subaddress (TDP) – See 6.4.4.1.

6) Calling Facility Group (TDP) – See 6.4.4.1.

7) Calling Facility Group Member (TDP) – See 6.4.4.1.

8) Failure Cause – This IE reflects the cause of the routing failure. This IE shall be populated as described in Recommendation Q.763. The cause/location values can be found in Recommendation Q.850.

9) Original Called Party ID (TDP) – See 6.4.4.1.

10) Prefix (TDP) – See 6.4.4.1.

11) Redirecting Party ID (TDP) – See 6.4.4.1.

12) Redirection Information (TDP) – See 6.4.4.1.

13) Route List (TDP) – See 6.4.4.1.

14) Travelling Class Mark (TDP) – See 6.4.4.1.

15) Extensions – If used, it is populated as defined by the network operator.

16) Carrier (TDP) – See 6.4.4.1.

6.4.4.9 T Answer

For the T Answer IF, the EDP IEs are those related to the answer condition.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of tAnswer.

2) Called Party Number (TDP) – See 6.4.4.1.

T Answer Specific IEs

3) Called Party Business Group ID (TDP) – This IE reflects the business group associated with the Called Party Number and should be populated when the called party is a member of a business group. The population of the IE is network operator specific.

4) Called Party Subaddress (TDP) – This IE contains the called party subaddress. This IE shall be populated as follows:

   - If the terminating UNI is a DSS 1 interface, this IE shall be populated with the DSS 1 called party subaddress IE, as defined in Recommendation Q.931.
   - If the terminating NNI is an SS7 interface, this IE shall be populated with the called party subaddress in the Access Transport parameter, as defined in Recommendation Q.762.

5) Called Facility Group (TDP) – For group related SSF/CCF terminating facilities, this IE identifies the type of group and group number. Population and/or mapping of this IE is network operator specific. For example, depending on the terminating facility type, the following procedures may apply:

   a) Public trunk group – The trunkGroupID choice should be populated with the trunk group number.

   b) Private trunk group – The privateFacilityID choice should be populated with the trunk group number of that facility.

   c) Multi-line hunt group – The huntGroup choice should be populated with the hunt group number of the facility.

   d) Route Index – For those facilities which do not belong in the above categories, this IE should contain the route index (network operator provided).

6) Called Facility Group Member (TDP) – Population and/or mapping of this IE is network operator specific. For example, for group related SSF/CCF terminating facilities which meet the example four types defined for Called Facility Group, this IE should be populated with the specific member number of the terminating facility.

7) Extensions – If used, it is populated as defined by the network operator.

6.4.4.10 T Busy

For the T Busy IF, the EDP IEs are those related to busy condition.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of tBusy.

2) Called Party Number (TDP) – See 6.4.4.1.

T Busy Specific IEs

3) Busy Cause – See 6.4.4.4.
4) Called Party Business Group ID (TDP) – See 6.4.4.9.
5) Called Party Subaddress (TDP) – See 6.4.4.9.
6) Original Called Party ID (TDP) – See 6.4.4.1.
7) Redirecting Party ID (TDP) – See 6.4.4.1.
8) Redirection Information (TDP) – See 6.4.4.1.
9) Route List (TDP) – See 6.4.4.1.
10) Travelling Class Mark (TDP) – See 6.4.4.1.
11) Extensions – If used, it is populated as defined by the network operator.

6.4.4.11 T Disconnect

For the T Disconnect IF, the EDP IEs are those related to the disconnect condition.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of tDisconnect.
2) Called Party Number (TDP) – See 6.4.4.1.

T Disconnect Specific IEs

3) Called Party Business Group ID (TDP) – See 6.4.4.9.
4) Called Party Subaddress (TDP) – See 6.4.4.9.
5) Called Facility Group (TDP) – See 6.4.4.9.
6) Called Party Facility Group Member (TDP) – See 6.4.4.9.
7) Release Cause – See 6.4.4.5.
8) Extensions – If used, it is populated as defined by the network operator.
9) Connect Time – See 6.4.4.5.

6.4.4.12 Term Attempt Authorized

Since this is the first DP encountered in the terminating call model, it cannot be reported as an EDP.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of termAttemptAuthorized.
2) Called Party Number (TDP) – See 6.4.4.1.

Term Attempt Authorized Specific IEs

3) Called Party Business Group ID (TDP) – See 6.4.4.9.
4) Called Party Subaddress (TDP) – See 6.4.4.9.
5) Calling Party Business Group ID (TDP) – See 6.4.4.1.
6) Original Called Party ID (TDP) – See 6.4.4.1.
7) Redirecting Party ID (TDP) – See 6.4.4.1.
8) Redirection Information (TDP) – See 6.4.4.1.
9) Route List (TDP) – See 6.4.4.1.
10) Travelling Class Mark (TDP) – See 6.4.4.1.
11) Extensions – If used, it is populated as defined by the network operator.

6.4.4.13 T No Answer

For the T No Answer IF, the EDP IEs are those related to the no answer condition.

DP Common IEs

The population rules for the common IEs are defined in 6.4.4.1 with the exception of the following IEs:

1) Service Address Information triggerType (TDP) – The trigger type shall be populated with the value of tNoAnswer.

2) Called Party Number (TDP) – See 6.4.4.1.

T No Answer Specific IEs

3) Called Party Business Group ID (TDP) – See 6.4.4.9.

4) Called Party Subaddress (TDP) – See 6.4.4.9.

5) Called Facility Group (TDP) – See 6.4.4.9.

6) Called Facility Group Member (TDP) – See 6.4.4.9.

7) Original Called Party ID (TDP) – See 6.4.4.1.

8) Redirecting Party ID (TDP) – See 6.4.4.1.

9) Redirection Information (TDP) – See 6.4.4.1.

10) Travelling Class Mark (TDP) – See 6.4.4.1.

11) Extensions – If used, it is populated as defined by the network operator.

6.5 SCF-SRF relationship

6.5.1 General

A relationship between the SCF and SRF is established by the SRF sending an “assist request instructions from SRF” to the SCF. The SCF can now instruct the SRF to perform some interaction with an end user (e.g. play an announcement and collect some digits). The relationship is terminated by the SCF. The establishment of this relationship must be preceded by the establishment of a relationship between the SCF and SSF.

6.5.2 Information flows between the SCF and SRF

6.5.2.1 Assist Request instructions From SRF

a) *FE relationship*: SRF to SCF.

b) *Synopsis*

This IF is sent by the SRF to the SCF, when the SRF has received an incoming call from an SSF/CCF as a result of the SCF sending an Establish Temporary Connection IF to the SSF.

NOTE – In the INAP, this information flow and the assist request instructions information flow are mapped on to a single operation.

c) *Information elements*

As for assist request instructions.

d) *IE description*

As for assist request instructions.

e) *Mapping to FE model(s)*

An assisting SRF sends this information flow to the SCF in order to obtain user interaction instructions.

For further details refer to the stage 2 description of the USER INTERACTION SIB in clause 5.

6.5.2.2 Cancel Announcement

a) *FE relationship:* SCF to SRF.

b) *Synopsis*

This IF is used to request the SRF to terminate the playing of an announcement, or cancel a prompt and collect user information. At the physical plane, a generic cancel operation will be used.

c) *Information elements*

- Operation identifier (M)

d) *IE description*

Operation identifier identifies the specific play announcement or prompt and collect to be cancelled. This will be mapped on to an Invoke ID in the physical plane.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SRF to terminate user interaction for a two-party call segment in an SSF.

For further details refer to the stage 2 description of the USER INTERACTION SIB in clause 5.

6.5.2.3 Collected User Information

a) *FE relationship:* SRF to SCF.

b) *Synopsis*

This IF is sent as the response to the prompt and collect user information IF. It contains the information collected from the user. Note that in the INAP, this IF maps on to the RESULT part of the prompt and collect user information operation.

c) *Information elements*

- SRF connect ID (M)
- Received information (M)

d) *IE description*

SRF connect ID is as previously defined.

Received information contains the information collected from the user. This is either digits or an IA5 string.

e) *Mapping to FE model(s)*

The SRF sends this IF to the SCF to provide information collected from a specific party in a two-party call segment.

For further details refer to the stage 2 description of the USER INTERACTION SIB in clause 5.

6.5.2.4 Play Announcement

a) *FE relationship:* SCF to SRF.

b) *Synopsis*

This IF is to be used after establish temporary connection (assist procedure with a second SSF or SRF assist procedure) or a connect to resource (no assist) IFs. It may be used for in-band interaction with an analogue user, or for interaction with an ISDN user. In the former case, the SRF is usually collocated with the SSF for standard tones (e.g. congestion tone) or standard announcements. In the latter case, the SRF is always collocated with the SSF in the switch.

c) *Information elements*

- SRF connect ID (M)
- Information To Send (M)

- Disconnection from IP Forbidden (M)
- Request Announcement Completed Indication (M)

d) *IE description*

SRF connect ID identifies a specific instance of a relationship between the SCF and the SRF. It is mapped to a TCAP transaction ID in the physical plane.

Information To Send specifies what information the SRF should send to the end user. It is a choice of the following:

- Inbandinfo;
- Displayinformation;
- Tone;
- Inbandinfo.

This structure is used for in-band interaction with any user.

– MessageID	(M)	(Note 1)
– Number of repetitions	(O)	(Note 2)
– Duration	(O)	(Note 2)
– Interval	(O)	

NOTES

1 Message ID is a choice of:

– Elementary Message ID;

– Text;

– Elementary Message IDs; or

– Variable Message.

One sub-element of the above list must always be present. "Elementary Message ID" indicates a single announcement.

"Text" will be transformed by the SRF into speech.

"ElementaryMessageIDs" specifies a sequence of announcements.

"Variable Message" specifies an announcement with one or more variable parts.

2 Number of repetitions and duration have a default value that may be pre-assigned or defined by network management.

Number of repetitions, duration and interval may be used in any combination. It is up to the service logic to decide which combination is most appropriate for the needs of the service.

Display information is used for interacting with an ISDN user.

Tone

This structure is used when sending an information tone to an analogue or ISDN user.

– Tone ID	(M)
– Duration	(O)

Disconnect from IP Forbidden informs the SRF whether it can release the connection to the SSF/CCF after the announcement has been completed. This is to be used mainly when the SRF is not collocated with the switch. For instance, when there is a sequence of announcements, it would prevent path release between each announcement. For not direct case, the disconnection from IP is always forbidden (see Recommendation Q.1218 for more detail).

Request Announcement Completed Indication indicates that the SRF should send a specialized resource report IF when the announcement is complete.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SRF to initiate user interaction for a two-party call segment in an SSF.

For further details refer to the stage 2 description of the USER INTERACTION SIB in clause 5.

6.5.2.5 Prompt And Collect User Information

a) *FE relationship:* SCF to SRF.

b) *Synopsis*

This IF is to be used after establish temporary connection (assist procedure with a second SSF or SRF assist procedure) or a connect to resource (no assist) IFs. This information flow is used to interact with the user in order to collect information.

c) *Information elements*

• SRF Connect ID	(M)
• Information To Send	(O)
• Disconnection From IP Forbidden	(M)
• Collected Info	(M)

d) *IE description*

SRF connect ID (as for Play announcement).

Information To Send has the same structure as that for Play Announcement.

Disconnect From IP Forbidden has the same meaning as for Play Announcement.

Collected Info describes how the information is to be collected from the user. It is a choice of:

Digits; or

IA5 information.

Digits have the following structure:

– Minimum number of digits	(M)
– Maximum number of digits	(M)
– End of reply digit	(O)
– Cancel digit	(O)
– Start digit	(O)
– Voiceback	(O)
– First digit time-out	(O)
– Inter digit time-out	(O)
– Error treatment	(O)
– Voice Info	(O)
– Interruptible announcement indicator	(O)

Minimum and maximum number of digits are used where the number of digits are not known.

End of reply digit indicates the type of digit used to signal the end of input (one or two character(s), e.g. * or #, digits 0-9 shall not be used).

Cancel digit specifies the digit which can be used by the user to cancel erroneous input (one or two character(s), e.g. * or #, digits 0-9 shall not be used).

Start digit specifies the type of digit which is used to signal the start of some particular piece of input information (one or two character(s), e.g. * or #, digits 0-9 shall not be used).

Voiceback indicates to the SRF that it should play-back to the user the digits they have input in the form of an announcement. Non-valid digits shall not be voicebacked.

First digit time-out specifies the maximum time which can elapse between the end of the announcement and the first digit being input. If this is not supplied a default value will be assumed.

Inter digit time-out specifies the maximum time which can elapse between successive digits. If this is not supplied a default value will be assumed.

Error treatment defines what specific actions should be taken by the SRF in the event of error conditions occurring, such as the expire of one of the timers described above.

The options available are:

a) Report error to the SCF (this is the default action).

b) Send any collected information to the SCF.

c) Repeat the prompting announcement.

d) Play the user a special “help” announcement.

Voiceinfo indicates that the digits may be collected by the use of voice recognition.

Interruptible announcement indicator if TRUE means that input from the user will be accepted before the prompt inviting input is complete.

IA5 information is used if it is required to collect text input from the user, e.g. “ABC”.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SRF to initiate user interaction for a two-party call segment in an SSF.

For further details refer to the stage 2 description of the USER INTERACTION SIB in clause 5.

6.5.2.6 Specialized Resource Report

a) *FE relationship:* SRF to SCF.

b) *Synopsis*

This IF is the response to a Play Announcement IF when the request announcement completed indication IE is set.

c) *Information elements*

- SRF connect ID (M)

d) *IE description*

As previously defined.

e) *Mapping to FE model(s)*

The SRF sends this information flow to the SCF to report announcement completion in a two-party call segment.

For further details refer to the stage 2 description of the USER INTERACTION SIB in clause 5.

6.6 SCF-SDF relationship

6.6.1 General

A relationship is established between the SCF and SDF at the request of the SCF when the SCF requires to retrieve or modify some data contained within the SDF. The relationship is terminated by the SDF.

IFs related to the SDF may be associated with some degree of processing, depending on the supported service. This processing is related to data manipulation but not to call control.

Only a logical view of data is known to the SCF. The IFs do not imply any physical organization of data or how they are stored. In particular, the fact that data are replicated is not known to the SCF.

As the Directory access protocol was introduced to this version on the physical plane, Information Flows (IFs) are aligned with them, and many Information Elements (IEs) are replaced with the equivalent parameters in Recommendation X.511. However, some of them are not employed in this version on physical plane.

6.6.2 Information flows between the SCF and SDF

6.6.2.1 Search

a) *FE relationship:* SCF to SDF.

b) *Synopsis*

This IF is used to query items of data held in the DIT in the SDF (e.g. a translation of a freephone number).

c) *Information elements*

- Authorized Relationship ID (M)
- Base Object (M)
- Subset (M)
- Selection (M)
- Filter (O)
- Matched Values Only (O)

d) *IE description*

Authorized Relationship ID identifies the established Authorized Relationship between the service logic and the database through which operations can be applied. At the physical plane for IN CS-1, it is mapped on to a TCAP transaction identity.

Base Object identifies a specific entry within the DIB in which or under which the requested information may reside. Base Object is the same as baseObject in 10.2/X.511.

Subset specifies to what level(s) the search should be done, i.e. the Base Object only, or the immediate subordinates of the Base Object, or the Base Object and all its subordinates. Subset is the same as subset in 10.2/X.511.

Selection specifies what information from the entries is requested. Selection is same as the EntryInformationSelection in 7.6/X.511.

Filter eliminates entries which are not of interest from the search space specified with Base Object and Subset. Filter is the same as Filter in 7.8/X.511.

Matched Values Only specifies that certain attribute values are to be omitted from the returned entry information. Matched Values Only is the same as matchedValuesOnly in 10.2/X.511.

Following is the possible information queried by Search IF:

– Routing address.

– Off net/On net indicator (destination address in VPN or not).

– Expected authorization result.

– Expected verification result.

– Expected screening result.

NOTE – The verification and screening mentioned here should not be related to authentication which uses the Authenticate IF.

Following are the examples which are candidates for Base Object, Subset, Extended filter, and Selection; however, precise mapping between them depends on an information model:

– Called number;

– PIN + ID;

– Calling Party Number;

– Input From User (Dialled digits);

– Calling terminal capabilities;

– Calling/called line service profile;

– Screened list ID + Screened information ID;

– Bearer resource type (this key must be combined with other keys);

– etc.

Information elements in the initial DP IF are all candidates for determining a set of Base Object, Subset, Selection, and Extended Filter. The precise structure and possible values for the IEs in this IF will be service specific.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SDF to read a service data object (search for an object whose name is not completely known and to compare object according to some given criteria).

For further details refer to the Stage 2 description of the SERVICE DATA MANAGEMENT, TRANSLATE and SCREEN SIBs in clause 5.

6.6.2.2 Search Result

a) *FE relationship:* SDF to SCF.

b) *Synopsis*

This IF is the response to the Search IF. Note that on the physical plane this IF maps on to the RESULT part of the Search operation.

c) *Information elements*

- Authorized Relationship ID (M)
- Search Info (M)

d) *IE description*

As previously defined, with the following additions:

Search info contains the information requested using the Search IF. It may contain data or more simply a result of the comparison.

e) *Mapping to FE model(s)*

The SDF sends this information flow to an SCF to provide the result of reading specified service data objects or the result of comparison.

For further details refer to the Stage 2 description of the SERVICE DATA MANAGEMENT, TRANSLATE and SCREEN SIBs in clause 5.

6.6.2.3 Modify Entry

a) *FE relationship:* SCF to SDF.

b) *Synopsis*

This IF when requested will entail an atomic execution of the update.

However, problems such as concurrent access to the data is not solved by the IFs.

c) *Information elements*

- Authorized Relationship ID (M)
- Object (M)

- Changes (M)
- Selection (O)

d) *IE description*

As previously defined, with following additions:

Object specifies the one specific entry to be targeted. Object is the same as object in 7.6/X.511.

Changes specify a sequence of modifications that are applied in the order specified. There are six modification type, add/remove Attribute or Values, alter Values, and set Values to its default. Changes is a sequence of the EntryModification defined in 11.3/X.511, except for the setting Values to its default.

Selection is used to request some data contained in the object where the modifications take place. Selection is the same as EntryInformationSelection in 7.6/X.511.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SDF to write to a service data object.

For further details refer to the Stage 2 description of the SERVICE DATA MANAGEMENT SIB in clause 5.

6.6.2.4 Modify Entry Result

a) *FE relationship:* SDF to SCF.

b) *Synopsis*

This IF is the response to the Modify Entry IF. Note that in the INAP this IF maps on to the RESULT part of the Modify Entry IF.

c) *Information elements*

- Authorized Relationship ID (M)
- Information (O)

d) *IE description*

As previously defined, with the following additions:

Information describes the result of the requested operation, e.g. success or failure with a specific reason. (If not empty, it contains the results of the modifications, i.e. the modified data; it can also contain some information requested during the Modify Entry IF as explained before.)

e) *Mapping to FE model(s)*

The SDF sends this information flow to an SCF to provide the result of writing the modification to a specified service data object.

For further details refer to the Stage 2 description of the SERVICE DATA MANAGEMENT SIB in clause 5.

6.6.2.5 Authenticate

a) *FE relationship:* SCF to SDF.

b) *Synopsis*

This IF is used by an SCF to request an SDF to perform authentication.

c) *Information elements*

- Authorized Relationship ID (M)
- Authentication Information (M)

d) *IE description*

As previously defined, with the following addition:

Authentication Information contains information needed to perform the required type of authentication. No information might be needed. Authentication Information is the same as the Directory Bind Argument in 8.1/X.511.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SDF to request the SDF to perform authentication.

6.6.2.6 Authenticate Result

a) *FE relationship:* SDF to SCF.

b) *Synopsis*

This IF is used to confirm the result of authentication by the SDF.

c) *Information elements*

- Authorized Relationship ID (M)
- Authentication Information (O)

d) *IE description*

As previously defined, with the following additions:

Authentication Information is as defined for the Authenticate IF, except that the meaning of the information is reversed.

e) *Mapping to FE model(s)*

The SDF sends this information flow to an SCF to inform SCF of authentication result and/or to perform a mutual authentication.

6.6.2.7 Add Entry

a) *FE relationship:* SCF to SDF.

b) *Synopsis*

This IF is used to add a leaf entry in the DIT in an SDF.

c) *Information elements*

- Authorized Relationship ID (M)
- Object (M)
- Entry (M)

d) *IE description*

As previously defined, with the following additions:

Entry contains the (set of) attribute information to be created. Entry is same as the entry in 11.1/X.511.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SDF to add a leaf entry to the DIT in the SDF.

6.6.2.8 Add Entry Result

a) *FE relationship:* SDF to SCF.

b) *Synopsis*

This IF is the response to the Add Entry IF. Note that on the physical plane this IF maps on to the RESULT part of the Add Entry operation.

c) *Information elements*

- Authorized Relationship ID (M)

d) *IE description*:

As previously defined.

e) *Mapping to FE model(s)*

The SDF sends this IF to the SCF to provide the result of adding a leaf entry to the DIT in the SDF.

6.6.2.9 Remove Entry

a) *FE relationship:* SCF to SDF.

b) *Synopsis*

This IF is used to remove a leaf entry in the DIT in an SDF.

c) *Information elements*

- Authorized Relationship ID (M)
- Object (M)

d) *IE description*

As previously defined.

e) *Mapping to FE model(s)*

The SCF sends this information flow to an SDF to remove a leaf entry in the DIT in the SDF.

6.6.2.10 Remove Entry Result

a) *FE relationship:* SDF to SCF.

b) *Synopsis*

This IF is the response to the Remove Entry IF. Note that on the physical plane this IF maps on to the RESULT part of the Remove Entry operation.

c) *Information elements*

- Authorized Relationship ID (M)

d) *IE description*

As previously defined.

e) *Mapping to FE model(s)*

The SDF sends this IF to the SCF to provide the result of removing a leaf entry in the DIT in the SDF.

6.7 Summary of information flows and related SIBs

The following table summarizes all the information flows and cross-references to the corresponding SIB. It also shows which IEs are used in each IF.

Information flows and information elements

SSF → SCF INFORMATION FLOWS (1/2)

	Event Notification Charging	Service Filtering Response	Status Report	Assist Request Instructions	Call Information Report	Event Report BCSM	Apply Charging Report	Activity Test Response
Information Elements								
BCSM Event Correlation ID						**O**		
Call ID	M			M		M		
Call Result							**M**	
Correlation ID			O	M	O			
Counters Value		**M**						
Event Specific Info BCSM						**O**		
Event Specific Info Charging	O							
Event Type BCSM						**M**		
Event Type Charging	M							
Filtering Criteria		**O**						
Leg ID	**O**					**O**		
Misc Call Info						O		
Monitor Mode	M							
Response Condition		**O**						
Report Condition			O					
Requested Information					M			
Resource ID			**O**					
Resource Status			**M**					
SRF Available				O				
SSF/SRF Capabilities				O				
MOTIVATING SIBs	CHG	Limit	SN	UI	LCI	BCP		CHG

(shaded box)	IE described in this IF	UI	USER INTERACTION
CHG	CHARGE	Trans	TRANSLATION
SN	STATUS NOTIFICATION	BCP	BASIC CALL PROCESS
LCI	LOG CALL INFORMATION	Auth	AUTHENTICATE

Information flows and information elements (*continued*)

SSF → SCF INFORMATION FLOWS (2/2)																
	Initial DP	Origina-tion Attempt Author-ized	Collected Infor-mation	Analysed Infor-mation	Route Selected Failure	O Called Party Busy	O No Answer	O Answer	O MidCall	O Discon-nect	Term Attempt Author-ized	T Busy	T No Answer	T Answer	T MidCall	T Dis-connect
Information Elements																
Access Code			O	**O**												
Additional Calling Party Number	**O**															
Bearer Capability	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
Busy Cause						**O**						O				
Call Gapping Encountered	**O**	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Call ID	M	M	M	**M**	M	M	M	M	M	M	M	M	M	M	M	M
Called Facility Group													O	O		O
Called Facility Group Member													O	O		O
Called Party Number	**O**	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
Called Party Business Group ID									**O**		O	O	O	O	O	O
Called Party Subaddress									**O**		O	O	O	O	O	O
Calling Facility Group		O	**O**	**O**	O	O	O	O		O						
Calling Facility Group Member		O	**O**	**O**	O	O	O	O		O						
Calling Party Business Group ID	O	O	O	**O**	O	O	O	O	**O**	O	O				O	
Calling Party Category	**O**	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Calling Party Number	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
Calling Party Subaddress	O	O	O	**O**	O	O	O	O	**O**	O					O	
Carrier		O	O	**O**	O	O	O		O	O						
Charge Number		O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
Dialled Digits	O	O	O	**O**	O											
Event Type BCSM	**O**															
Failure Cause					**O**											
Feature Code			O	**O**												
Feature Request Indicator									**O**						O	
Forward Call Indicators	**O**															
High Layer Compatibility	**O**															
ISDN Access Related Information		O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
Location Number	**O**	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Misc Call Info	**O**															
Original Called Party ID	O		O	**O**	O	O	O	O			O	O	O			

Information flows and information elements (*continued*)

SSF → SCF INFORMATION FLOWS (2/2)																
	Initial DP	Origina-tion attempt Author-ized	Collected Infor-mation	Analysed Infor-mation	Route Selected Failure	O called Party Busy	O No Answer	O answer	O MidCall	O Discon-nect	Term Attempt Author-ized	T Busy	T No Answer	T Answer	T MidCall	T Dis-connect
Prefix			O	**O**	O	O	O									
Redirecting Party ID	O		O	**O**	O	O	O	O			O	O	O			
Redirection Information	O		O	**O**	O	O	O	O			O	O	O			
Release Cause										**O**						**O**
Route List				**O**	O	O	O	**O**		O	O	**O**				
Service Address Information		M	M	**M**	M	M	M	M	M	M	M	M	M	M	M	M
Serving Area ID		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Service Interaction Indicators	**O**															
Service Key	**O**															
Service Profile Identifier (SPID)	**O**	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
SRF Available	**O**	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
SSF/SRF Capabilities	**O**	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
Terminal Type	**O**	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Travelling Class Mark		O	O	**O**	O	O	O	O			O	O	O			
Trigger Type	O															
MOTIVATING SIBs	BCP	BCP	BCP	BCP	BCP	BCP	BCP	BCP	BCP	BCP	BCP	BCP	BCP	BCP	BCP	BCP

Information flows and information elements (*continued*)

SCF → SSF INFORMATION FLOWS (1/4)									
	Apply Charging	Furnish Charging Information	Request Notification Charging Event	Activate Service Filtering	Hold Call In Network	Cancel Status Report Request	Request Status Report	Send Charging Information	Activity Test
Information Elements									
Billing Charging Characteristics	**M**	**M**						**M**	
Call ID	M	M			M			M	
Correlation ID							**O**		
Filtered Call Treatment				**M**					
Filtering Characteristics				**M**					
Filtering Criteria				**O**					
Filtering Timeout				**M**					
Hold Cause					**O**				
Monitor Duration							**O**		
Monitor Type							**M**		
Party To Charge	**O**							O	
Resource ID						**M**	**M**		
Resource Status							**O**		
Sequences of Charging Event			**M**						
Event Type Charging			**M**						
Leg ID			**O**					**O**	
Monitor Mode			**M**						
Start Time				**O**					
MOTIVATING SIBs	CHG	CHG	CHG	Limit	Queue	SN	SN	CHG	

Information flows and information elements (*continued*)

SCF → SSF INFORMATION FLOWS (2/4)					
	Reset Timer	Connect To Resource	Disconnect Forward Connection	Establish Temporary Connection	Call Gap
Information Elements					
Assisting SSF/SRF Routing Address				**M**	
Call ID	M	M	M	M	
Control Type					**O**
Correlation ID				**O**	
Gap Criteria					**M**
Gap Indicators					**M**
Duration					**M**
Gap Interval					**M**
Gap Treatment					**O**
IP Routing Address		**O**			
Leg ID		**O**		**O**	
SCF ID				**O**	
Service Interaction Indicators		O		O	
Timer ID	**M**				
Timer Value	**M**				
MOTIVATING SIBs	Queue UI	UI	UI	UI	

Information flows and information elements (*continued*)

SCF → SSF INFORMATION FLOWS (3/4)						
	Call Information Request	Cancel Call Information Request	Connect	Continue	Initiate Call Attempt	Release Call
Information Elements						
Alerting Pattern			O		O	
Call ID			M	M	M	M
Calling Party Category			O			
Calling Party Number			O			
Cause						**O**
Correlation ID	**O**		**O**			
Cut and Paste			**O**			
Destination Routing Address			**M**		**O**	
Forwarding Condition			**O**			
ISDN Address Related Information			O		O	
Operation ID		**M**				
Original Called Party ID			O			
Requested Information Type	**M**					
Redirection Information			O			
Redirecting Party ID			O			
Route List			O			
SCF ID			**O**			
Service Interaction Indicators			O		O	
Travelling Class Mark			O		O	
MOTIVATING SIBs	LCI	BCP	BCP	BCP	BCP	BCP

Information flows and information elements (*continued*)

SCF → SSF INFORMATION FLOWS (4/4)					
	Request Report BCSM Event	Collect Information	Analyse Information	Select Route	Select Facility
Information Elements					
Alerting Pattern		O	**O**	O	O
BCSM Event List	**M**				
Application Timer	**O**				
Event Type	**M**				
Leg ID	**O**				
Monitor Mode	**M**				
BCSM Event Correlation ID	**O**				
Call ID	M	M	M	M	M
Called Facility Group					**O**
Called Facility Group Member					**O**
Calling Party Number		O	O		
Carrier				O	
Charge Number		O			
Correlation ID				**O**	
Destination Routing Address			**O**	**O**	**O**
Dialled Digits		O			
ISDN Access Related Information			O	O	O
Numbering Plan		**O**			
Original Called Party ID		O	**O**	O	O
Route List				**O**	
SCF ID				**O**	
Travelling Class Mark		O		O	
MOTIVATING SIBs	BCP Queue	BCP	BCP	BCP	BCP

Information flows and information elements (*continued*)

SCF → SRF INFORMATION FLOWS			
	Cancel Announcement	Play Annoucement	Prompt & Collect User Info
Information Elements			
Collected Info			**M**
Cancel Digit			**O**
End of Reply Digit			**O**
Error Treatment			**O**
First Digit Timeout			**O**
Inter Digit Timeout			**O**
Maximum Number of Digits			**M**
Minimum Number of Digits			**M**
Start Digit			**O**
Voice Info			**O**
Voiceback			**O**
Disconnect from IP Forbidden		**M**	M
Information To Send		**M**	O
Duration		**O**	
Interval		**O**	
Message ID		**M**	
Number of Repetitions		**O**	
or			
Duration		O	
Tone ID		M	
Interruptable Announcement Indicator			**O**
Operation ID	**M**		
Request Announcement Complete Indicator		**M**	
SRF Connect ID		**M**	M
MOTIVATING SIBs	UI	UI	UI

Information flows and information elements (*continued*)

SRF → SCF INFORMATION FLOWS			
	Specialized Resource Report	Assist Request Instruction SRF	Collected User Information
Information Elements			
Call ID		M	
Correlation ID		M	
Received Info			**M**
SRF Available		O	
SRF Connect ID	M		M
SSF/SRF Capability		O	
MOTIVATING SIBs	UI	UI	UI

Information flows and information elements (*continued*)

SCF → SDF INFORMATION FLOWS					
	Search	Modify Entry	Authenticate	Add Entry	Remove Entry
Information Elements					
Authorized Relationship ID	**M**	M	M	M	M
Changes		M			
Authentication Information			**M**		
Entry				**M**	
Filter	**O**				
Matched Values Only	**O**				
Base Object	**M**				
Object		**M**		M	M
Selection	**M**	**O**			
Subset	**M**				
MOTIVATING SIBs	SDM Screen Trans	SDM LCI	AUTH	SDM LCI	SDM LCI

Information flows and information elements (*end*)

SDF → SCF INFORMATION FLOWS					
	Search Result	Modify Entry Result	Authenticate Result	Add Entry Result	Remove Entry Result
Information Elements					
Authorized Relationship ID	M	M	M	M	M
Authentication Information			O		
Information		**O**			
Search info	**M**				
MOTIVATING SIBs	SDM Screen Trans	SDM LCI	AUTH	SDM LCI	SDM LCI

Annex A

SSF/SCF relationship scenarios

(This annex forms an integral part of this Recommendation)

This annex addresses the nature of the IN service control relationship between the SSF/CCF and the SCF. It describes general terminology and possible control and monitor scenarios for both normal and abnormal situations. Note that terminology relating to information flows is simply an aid to understanding. The status of relationships as "control" or "monitor" is not determined by an information flow type, but rather by the SSF upon examining the DP arming messages returned from the SCF and examining the DP types which have been armed.

a) *Terminology*

An **initiating information flow (IF)** is an IF that opens a "**control window**" between the SSF and SCF.

A **relinquish control IF** is an IF that closes a "control window" and opens a "**monitor window**" between the SSF and SCF.

A **subsequent IF** is an IF sent between the SSF and SCF while a “control window” or “monitor window” is open.

A **terminating IF** is an IF that closes a “control window” between the SSF and SCF, but does not open a “monitor window”, or it is an IF that closes a “monitor window”.

A **one-way IF** is an IF sent between the SSF and SCF that opens a “monitor window” or “control window”. In this case, the window is closed as soon as the one-way IF is sent.

This terminology is illustrated in Figure A.1.

b) *Normal SSF IFs*

A **DP notification IF** is sent from the SSF to the SCF to report a DP event in “report-only” mode:

– for a TDP-N, this is a one-way IF only;

– for an EDP-N, this can be a Subsequent or Terminating IF only.

A **DP request IF** is sent from the SSF to the SCF to report a DP event and request instructions in “response-required” mode:

– for a TDP-R, this is an initiating IF only;

– for an EDP-R, this is a subsequent IF only.

c) *Normal SCF IFs*

An **immediate (Imm) instruction IF** is sent from the SCF to the SSF in immediate response to a DP Request IF:

– this can be a relinquish control, subsequent or terminating IF only.

A **Following (Foll) Instruction IF** is sent from the SCF to the SSF following an Immediate Instruction IF:

– this is a relinquish control, subsequent or terminating IF only.

An **asynchronous (Async) instruction IF** is sent from the SCF to the SSF independent of a DP Request IF:

– for SCF-initiated calls, this is an initiating IF only;

– to cancel a previous instruction, this is a relinquish control, subsequent or terminating IF only;

– for other SCF-initiated instructions, this can be an initiating, relinquish control, subsequent, terminating, or one-way IF.

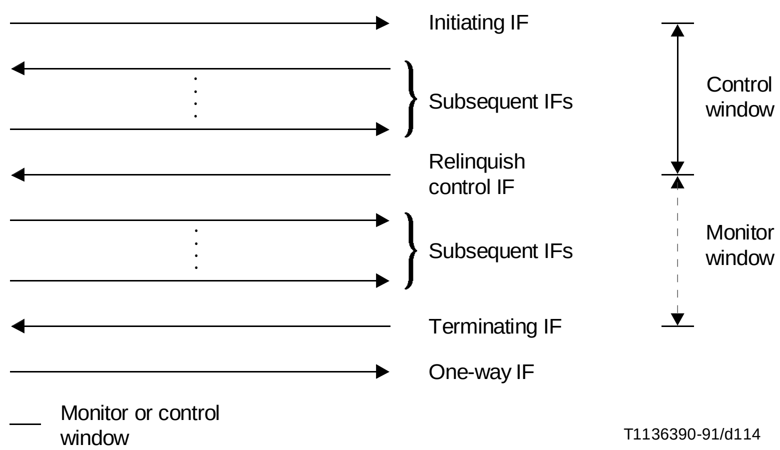


FIGURE A.1/Q.1214

General information flow terminology

d) *Normal scenarios*

Normal scenarios are illustrated below using the terms in items a) through c).

Scenario 1)

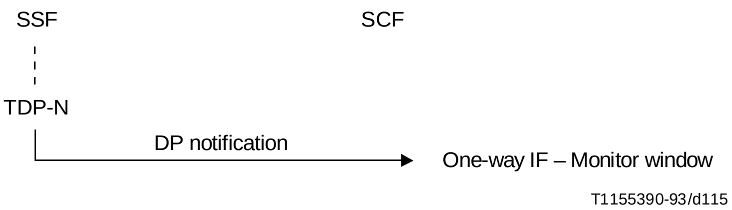


FIGURE A.2/Q.1214 (sheet 1 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 2)

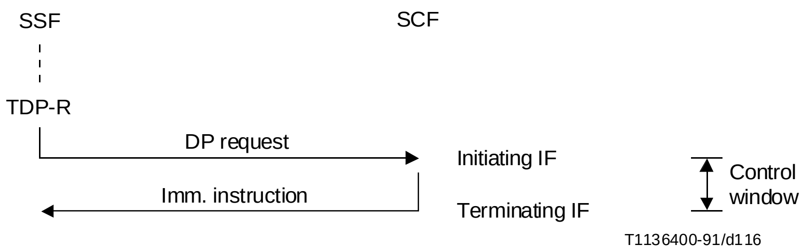


FIGURE A.2/Q.1214 (sheet 2 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 3)

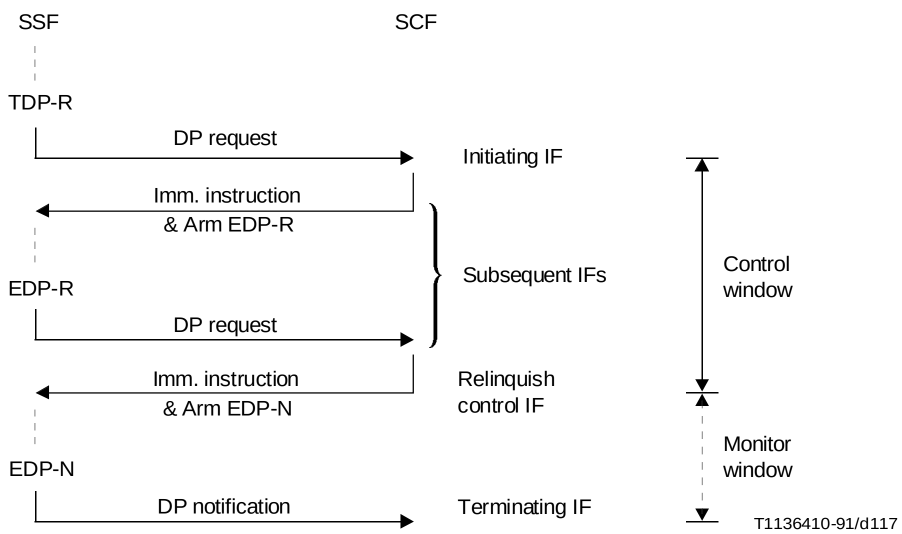


FIGURE A.2/Q.1214 (sheet 3 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 4)

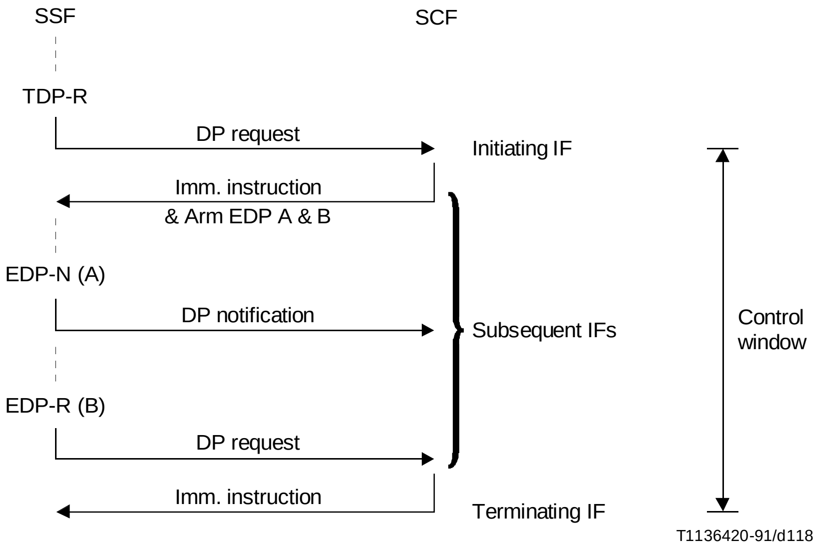


FIGURE A.2/Q.1214 (sheet 4 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 5)

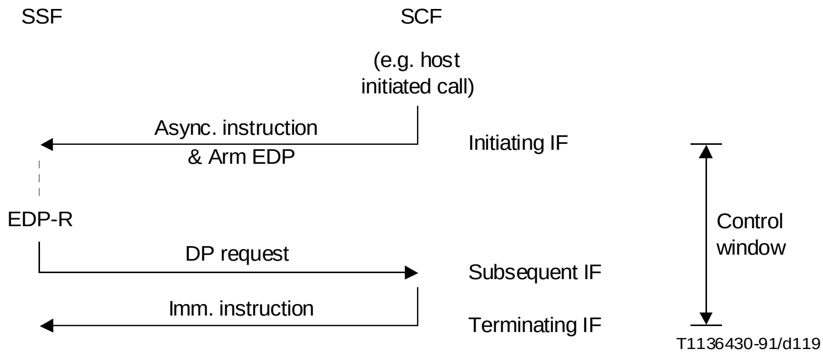


FIGURE A.2/Q.1214 (sheet 5 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 6)

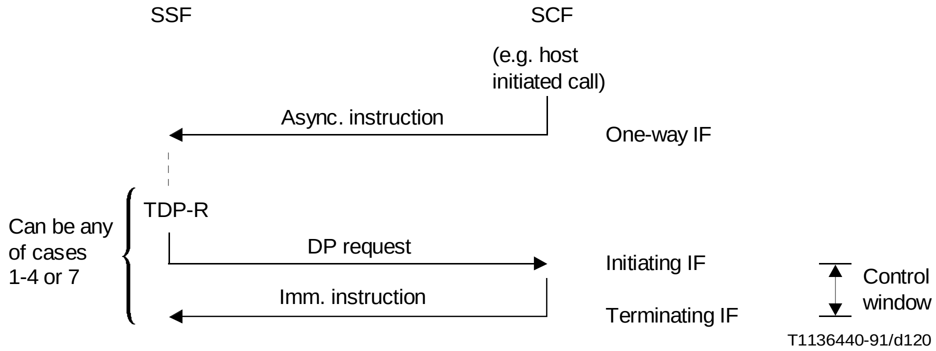


FIGURE A.2/Q.1214 (sheet 6 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 7)

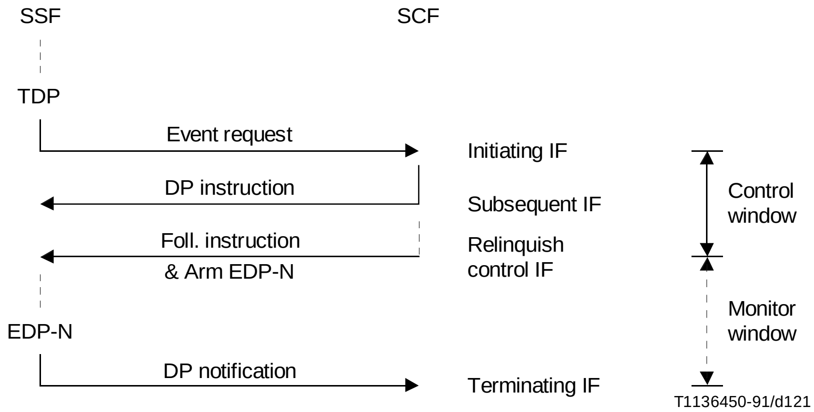


FIGURE A.2/Q.1214 (sheet 7 of 12)

SSF/CCF-SCF relationship scenarios

e) *Abnormal IFs*

An **Error IF** is sent between the SSF and the SCF to report an error with a previously received IF or due to response time-out:

– this can be a subsequent or terminating IF[8].

f) *Abnormal control scenarios*

Abnormal control scenarios are illustrated below using the terms in items a) through c), and e).

[8] This IF is not explicitly identified in the DFP, but is supported by the protocol in the PHP (e.g. TCAP return error or abort), as described in clause 2/Q.1218 for particular operations.

Scenario 1)

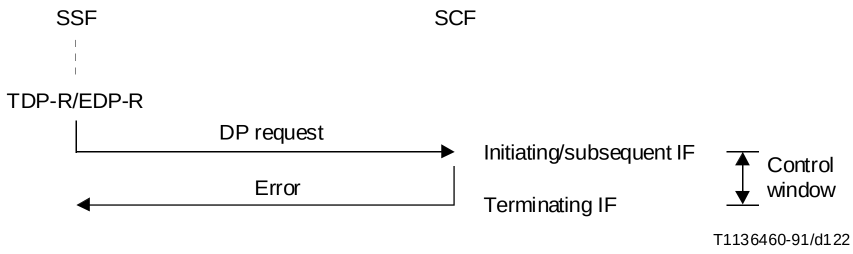


FIGURE A.2/Q.1214 (sheet 8 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 2)

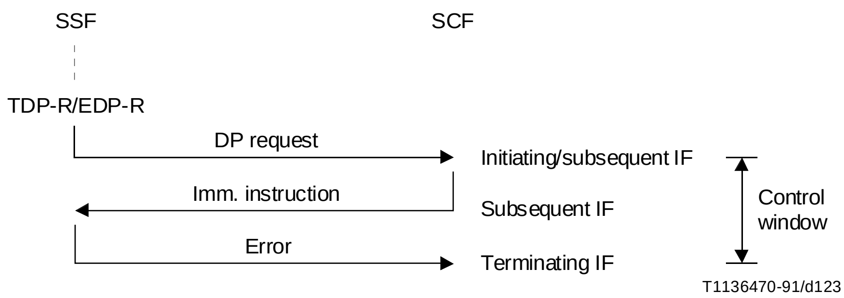


FIGURE A.2/Q.1214 (sheet 9 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 3)

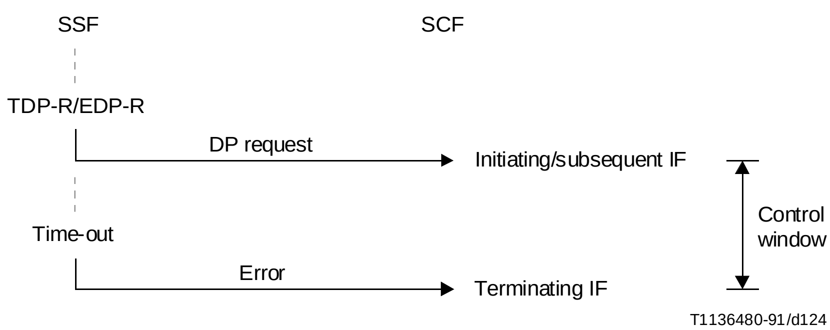


FIGURE A.2/Q.1214 (sheet 10 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 4)

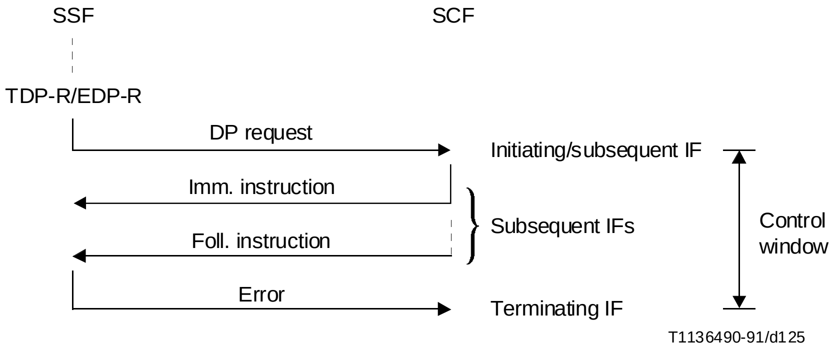


FIGURE A.2/Q.1214 (sheet 11 of 12)

SSF/CCF-SCF relationship scenarios

Scenario 5)

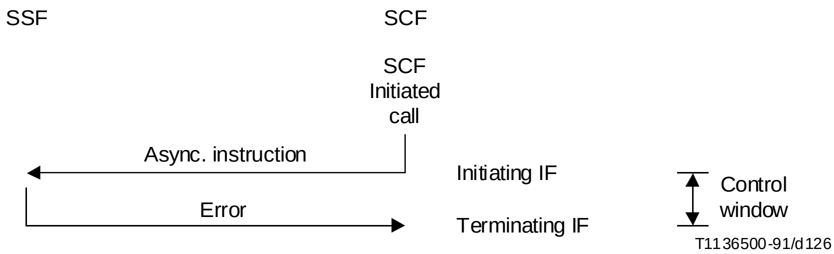


FIGURE A.2/Q.1214 (sheet 12 of 12)

SSF/CCF-SCF relationship scenarios

Annex B

BCSM SDL diagrams

(This annex forms an integral part of this Recommendation)

The BCSM description in 4.2.2.2 consists of high-level overview diagrams and text. As an aid to understanding of the BCSM, the SDL diagrams contained in Figures B.5 to B.7 combine this diagrammatic and textual information into one diagrammatic view. This material is illustrative and must be read in conjunction with 4.2.2.2. The SDL description of the underlying functional model is shown in the first three pages of the diagrams and is based on Figure 3-1 and 4.2.2.2. The SDL diagram for SSF DP processing is Figure 4-6 and is not contained in this annex.

The SDL diagrams are derived from 4.2.2.2 as follows:

– Detection points are mapped directly into SDL states, as they represent points in call/connection processing where CCF processing is suspended awaiting instructions from the SSF.

– All the inputs following a detection point state are internal inputs from SSF processing or an input from user abandon or disconnection.

– PICs are modelled as SDL transitions, i.e. as a sequence of actions, but where the textual description of PIC actions includes the fact that the PIC must wait for a response from (for example) the terminating half BCSM, that state is explicitly modelled in the SDL. In general, the corresponding Q.71 (1993) or Q.931 (1988) state has been used, though for simplicity several Q.71 or Q.931 states may be modelled as one. The Q.71 and Q.931-based states are not points in call/connection processing where IN service logic can be invoked.

– The inputs following a Q.71 or Q.931-based state can only be events external to SSF logic, e.g. network responses.

– PICs have different processing results, e.g. to a DP on success and to exception handling on failure; this requirement is modelled using SDL decisions.

– The information on allowed resume points and IN transitions from 4.2.2.2.3 is included.

– There is no attempt to provide a full description of indications between the user and the network, as described in 4.2.2.3. Indications are included where they are relevant to the sequence of BCSM processing.

The first stage of development of the SDL diagrams is illustrated in Figures B.1 and B.2. These are expanded BCSM overview diagrams, and correspond to Figures 4-3 and 4-4. In these diagrams the DPs have been separated from the PICs to demonstrate that DPs and PICs are different entities. The Q.71 and Q.931-based states are included and drawn in a different way from DP states to illustrate their different status for IN service logic. The separation of DPs and PICs also allows the lines modelling the sequencing within the diagram to be correctly shown, either as SDL events (shown as exit lines from a DP or Q.71/Q.931 state) or the result of processing actions (shown as exit lines from a PIC).

A further intermediate stage of conversion to SDL is shown in the SDL fragment in Figure B.3. This illustrates the addition of input symbols to show the SDL events allowed in each state, and the use of a decision symbol to model the processing outcomes from a PIC.

Figure B.4 explains the SDL symbols used. Figure B.5 contains the SDL representation of the IN functional model, Figure B.6 contains the process diagram for the originating BCSM and Figure B.7 is the process diagram for the terminating BCSM.

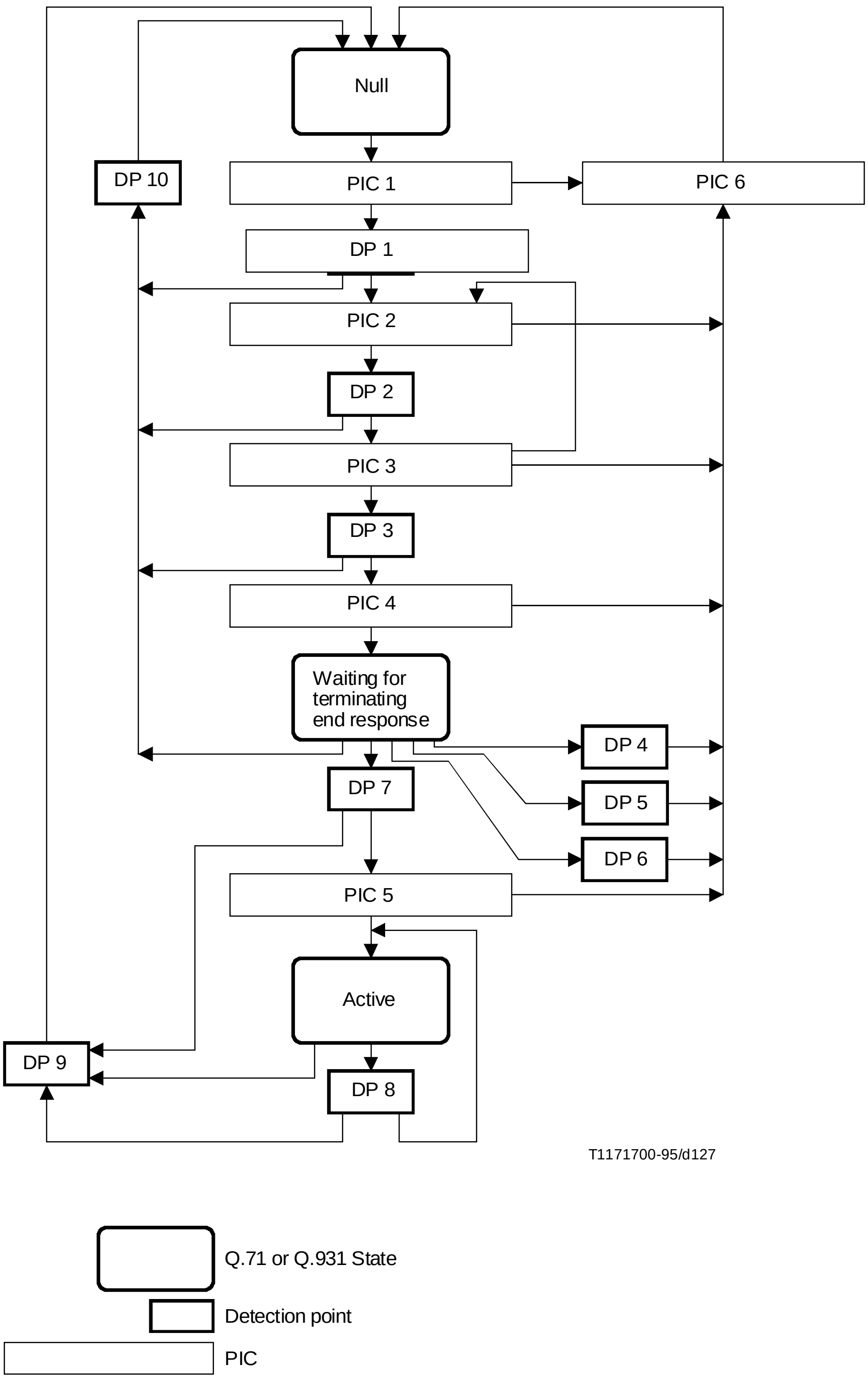


FIGURE B.1/Q.1214

Expanded O_BCSM

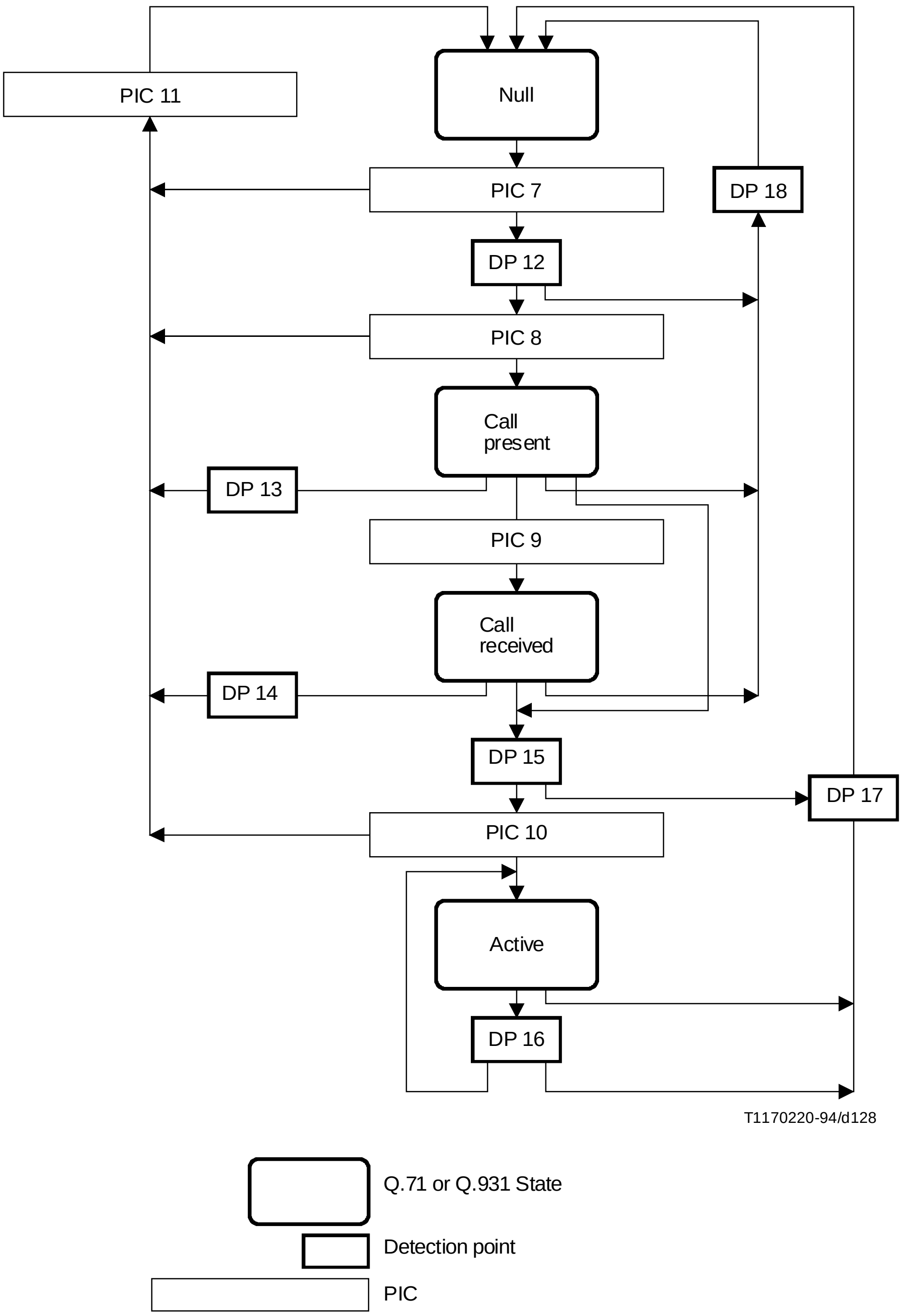


FIGURE B.2/Q.1214

Expanded T_BCSM

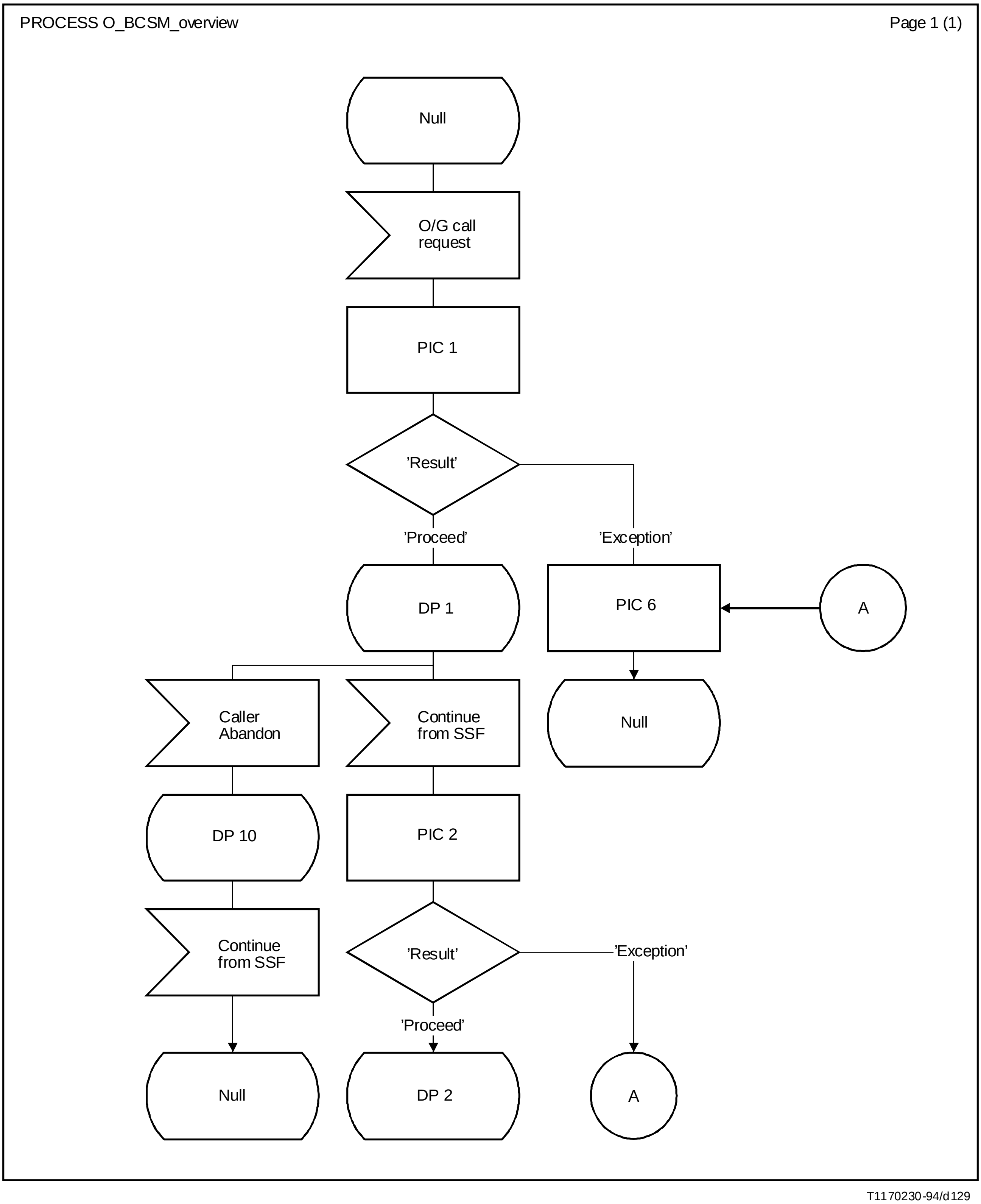


FIGURE B.3/Q.1214

Fragment of high-level SDL for O_BCSM

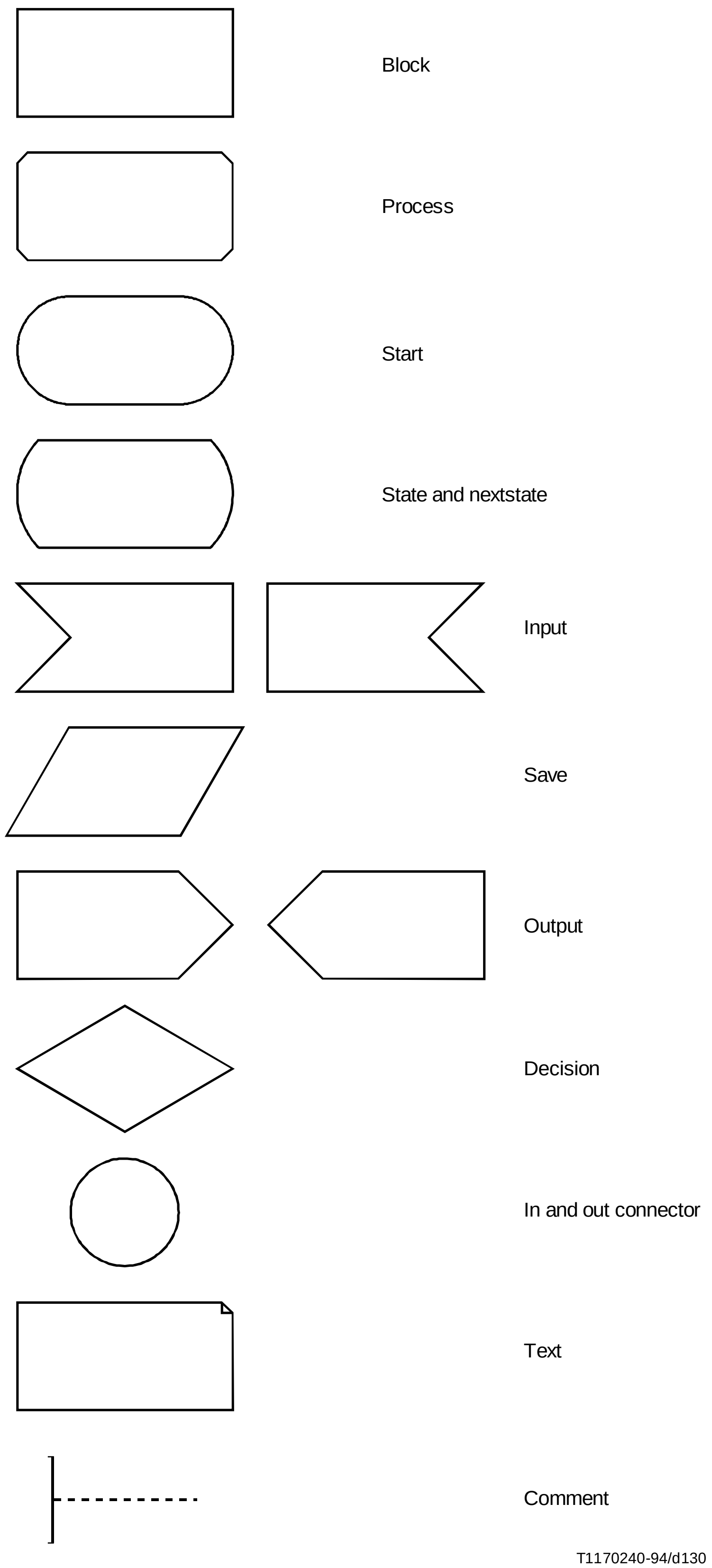


FIGURE B.4/Q.1214

SDL symbol set explanation

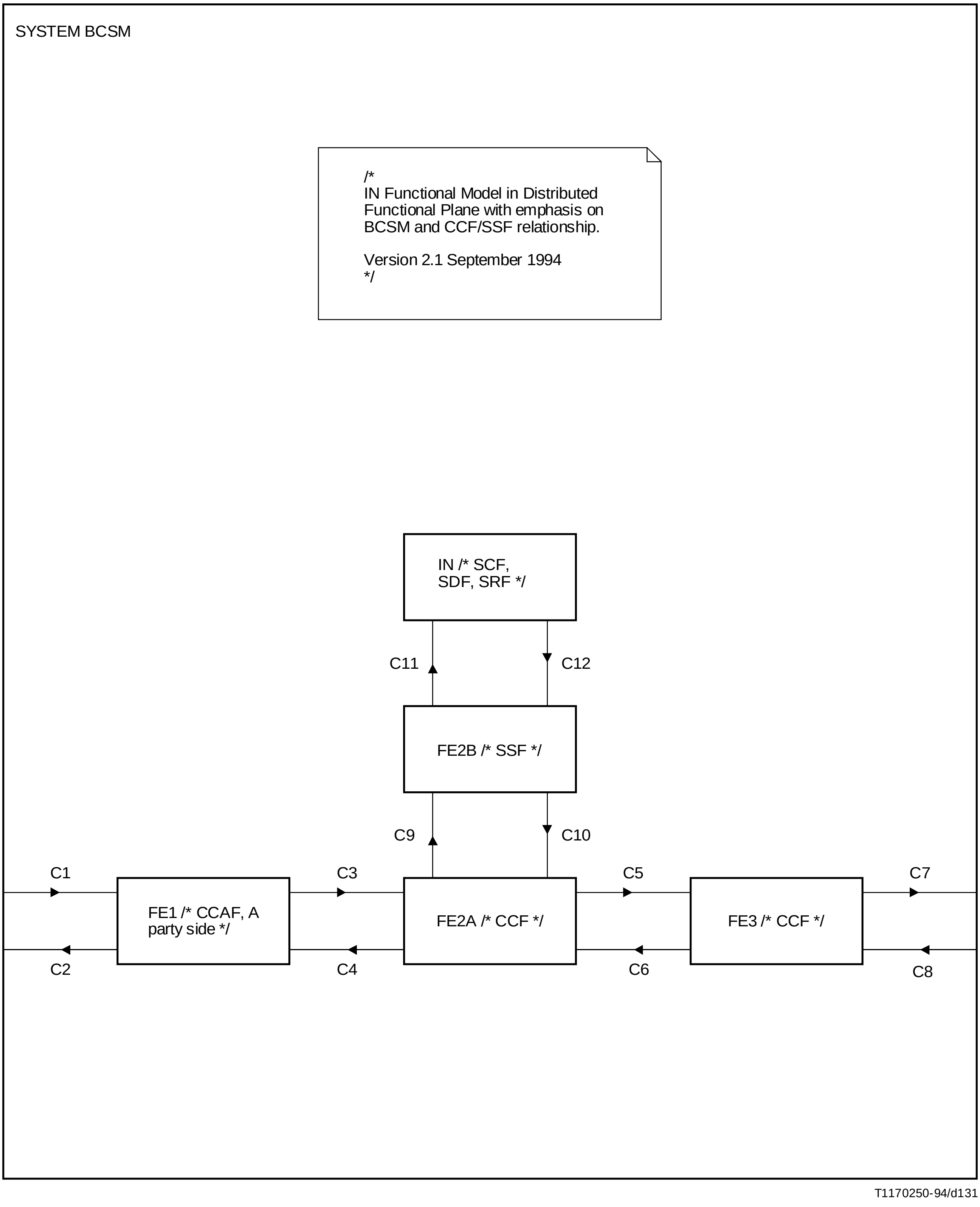


FIGURE B.5/Q.1214 (sheet 1 of 3)

SDL representation of the IN functional model in the Distributed Functional Plane, with emphasis on the BCSM and SSF/CCF relationships

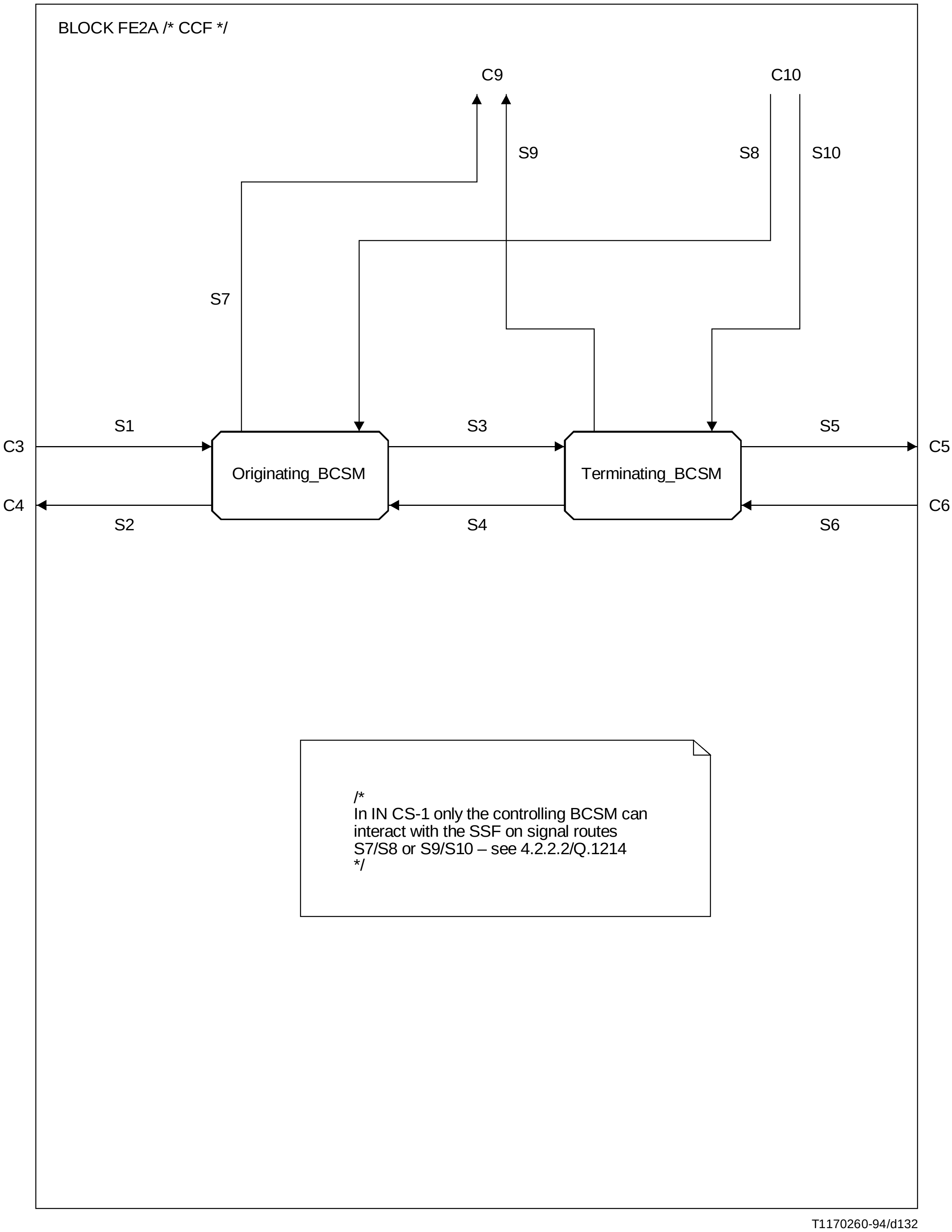


FIGURE B.5/Q.1214 (sheet 2 of 3)

Expansion of CCF block to show originating and terminating BCSMs

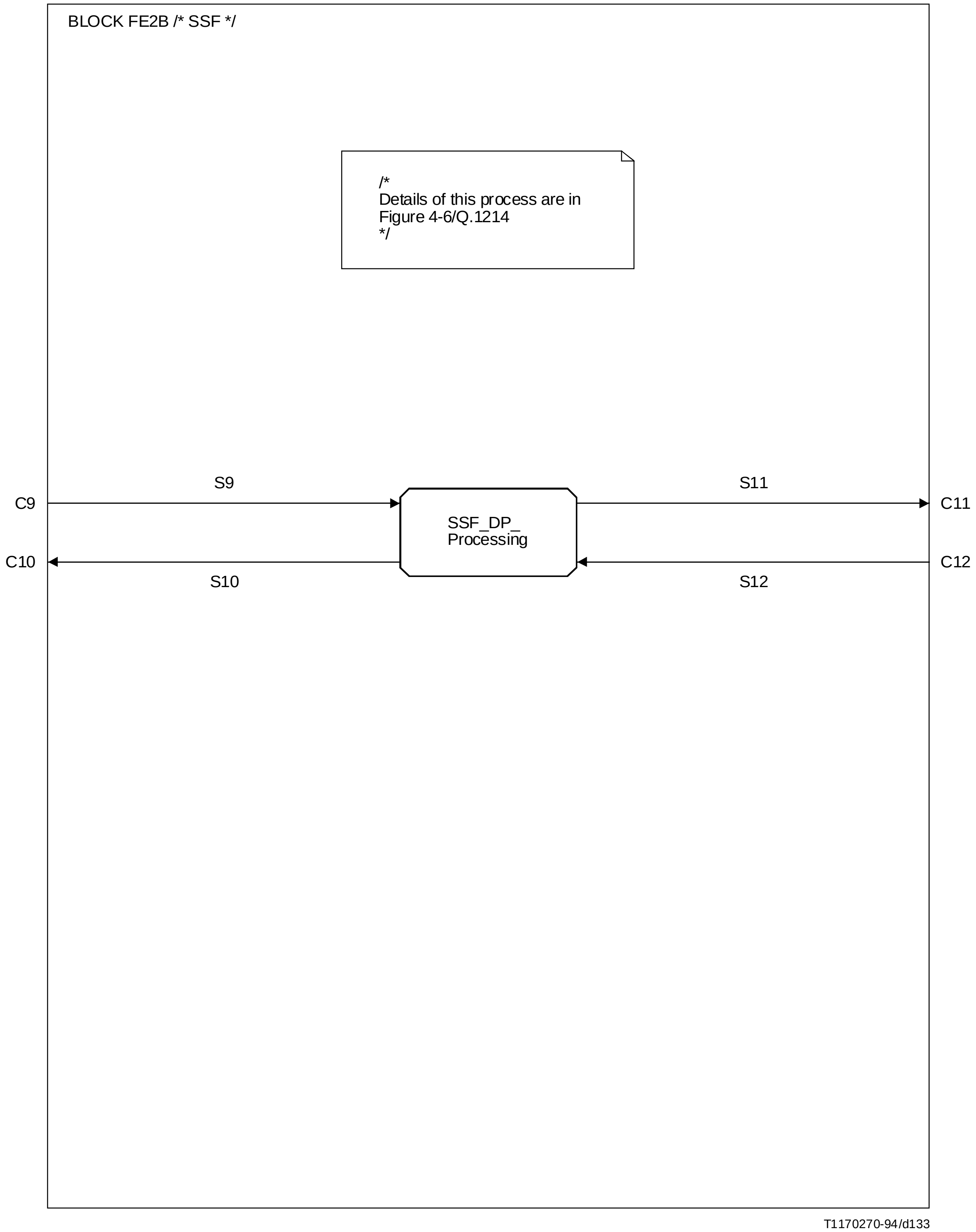


FIGURE B.5/Q.1214 (sheet 3 of 3)

Expansion of SSF block – See Figure 4-6 for details of detection point processing

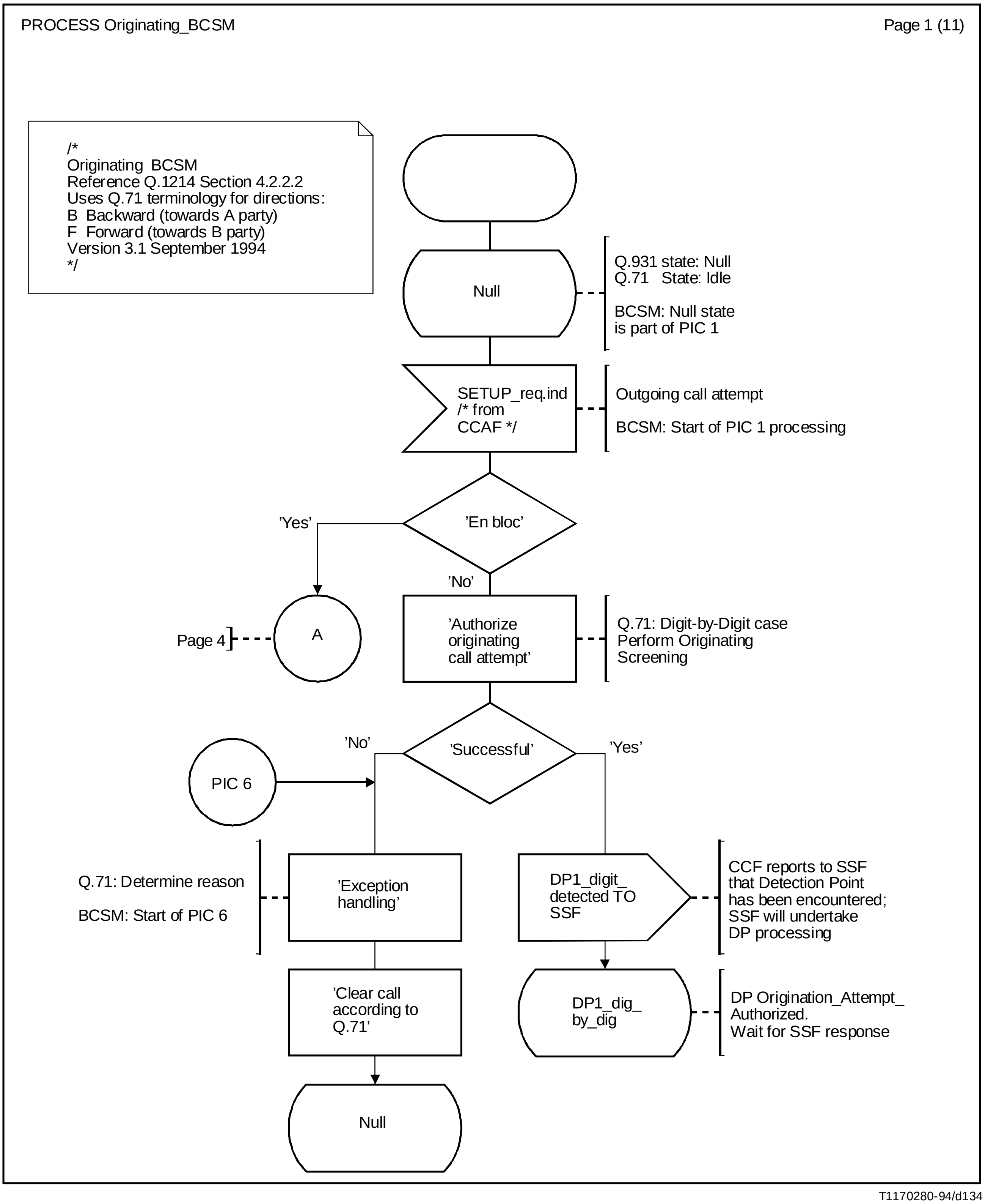


FIGURE B.6/Q.1214 (sheet 1 of 11)

SDL for originating BCSM

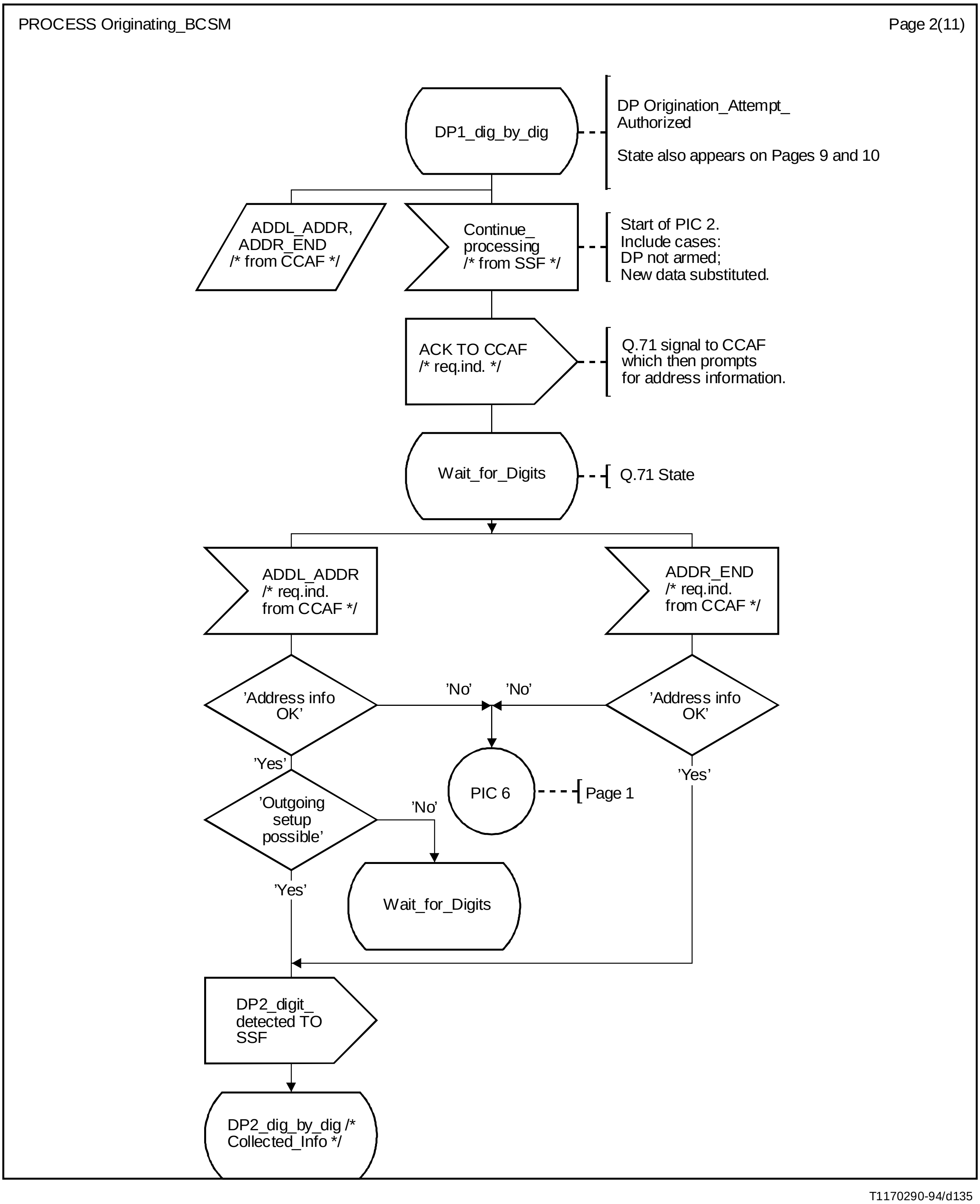


FIGURE B.6/Q.1214 (sheet 2 of 11)

SDL for originating BCSM

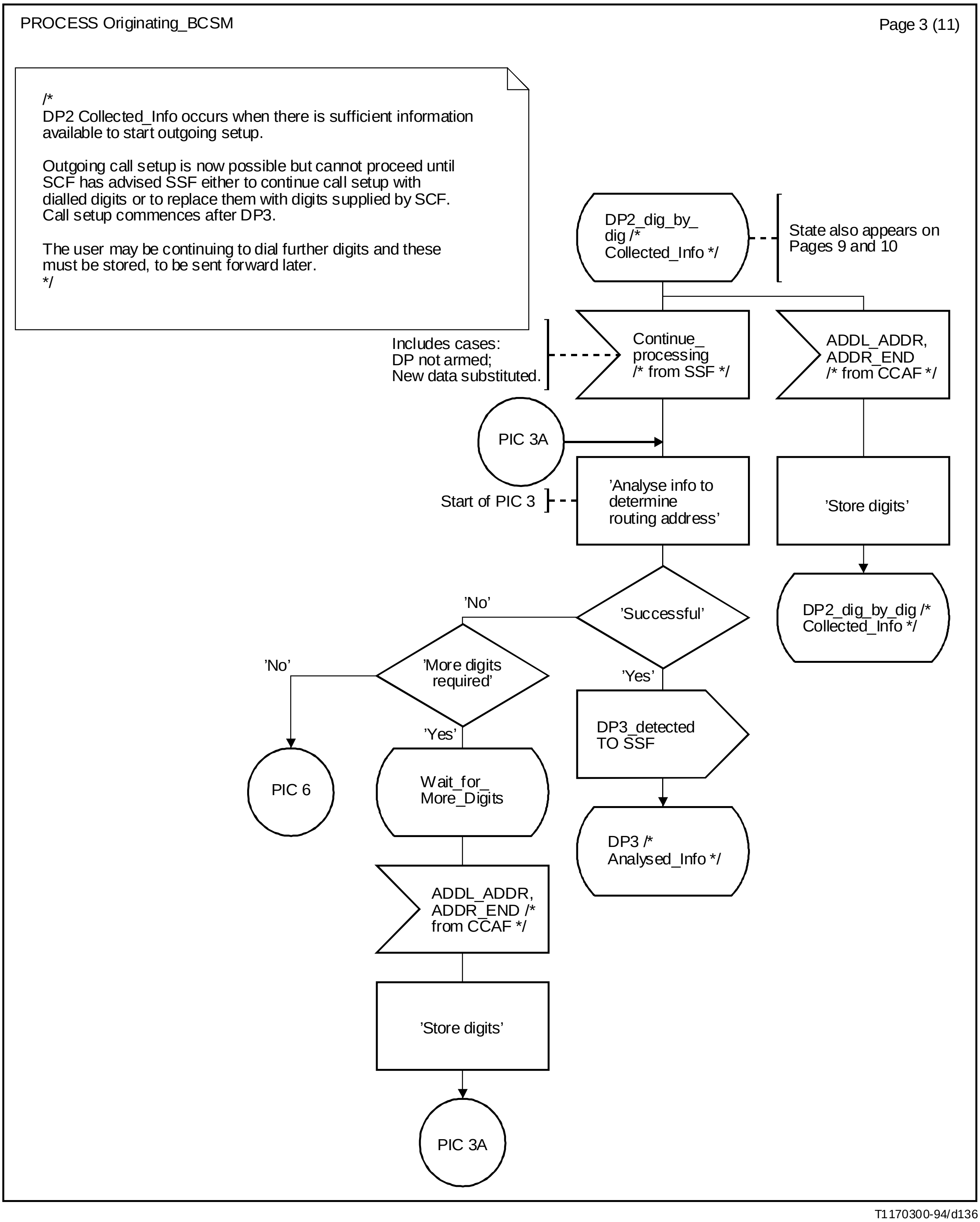


FIGURE B.6/Q.1214 (sheet 3 of 11)

SDL for originating BCSM

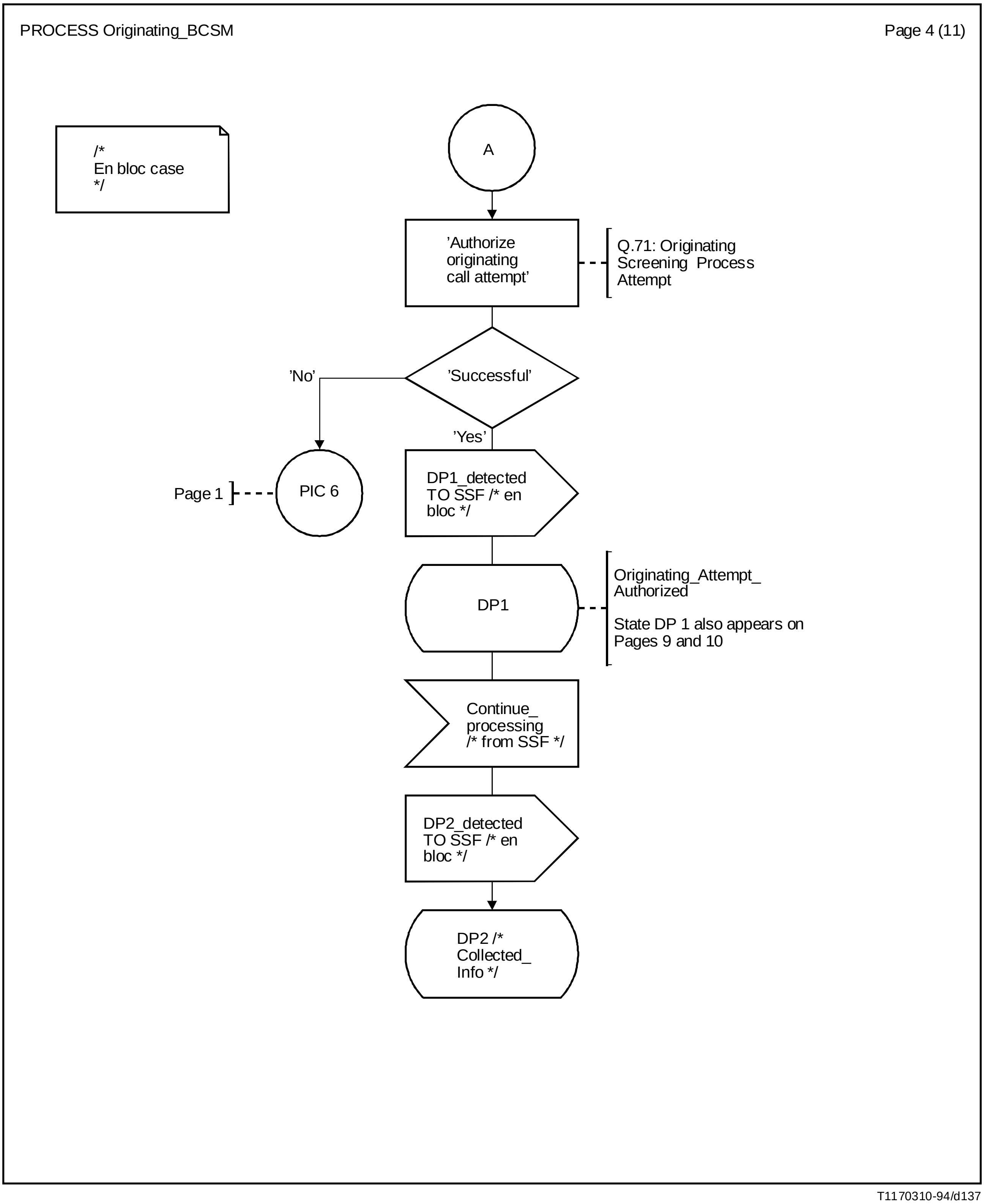


FIGURE B.6/Q.1214 (sheet 4 of 11)

SDL for originating BCSM

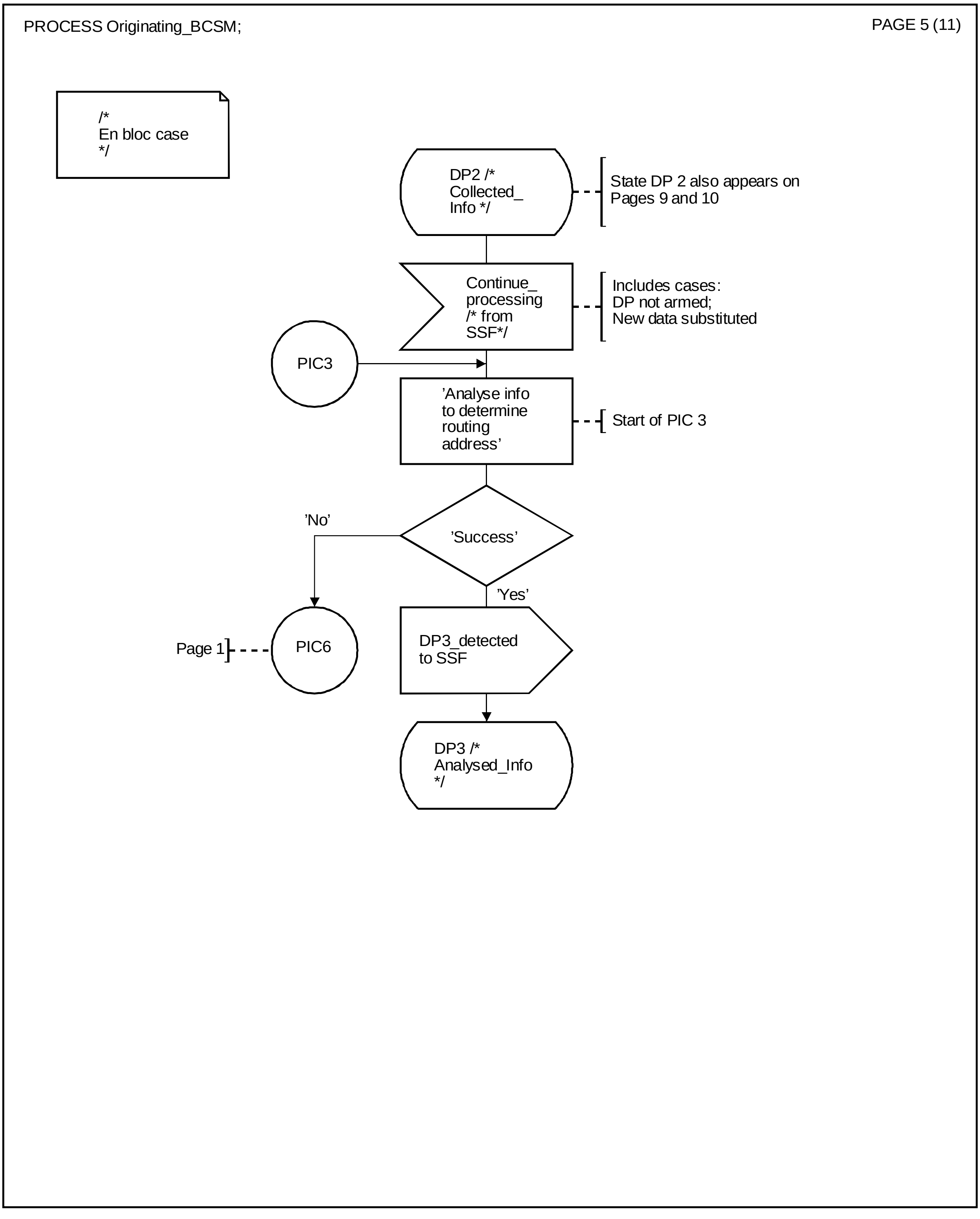


FIGURE B.6/Q.1214 (sheet 5 of 11)

SDL for originating BCSM

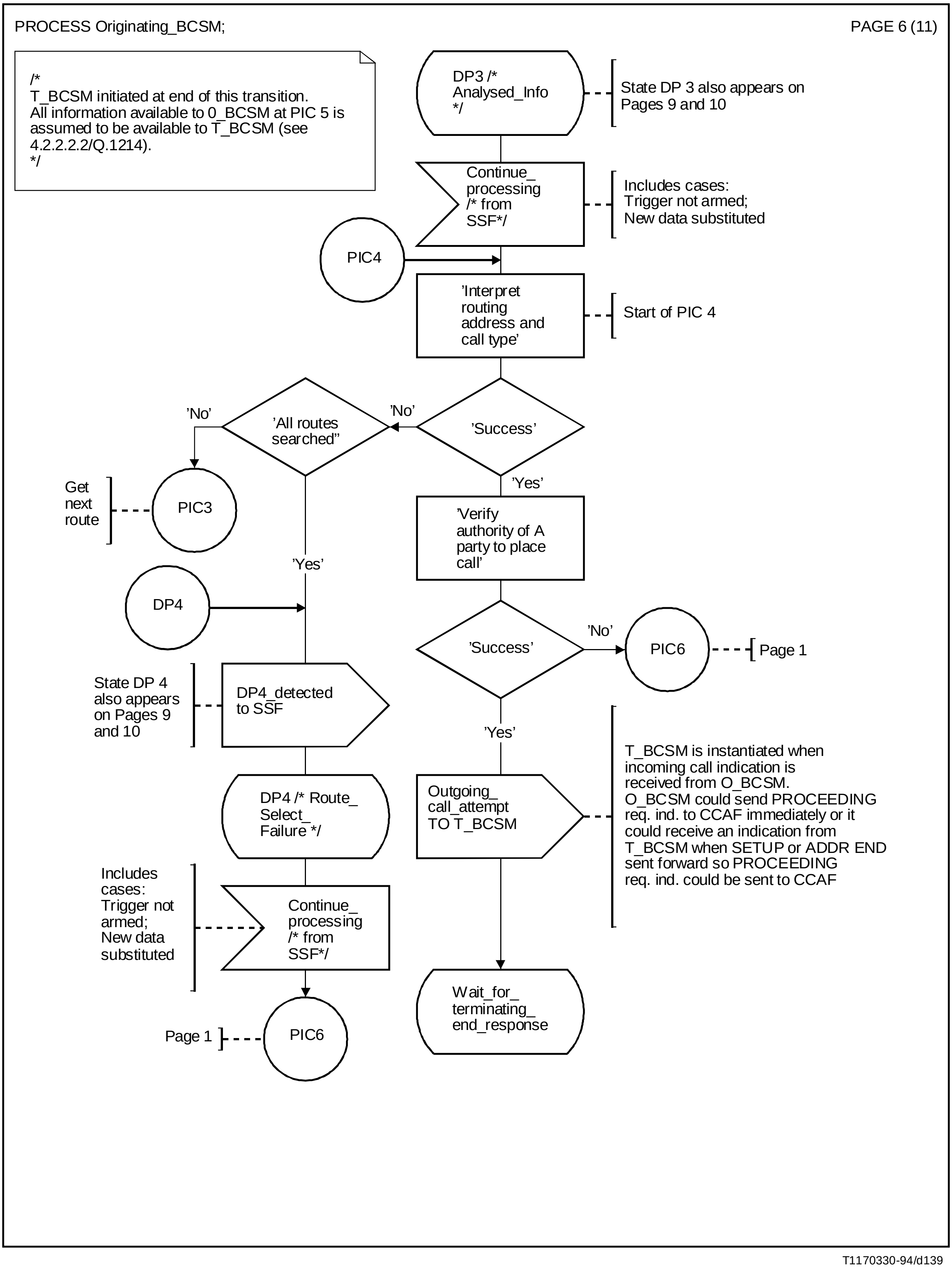


FIGURE B.6/Q.1214 (sheet 6 of 11)

SDL for originating BCSM

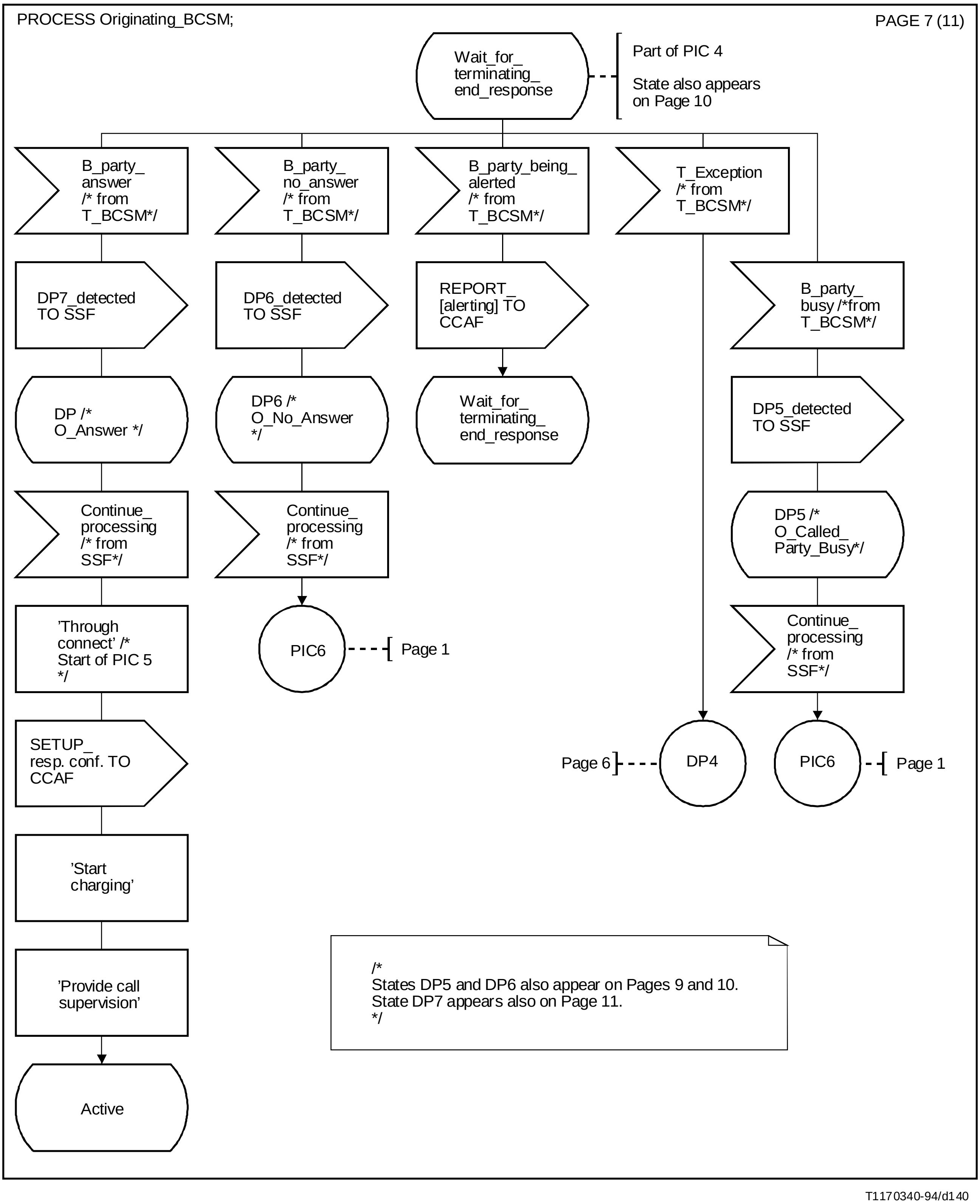


FIGURE B.6/Q.1214 (sheet 7 of 11)

SDL for originating BCSM

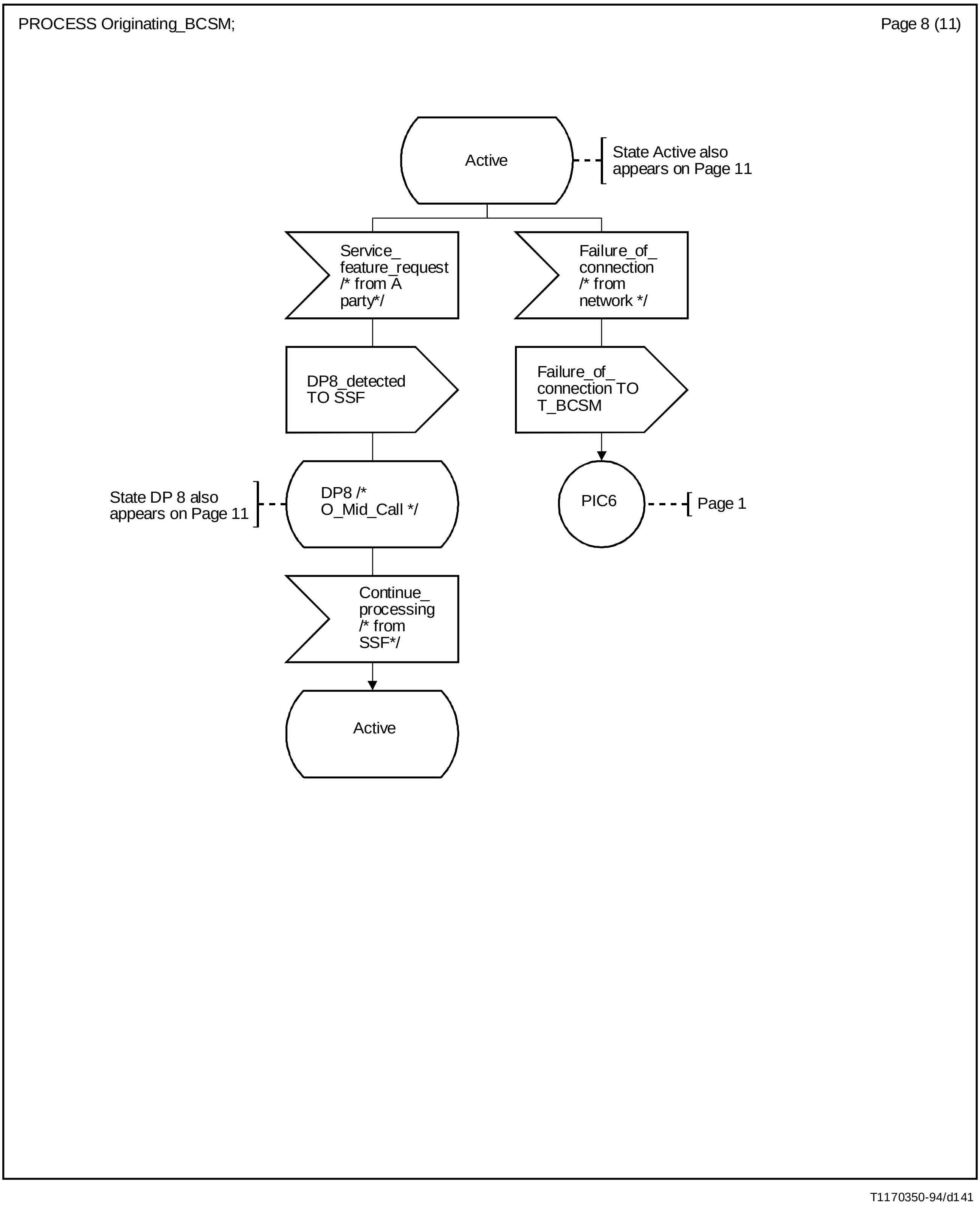
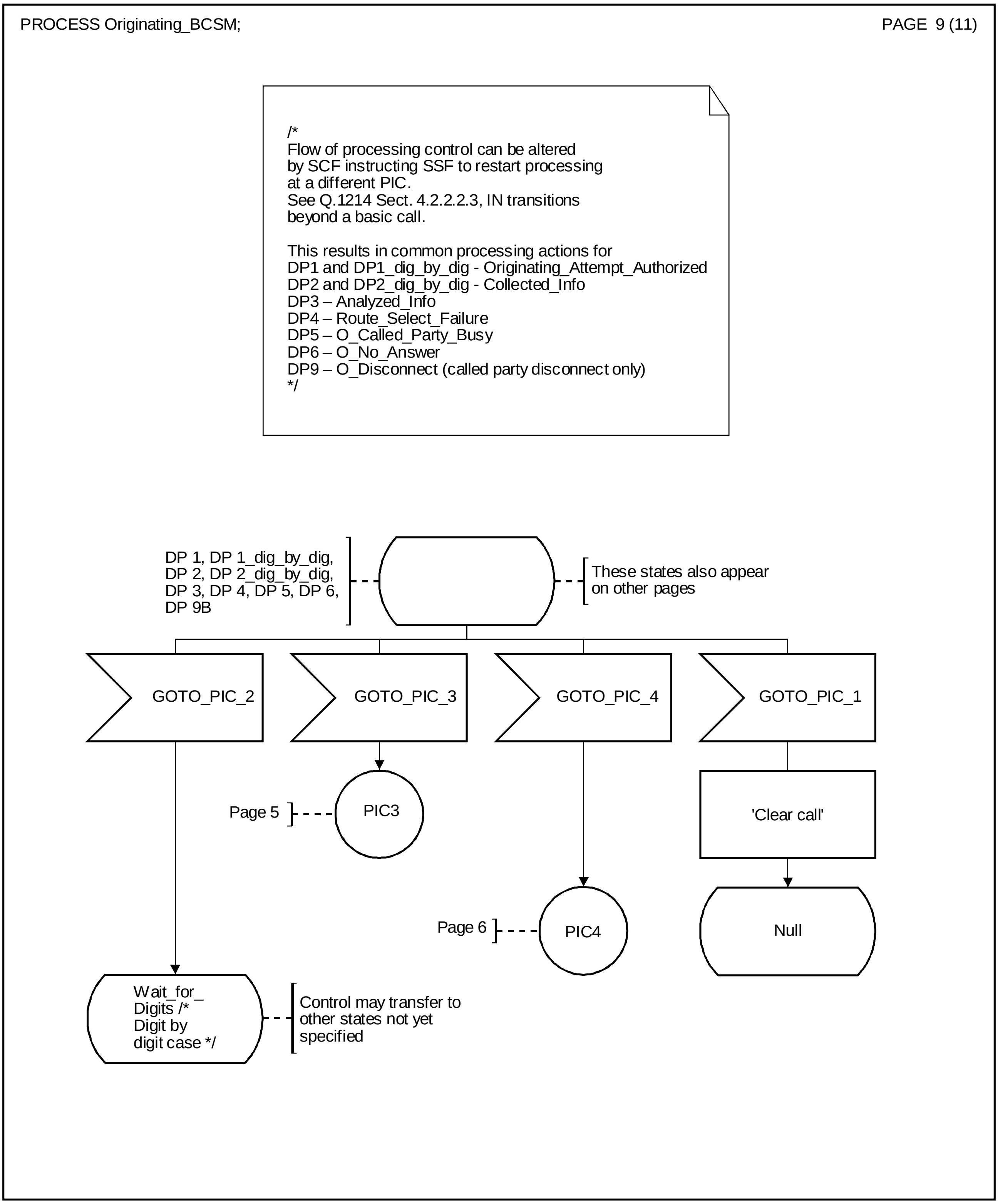


FIGURE B.6/Q.1214 (sheet 8 of 11)

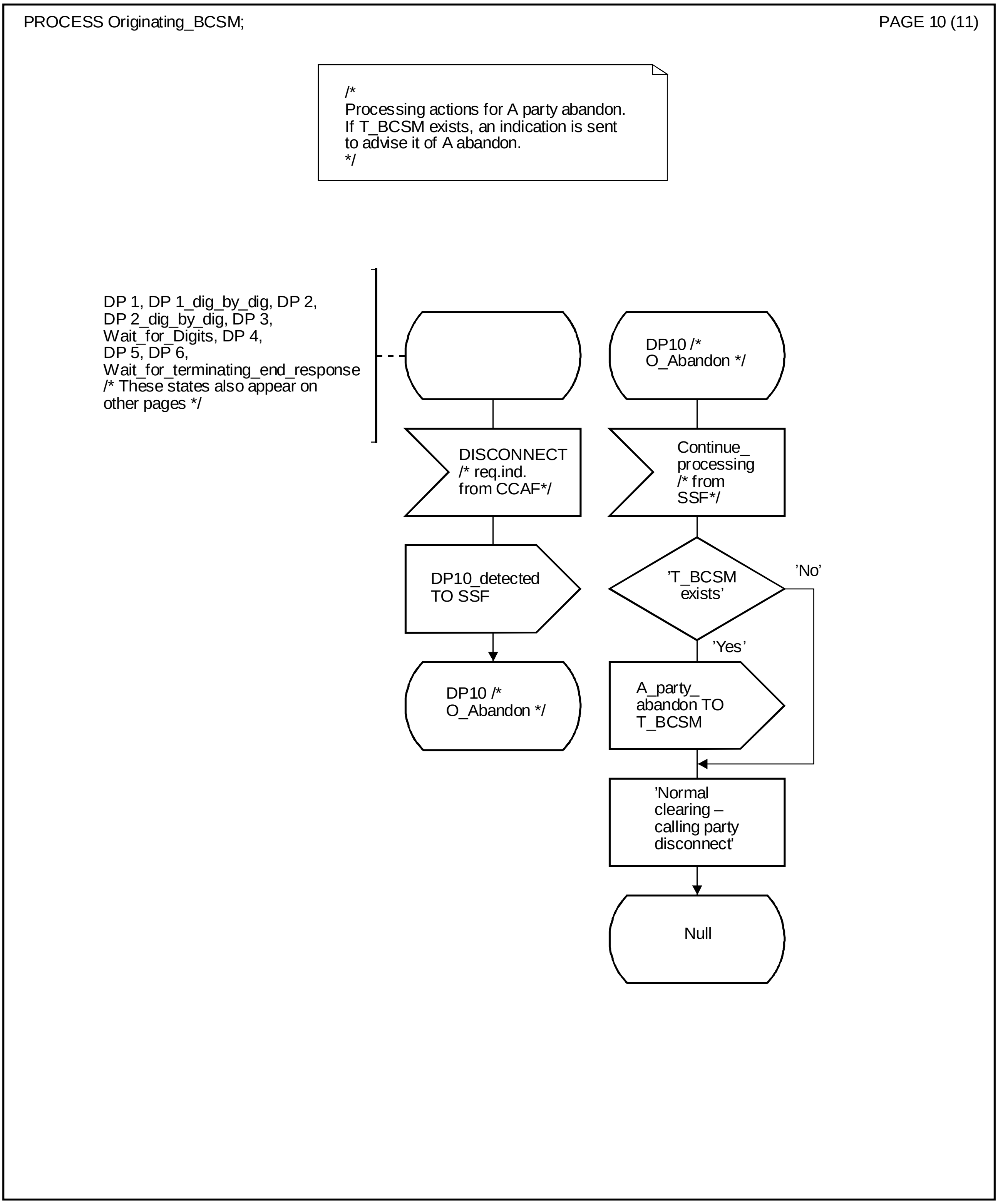
SDL for originating BCSM



T1170360-94/d142

FIGURE B.6/Q.1214 (sheet 9 of 11)

SDL for originating BCSM



T1170370-94/d143

FIGURE B.6/Q.1214 (sheet 10 of 11)

SDL for originating BCSM

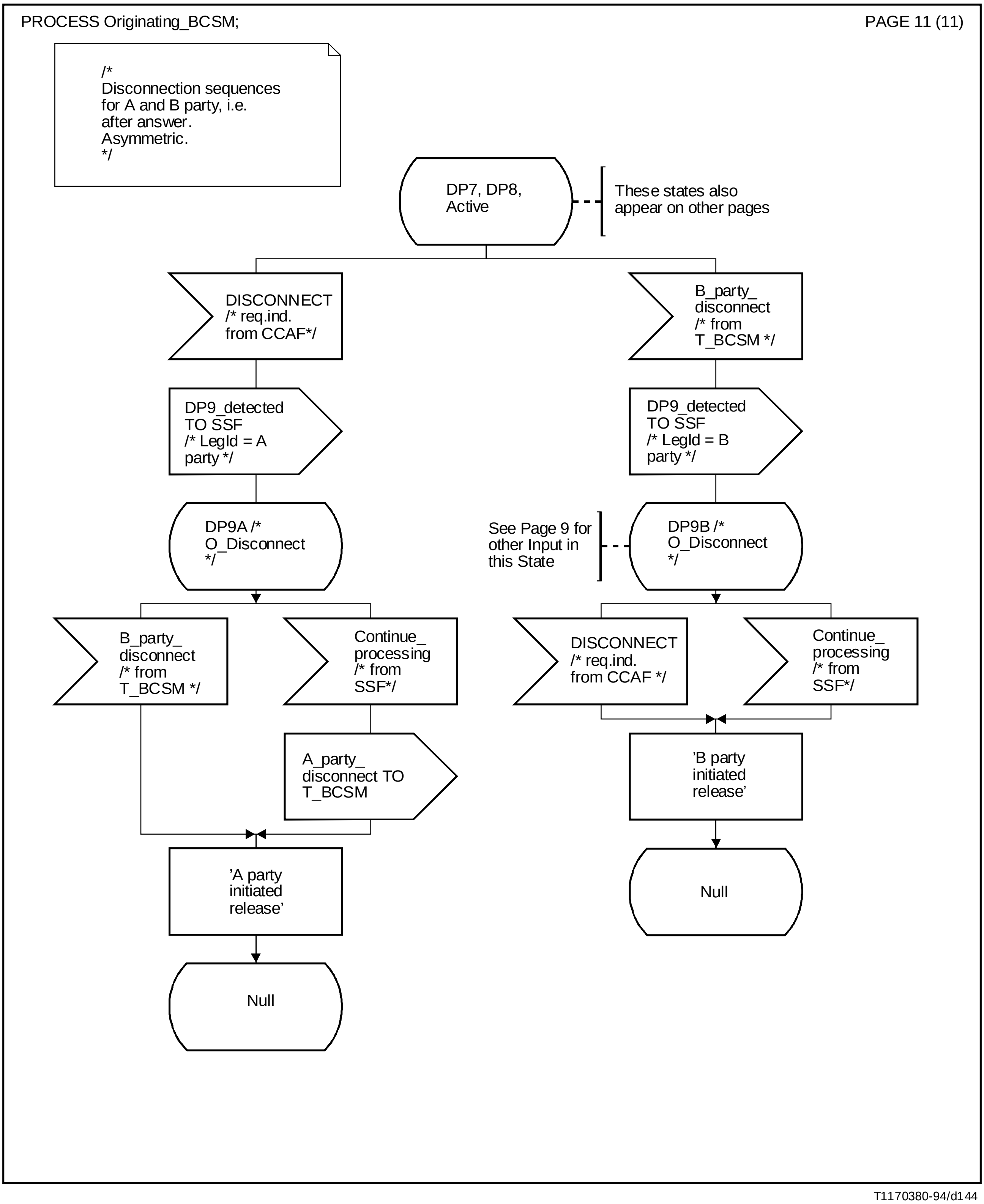


FIGURE B.6/Q.1214 (sheet 11 of 11)

SDL for originating BCSM

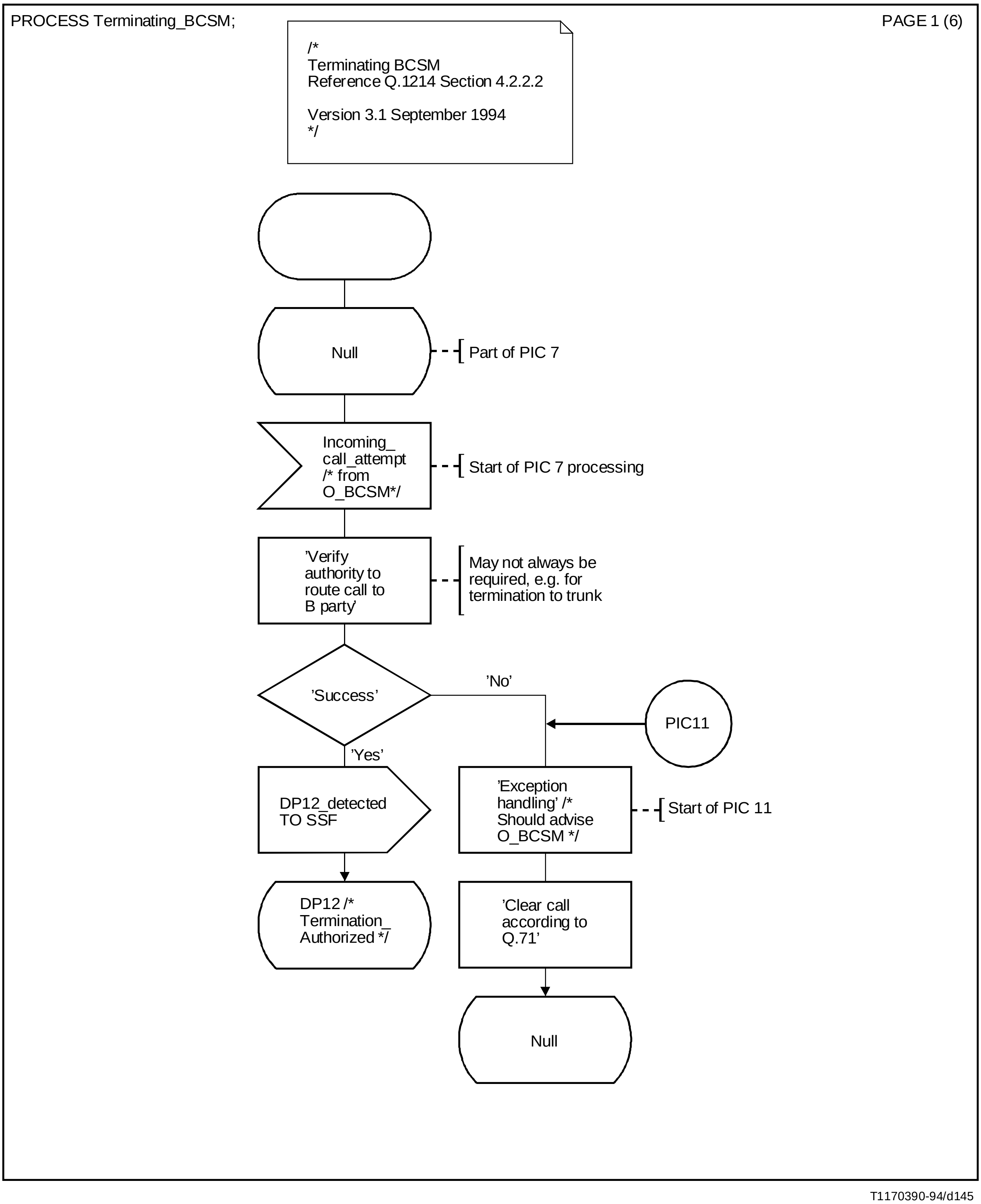
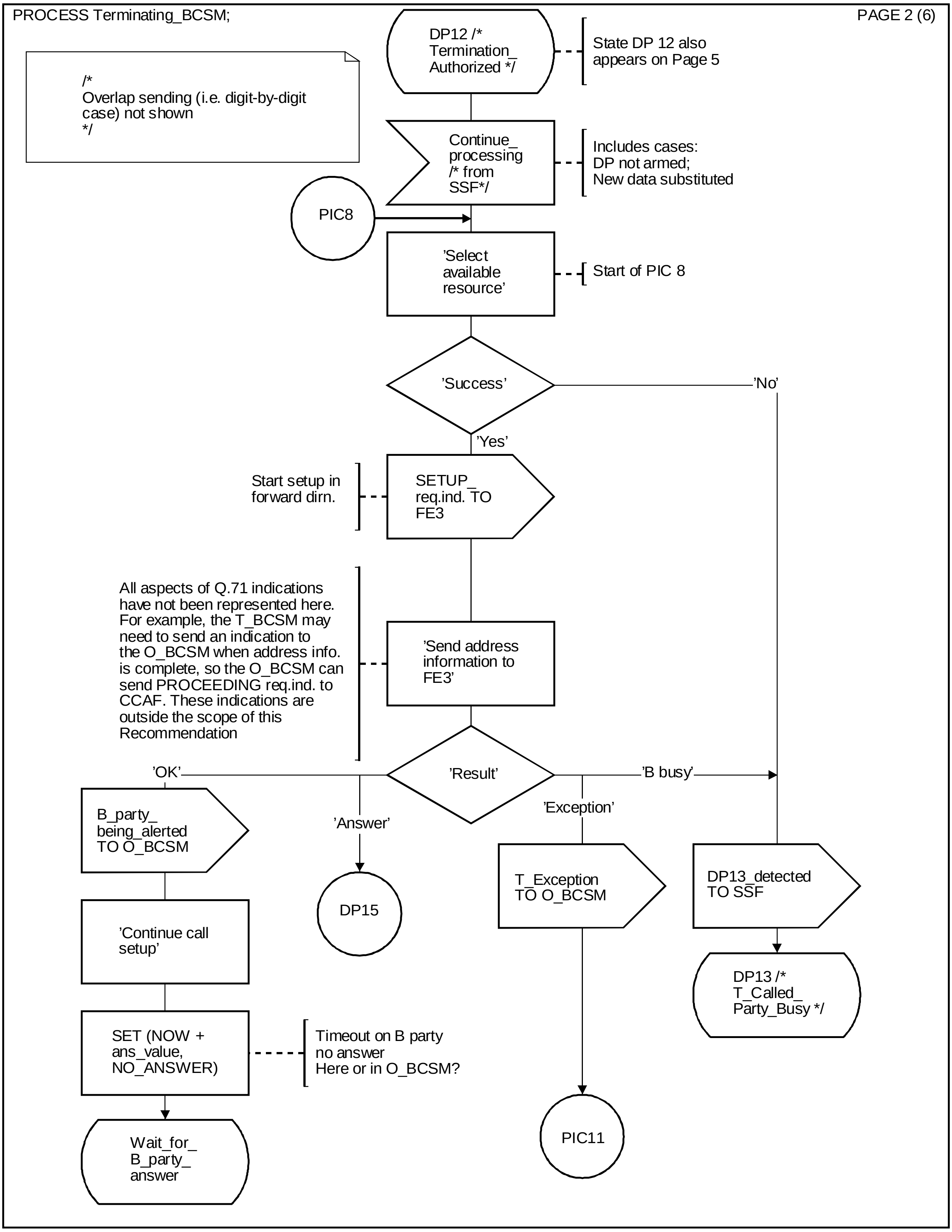


FIGURE B.7/Q.1214 (sheet 1 of 6)

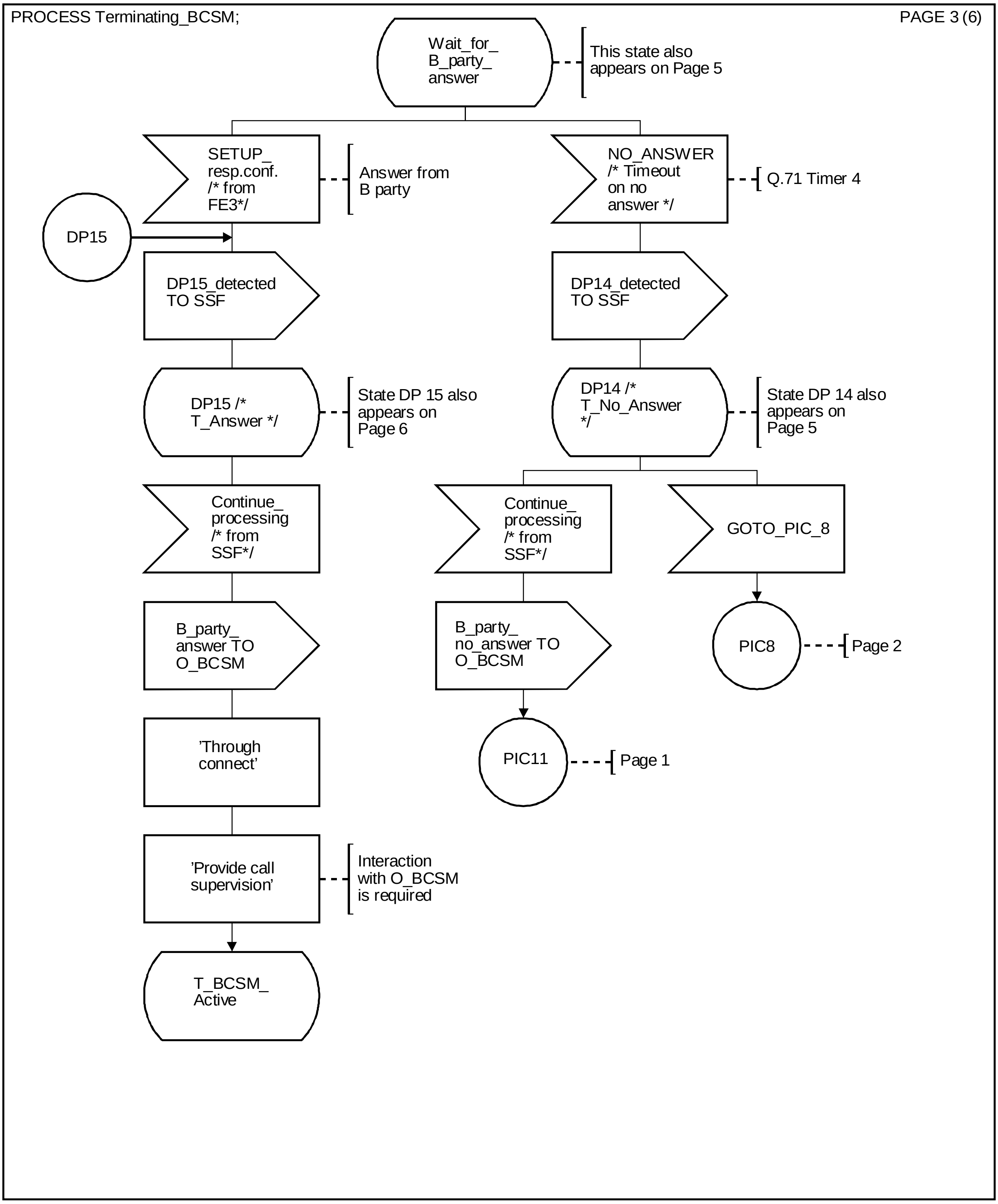
SDL for terminating BCSM



T1170400-94/d146

FIGURE B.7/Q.1214 (sheet 2 of 6)

SDL for terminating BCSM



T1170410-94/d147

FIGURE B.7/Q.1214 (sheet 3 of 6)

SDL for terminating BCSM

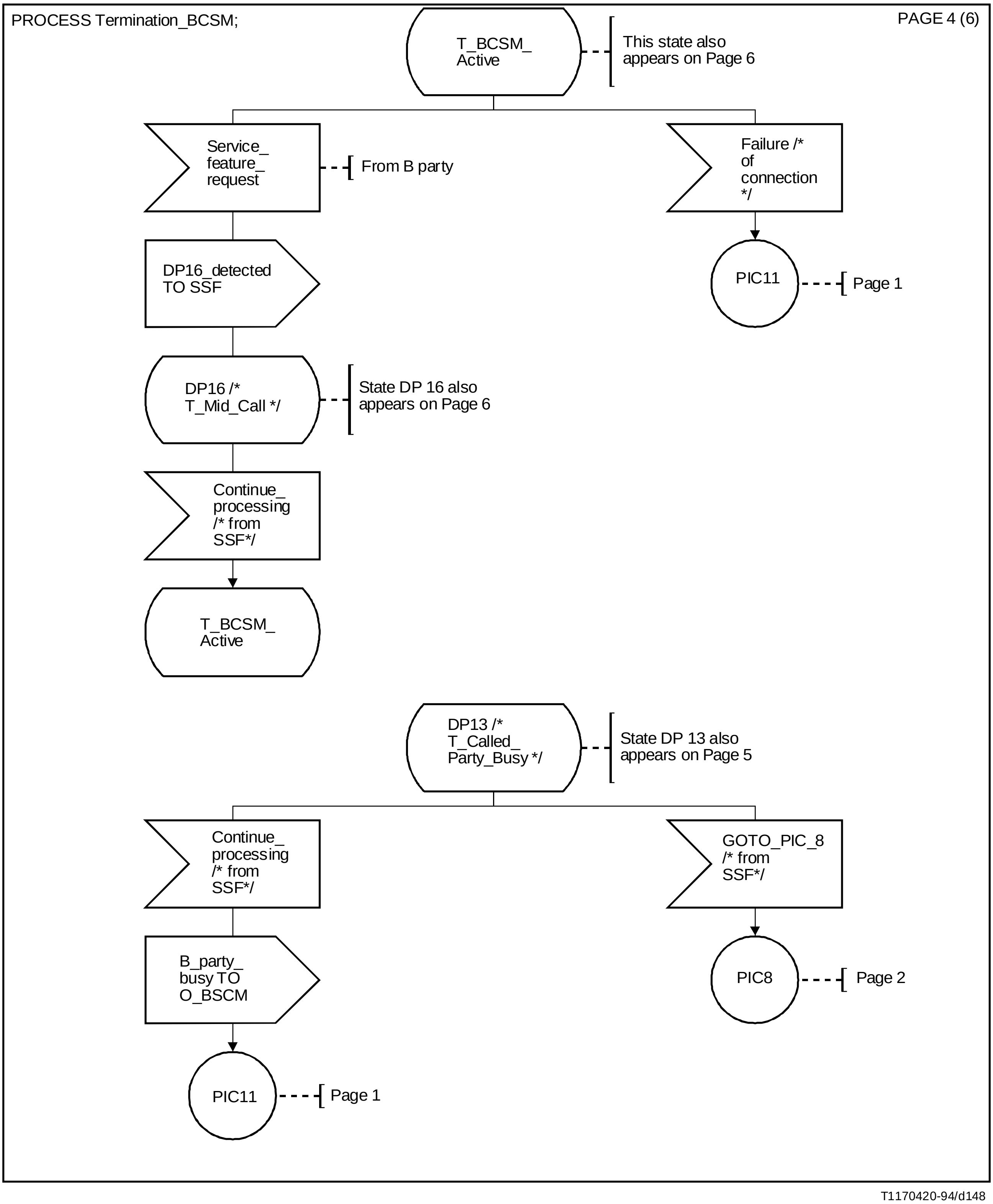
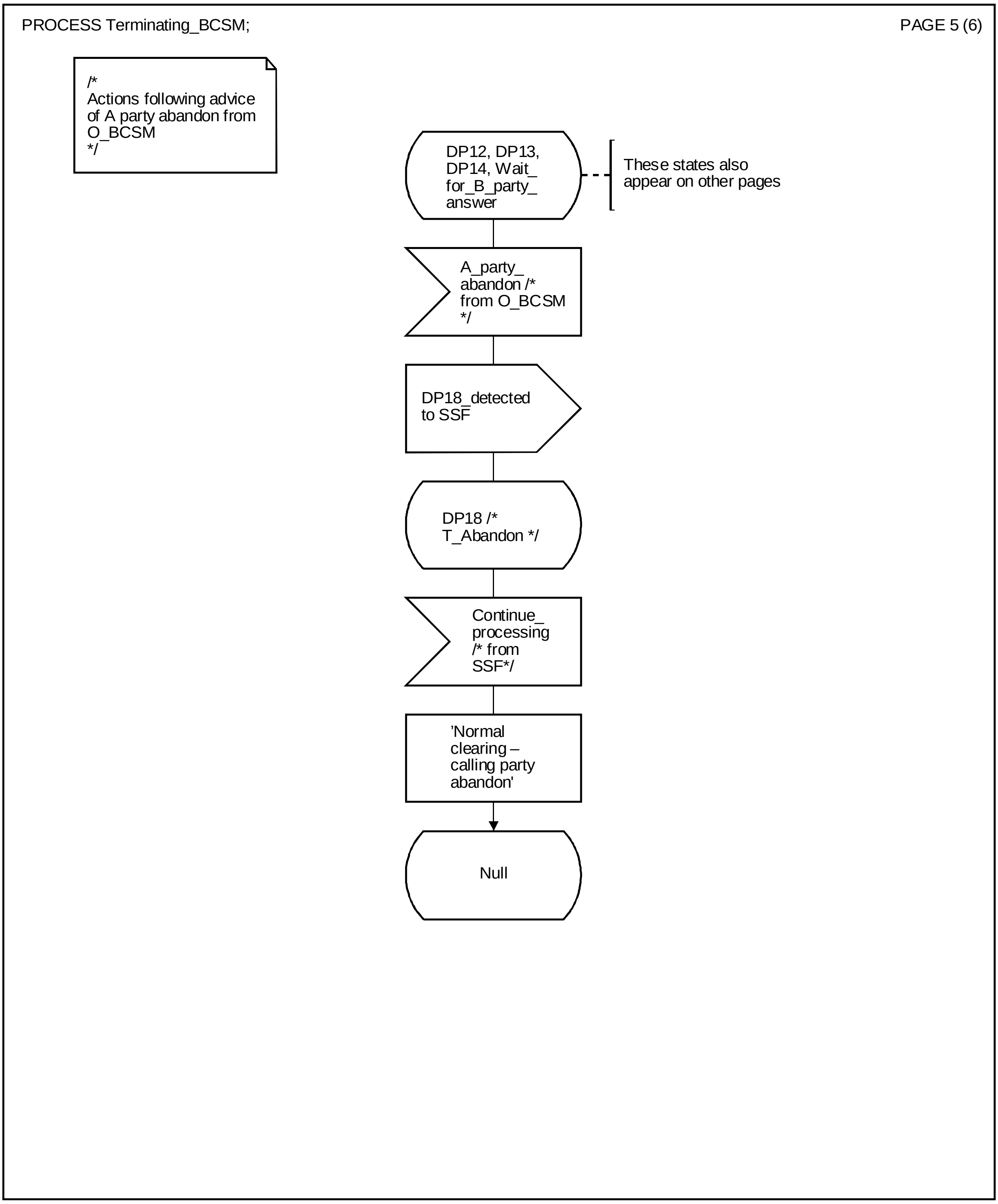


FIGURE B.7/Q.1214 (sheet 4 of 6)

SDL for terminating BCSM



T1170430-94/d149

FIGURE B.7/Q.1214 (sheet 5 of 6)

SDL for terminating BCSM

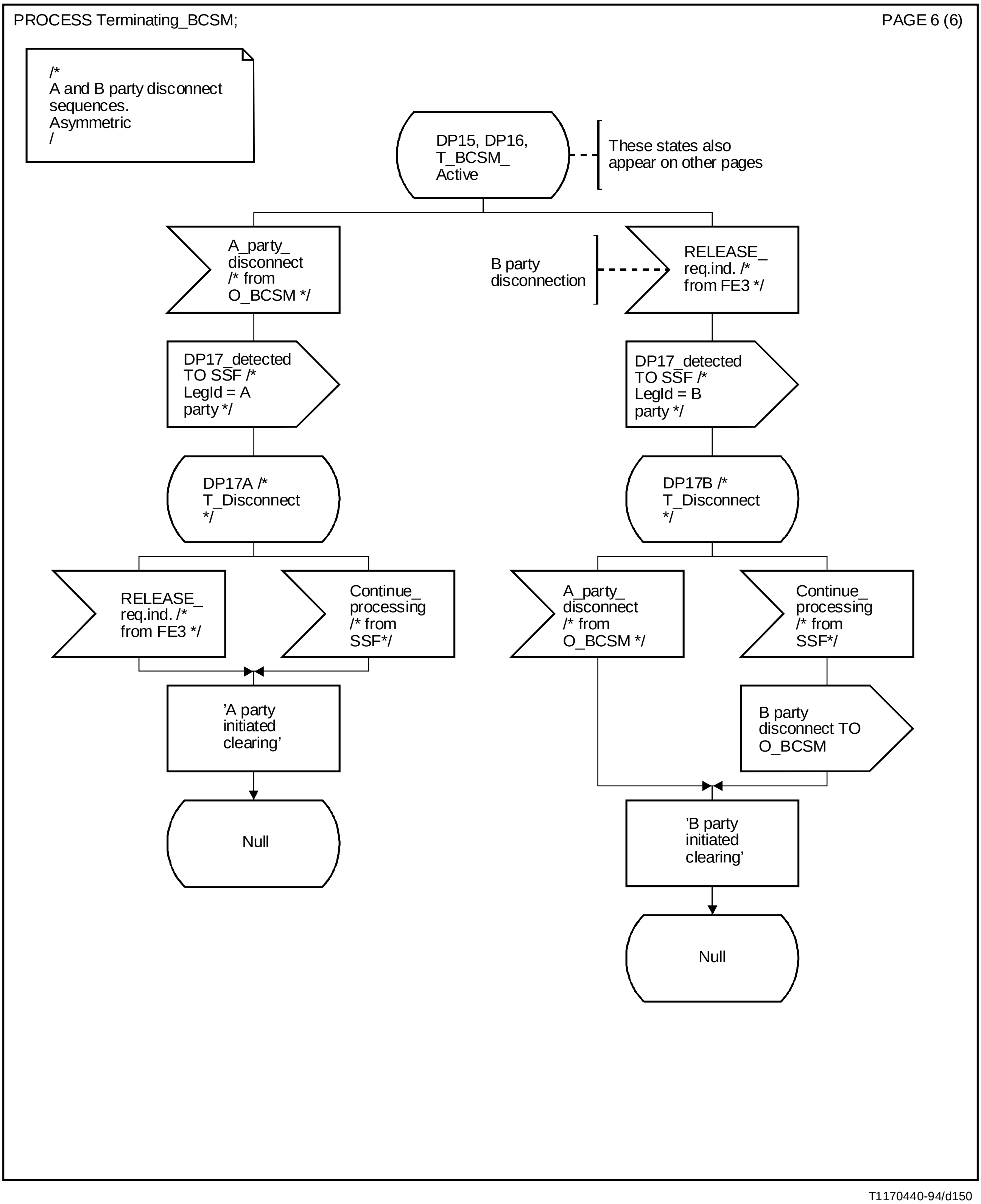


FIGURE B.7/Q.1214 (sheet 6 of 6)

SDL for terminating BCSM

Appendix I

Aspects of the distributed functional plane identified as "for further study" (FFS) relative to IN CS-1

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

I.1 General

I.1.1 General consideration

This appendix includes call party handling and other issues which were considered to be incomplete when developing the Q.1214 distributed functional plane Recommendation for intelligent network IN CS-1. Although the material in this appendix is built upon IN CS-1, the Procedures for these capabilities may be undefined and FFS relative to IN CS-1. The material is included in this appendix to provide some technical basis for future work.

I.1.2 Format of appendix

This introduction provides an explanation of the purpose and scope of the appendix.

Subclause I.2 itemizes the Information Flows.

Subclause I.3 itemizes the Information Elements.

Subclause I.4 is a chart relating the Information Elements (IEs) to Information Flows (IFs) and Points in Call (PIC).

Subclause I.5 includes the SDL Diagrams and Functional Entity Actions for the BCP SIB Stage 2 description.

I.1.3 Relationship to other appendices of the Q.1200-Series Recommendations

This appendix only applies to Q.1214 distributed functional plane for intelligent network IN CS-1. Each of the Q.1200-series Recommendations includes a specific appendix, if needed.

I.2 Information flows (IFs)

The information flows (IFs) listed in this subclause are in addition to the information flows itemized in clause 5.

I.2.1 Consideration applicable to all IFs in this appendix

The following information flows (IFs) or aspects of the IFs are FFS relative to IN CS-1. These IFs rely on IN CS-1 capabilities for which the corresponding Procedures are undefined. Therefore, they are included in this appendix for completeness.

I.2.2 Add party information flow

I.2.2.1 Consideration

Party ID assignment needs to be included.

The difference between this IF and the attach IF needs to be clarified.

I.2.2.2 Description

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to perform the call processing actions to add all call party connections from one call segment to an associated call segment, then clear the first call segment (e.g. to create a conference call). From the perspective of the controlling party, this information flow effectively bridges two associated call segments into a single call segment.

c) *Information elements*

- Originating call ID (O)
- Destination call ID (O)

d) *IE description*

For further study.

e) *Mapping to FE model(s)*

For further study.

I.2.3 Attach information flow

I.2.3.1 Consideration

The difference between this IF and the add party IF needs to be clarified.

I.2.3.2 Description

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow enables the SCF to request the SSF to include a leg in the current relationship instance. The leg is transferred from another relationship instance, from which it was removed using the detach information flow. Notice that detach may also be executed after attach using the same absolute identifier.

c) *Information elements*

- Call ID (M)
- NewLegID (M)
- Correlation identifier (M)

d) *IE description*

As previously described.

e) *Mapping to FE model(s)*

SSF Precondition:

– The leg is in a detached state for this IN-SSM instance.

SSF Postcondition:

– The leg is in an attached state for this IN-SSM instance.

The relation of the attached state to either the pending or unconnected state is for further study.

I.2.4 Change parties information flow

I.2.4.1 Description

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to perform the call processing actions to change a particular party connection from one call segment to an associated call segment. From the perspective of the particular call party, this information flow effectively places the first call segment on hold and retrieves the associated call segment from hold.

c) *Information elements*

- Call ID (O)
- Target call ID (M)
- Leg to be connected (M)

d) *IE description*

Target Call ID specifies the call to be reactivated.

Leg to be connected specifies the party within the reactivated call which is to be connected.

e) *Mapping to FE model(s)*

For further study.

I.2.5 Detach information flow

I.2.5.1 Consideration

The difference between this IF and the release call party IF needs to be clarified.

I.2.5.2 Description

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow enables the SCF to request the SSF to remove a leg from one relationship instance and to assign it an absolute (i.e. single network-wide) identifier (Correlation identifier), so that it can be transferred to another relationship instance, to which the leg was/will be attached by means of the attach information flow using the same absolute identifier.

c) *Information elements*

• Call ID	(M)
• LegIDtobeDetached	(M)
• Correlation Identifier	(M)

d) *IE description*

As previously described.

e) *Mapping to FE model(s)*

SSF Precondition:

– The leg is either in pending or unconnected state.

SSF Postcondition:

– The leg is in a detached state for this IN-SSM instance.

I.2.6 Hold call party connection information flow

I.2.6.1 Description

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to perform the call processing actions to place a particular party connection in a call segment on hold, as indicated by the controlling party or by the SCF.

c) *Information elements*

• Call ID	(O)
• Leg ID	(M)

d) *IE description*

As previously defined with the following additions.

Leg ID specifies the party to be placed on hold.

e) *Mapping to FE model(s)*

For further study.

I.2.7 Initiate call attempt information flow (for case of more than one party)

I.2.7.1 Consideration

This information flow is included in the main body of this Recommendation, for the case of creating a call to one call party. The IF is listed in this appendix for the case of creating a call to more than one party, in the same call, which for IN CS-1 is for further study.

I.2.7.2 Description

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This IF is used to request the SSF to create a new call to one or more call parties using address information provided by the SCF (e.g. predefined conference call)

c) *Information elements*

• Call ID	(M)
• Destination routing address	(O)
• Destination address	(O)
• Alerting pattern	(O)
• Time-out	(O)
• Leg ID created	(O)

d) *IE description*

As previously defined.

The usage of the "Time-out" IE needs clarification.

Leg ID created defaults to "B party", if no value is supplied.

e) *Mapping to FE model(s)*

This information flow applies outside the context of an existing relationship between the SCF and the SSF, or within the context of an existing control relationship for a given two-party or multi-party call segment.

SCF Precondition:

l) A SLPI has been invoked; and

2) The SLPI invokes an Initiate Call Attempt functional routine.

SCF Postcondition:

– SLPI execution may continue.

SSF Precondition:

a) Outside the context of an existing relationship:

- Destination information and optional call setup information is provided by the SCF.

b) Within the context of an existing control relationship:

- Call origination attempt has been initiated; and
- Basic call processing is suspended at a DP; and
- Destination information and optional call setup information is provided by the SCF.

SSF Postcondition:

1) A new originating call segment is initiated; and

2) If within the context of an existing control relationship, the new call segment is associated with an existing call segment; and

3) DP 3-7 or 10, or an exception is encountered.

I.2.8 Reconnect information flow

I.2.8.1 Description

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to perform the call processing actions to retrieve a particular party connection in a call segment from hold, as indicated by the controlling party or by the SCF. The information flow is the inverse of the HoldCallPartyConnection information flow for a single call party connection.

c) *Information elements*

- Call ID (O)
- Held leg ID (M)

d) *IE description*

As previously defined with the following additions.

Held Leg ID specifies the identity of the party which is currently on hold and which is to be reconnected.

e) *Mapping to FE model(s)*

For further study.

I.2.9 Release call party connection information flow

I.2.9.1 Consideration

The difference between this IF and the detach IF needs to be clarified.

I.2.9.2 Description

a) *FE relationship:* SCF to SSF.

b) *Synopsis*

This information flow requests the SSF to perform the call processing actions to release a call party connection from a call segment, or to release all call party connections from the call segment, effectively releasing the call segment.

c) *Information elements*

- Leg to be released (M)
- Call ID (O)
- Release cause (O)

d) *IE description*

As previously defined with the following additions.

Leg to be released specifies the party to be released.

Release cause specifies the reason for the release, and is used by the SSF to apply the appropriate treatment.

e) *Mapping to FE model(s)*

For further study.

I.3 Information elements (IEs)

The information elements (IEs) listed in this subclause are additional IEs for the information flows itemized in clause 5.

I.3.1 Considerations applicable to all IEs in this appendix

The following information elements (IEs) are FFS relative to IN CS-1. These IEs rely on IN CS-1 capabilities for which the corresponding Procedures are undefined. Therefore, they are included in this appendix for completeness.

I.3.2 Leg ID created IE (from Analyse Information IF)

I.3.2.1 Description

Leg ID created (O)

Leg ID created. The default value identifies the "B-party".

I.3.3 Leg ID created IE (from Connect IF)

I.3.3.1 Description

Leg ID created (O)

Leg ID created defaults to the "B-party", if no value is supplied.

I.3.4 Leg ID created IE (from initiate call attempt IF)

I.3.4.1 Description

Leg ID created (O)

Leg ID created defaults to the "B-party", if no value is supplied.

I.3.5 Leg ID created IE (from select facility IF)

I.3.5.1 Description

Leg ID created (O)

As previously defined.

I.3.6 Leg ID created IE (from select route IF)

I.3.6.1 Description

Leg ID created (O)

As previously defined.

I.3.7 Leg 1 IE (from initial request instruction IF)

I.3.7.1 Description

Leg 1 (O)

Leg 1 refers to the calling party. This is an operator optional IE. It is used when there is a need to address the individual parties in a call. This IE has two sub-elements:

- Leg ID;
- Leg status (connected ...).

When the Leg 1 IE is not present, a default value of "A party" and "Pending" is assumed for Leg ID and LegStatus.

I.3.8 Leg 2 IE (from initial request instruction IF)

I.3.8.1 Description

Leg 2 (O)

Leg 2 refers to the called party. This is an operator optional IE. It is used when there is a need to address the individual parties in a call. This IE has two sub-elements:

- Leg ID;
- Leg status (connected ...).

Leg 2 is network operator optional and can only be sent if the T_MidCall or O_Midcall_DP is encountered.

I.4 Chart – IFs, IEs

See Table I.1.

TABLEAU I.1/Q.1214

Eléments d'information	Adjonction de correspondant	Attachement	Changement de correspondant	Détachement	Maintien d'une connexion de correspondant	Reconnexion	Liberation de correspondant	Tentative d'appel au départ (à plusieurs correspondants)
Identification d'appel au départ	O							
Identification d'appel à l'arrivée	O							
Identification d'appel		M	O	M	O	O	O	M
Identification de nouveau demi-appel		M						
Identification de corrélation		M		M				
Identification d'appel cible			M					
Demi-appel à connecter			M					
Demi-appel à détacher				M				
Identification de demi-appel					M			
Identification de demi-appel en maintien						M		
Demi-appel à libérer							M	
Cause de libération							O	
Informations d'acheminement à destination								O
Adresse de destination								O
Protocole d'alerte								O
Temporisation								O
Identification de demi-appel créée								O
Modules SIB promoteurs	Pour étude complémentaire	Pour étude complémentaire	Pour étude complémentaire	Pour étude complémentaire	Pour étude complémentaire	Pour étude complémentaire	Pour étude complémentaire	BCP

I.5 BCP SIB Stage 2

The SDL diagrams and Functional Entity Actions (FEAs) described in this subclause are additional items for the BCP SIB described in clause 5.

I.5.1 BCP SIB Stage 2 SDL diagrams

I.5.1.1 General consideration

The following SDL diagrams are pertinent to the Basic Call Process (BCP) SIB and are for further study relative to IN CS-1. These diagrams refer to IN CS-1 capabilities for which the corresponding Procedures are undefined. Therefore, they are included in this appendix for completeness.

1.5.1.2 SDL diagrams

These SDL diagrams are intended to accompany the diagrams in 5.3.3, SDL Diagrams for the BCP SIB.

See Figures I.1 to I.4.

I.5.2 BCP SIB Stage 2 Functional Entity Actions (FEAs)

I.5.2.1 General consideration

The following Functional Entity Actions (FEAs) are pertinent to the basic call process SIB and are FFS relative to IN-CS-1. These FEAs refer to IN CS-1 capabilities for which the corresponding Procedures are undefined. Therefore, they are included in this appendix for completeness. See Figure I.5.

I.5.2.2 FEAs

These FEAs are intended to accompany the FEAs in 5.3.4 for the BCP SIB.

Process Hold Call Party Connection req.ind

Reference number 20021.

Process Reconnect req.ind

Reference number 20022.

Process Add Party req.ind

Reference number 20023.

Process Change Parties req.ind

Reference number 20024.

Process Release Call Party Connection req.ind

Reference number 20025.

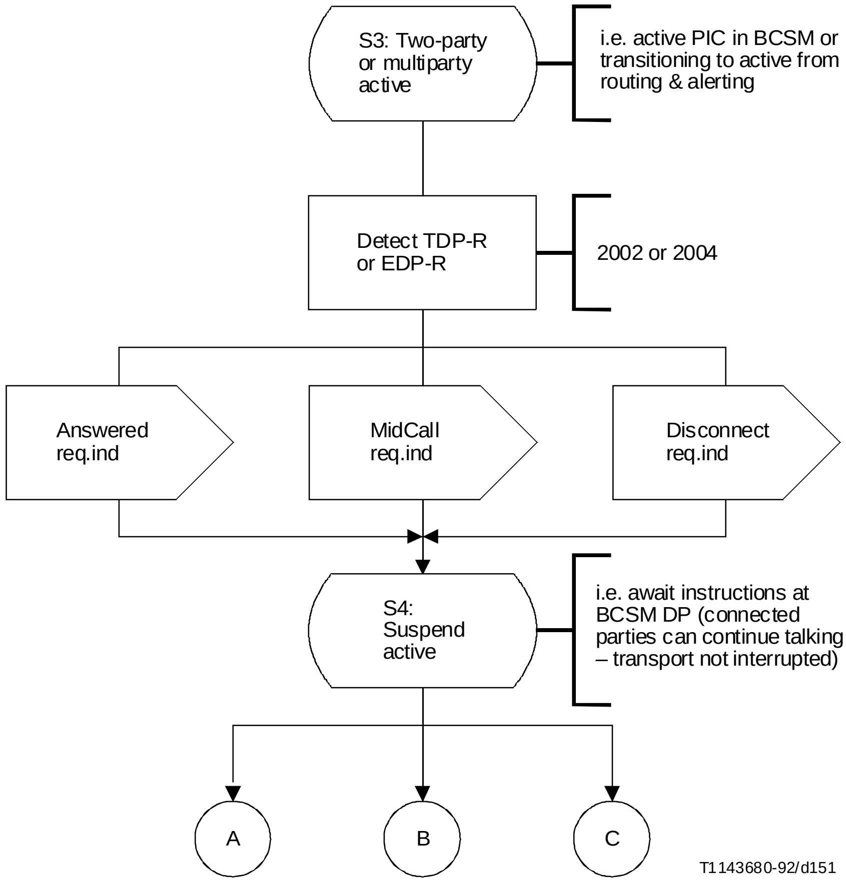


FIGURE I.1/Q.1214

Basic call process SIB (two-party or multiparty active)

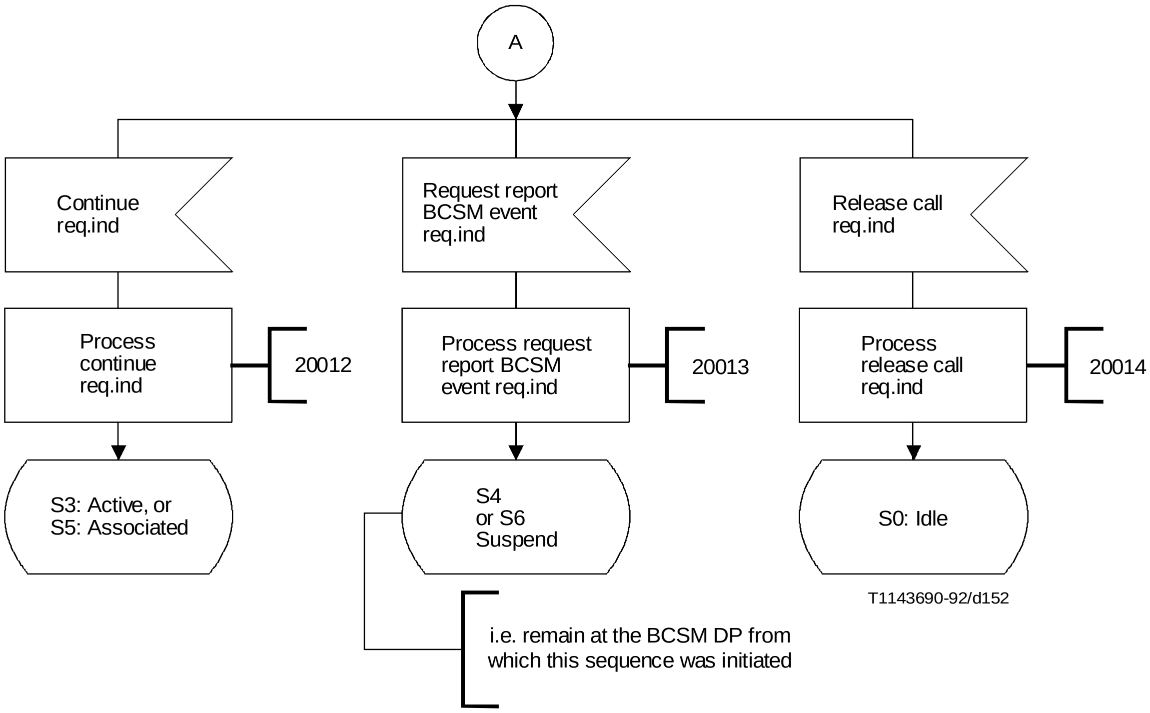


FIGURE I.2/Q.1214

Basic call process SIB
(continuation of active)

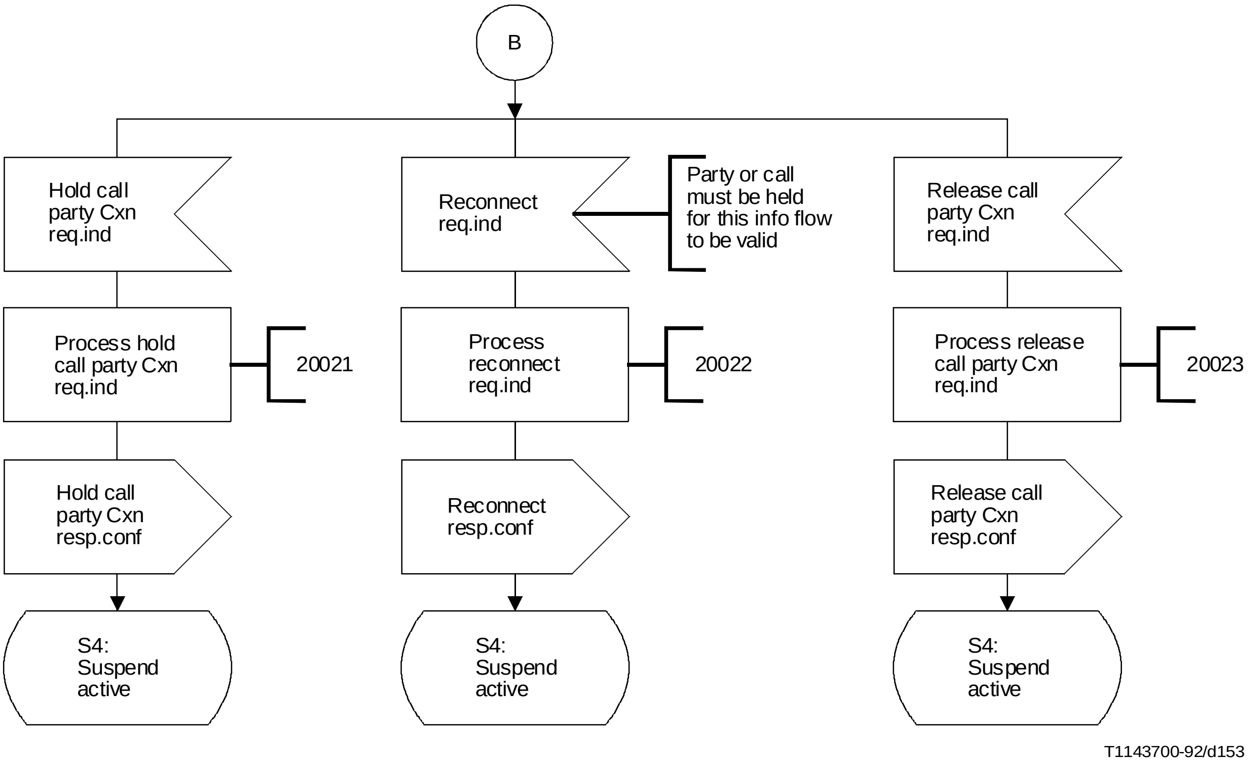


FIGURE I.3/Q.1214

Basic call process SIB
(continuation of active or associated)

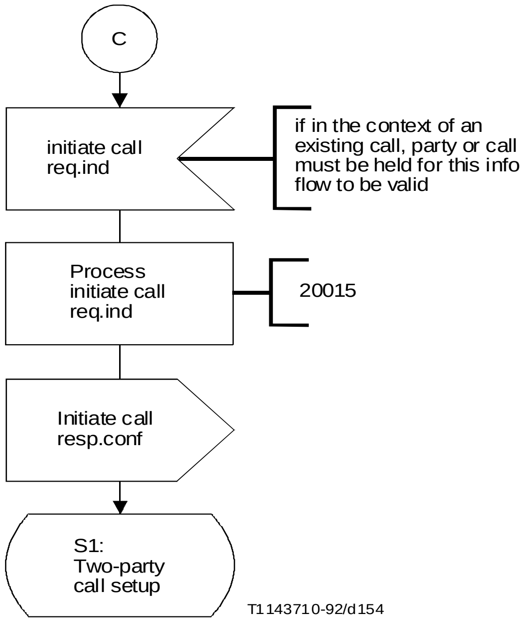


FIGURE I.4/Q.1214

Basic call process SIB
(continuation of two-party or multiparty active)

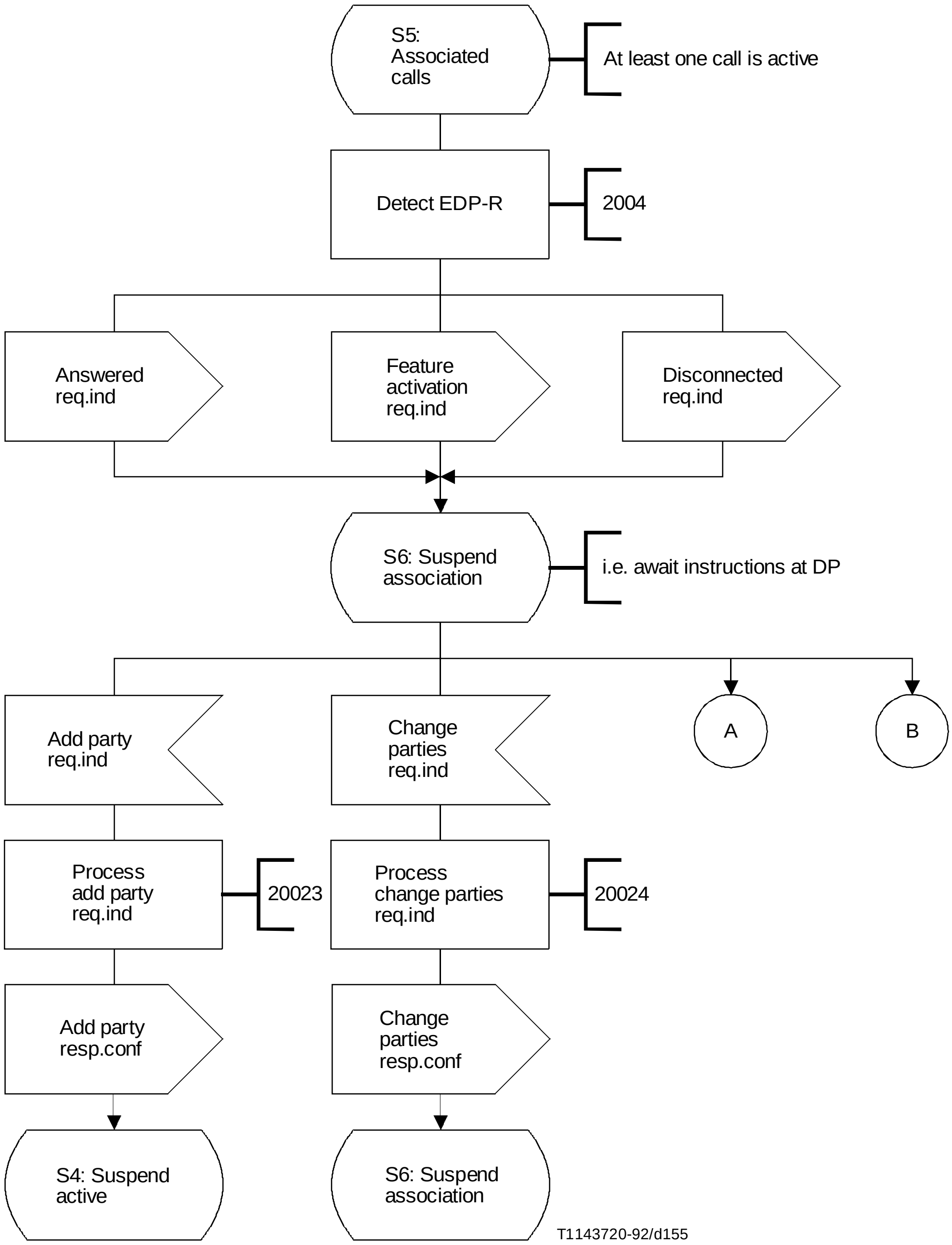


FIGURE I.5/Q.1214

**Basic call process SIB
(associated calls)**

Appendix II

Charging scenarios

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

II.1 Introduction

This appendix provides information on how the different charging capabilities in the IN Application Part CS-1 may be used. Networks may support different or additional charging capabilities then listed in this appendix. The reader should also refer to the appropriate D-Series Recommendations for relative charging and accounting principles.

With the introduction of IN, the charging as performed by the basic call process has to be extended. With IN, charging processes can be activated in both, SCFs and SSFs. When for an IN call the charging processes in the SCF have to interwork with the charging processes in the SSF, specific charging information flows are required between these functional entities. This appendix describes the IN charging requirements from an IN point of view. First some terminology concerning charging processes and charging capabilities is listed, followed by particular charging scenarios for which the information flow requirements are listed. Via the information flows and information elements, the corresponding charging operations for the INAP can be defined.

II.2 Charging requirements

In general two types of charging capabilities are required.

II.2.1 Off-line charging

The usage and/or charge information of the call is recorded in the network. The calculation of the charge for that call and the billing is performed in an off-line process. The information recorded could also be used for other purposes by the network operator (e.g. accounting).

II.2.2 On-line charging

In this case charging information during the call instance has to be calculated in real time. This further processing of charging information in real time could be for the support of the payphone, AOC (Advice Of Charge) or for charge metering.

II.3 Charging processes

The following considerations apply to the case of one service and one network.

At a high level the following processes concerning the charging can be identified:

Charge Determination Process (DET):

- Determining the charge party. Charge party can be the calling line or IN service subscriber or both.
- Determining the level of charge.
- Determining the items to be charged.

If determination of the previous elements is performed off-line, then in that case only a default call record is registered.

Charge Generation Process (GEN):

- Generation of charge pulses or charge related signalling or charge related information for the off-line process.

Charge Registration Process (REG):

- Updating the charge meters or creating call records or both.

On-line Charge Information provision to the user access (ONC):

- Provision of charge pulses or signalling information on the user/network interface during call instance.

Charge Output Process (OUT):

– Output of charging data for further processing. Charging data can be output to magnetic tapes or datalinks, on operator request or scheduled.

These are not defined within the context of the IN GFP.

Off-line charging/billing/accounting process (OFC):

– A FE which processes the call records retrieved from the other FEs (SSF, SCF, international exchange, LE) to prepare the bill for the subscriber or to support other accounting processes. These FEs are not defined within the context of the GFP.

II.4 Charging scenarios

In an IN structured network, the charging for services may be split between several parties. Each of the following scenarios shows a possible charging configuration for one of the parties. Scenarios may be combined to give the total charging capabilities required for a service. The choice of scenario for each charged party is a network specific option.

For each of the scenarios (and therefore for each charged party) there is only one point of control for IN charging per call.

II.4.1 Charging scenarios related to off-line charging

To support the off-line charging process, some charging related functions have to be executed during a call instance.

II.4.1.1 Scenario 1: IN charging completely in the PSTN

In this case (scenario 1), the charging is done by the existing charging mechanisms in the PSTN, such as using the service access code to determine the tariff, and meters in the LE to count the charge pulses. For this mechanism, no information flows between SSF and SCF are required, as no charging functions are performed by the SSF, SCF or any other IN FE.

II.4.1.2 Scenario 2: IN charging completely in the IN

In this scenario, the charging is done completely in the IN nodes. The PSTN will determine from, for example, the service access code, that no charge is to be raised, and all accounting will be performed at either the SSF or the SCF. The control of charging is always at the SCF, but call records may be registered at either the SSF (scenarios 2.2, 2.3) or SCF (scenario 2.1) or both (scenario 2.4).

In case call records are registered at both SSF and SCF, for the same call instance there should be a correlation between both call records to allow the off-line billing process to correlate them. For this purpose the SCF should generate a unique correlationID and send it to the SSF. Both the SCF and SSF should register this in the call record.

II.4.1.3 Scenario 3: IN charging shared between IN and PSTN

In this case, the SCF has control of the charging information and instructs the SSF on the charging information to be sent by the SSF (scenario 3.2).

In the LE, either a charge meter can be updated or a standard call record can be generated. There is no call record generated at the SSF or SCF.

If the SSF is a LE, the principles are the same, but the SSF-LE interface will be internal rather than by network signalling. The SCF need not know whether the SSF is located at the transit or the local level. See Figure II.1.

II.4.1.4 Scenario 4 – Charging at the SCF, assisted by the SSF

The SCF has the relevant charging information to apply charging and instructs the SSF to calculate the call charge. Included in these instructions are the conditions on which the SSF should request further information from the SCF (e.g. thresholds, i.e. inform the SCF when the charge reaches a certain amount).

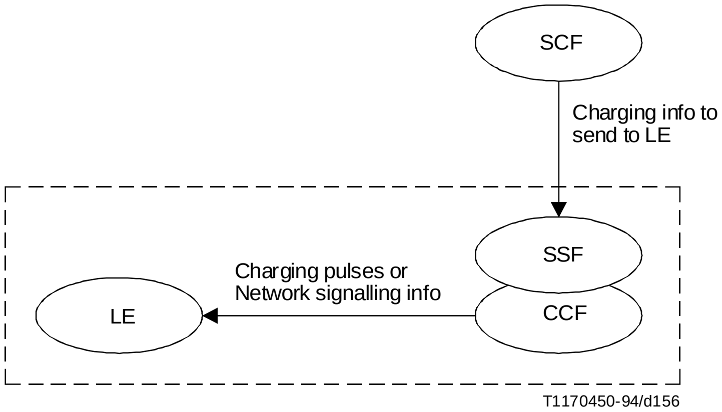


FIGURE II.1/Q.1214

Scenario 3

When the call has finished or, for example, a threshold is reached, then the SSF informs the SCF on what has happened and the SCF performs the necessary processing of the charge information, and possibly instructs the SSF what to do next (e.g. clear the call).

The calculated call charge can be registered at either the SCF (scenario 4.1) or SSF (scenario 4.2).

II.4.2 Charging scenarios related to on-line charging

Apart from the scenarios supporting the off-line charging, some networks require scenarios to support the on-line charging capability. This means that at the user/network interface charge related information (like charge pulses or signalling information) has to be offered.

If the charging is controlled by the SCF, it shall be possible to offer the charge information to the LE. The LE uses this information at the UNI. If this charge information is delivered to the LE for call recording purposes (i.e. scenario 3, scenario 4 in case SSF in LE), this information may also be used for on-line charging.

If this charge information is not delivered to the LE (i.e. scenarios 2 and 4 in case SSF not in LE), then additional IFs are needed for on-line charging. In that case the same configuration described in scenario 3 could be used to transfer the charge information in addition to the off-line charging related scenario.

Flexible tariffing is a concept used in many networks. For IN calls, charge rates need to be changed at certain times to all or dedicated destinations, or per call instance dependent on the duration of the conversation or the service interactions involved.

When SCF controls the charging and on-line charging is required for a call instance, the SCF should be able to change the charge rates in the network. This on-line charging process may cause additional signalling traffic and processing load in both the IN and the PSTN/ISDN.

To avoid additional processing and signalling in the network it may be useful to apply the on-line charging selectively (i.e. only on the calls for which it is necessary, e.g. payphone or AOC). Whether on-line charging is required or not can be determined by either:

- an on-line charging indication from PSTN/ISDN to IN; or
- the SL (e.g. based on serviceKey, user service profile or user interaction).

II.5 Interactions

Interactions concerning the charging of an IN call can occur in the following cases:

1) a higher exchange generating charge related signalling towards the SSF;

2) call parties controlled by different SLs.

II.5.1 Interactions with other networks concerning charging control

This is the case when SSF receives charging-related signalling from a higher exchange (e.g. international exchange or dedicated service exchanges).

There are three options identified to handle this type of interaction. For a call instance controlled by the SCF, the SCF should select one of these options. According to the general requirement "there is only one point of control for charging per call party per call", the selected option will remain during the lifetime of the call instance for the call party.

Option 1

In this option SCF has control of the charging information and instructs SSF to monitor and intercept the charge related signalling message(s) (from ISUP and not charge pulses) received from a higher exchange. Based on criteria supplied by the SCF, the SSF will send this information to the SCF:

1) immediately after receipt of the appropriate message type;

2) after receipt of a specified number of messages of the appropriate type; or

3) at the end of the call.

Subsequently SCF may use this information performing its charging control (use the received charging information in the call record generation or to adjust new charge rates/pulses to be sent to the SSF for on-line charging).

Option 2

The SCF may also decide to leave the charge control to the higher exchange and monitor the charging events. In this case the SCF instructs SSF to use normal charging processing, e.g. send charge signalling information and/or charge pulses through to the LE and/or update charge meters according to the received charging information from the higher exchange, and to notify the SCF. Based on criteria supplied by the SCF, the SSF will send this information to the SCF:

1) immediately after receipt of the appropriate message type;

2) after receipt of a specified number of messages of the appropriate type; or

3) at the end of the call.

Option 3

Same case as for option 2 except that the SCF does not wish to monitor the charging events.

II.5.2 Call parties controlled by different SLs

This is the case for e.g. UPT-to-UPT or UPT-to-VPN calls. Interaction occurs in the following cases:

– Case 1: SL-B causes charging information from SSF-B towards SSF-A.

– Case 2: SL-A causes charging information from SSF-A towards SSF-B.

– Case 3: Case 1 and case 2.

II.5.2.1 Case 1: Charging information from SSF-B to SSF-A

This interaction occurs when SL-B causes a charge pulse or signalling information from SSF-B to SSF-A.

NOTE – If both SSFs reside in the same SSF, then the principles will be the same, but the SSF-A/SSF-B interface will be internal rather than by network signalling.

There are three options identified to handle this type of interaction. For a call instance controlled by SL-A, the SL-A should select one of these options. According to the general requirement “there is only one point of control for charging per call party per call”, the selected option will remain during the lifetime of the call instance for the call party.

Option 1

In this option SL-A has control of the charging information for the A-party and instructs SSF-A to monitor and intercept the charge related messages received from SSF-B and send it to the SL-A. Based on criteria supplied by the SL-A the SSF will send this information to the SL-A:

1) immediately after receipt of the appropriate message type;
2) after receipt of a specified number of messages of the appropriate type; or
3) at the end of the call.

Subsequently SL-A may use this information performing its charging control (use the received charging information in the call record generation, adjust new charge rates/pulses to be sent to the SSF-A for on-line charging mechanism).

Option 2

The SL-A may also decide to leave the charge control to the SL-B but monitor the charging events. In this case the SL-A instructs SSF-A to use normal charging processing, e.g. send charge signalling information and/or charge pulses through to the LE and/or update charge meters according to the received charging information from the SSF-B, and to notify the SL-A. Based on criteria supplied by the SCF, the SSF will send this information to the SCF:

1) immediately after receipt of the appropriate message type;
2) after receipt of a specified number of messages of the appropriate type; or
3) at the end of the call.

Option 3

Same case as for option 2 except that SL-A does not wish to monitor the charging events.

II.5.2.2 Case 2: Charging information from SSF-A to SSF-B

This interaction occurs when SL-A causes a charge pulse or signalling information[9] from SSF-A to SSF-B. To handle this type of interaction the same options apply as case 1 (i.e. SL-B selects one of the options).

II.5.2.3 Case 3: Charging information from SSF-A to SSF-B and reverse

This interaction occurs when both SL-B causes a charge pulse or signalling information from SSF-B to SSF-A and SL-A causes a charge pulse or signalling information from SSF-A to SSF-B.

This interaction can be managed by a superposition of the principles given for the cases 1 and 2.

II.6 Framework for the charging information flows between SSF and SCF

In general:

– the starting point for the discussion of IN charging is one service and one network;
– charging scenario(s) are predefined per service. The decision to perform DET/GEN/REG in the SSF or SCF can be made on a per call basis by the SCF;
– the processes OFC and OUT are not listed in the framework, as they have no impact on the scenarios defined.

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[9] If both SSF FSMs reside in the same SSF, then the principles will be the same, but the SSF FSM-A/SSF FSM-B interface will be internal rather than by network signalling.

See Table II.1

TABLE II.1/Q.124

Framework charging related information flows between SSF and SCF

Reference scenario no.	Applicable	DET	GEN	REG	ONC (LE)	Information to be transferred	Information flow	Information element
1	Yes	PSTN	PSTN	PSTN	Yes/no	No	No	No
2.1	Yes	SCF	SCF	SCF	No	No	No	No
2.2	Yes	SCF	SCF	SSF	No	SCF ≥ SSF charge records	FCI (complete charging record)	BCC in FCI
2.3	Yes	SCF	SSF	SSF	No	SCF ≥ SSF Charged Party/Level/Item	FCI	BCC in FCI
2.4	Yes	SCF	SCF	SSF + SCF	No	SCF ≥ SSF CorrelationID (Note 4)	FCI	BCC in FCI
3.2	Yes	SCF	SSF	PSTN	Yes/No	SCF ≥ SSF Charged Party/Level (Note 1)	SCI	BCC in FCI partytoCharge
4.1 (Note 5)	Yes	SCF	SSF	SCF	Yes/no (Note 2)	SCF ≥ SSF Charged Party/Level/Item SCF ≤ SSF Call charge or threshold (Note 3)	APC ACR	BCC in APC partytoCharge (Optional) CallResult
4.2	Yes	SCF	SSF	SSF	Yes/No	SCF ≥ SSF Charge Level SCF ≤ SSF threshold (Note 3)	APC FCI (Note 6) ACR	BCC in APC partytoCharge (Optional) BCC in FCI CallResult

FCI FURNISHCHARGINGINFORMATION

SCI SENDCHARGINGINFORMATION

APC APPLYCHARGING

APR APPLYCHARGINGREPORT

BCC BillingChargingCharacteristics

NOTES:

1 No elaboration on the interworking of the SSF to the PSTN will be made because the objective is to define charging information transferred between SSF and SCF. This scenario has much PSTN/IN interactions.

2 On-line charging applicable in case LE SSF is located in the LE otherwise network signalling needed.

3 The threshold is not intended for statistics but used by services like credit card calling.

4 In this case SSF creates a default/standard call record and includes a correlationID supplied by SCF. It is up to the network operator to use an additional scenario to perform on-line charging (e.g. scenario 3.2).

5 In this scenario, the SCF generates the call record to be used by the post processing centre to determine the party to charge and the cost of the call.

6 FurnishChargingInformation controls the record generation at the SSF. ApplyCharging and ApplyChargingReport are used to transfer charging related information from the SSF to the SCF (e.g. debit card calling).