SIGNALLING CONNECTION CONTROL PART PROCEDURES Q.714

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SIGNALLING CONNECTION CONTROL PART PROCEDURES Q.714

1. INTRODUCTION

1.1 General characteristics of signalling connection control procedures.

1.1.1 Purpose. This Recommendation describes the procedures performed by the Signalling Connection Control Part (SCCP) of Signalling System No. 7 to provide both connection-oriented and connectionless network services as defined in Recommendation Q.711. These procedures make use of the messages and information elements defined in Recommendation Q.712, whose formatting and coding aspects are specified in Recommendation Q.713.

1.1.2 Protocol classes. The protocol used by the SCCP to provide network services is subdivided into five protocol classes, defined as follows:

— Class 0 : Basic connectionless class,

— Class 1 : Sequenced (MTP) connectionless class,

— Class 2 : Basic connection-oriented class,

— Class 3 : Flow control connection-oriented class, and

— Class 4 : Error recovery and flow control connection-oriented class.

The connectionless protocol classes provide those capabilities that are necessary to transfer one Network Service Data Unit (NSDU), (i.e., one user-to-user information block) in the user data field of a *Unitdata* message. The maximum length of an NSDU is restricted to 255 octets[1] since segmenting and reassembly are not provided by protocol classes 0 and 1.

The connection-oriented protocol classes (protocol classes 2, 3, and 4) provide segmenting and reassembly capabilities. If a Network Service Data Unit is longer than 255 octets, it is split into multiple segments at the originating node, prior to transfer in the user data field of *Data* messages. Each segment is less than or equal to 255 octets[1] At the destination node the NSDU is reassembled.

1.1.2.1 Protocol class 0. Network Service Data Units passed by higher layers to the SCCP in the node of origin are delivered by the SCCP to higher layers in the destination node. They are transported independently of each other, therefore, they may be delivered out-of-sequence. Thus, this protocol class corresponds to a pure connectionless network service.

1.1.2.2 Protocol class 1. In protocol class 1, the features of class 0 are complemented by an additional feature (i.e., sequence control parameter associated with the N-UNITDATA request primitive) that allows the higher layer to indicate to the SCCP that a given stream of NSDUs have to be delivered in-sequence. The Signalling Link Selection (SLS) field is chosen, based on the value of the sequence control parameter. The SLS chosen for a stream of NSDUs with the same sequence control parameter will be identical. The SCCP will then encode the Signalling Link Selection (SLS) field in the routing label of messages relating to such NSDUs, so that their sequence is, under normal conditions, maintained by the signalling network as defined in Recommendation Q.704. Thus this class corresponds to an enhanced connectionless service where an additional sequencing feature is included. *

An asterisk '*' indicates a change from the CCITT Red Book Vol. VI which is specific to U. S. Networks.

A bar '|' indicates a change from Issue 1 of Bell Communications Research Specification of Signalling System Number 7, Vol. 1 and 2.

1. The transfer of up to 255 octets of user data is allowed provided that the maximum length of signal units chosen for the network as specified in Q.703 is not exceeded.

1.2 Outline of removed text.

The current implementation of the SCCP provides for connectionless service only, using protocol classes 0 and 1. Thus, the text pertaining to connection-oriented procedures and protocol classes 2, 3, and 4 has been removed. In order to put the text provided at this time into perspective, an outline is given below that lists sections temporarily removed.

1.1.2.3 Protocol class 2
1.1.2.4 Protocol class 3
1.1.2.5 Protocol class 4
1.1.7 Protocol class 4
1.1.3 Signalling connections
1.2 Overview of procedures for connection-oriented services
1.2.1 Connection establishment
1.2.2 Data transfer
1.2.3 Connection release

1.3 Overview of procedures for connectionless services.

1.3.1 General. When the SCCP functions at the node of origin receive from a higher layer an NSDU to be transferred by the protocol class 0 or 1 connectionless service, the Called Address parameter is analyzed to identify the node towards which the message should be sent. The NSDU is then included as user data in a *Unitdata* (UDT) message, which is sent towards the node using the MTP functions. Upon receipt of the UDT message, the SCCP functions at that node perform the routing analysis as described in Section 2 of this Recommendation and, if the destination of the UDT message is a local user, deliver the NSDU to the local higher layer functions. If the Called Party Address is not at that node, then the UDT message is forwarded to the next node. This process continues until the NSDU has reached the Called Party Address.

1.4 Structure of the SCCP and contents of specification.

The basic structure of the SCCP appears in Figure 1/Q.714. It consists of four functional blocks as follows.

a. *SCCP connection-oriented control*: its purpose is to control the establishment and release of signalling connections and to provide for data transfer on signalling connections.

b. *SCCP connectionless control*: its purpose is to provide for the connectionless transfer of data units.

c. *SCCP management*: its purpose is to provide capabilities, in addition to the Signalling Route Management and flow control functions of the MTP, to handle the congestion or failure of either the SCCP user or the signalling route to the SCCP user.

d. *SCCP routing*: upon receipt of a message from the MTP or from functions a, b, or c above, SCCP routing provides the necessary routing functions to either forward the message to the MTP for transfer, or pass the message to functions a, b, or c above. A message whose Called Party Address is a local user is passed to functions a, b, or c, while one destined for a remote user is forwarded to the MTP for transfer to a distant SCCP user.

Section 2 of this specification describes the addressing and routing functions performed by the SCCP. Section 3 specifies the procedures for the connection-oriented services (protocol classes 2-4). Section 4 specifies the procedures for the connectionless services (protocol classes 0 and 1). Section 5 specifies the SCCP management procedures.

2. ADDRESSING AND ROUTING

2.1 SCCP Addressing.

The Called and Calling Party Addresses contain the information necessary for the SCCP to determine an origination and destination user, respectively. In the case of the connection-oriented procedures, the addresses are the origination and destination points of the signalling connection, while in the case of the connectionless procedures, the addresses are the origination and destination points of the message.

When transferring connection-oriented or connectionless messages, two basic categories of address are distinguished by SCCP routing:

1. Global Title - A global title is an address, such as a DPC or dialed-digits, which does not explicitly contain information that would allow routing in the signalling network, that is the translation function of the SCCP is required. This translation function could be performed on a distributed basis or on a centralized basis. The last case, where a request for translation is sent to a centralized data base while waiting for the response is for further study.

2. DPC + SSN - A Destination Point Code and Subsystem Number allow direct routing by the SCCP and MTP, that is, the translation function of the SCCP is not required. In the called address, the point code used is the DPC in the routing label. In the calling address, the point code is either supplied by the Calling Party Address parameter, or if not present there, by the OPC.

   If a reply or a message return is required, the Calling Party Address plus the OPC in the routing label must contain sufficient information to uniquely identify the originator of the message. If the message requires global title translation where the OPC may change, then the Calling Party Address should not contain a SSN only.

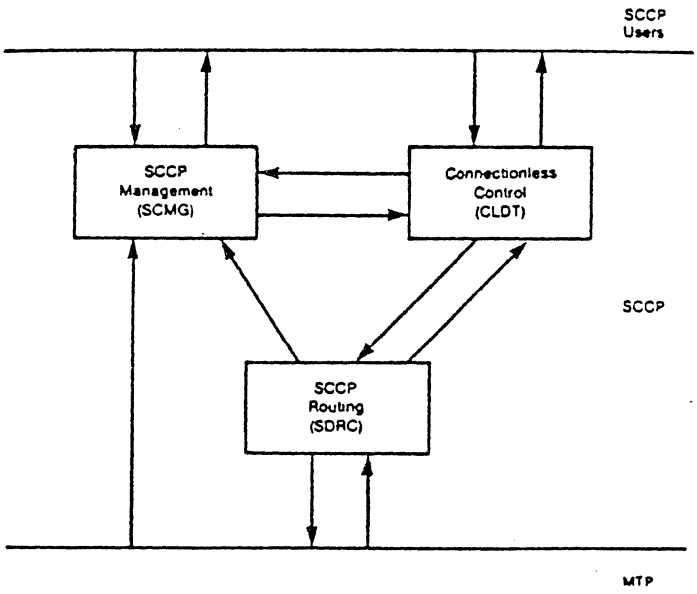


Figure 1/Q.714. SCCP Overview

2.2 SCCP Routing Principles. *

SCCP Routing Control receives messages from the Message Transfer Part for routing and * discrimination, after they have been received by the MTP from another node in the signalling network. *

SCCP Routing also receives internal messages from SCCP Connection-oriented and Connectionless Control and performs any necessary routing functions (e.g. address translation) before passing them to the MTP for transport in the signalling network. SRC may also translate (e.g. for security reasons) a Calling party Address from PC + SSN to GT. This function is optional depending on the security requirements of network interconnections. *

2.2.1 Message Received From MTP A message received from the MTP that requires routing will include the Called Party Address parameter giving information for routing the call. These messages include the Connection Request message, and all types of Connectionless messages. Other messages either have no Called Party Address or give the Called Party Address for information purposes only, and are passed to connection-oriented control for processing. *

If the Called Party Address parameter is used for routing, it shall take one of the following values. *

1. Subsystem Number only - This indicates that the receiving SCCP is the termination point of the message. The SSN is used to determine the local subsystem. *
2. Global Title only - This indicates that translation is required. Translation of the Global Title results in a new DPC for routing the message, and possibly a new SSN or GT or both in the Called Party Address. *
3. SSN + GT - In this case, the address type information is used to determine whether the SSN or the GT should be used for routing and processing as in items 1 and 2 above. *

2.2.2 Message from Connection-Oriented or Connectionless Control Addressing information, indicating the destination of the message, is included with every internal message received from connection-oriented or connectionless control. For connectionless messages, this addressing information is obtained from the Called Address parameter associated with the N-UNITDATA request primitive. For connection-oriented messages received by SCCP routing during the connection establishment phase, the addressing information is obtained from the Called Address parameter associated with the N-CONNECT request primitive. During the data transfer or connection release phases, the addressing information (i.e., the DPC) is that associated with the connection section. *

The addressing information can take the following forms: *

1. DPC *
2. DPC + (SSN or GT or both), *
3. GT *
4. GT + SSN. *

The first form applies to connection-oriented messages during the data transfer and connection release phases. The last three forms apply to connectionless messages and to the Connection Request message. *

2.2.2.1 DPC Routing If the DPC is present in the addressing information then the DPC is used in the routing label and: *

1. If no other addressing information is available, no Called Party Address is provided;
2. if SSN or GT or both are available, this information is used in the Called Party Address with an indication of which one is to be used for routing.

If the DPC is the node itself, the information is passed to connection-oriented or connectionless control, as if it had been received from the MTP.

2.2.2.2 Global Title Translation If the DPC is not present, then a global title translation is required before the message can be sent out. Translation results in a DPC and possibly a new SSN or new GT, or both. The routing procedures then continue as in section 2.2.2.1.

2.3 SCCP Routing.

The SCCP routing functions are based on information contained in the Called Party Address. The Address consists of the Address indicator and Address fields.

In this section, "unavailable" encompasses all reasons why it may not be possible to transfer a message to a signalling point or subsystem. Included are failure, congestion, and unequippedness. *

2.3.1 Receipt of a Message Transferred by the MTP One of the following actions is taken by SCCP routing upon receipt of a message from the Message Transfer Part. The message is received by the SCCP when the MTP invokes an MTP-TRANSFER indication:

1. If the message is not a Connection Request, Unitdata or Unitdata Service message, then SCCP routing passes the message to connection-oriented control.
2. If the Called Party Address indicates that routing on subsystem number is desired, then SCCP routing checks the status of the subsystem:
   a. If the subsystem is available, the message is passed, based on the message type, to either connection-oriented control or connection-less control.
   b. If the subsystem is unavailable and
      — the message is a connectionless message, then the return procedure is initiated.
      — the message is a connection-oriented message, then the refusal procedure is initiated.

      In addition, if the subsystem is failed, SCCP management is notified that a message was received for a failed subsystem.
3. If the Called Party Address indicates that routing on global title is desired, a translation of the global title must be performed.
   a. If the translation of the global title does not exist, and:
      — the message is a connectionless message, then the message return procedure is initiated;
      — the message is a connection-oriented message, then the connection refusal procedure is initiated.
   b. If the translation of the global title exists and both the DPC and subsystem number (SSN) are determined, then:
      1. if the DPC is the node itself, then the procedures in 2 above are followed.
      2. if the DPC is not the node itself, the DPC and SSN are available, and the message is a connectionless message, then the MTP-TRANSFER request primitive is invoked.
      3. if the DPC is not the node itself, the DPC and SSN are available, and the message is a connection-oriented message, then:
         a. if an association of connection sections is required, the message is passed to connection-oriented control;
         b. if no association of connection sections is required, the MTP-TRANSFER request primitive is invoked;

4. if the DPC is not the node itself, and the DPC and/or SSN are not available and
   a. the message is a connectionless message, the message return procedure is then initiated;
   b. the message is a connection-oriented message, then the refusal procedure is initiated.

c. If the translation of the global title exists, and only a DPC or DPC + new GT is determined, then:
   1. If the DPC is available, and the message is a connectionless message, then the MTP-TRANSFER request primitive is invoked;
   2. if the DPC is available, and the message is a connectionless message then
      — If an association of the connection sections is required, then the message is passed to connection-oriented control;
      — If no association of connection sections is required, then the MTP-TRANSFER request primitive is invoked;
   3. If the DPC is not available and
      — the message is a connectionless message, then the message return procedure is initiated;
      — the message is a connection-oriented message, then the connection refusal procedure is initiated.

2.3.2 Receipt of Message from Connectionless or Connection-Oriented Control. One of the following actions is taken by SCCP Routing upon receipt of a message from connectionless control or connection-oriented control.

1. If the message is a Connection Request message at an intermediate node (where connection sections are being associated), and *
   a. the DPC is available, then the MTP-TRANSFER request primitive is invoked; *
   b. the DPC is not available, then the connection refusal procedure is initiated via SCOC. *
2. If the message is a connection-oriented message other than a Connection Request message, and *
   a. the DPC is available, then the MTP-TRANSFER request primitive is invoked; *
   b. the DPC is not available, then the release procedure is initiated. *
3. If the primitive associated with a Connection Request or connectionless message includes a DPC, and the routing indicator indicates route on SSN, and *
   a. the DPC is the node itself, then the procedures in section 2.3.1.2 are initiated. *
   b. the DPC is not the node itself and the DPC and SSN are available then the MTP-TRANSFER request primitive is invoked.[2] *

2. Note that association of connection sections is not required, as this is the origination node of the message.

c. the DPC is not the node itself and the DPC and/or SSN are not available, then

— for connectionless messages, the message return procedure is initiated;

— for connection-oriented messages, the refusal procedure is initiated.

4. If the primitive associated with a Connection Request or a connectionless message includes a DPC and the routing indicator indicates route on global title, and

a. the DPC is the node itself, then the procedures in 2.3.2.5 are followed.

b. the DPC is not the node itself, and the DPC is available, then the MTP-TRANSFER request primitive is invoked.

c. the DPC is not the node itself, and the DPC is not available and

— the message is a connectionless message, then the return procedure is initiated.

— the message is a connection-oriented message, then the refusal procedure is initiated.

5. If the primitive associated with a Connection Request or a connectionless message does not include a DPC and the routing indicator indicates route on global title, then a translation of the global title must be performed.

a. If the translation of the global title does not exist, and:

— the message is a connectionless message, then the message return procedure is initiated.

— the message is a connection-oriented message, then the connection refusal procedure is initiated.

b. If the translation of the global title exists, and both the DPC and SSN are determined, then:

1. if the DPC is the node itself, the procedures in 2.3.1.2 above are then followed;

2. if the DPC is not the node itself, and the DPC and SSN are available, the MTP-TRANSFER request primitive is then invoked;[3]

3. if the DPC is not the node itself, and the DPC and/or SSN are not available and

a. the message is a connectionless message, then the message return procedure is initiated.

b. the message is a connection-oriented message, then the refusal procedure is initiated.

c. If the translation of the global title exists, and the DPC or DPC + new GT is determined, then:

1. If the DPC is available then the MTP-TRANSFER request primitive is invoked.

2. If the DPC is not available and

a. the message is a connectionless message, then the message return procedure is initiated;

3. Note that association of connection sections is not required, as this is the origination node of the message.

b. the message is a connection-oriented message, then the refusal procedure is initiated.

2.4 Routing failures.

The SCCP recognizes a number of reasons for failure in SCCP routing control. Examples of these reasons are:

1. translation does not exist for addresses of this nature,
2. translation does not exist for this address,
3. network failure,
4. network congestion, and
5. unequipped user.

The precise classification of the causes by which such failures are recognized is for further study.

When SCCP routing is unable to transfer a message due to the unavailability of a Point Code or Subsystem, one of the above reasons is indicated in the *Connection Refused* message or the *Unitdata Service* message.

3. CONNECTION-ORIENTED PROCEDURES

Text temporarily removed. *

4. CONNECTIONLESS PROCEDURES

The connectionless procedures allow a user of the SCCP to request transfer of up to 255 octets[4] of user data without first requesting establishment of a signalling connection.

The N-UNITDATA request and indication primitives are used by the user of the SCCP to request transfer of user data by the SCCP and for the SCCP to indicate delivery of user data to the destination user. Parameters associated with the N-UNITDATA request primitive must contain all information necessary for the SCCP to deliver the user data to the destination.

Transfer of the user data is accomplished by including the user data in *Unitdata* messages.

When the user of the SCCP requests transfer of user data by issuing a N-UNITDATA request primitive, there are two classes of service that can be provided by the SCCP, protocol classes 0 and 1. These protocol classes are distinguished by their message sequencing characteristics.

When the user of the SCCP requests transfer of several messages by issuing multiple N-UNITDATA request primitives, the the probability of these messages being received in sequence at the Called Address depends on the protocol class designated in the request primitives. For protocol class 0 the sequence control parameter is not included in the N-UNITDATA request primitive and the SCCP may generate a different SLS for each of these messages. For protocol class 1 the sequence control parameter is included in the N-UNITDATA request primitive and, if the parameter is the same in each request primitive, then the SCCP will generate the same SLS for these messages.

4. The transfer of up to 255 octets of user data is allowed depending on the maximum length of signal units chosen for the network as specified in Q.703.

The Message Transfer Part retains message sequencing for those messages with the same SLS field. The Signalling Connection Control Part relies on the services of the MTP for transfer of SCCP messages. Based on the characteristics of the MTP, the protocol class 1 service may be used in such a way that it provides a quality of service that has a lower probability of out-of-sequence messages than that provided by protocol class 0.

4.1 Data transfer

The N-UNITDATA request primitive is invoked by the SCCP user at an originating node to request connectionless data transfer service. The connectionless data transfer service is also used to transport * SCCP management messages, which are transferred in the user data field of *Unitdata* messages.

The *Unitdata* message is then transferred, using SCCP and MTP routing functions, to the Called Address indicated in the N-UNITDATA request primitive.

SCCP routing and relaying functions may be required at intermediate nodes, since complete translation and routing tables for all addresses are not required at every node.

When the *Unitdata* message can not be transferred to its destination, the message return function may be initiated.

The SCCP uses the services of the MTP and the MTP may, under severe network conditions, discard messages. Therefore, the user of the SCCP may not always be informed of nondelivery of user data. The MTP notifies the SCCP of unavailable or congested signalling points using the MTP-PAUSE and MTP-STATUS indications. The SCCP then informs its users.

When a *Unitdata* message is received at the destination node, an N-UNITDATA indication primitive is invoked. Because SCCP management messages are transferred using the connectionless data transfer service, these messages must be identified prior to invoking the N-UNITDATA primitive.

4.2 Message return.

The purpose of message return is to discard or return messages which cannot be delivered to their final destination.

The message return procedure is initiated if SCCP routing is unable to transfer a *Unitdata* or *Unitdata Service* message. The procedure may be initiated, for example, as a result of insufficient translation information or the inaccessibility of a subsystem or point code. Specific reasons are enumerated in Section 2.3.

a. If the message is a *Unitdata* message, and

   — the option field is set to return, then a *Unitdata Service* message is transferred to the Calling Party Address.

   — the option field is not set to return, the message is then discarded.

b. If the undeliverable message is a *Unitdata Service* message, it is discarded.

The user data field of the *Unitdata* message and the reason for return are included in the *Unitdata Service* message.

When a *Unitdata Service* message is received at the destination node, an N-NOTICE indication primitive is invoked.

4.3 Syntax Error.

This type of error occurs when a node receives a message that does not conform to the format specifications of the SCCP. Examples of syntax errors are:

1. Unreasonable pointer value (e.g. points beyond the end of the message)
2. Mismatch between type and protocol class parameters
3. Inconsistent address indicator and address contents.

When a syntax error is detected for a connectionless message, the message is discarded. Checking for syntax errors beyond the processing required for SCCP connectionless message routing is not mandatory.

5. SCCP MANAGEMENT PROCEDURES

5.1 General.

The purpose of SCCP management is to provide the procedures necessary to maintain network performance by rerouting or throttling traffic in the event of failure or congestion in the network.

Although SCCP Management has its own SSN, these procedures do not apply to it.

SCCP management is organized into three subfunctions: Signalling point status management and subsystem status management allow SCCP management to use information concerning the availability of point codes and subsystems, respectively, to allow the network to adjust to failure, congestion, and recovery in the network. Traffic information management provides a means for SCCP users to know received traffic patterns.

SCCP management procedures rely on signalling point and signalling link failure, recovery, and congestion information provided in the MTP-PAUSE, MTP-RESUME and MTP-STATUS indication primitives as well as on subsystem failure and recovery information found in SCCP management messages[5]. Management information is transferred using SCCP connectionless service with no return requested. Formats of these messages appear in Q.713.

The information pertaining to both single and replicated subsystems or nodes is used for management purposes. In particular, this allows a Called Party Address which is specified in the form of a global title to be translated to different point codes and/or subsystem numbers depending on the status of the network or SCCP subsystems.

Nodes or subsystems that are replicated may relate to their replicates in one of several ways. ("Replicate" is a term meaning "multiple copies" and may be used to generically describe either mode below. A node or subsystem that is not replicated is termed "solitary".)

The first mode uses a concept of dominance. Traffic is split among several subsystems. Under normal conditions, each portion of the traffic is routed to a preferred, or "primary", system. When the primary system fails, this traffic is routed to a "backup" system. When the primary system recovers, it reassumes its normal traffic load.

A second mode uses a replacement concept. Consider two systems, A and B, which are "alternates". When A fails, its traffic is routed to B; but when A recovers, the traffic is not moved back to A. It is only when B fails that traffic is shifted to A. In addition, other modes are possible.

The current SCCP management procedures are designed to manage replicated nodes and subsystems that operate in a dominant mode and for which any given primary system has only one

5. Subsystem congestion control is for further study.

backup (i.e., duplicated subsystems). Management procedures for subsystems which operate in a mode other than the dominant mode and which have more than one backup are for further study.

SCCP management procedures utilize the concept of a "concerned" subsystem or signalling point. In this context, a "concerned" entity means an entity with an immediate need to be informed of a particular signalling point/subsystem status change, independently of whether SCCP communication is in progress between the "concerned" entity and the affected entity at the time of the status change.

In the following procedures, the term "adjacent" is understood to include logical adjacency. That is to say that node A is adjacent to node B if any SS7 path exists from A to B without a global title translator node in the path.

The signalling point prohibited, signalling point allowed and signalling point congested procedures, specified in 5.2.2, 5.2.3, and 5.2.4 respectively, deal with the accessibility of a signaling point.

The subsystem prohibited and subsystem allowed procedures, detailed in 5.3.2 and 5.3.3, respectively, deal with the accessibility of a subsystem.

An audit procedure to ensure that necessary subsystem management information is always available is specified in the subsystem status test procedure outlined in 5.3.4.

A subsystem may request to go out of service using the coordinated state change control procedure specified in 5.3.5.

Local subsystems are informed of any related subsystem status by the local broadcast procedure specified in 5.3.6.

Concerned signalling points are informed of any related subsystem status by the broadcast procedure specified in 5.3.7.

Information regarding traffic patterns an SCCP user receivers is provided by the traffic mix procedures outline in 5.4.2, 5.4.3 and 5.4.4. All procedures related to traffic mix information are optional, and included for information only.

5.2 Signalling point status management.

5.2.1 General. Signalling point status management allows routing and translation tables to be updated in a manner which best allows that network to adjust to and compensate for failure, congestion, or recovery of signalling points.

5.2.2 Point code prohibited. When SCCP management receives an MTP-PAUSE indication relating to a destination that has failed, SCCP management

1. marks its translation table
   - — "translate to backup node" if that point code has a backup.
   - — "translate to backup subsystem" for each replicated subsystem at that point code if the subsystem has a backup.
2. marks the status as
   - — "prohibited" for that point code.
   - — "prohibited" for each subsystem at that point code.
3. Discontinues any subsystem status tests (see 5.3.4) it may be conducting to any subsystems at that signalling point.

4. Initiates a local broadcast (see 5.3.6) of "User-out-of-service" information for each subsystem at that signalling point.

5. Sends a Subsystem-Backup-Routing message regarding each duplicated subsystem at that signalling point to SCCP management at the location of the corresponding backup subsystem. (This action is taken only if the node receiving the MTP-PAUSE is a "translator node" that is adjacent to the node at which the backup subsystem is located. For example, a signalling transfer point that learns that an adjacent database has failed sends a Subsystem-Backup-Routing Message to SCCP management for each backup subsystem at the backup database. If the signalling transfer point is not adjacent to the allowed backup subsystem, it does not send Subsystem-Backup-Routing messages.) (Optional)

6. Marks all local equipped duplicated subsystems backup routed from the failed signalling point, if the failed signalling point is an adjacent translator node. (Optional)

7. Initiates the traffic-mix information procedure (see 5.4.2.1.1) to the local allowed users if the failed signalling point is an adjacent translator node. (Optional)

8. Informs local concerned subsystems of the status of that signalling point.[6]

5.2.3 Point code allowed. When SCCP management receives an MTP-RESUME indication relating to a destination that has recovered from failure, SCCP management

1. resets the congestion level for that signalling point

2. marks its translation table

   — "translate to primary node" if that node has a backup.

3. marks the status as

   — "allowed" for that point code.

4. Initiates the subsystem status test procedure (see 5.3.4) with affected subsystems at that signalling point.

5. Initiates, if the recovered signalling point is an adjacent translator node, (Optional)

   a. The subsystem routing status test procedure (see 5.4.4) for all local equipped duplicated subsystems.

   b. The traffic-mix information procedure (see 5.4.2.1.1) to the local allowed subsystems.

6. Informs local concerned subsystems of the status of that signalling point.[6]

5.2.4 Signalling Point Congested. When SCCP management receives an MTP-STATUS indication relating to signalling network congestion to a signalling point, SCCP management

1. Updates that signalling point status to reflect the congestion

2. Notifies local concerned subsystems of network congestion to that signalling point[6]

6. The criteria and methods for notification to local subsystems are for further study.

5.3 Subsystem status management. *

5.3.1 General. Subsystem status management updates routing and translation tables based on the information of failure, withdrawal, congestion and recovery of subsystems. This allows alternative routing to backup subsystems. Local users are informed of the status of their backup subsystems. * * *

5.3.2 Subsystem prohibited. *

5.3.2.1 Receipt of message for a prohibited subsystem. If SCCP routing control receives a message for a prohibited local subsystem, SCCP routing control invokes subsystem prohibited control. A Subsystem-Prohibited message is sent to SCCP management at the originating point code if the originating subsystem is not local; the OPC is determined from the routing label of the received message. * * * * *

5.3.2.2 Receipt of Subsystem-Prohibited message or subsystem failure. Under one of the following conditions: * *

a. SCCP management receives a Subsystem-Prohibited message about a subsystem marked allowed, *

b. a N-STATE request primitive with "User-out-of-service" information is invoked by a local subsystem marked "allowed", or * *

c. SCCP management detects that a local subsystem has failed, *

then SCCP management does the following: *

1. marks its translation table (in entries where the affected subsystem is the primary) *

   — "translate to backup subsystem" if a backup subsystem exists for the prohibited subsystem. *

2. marks the status as *

   — "prohibited" for that subsystem. *

3. initials a local broadcast (Section 5.3.6) of "user-out-of-service" information for the prohibited subsystem. * *

4. initiates the subsystem status test procedure (Section 5.3.4) if the prohibited subsystem is not local. * *

5. forwards the information throughout the network by *

   — sending a Subsystem-Prohibited message to the backup of the prohibited subsystem if the backup subsystem is allowed and is located at an adjacent node. (This may be included in the broadcast procedure). * * *

   — initiating a broadcast of Subsystem-Prohibited messages to concerned signalling points. *

6. sends *

   — a Subsystem-Backup-Routing message to the backup of the prohibited subsystem if the backup subsystem is allowed (This action is taken only if the prohibited subsystem is located at an adjacent node.) (This item is for further study.) * * *

7. cancels "ignore subsystem status test" and the associated timer if they are in progress and if the prohibited subsystem resides at the local node. * *

5.3.3 Subsystem allowed. *

5.3.3.1 Receipt of Subsystem-Allowed message or N-STATE request primitive. Under one of the following conditions:

a. SCCP management receives a Subsystem-Allowed message about a subsystem marked prohibited, or

b. the N-STATE request primitive with "User-in-Service" information is invoked by a subsystem marked "prohibited",

then SCCP management does the following:

1. marks its translation table (in entries where the affected subsystem is the primary)

   — "translate to primary subsystem" if a backup subsystem exists for the allowed subsystem.

2. marks the status as

   — "allowed" for that subsystem.

3. initiates a local broadcast (Section 5.3.6) of "user-in-service" information for the allowed subsystem.

4. discontinues the subsystem status test relating to that subsystem if such a test was in progress.

5. forwards the information throughout the network by

   — sending a Subsystem-Allowed message to the backup of the allowed subsystem, if the backup subsystem is located at an adjacent node. (This may be included in the broadcast procedure.)

   — initiating a broadcast of Subsystem-Allowed messages to concerned signalling points.

6. sends

   — Subsystem-Normal-Routing to the backup of the newly allowed subsystem. (This action is taken only if the allowed subsystem is located at an adjacent node.) (This item is optional only.)

5.3.4 Subsystem status test.

5.3.4.1 General. The subsystem status test procedure is an audit procedure that verifies the status of subsystems marked prohibited.

5.3.4.2 Actions at the initiating node. A subsystem status test is initiated by other SCCP management procedures when

a. a Subsystem-Prohibited message is received, or

b. an MTP-RESUME indication primitive for a previously failed point code is invoked.

A subsystem status test associated with a failed subsystem is commenced by starting a timer (stat. info) and marking a test in progress. No further actions are taken until the timer expires.

Upon expiration of the timer, a Subsystem-Status-Test message is sent to SCCP management at the node of the failed subsystem and the timer is reset.

The cycle continues until the test is terminated by another SCCP management function at that node. Termination of the test causes the timer and the test mark to be canceled.

5.3.4.3 Actions at the receiving node. When SCCP management receives a Subsystem-Status-Test message, and there is no "ignore subsystem status test" in progress it checks the status of the named subsystem. If the subsystem is allowed, a Subsystem-Allowed message is sent to SCCP management at the node conducting the test. If the subsystem is prohibited, no reply is sent.

5.3.5 Coordinated state change.

5.3.5.1 General. A subsystem may be withdrawn from service without degrading the performance of the network by using the coordinated state change procedure.

5.3.5.2 Actions at the requesting node. When a replicated subsystem wishes to go out of service, it invokes an N-COORD request primitive. SCCP management at that node sends a Subsystem-Out-of-Service-Request message to the backup subsystem, sets a timer (coord.chg) and marks the subsystem as "waiting for grant".

Arrival of a Subsystem-Out-of-Service-Grant message at the originating SCCP management causes the timer to be canceled, the "waiting for grant" state to be canceled, and an N-COORD confirmation primitive to be invoked to the originating subsystem. Subsystem Prohibited messages are broadcasted (Section 5.3.7). An ignore subsystem status test timer is started and the subsystem is marked as "ignore subsystem status test." Subsystem status tests are ignored until the "ignore subsystem status test" timer expires or the marked subsystem involves an N-STATE request primitive with "User-out-of-service" information. If no "waiting for grant" is associated with the subsystem named in the Subsystem-Out-of-Service-Grant message, the Subsystem-Out-of-Service-Grant message is discarded.

If the timer associated with the subsystem waiting for the grant expires before a Subsystem-Out-of-Service-Grant message is received, the "waiting for grant" is canceled and the request is denied by sending an N-COORD primitive indicating denial.

5.3.5.3 Actions at the granting node. When the SCCP management at the node at which the backup subsystem is located receives the Subsystem-Out-of-Service-Request message, it checks the status of local resources. If the SCCP has sufficient resources to assume the increased load, it invokes an N-COORD indication primitive to the backup subsystem. If the SCCP does not have sufficient resources, no further action is taken.

If the backup subsystem has sufficient resources to allow its mate to go out of service, it informs SCCP management by invoking an N-COORD request primitive. A Subsystem-Out-of-Service-Grant message is sent to the originating node. If the backup subsystem does not have sufficient resources, no reply is returned.

5.3.6 Local broadcast.

5.3.6.1 General. The local broadcast procedure provides a mechanism to inform local SCCP subsystems of any related subsystem status information received.

5.3.6.2 User-out-of-service. A local broadcast of "User-out-of-service" information is initiated by other SCCP management procedures when

a. a Subsystem-Prohibited message is received, or

b. an N-STATE request primitive with "User-out-of-service" information is invoked, or

c. a local subsystem failure is detected by SCCP management, or

d. an MTP-PAUSE indication primitive is received.

SCCP management then informs all local allowed SCCP subsystems about the subsystem failure by invoking an N-STATE indication primitive with "User-out-of-service" information.

vice. A local broadcast of "subsystem-in-service" information is initiated by other procedures when

owed message is received, or

quest primitive with "User-in-service" information is invoked.

nent then informs all local allowed SCCP subsystems, except the newly allowed one, a recovery by invoking an N-STATE indication primitive with "User-in-service"

The broadcast procedure provides a mechanism to inform concerned signalling subsystem status at local or adjacent point codes.

prohibited. A broadcast of Subsystem-Prohibited messages is initiated by other procedures when

rohibited message is received, or

equest primitive with "User-out-of-service" information is invoked, or

m failure is detected by SCCP management, or

ut-of-Service-Grant message arrives for a subsystem marked "waiting for grant".

nent does nothing if the signalling point where the prohibited subsystem is located informer signalling point from which the SCCP message is received. Otherwise, informs all concerned signalling points, except the informer signalling point, about by Subsystem-Prohibited messages.

allowed. A broadcast of Subsystem-Allowed messages is initiated by other SCCP ures when

llowed message is received, or

equest primitive with "User-in-service" information is invoked.

nent does nothing if the signalling point where the allowed subsystem is located is nformer signalling point from which the SCCP message is received. Otherwise, nforms all concerned signalling points, except the informer signalling point, about ry by Subsystem-Allowed messages.

ation management.

n this section are optional and provided for information only.

bsystem routing status management procedures provide a mechanism for informing ed traffic patterns as described in Q.711.

procedures There is one mix procedure, which is invoked when local users are consequences of

unavailable

available

to subsystem, or

d. backup routing to subsystem.

The traffic pattern is determined by analyzing the status of adjacent nodes, the status of backup subsystems, and the routing flag.

The analysis is performed on the basis of node category. Thus, there are six specific procedures for each node category. Each set of procedures at a given node uses the same method of determining the traffic pattern; these methods are specified in Section 5.4.3.

Node category serves to differentiate the position and function of a node in the network. "End-node/database" and "intermediate-node/translator" are two examples.

5.4.2.1 End-Node/Database

5.4.2.1.1 Traffic-Mix Information. SCCP management may invoke an N-TRAFFIC indication primitive with "Traffic-mix" information to each local concerned user, when one of the following occurs:

1) The MTP invokes an MTP-PAUSE indication primitive
2) The MTP invokes an MTP-RESUME indication primitive
3) A Subsystem-Backup-Routing message is received by SCCP management
4) A Subsystem-Normal-Routing message is received by SCCP management
5) An N-STATE request primitive with "User-in-Service" information is invoked by a subsystem marked prohibited.

5.4.2.2 Subsystem backup routing. Upon receipt of a Subsystem-Backup-Routing message, SCCP management

1. marks the routing flag associated with
   a. the signalling transfer point from which the Subsystem-Backup-Routing message was received, and
   b. the subsystem to which the message refers

   to "backup".
2. initiates a subsystem routing status test.
3. initiates a traffic mix information procedure to the affected local user if it's allowed.

5.4.2.3 Subsystem normal routing.

5.4.2.3.1 End-node/database. Upon receipt of a Subsystem-Normal-Routing message, SCCP management

1. marks the routing indicator associated with
   a. the signalling transfer point from which the Subsystem-Normal-Routing message was received, and
   b. the subsystem to which the message refers

   to "normal".
2. stops the subsystem routing status test.
3. initiates a traffic mix information procedure to the affected local user if it's allowed.

5.4.3 Calculation of traffic-mix information.

5.4.3.1 General. The quasi-associated network (see Recommendation Q.705, Annexes 1 and 2) uses one piece of additional information called the routing flag. The routing flag provides additional network connectivity information. Two network-specific messages, Subsystem-Backup-Routing and Subsystem-Normal-Routing, allow the value (i.e., "backup" or "normal") of the routing flag to be determined.

Subsystem routing status messages are sent only by intermediate nodes adjacent to the end node at which a subsystem has become recovered or prohibited. When SCCP management marks a subsystem "translate to backup subsystem", a Subsystem-Backup-Routing message is sent to the SCCP management associated with the backup subsystem. When SCCP management marks a subsystem "translate to primary subsystem" and the backup is allowed, a Subsystem-Normal-Routing message is transferred to the SCCP management associated with the backup subsystem.

5.4.3.2 End-node/database. The method of determining the traffic pattern received by a local user at an "end-node/database" is summarized in Figure 18/Q.714. The possible failure combinations upon which this method is based are shown in Figure 19/Q.714.

Traffic-mix information is currently provided only at "end-node/databases".

5.4.4 Subsystem routing status test.

5.4.4.1 General. The subsystem routing status test procedure is an audit procedure which provides recovery from a lost Subsystem-Normal-Routing message.

5.4.4.2 Actions at the initiating node. A subsystem routing status test is initiated by the subsystem routing status procedure when a Subsystem-Backup-Routing message is received.

A subsystem routing status test associated with a subsystem is commenced by starting a timer (rtg.stat.info) and marking a test in progress. No further actions are taken until the timer expires.

Upon expiration of the timer, a Subsystem-Routing-Status-Test message is sent to SCCP management at the node from which the Subsystem-Backup-Routing message was received, and the timer is restarted.

The cycle continues until the test is terminated by another SCCP management function at that node. Termination of the test causes the timer and the test mark to be canceled.

5.4.4.3 Actions at the receiving node. When SCCP management receives an SRT message, it checks the status of the routing flags. If the routing is normal, a Subsystem-Normal-Routing message is sent to SCCP management at the node conducting the test. If there is backup routing, no reply is sent.

6. STATE TRANSITION DIAGRAMS

6.1 General.

This section contains the description of the signalling network functions described in Sections 2 through 5 according to the CCITT Specification and Description Language.

A set of diagrams is provided for each of the following major functions:

a. SCCP routing control (SCRC), described in Section 2.

b. SCCP connectionless control (SCLC), described in Section 4; and

c. SCCP management (SCMG), described in Section 5.

For each major function, a figure illustrates a subdivision into functional specification blocks, showing their functional interactions as well as the interactions with the other major functions. In each

case, this is followed by figures showing state transition diagrams for each of the functional specification blocks. *

The detailed functional breakdown shown in the following diagrams is intended to illustrate a reference model, and to assist interpretation of the text in the earlier section. The state transition diagrams are intended to show precisely the behavior of the signalling system under normal and abnormal conditions as viewed from a remote location. It must be emphasized that the functional partitioning shown in the following diagrams is used only to facilitate understanding of the system behavior, and is not intended to specify the functional partitioning to be adopted in a practical implementation of the signalling system. *

6.2 Drafting conventions. *

Each major function is designated by its acronym (e.g., SCMG = SCCP management). *

Each functional block is designated by an acronym which identifies it (e.g., SSAC = Subsystem allowed control). *

External inputs and outputs are used for interactions between different functional blocks. Included within each input and output symbol in the state transition diagrams are acronyms that identify the functions which are the source and destination of the message, e.g.,: *

SSAC → SSTC indicates that the message is sent within a functional level *
from: subsystem allowed control *
to: subsystem status test control *

Internal inputs and outputs are only used to indicate control of time-outs. *

6.3 Abbreviations and Timers.

Abbreviations and timers used in Figures 1/Q.714 to 19/Q.714 are listed below.

APNB - All-primary/No-backup
APSB - All-primary/Some-backup
APAB - All-primary/All-backup
BCST - Broadcast
CL - Connectionless
CO - Connection-oriented
CSCC - Coordinated State Change Control
DPC - Destination Point Code
DSN - Destination Subsystem Number
GT - Global Title
MTC - Message Type Code
MTP - Message Transfer Part
NPNB - No-primary/No-backup
PATI - Point Code Allowed Traffic Information
PC - Point Code
PCAC - Point Code Allowed Control
PCPC - Point Code Prohibited Control
PPTI - Point Code Prohibited Traffic Information
RFSL - Refusal
SATI - Subsystem Allowed Traffic Information
SBRC - Subsystem Backup Routing Control
SBR - Subsystem-Backup-Routing
SCLC - SCCP Connectionless Control (formerly CLMD)
SCMG - SCCP Management
SCOC - SCCP Connection-Oriented Control (formerly SCDC)
SCRC - SCCP Routing
SLS - Signaling Link Selection
SNR - Subsystem-Normal-Routing
SNRC - Subsystem Normal Routing Control
SOG - Subsystem-Out-of-Service-Grant
SOR - Subsystem-Out-of-Service-Request
SPTI - Subsystem Prohibited Traffic Information
SPNB - Some-primary/No-backup
SPSB - Some-primary/Some-backup
SRT - Subsystem-Routing-Test
SRTC - Subsystem Routing Status Test Control
SSA - Subsystem-Allowed
SSAC - Subsystem Allowed Control
SSN - Subsystem Number
SSP - Subsystem-Prohibited
SSPC - Subsystem Prohibited Control
SST - Subsystem-Status-Test
SSTC - Subsystem Status Test Control
UIS - User-in-Service
UOG - User-Out-of-Service-Grant
UOR - User-Out-of-Service-Request
UOS - User-Out-of-Service

	Timers	*
T(stat.info)	= delay between requests for subsystem status information.	*
T(coord.chg)	= waiting for grant for subsystem to go out of service.	*
T(rtg.stat.info)	= delay between requests for subsystem routing status information.	*
T(ignore sst)	= delay for subsystem receiving grant to go out of service until actually going out of service (provisional value = 30 seconds)	* *

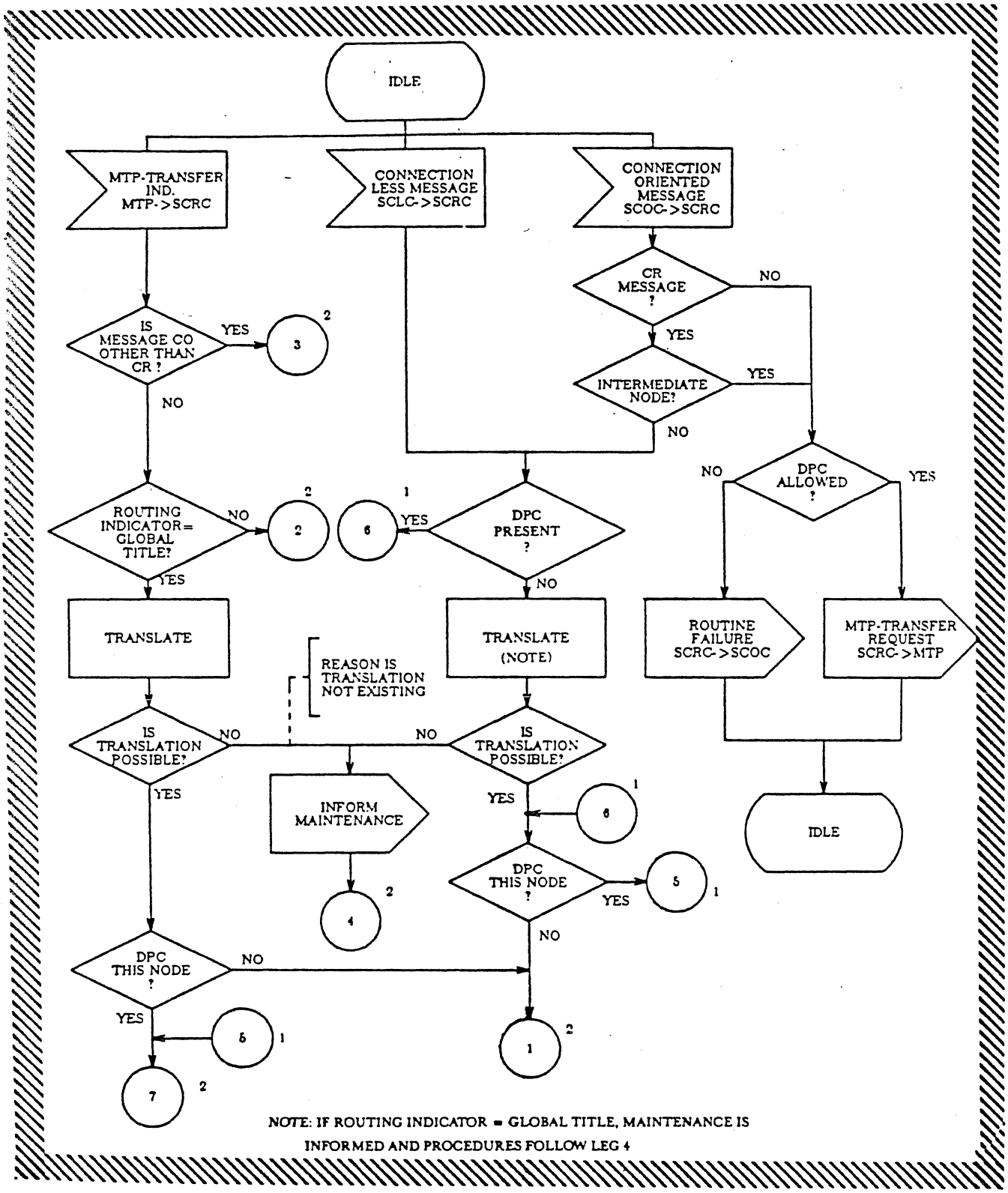


Figure 2/Q.714. SCCP Routing Control Procedures (SCRC) (Sheet 1 of 2)

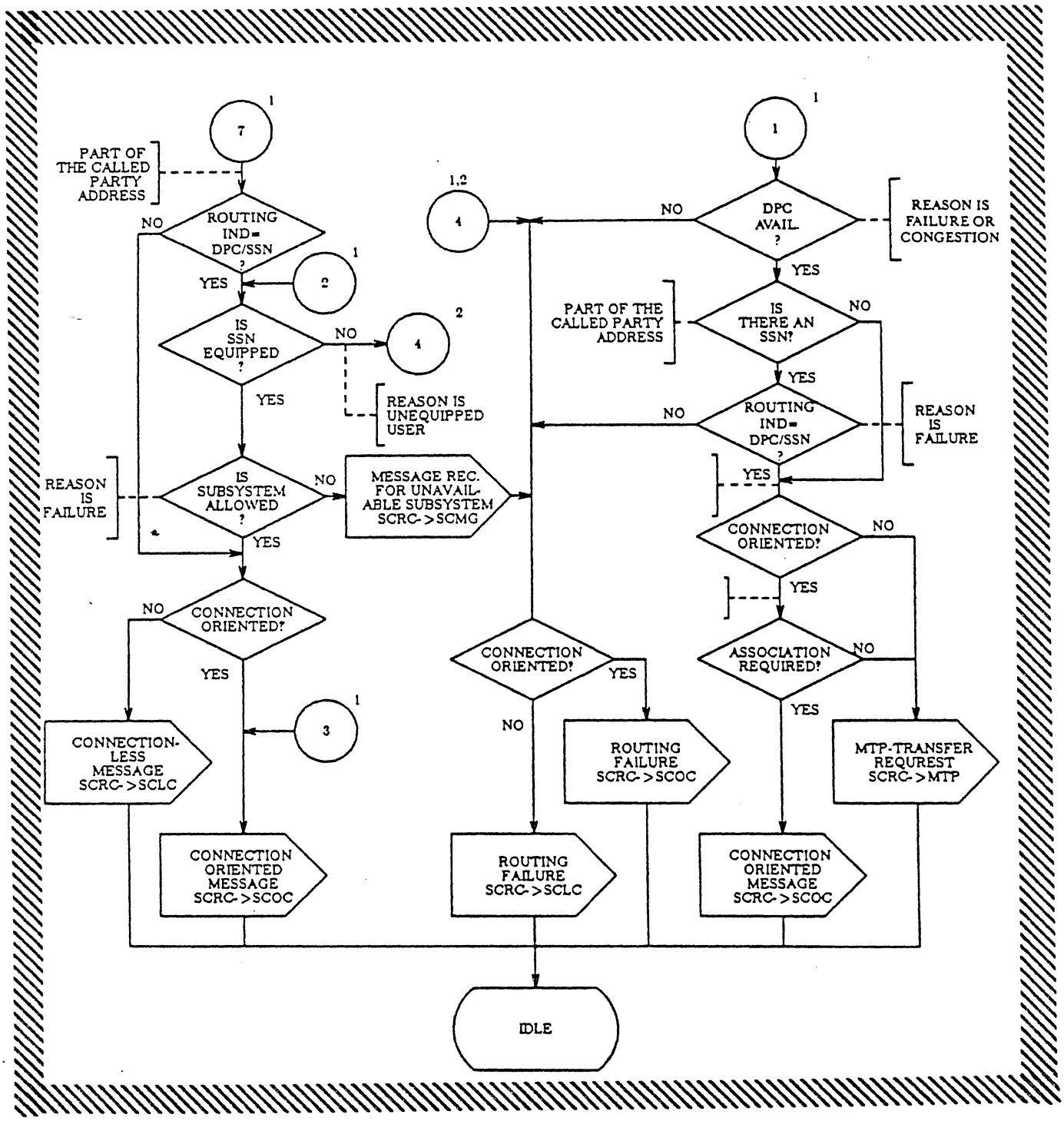


Figure 2/Q.714. SCCP Routing Control Procedures (SCRC) (Sheet 2 of 2)

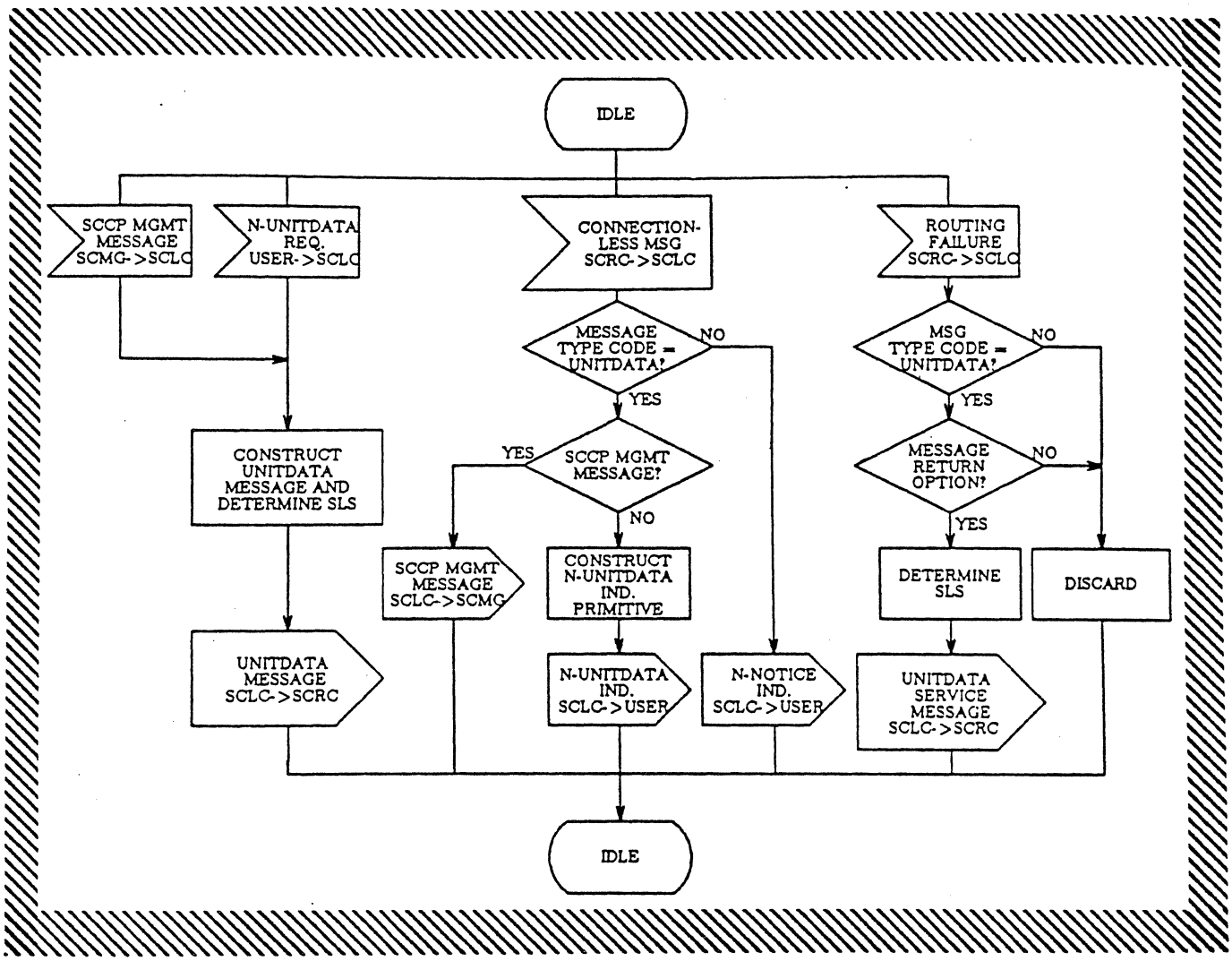


Figure 3/Q.714. SCCP Connectionless Control (SCLC)

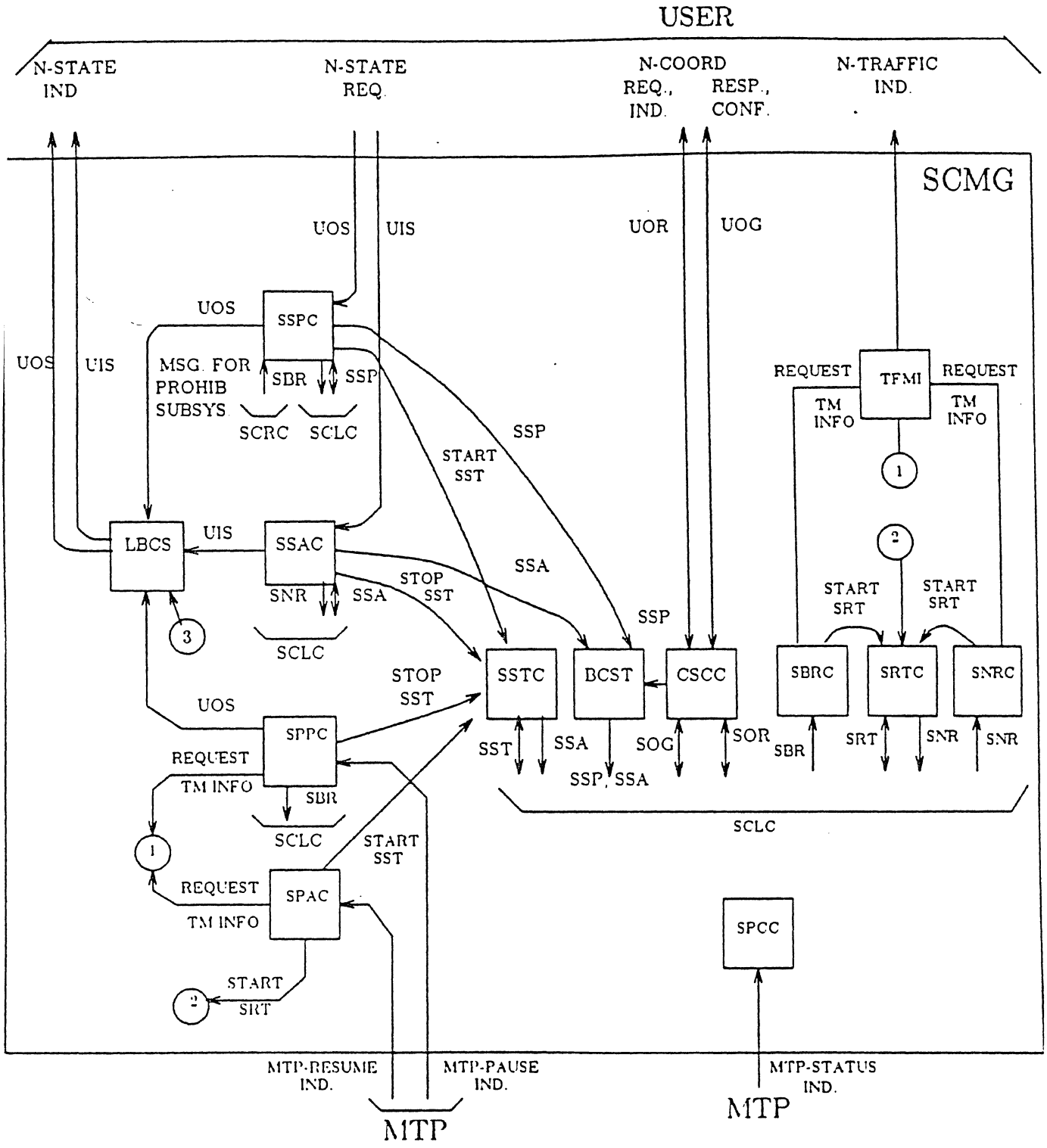
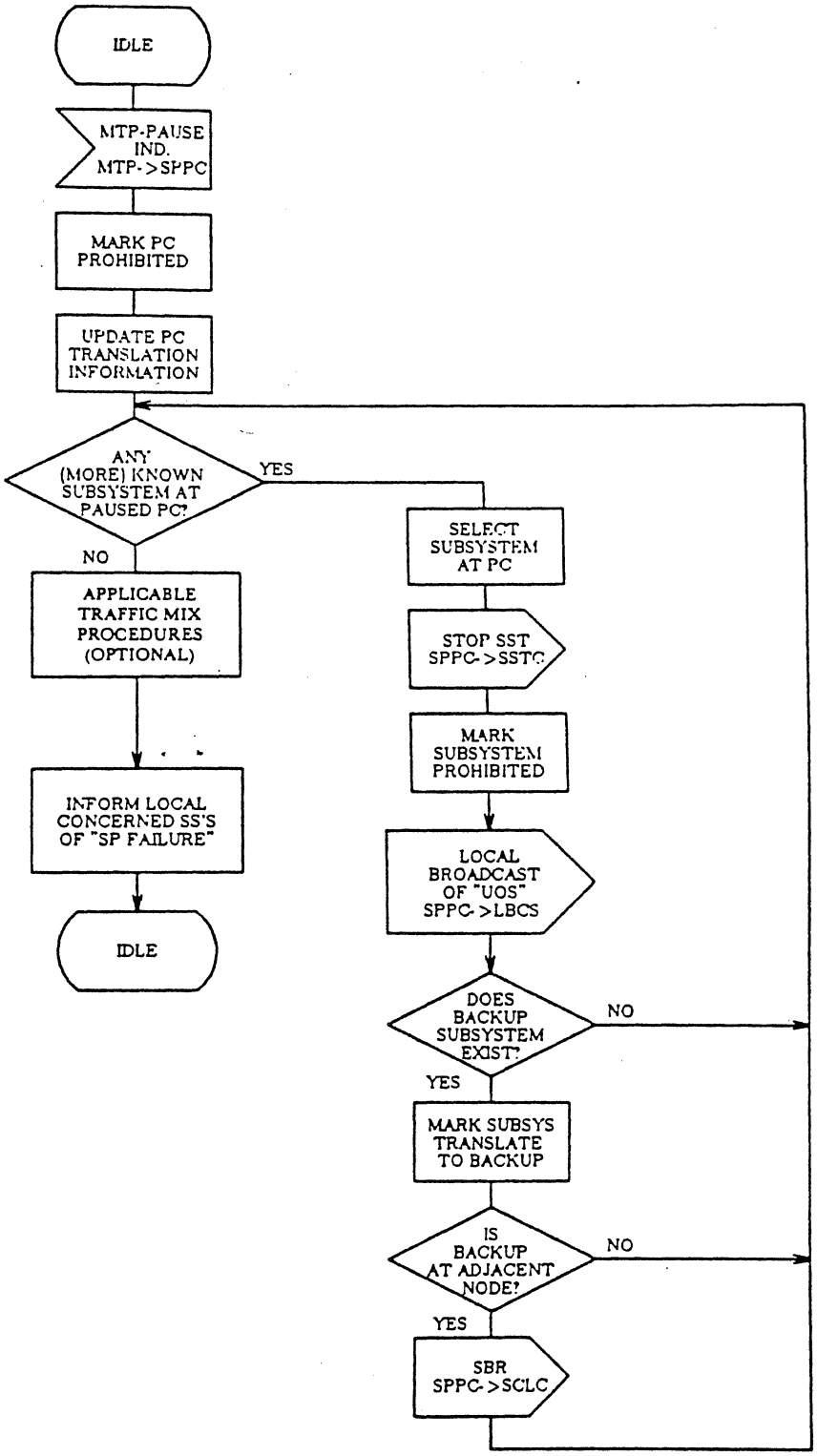


Figure 4/Q.714. SCCP Management Overview (SCMG)



.714. SCCP Management; Signalling Point Prohibited Control (SPPC)

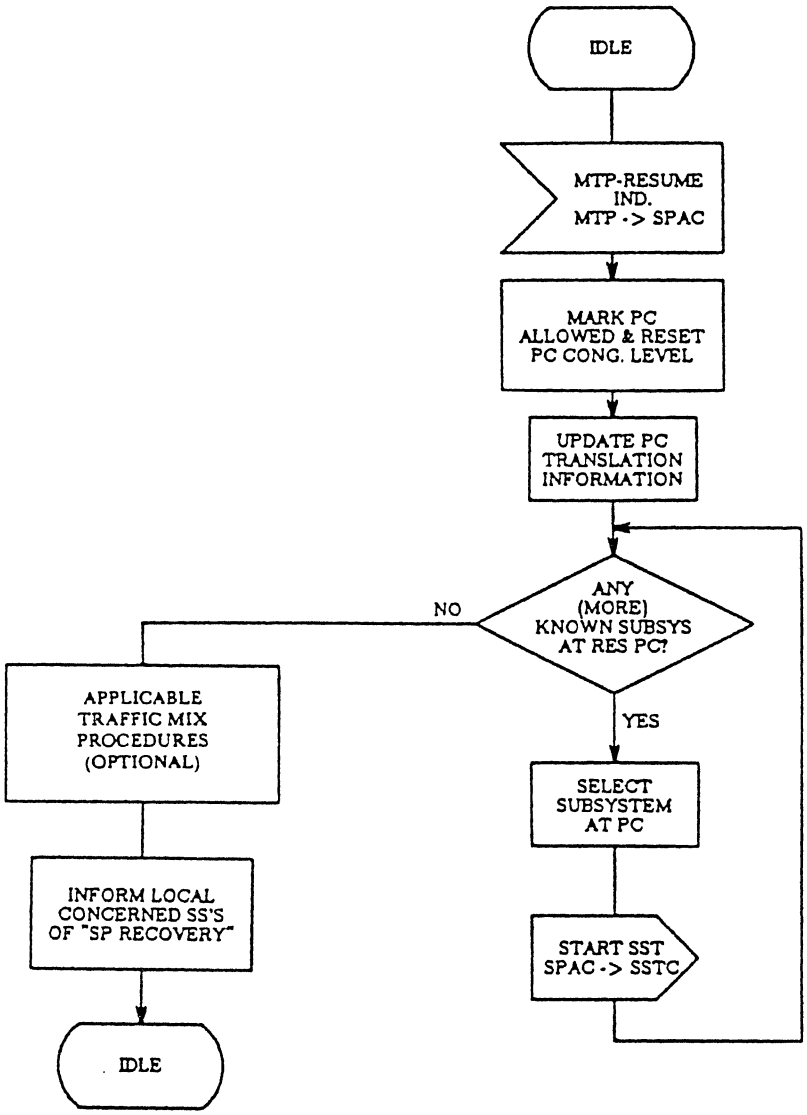


Figure 6/Q.7147. SCCP Management; Signalling Point Allowed Control (SPAC) *

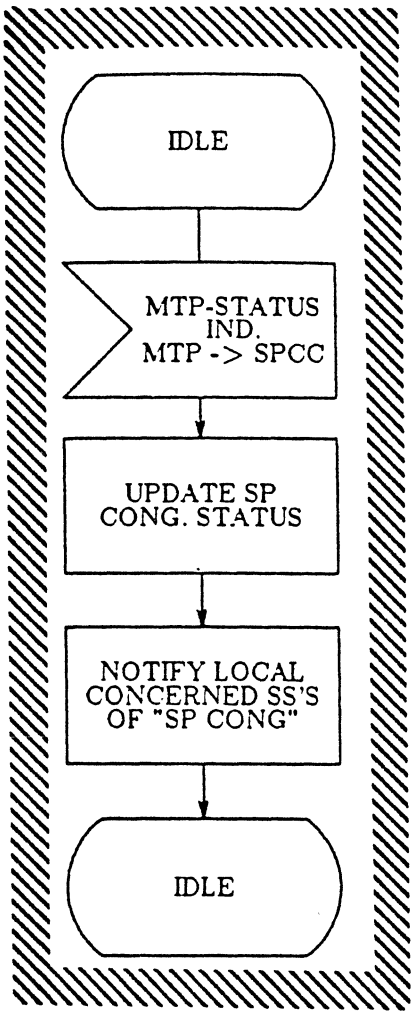


Figure 7/Q.714. SCCP Management; Signalling Point Congested Control (SPCC) *

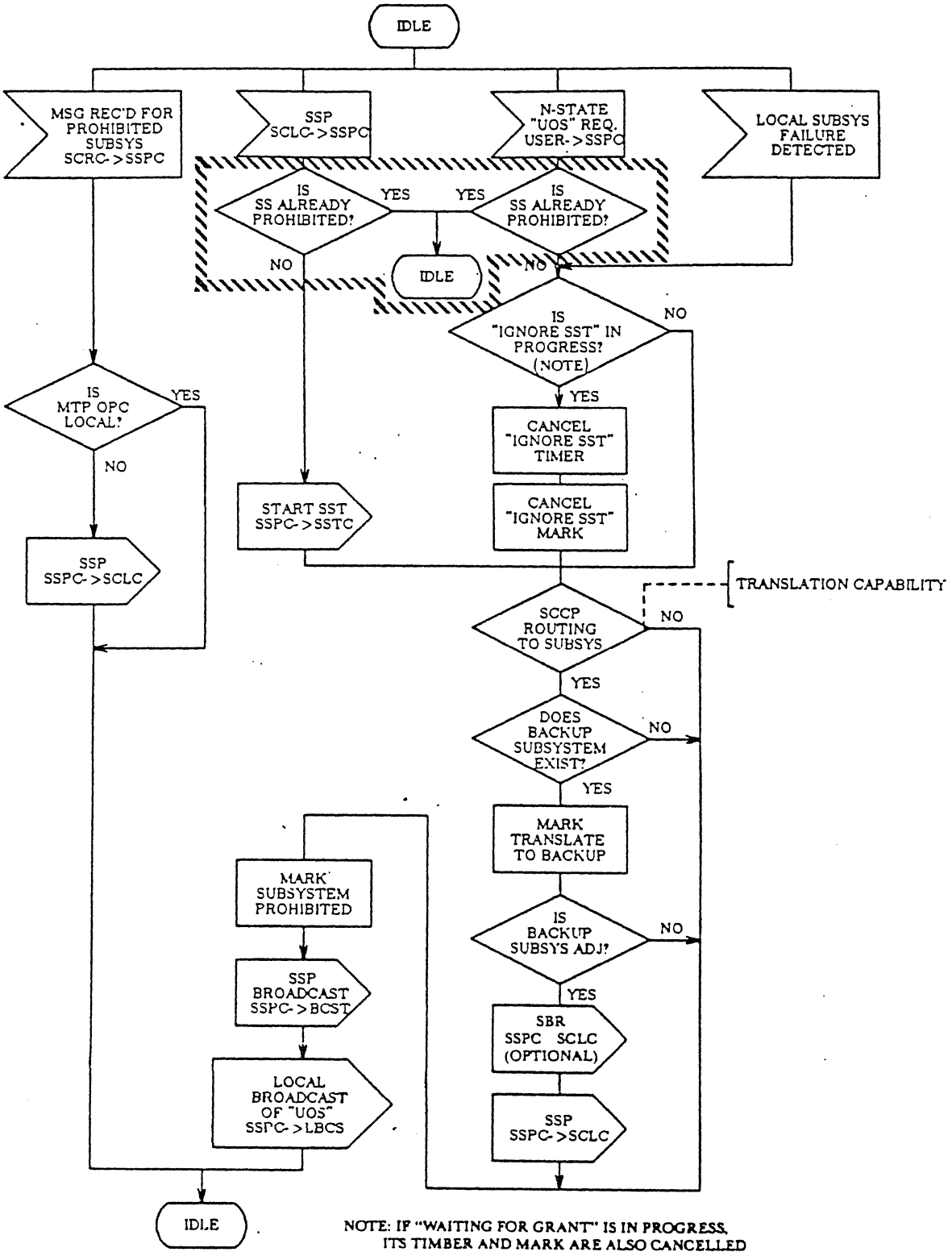


Figure 8/Q.714. SCCP Management; Subsystem Prohibited Control (SSPC)

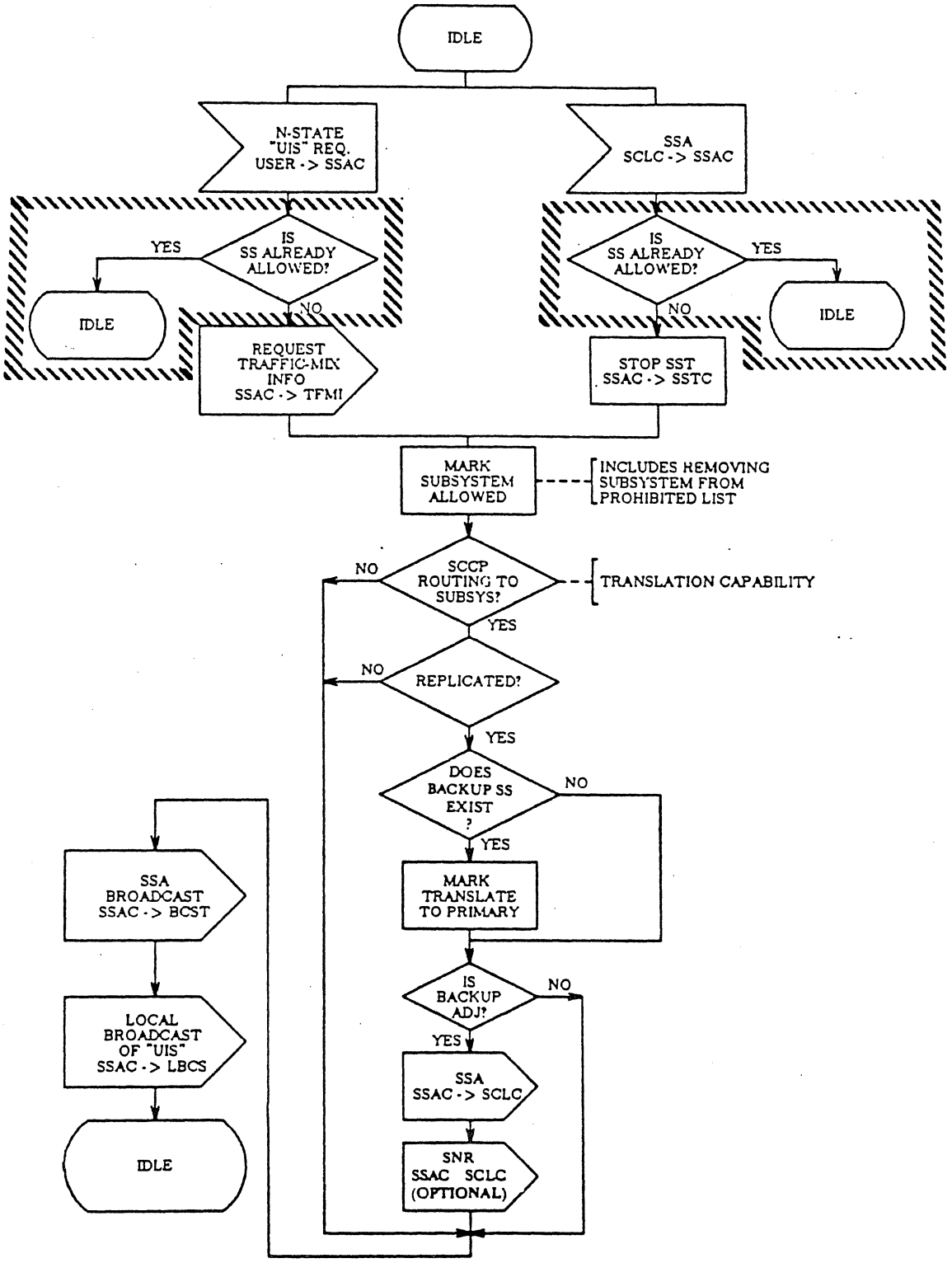


Figure 9/Q.714. SCCP Management; Subsystem Allowed control (SSAC) *

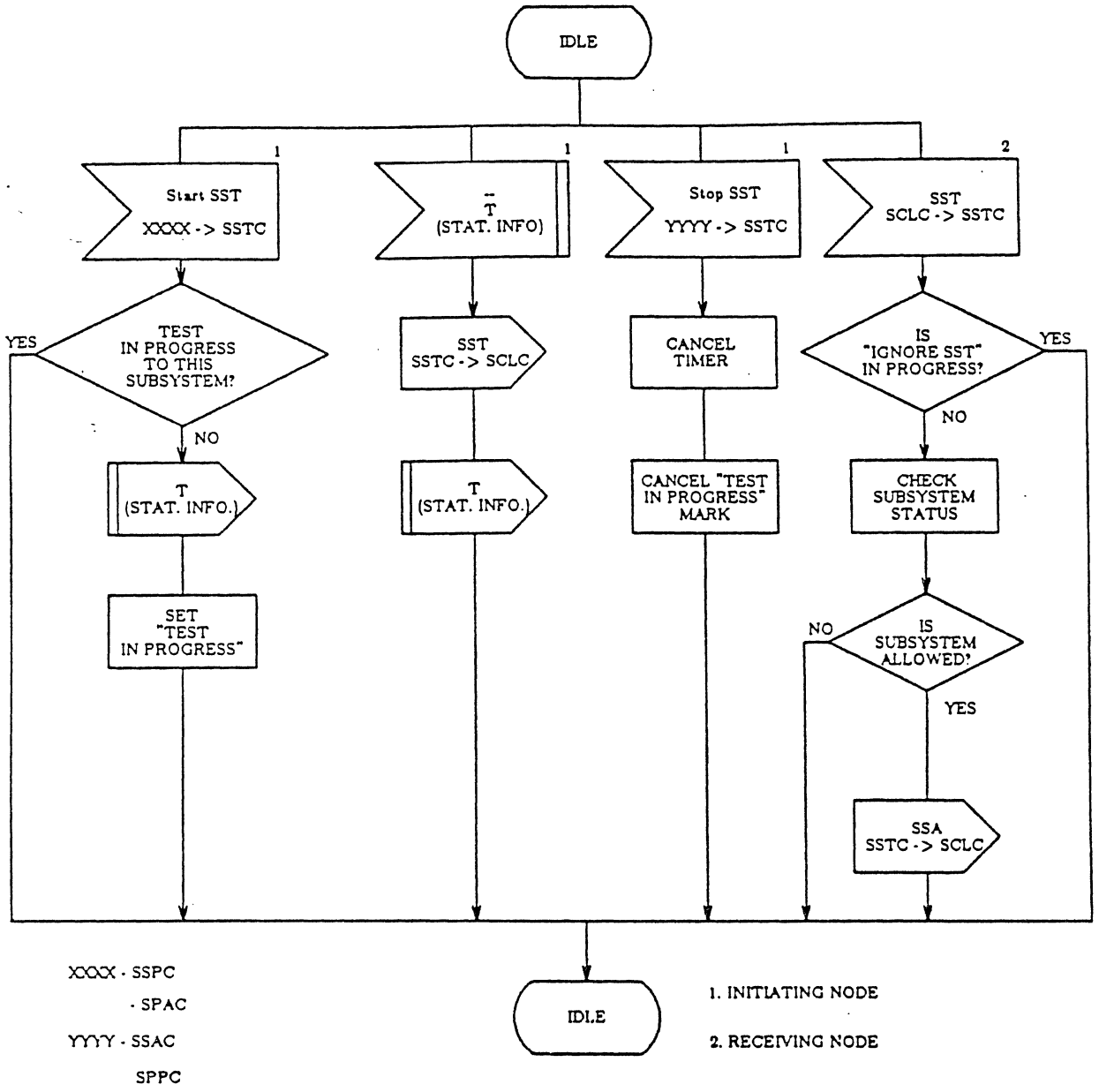


Figure 10/Q.714. SCCP Management; Subsystem Status Test Control (SSTC)

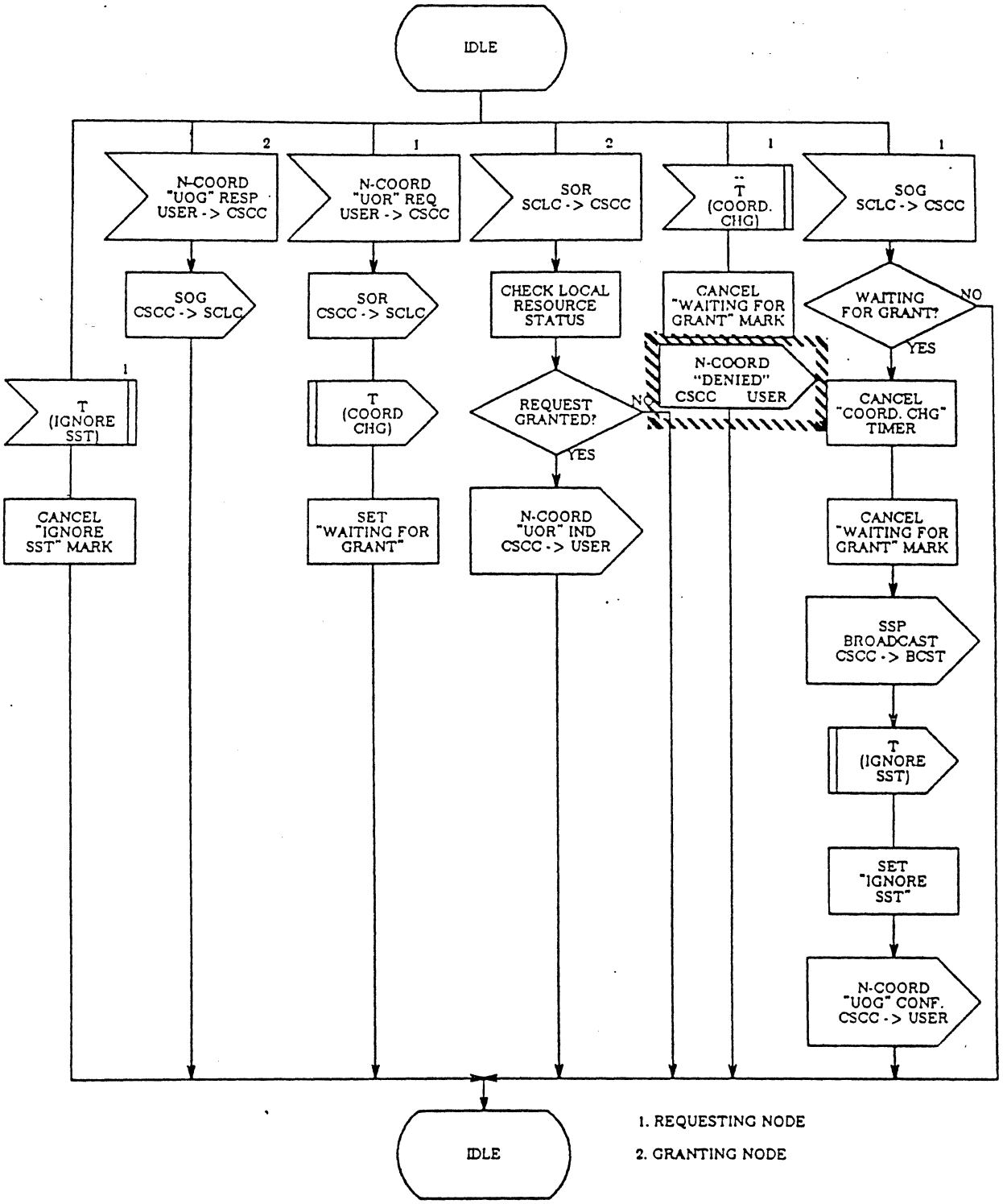


Figure 11/Q.714. SCCP Management; Coordinated State Change Control (CSCC)

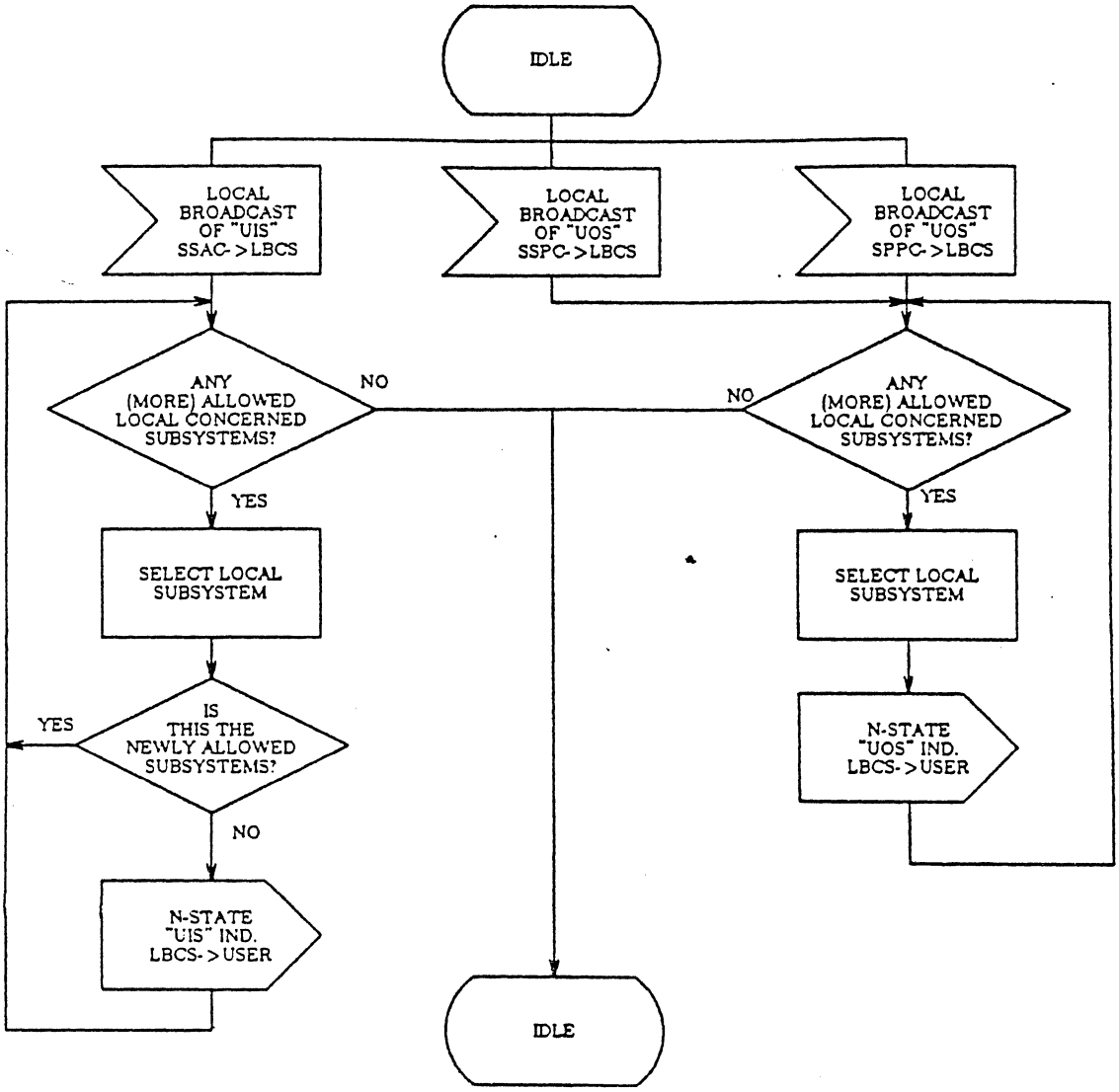


Figure 12/Q.714. SCCP Management; Local Broadcast (LBCS)

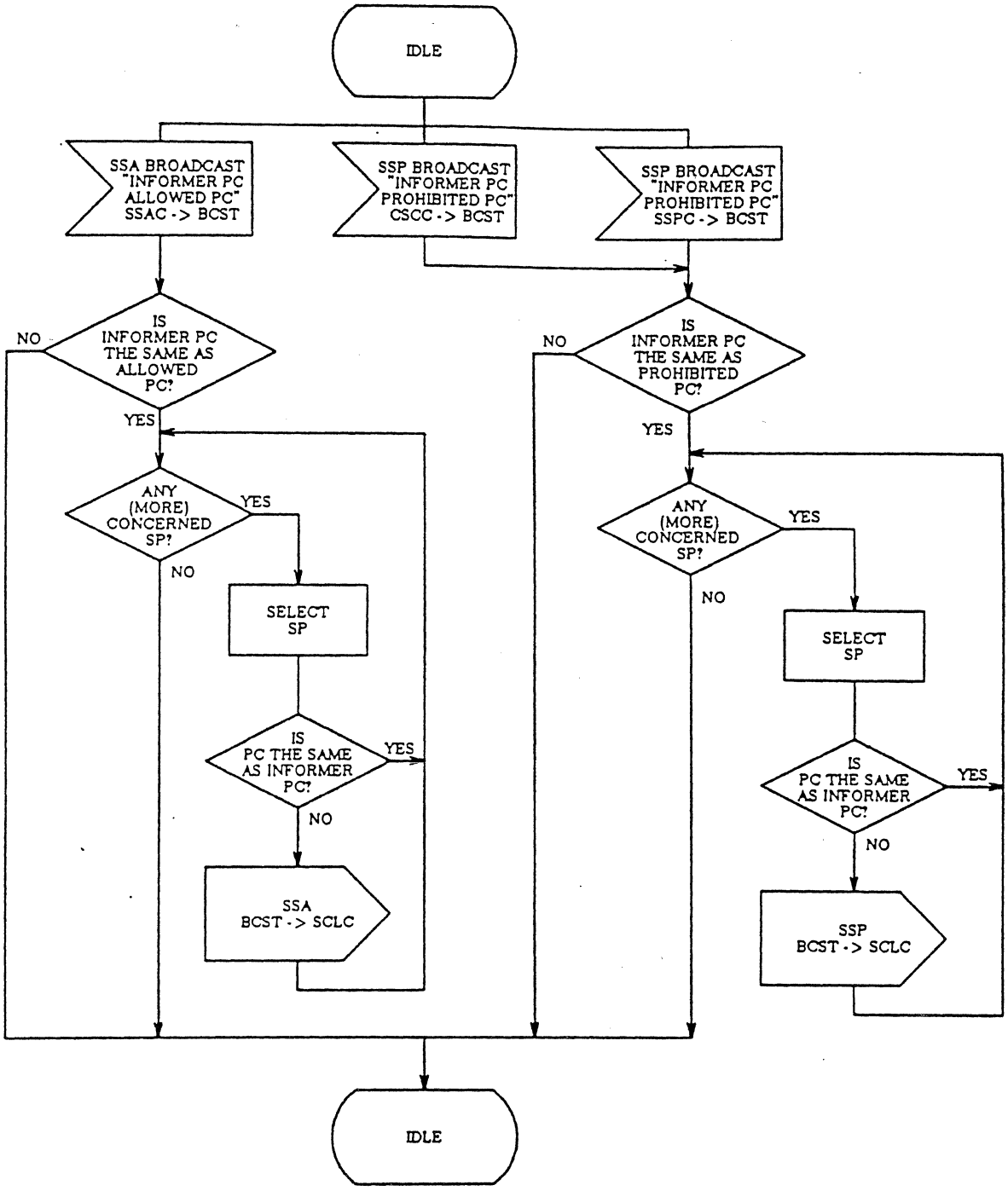


Figure 13/Q.714. SCCP Management; Broadcast (BCST)

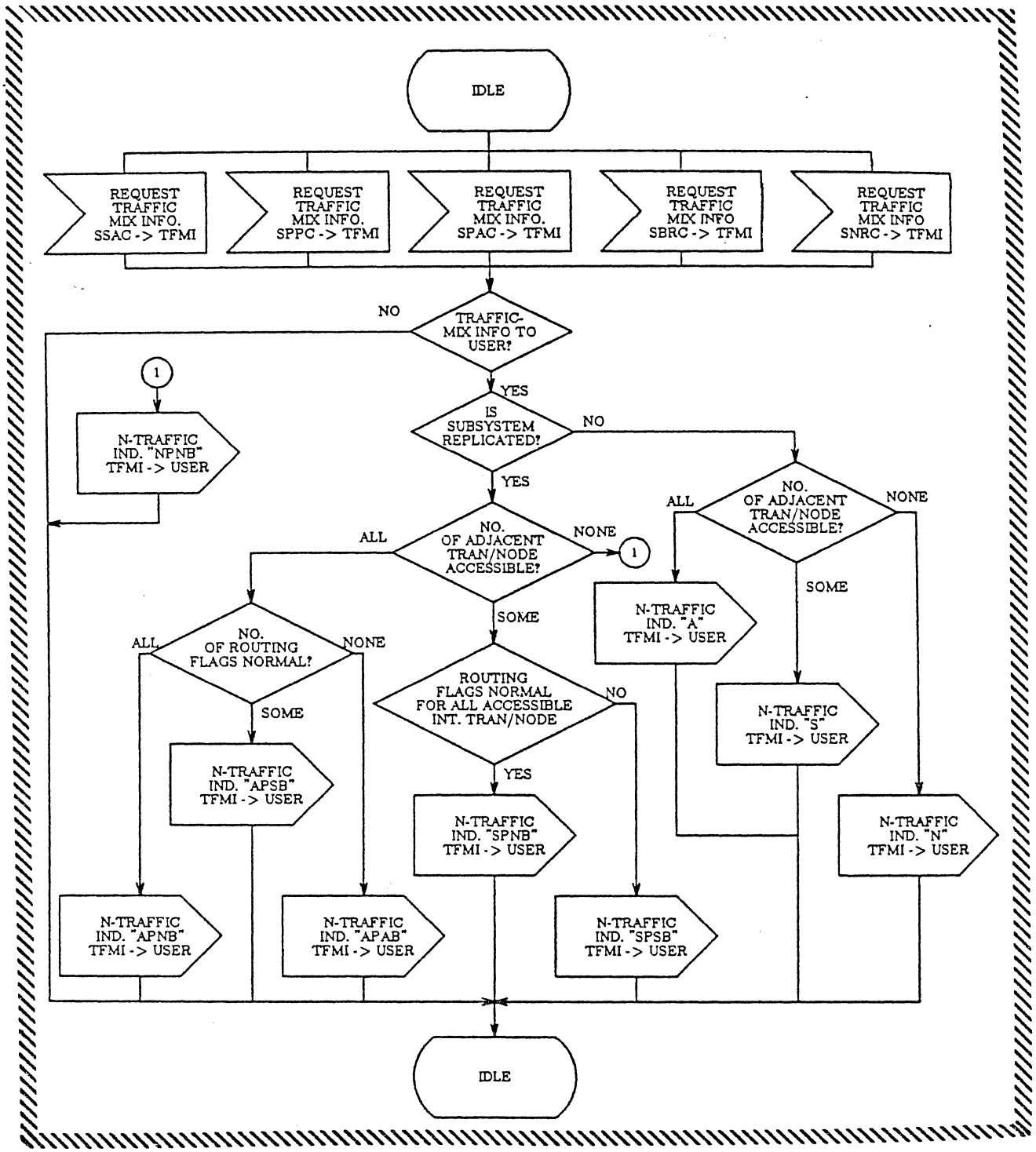


Figure 14/Q.714. SCCP Management; Traffic-Mix Information (TFMI) (Optional)

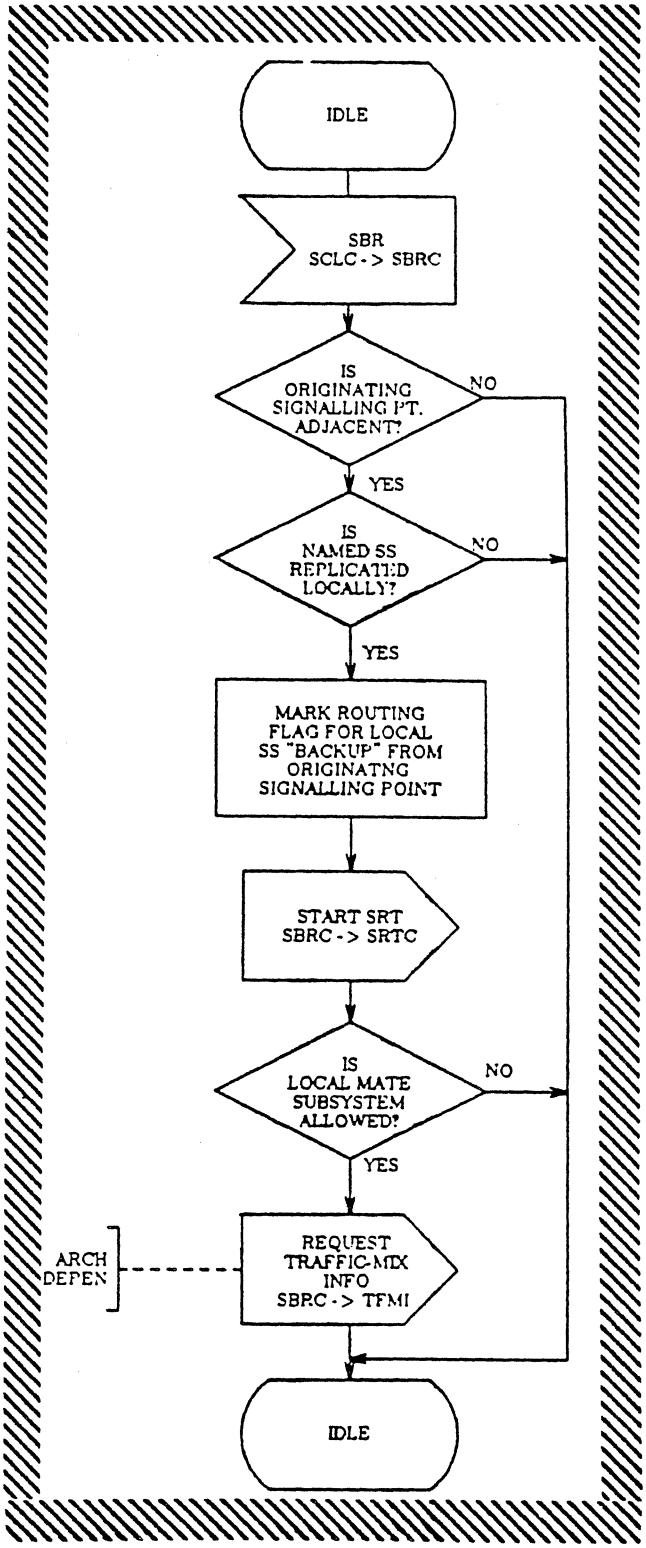


Figure 15/Q.714. SCCP Management; Subsystem Backup Routing Control (SBRC) (Optional)

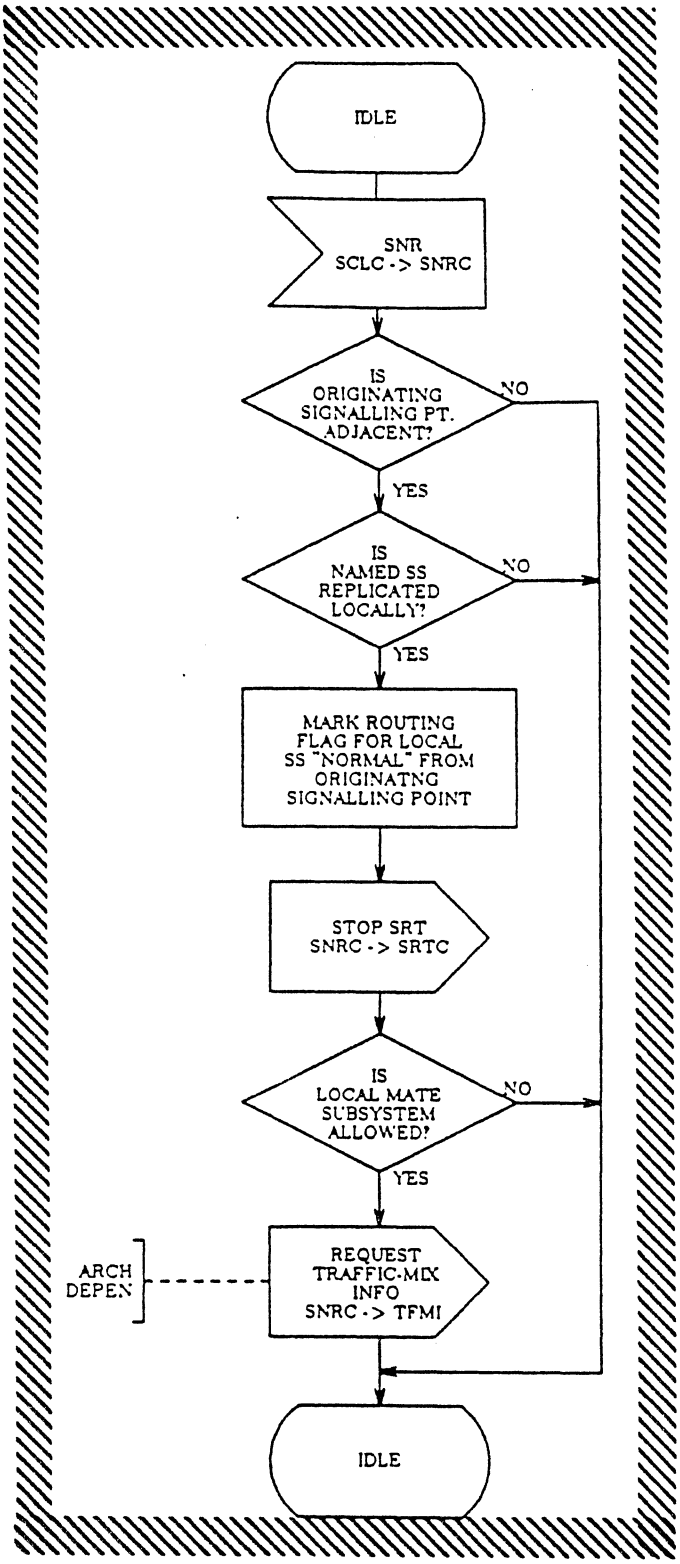


Figure 16/Q.714. SCCP Management; Subsystem Normal Routing Control (SNRC) (Optional)

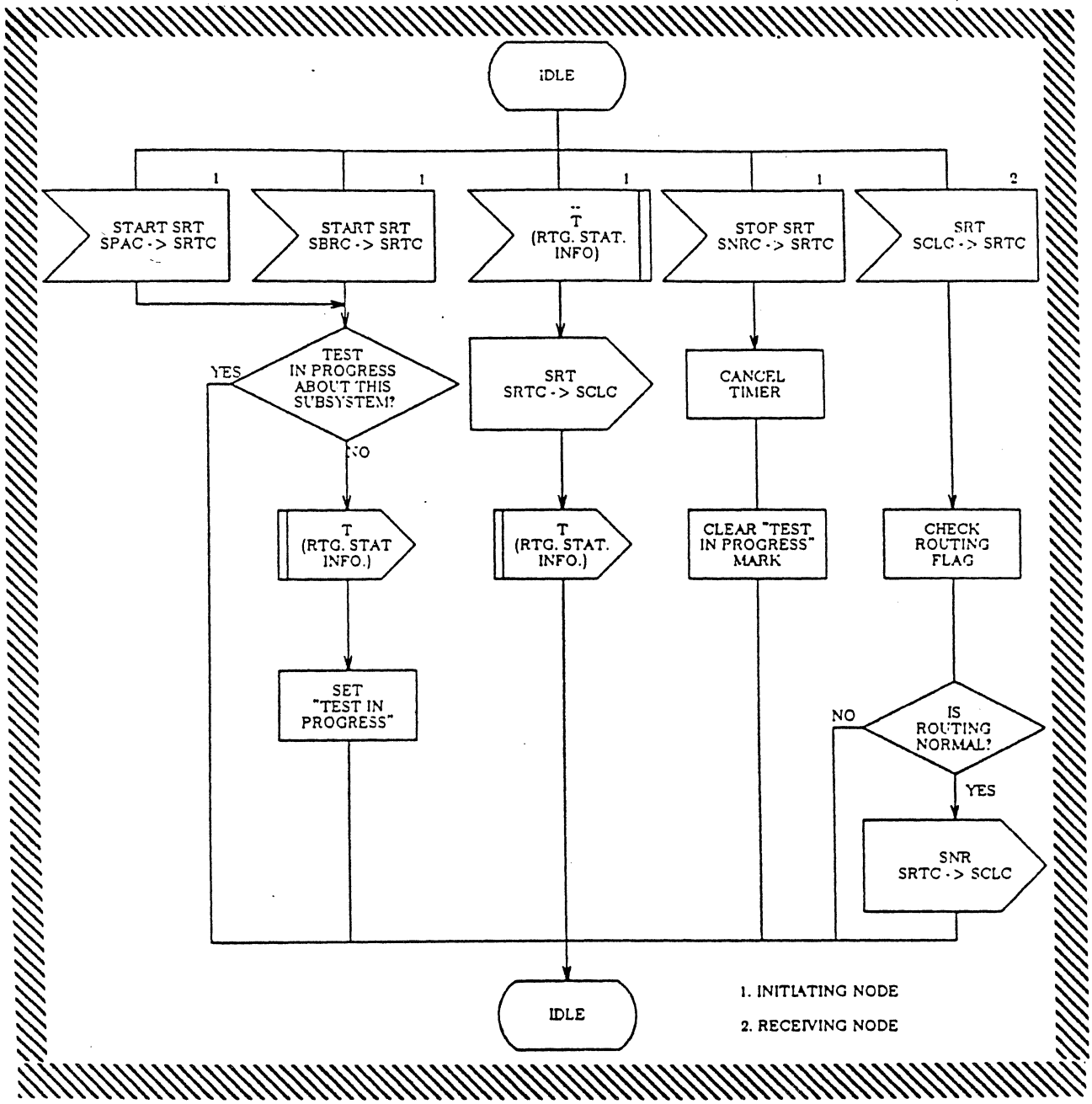


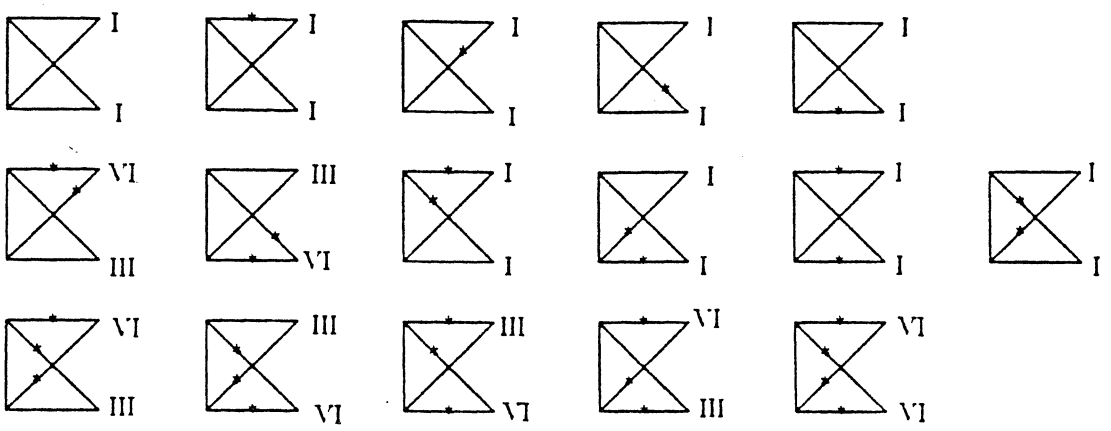
Figure 17/Q.714. SCCP Management; Subsystem Routing Status Test Control (SRTC) (Optional) *

		NUMBER OF ADJACENT STPs ACCESSIBLE	NUMBER OF ROUTING FLAGS NORMAL	TRAFFIC MIX
	I	BOTH	2	AP/NB
	II	BOTH	1	AP/SB
DUPLEX	III	BOTH	0	AP/AB
	IV	ONE	1	SP/NB
	V	ONE	0	SP/SB
	VI	ZERO	-	NP/NB
	VII	BOTH	-	A
SIMPLEX	VIII	ONE	-	S
	IX	ZERO	-	N

Figure 18/Q.714. Architecture - Dependent Traffic Mix Calculation (Optional)

I - APNB III - APAB V - SPSB
II - APSB IV - SPNB VI - NPNB

C-LINK IN SERVICE



C-LINK OUT OF SERVICE

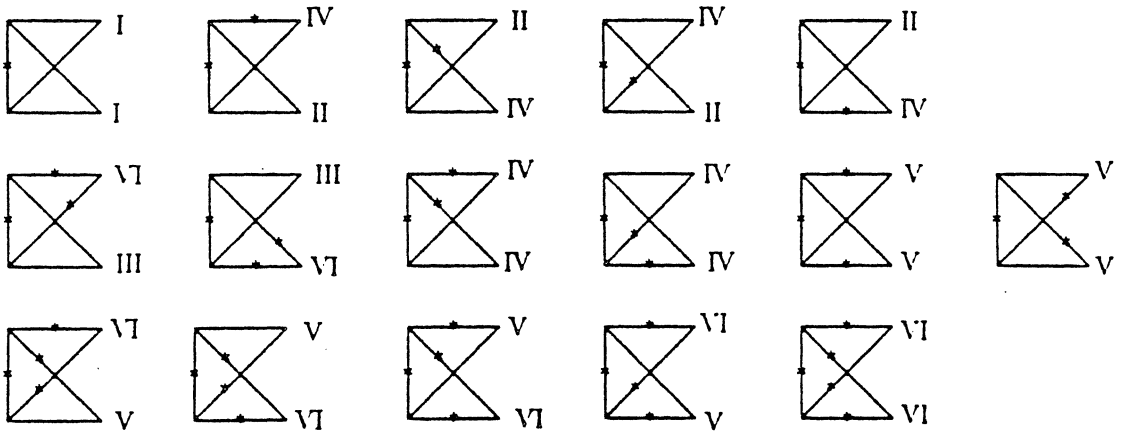


Figure 19/Q.714. Link Failure Summary (Optional)

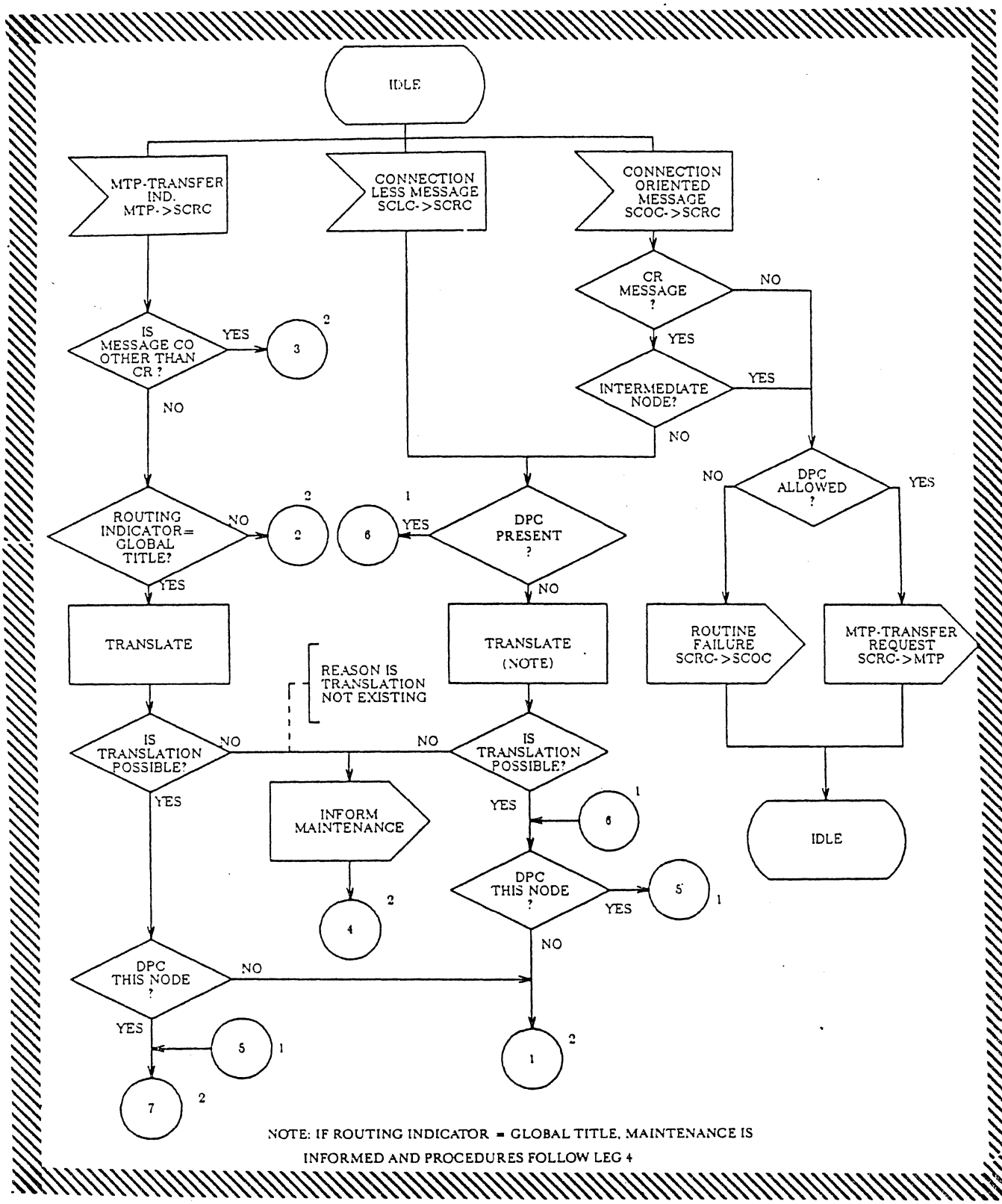


Figure 2/T1.112.4 - SCCP Routing Control Procedures (SCRC) (Sheet 1 of 2)

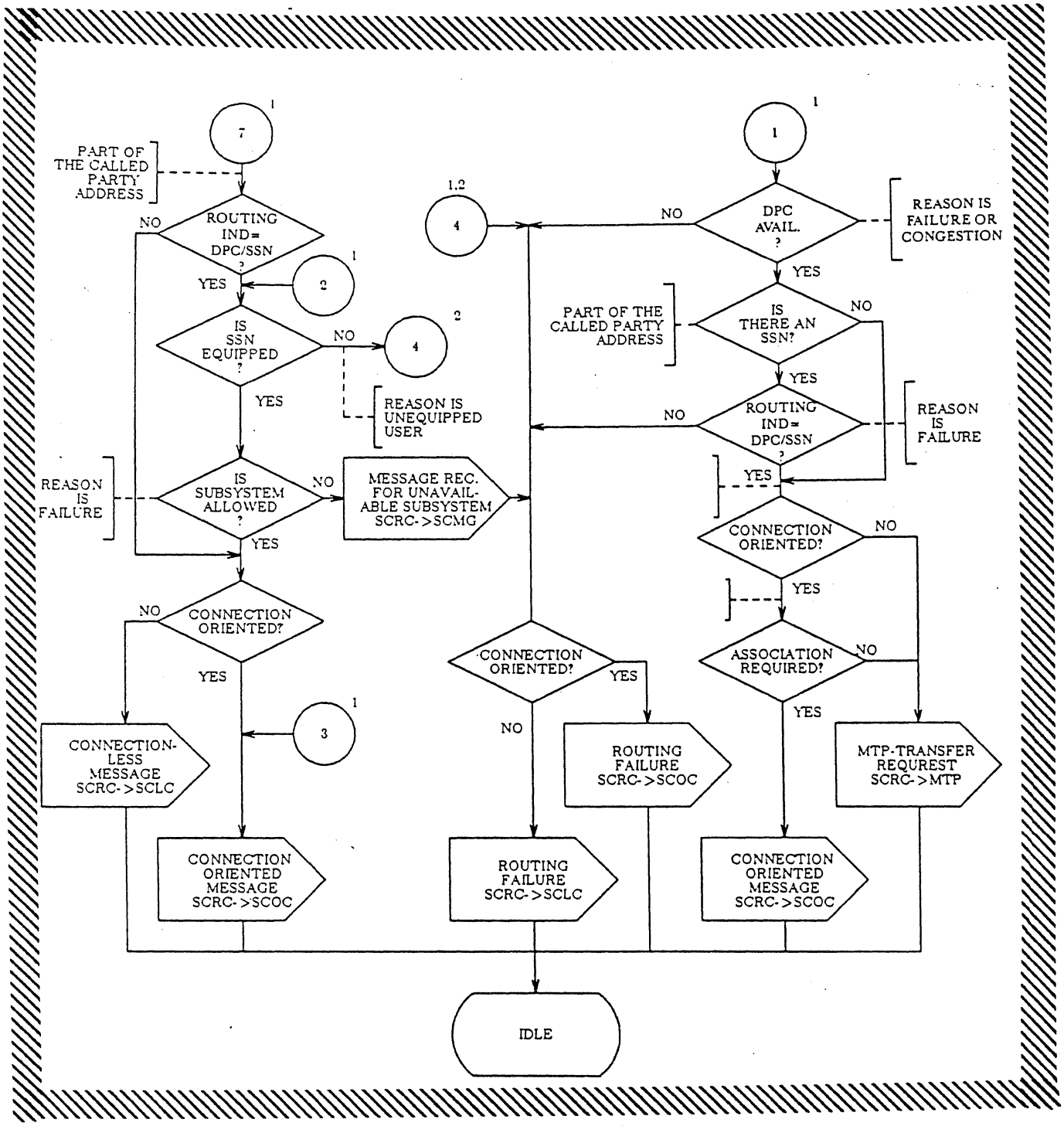


Figure 2/T1.112.4 - SCCP Routing Control Procedures (SCRC) (Sheet 2 of 2) *

ANNEX

CONTENTS

LIST OF FIGURES

ANNEX

(to Q.714)

Examples of SCCP Routing

1. Introduction

This Annex contains examples of addressing used in SCCP routing of connectionless messages. They are intended only to describe the use of global titles and the message return function, and should not be taken as a specification of how SCCP routing must be used. The point code, subsystem number and global title values are symbolic only.

2. Simple Global Title Translation

2.1 Successful Routing

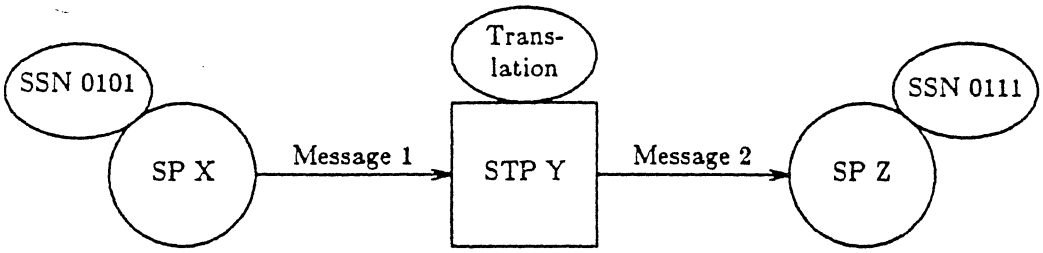


Figure 1 - Routing Model for Simple Successful Routing

The initial message (message 1) from SP X has address information coded as follows:

MTP information:

DPC = Y
OPC = X

SCCP information:

Cd Addr = GT + SSN, GT routing
GT = 201-758
SSN = 0000
Cg Addr = PC + SSN, SSN routing
PC = X
SSN = 0101

At STP Y, in this case GT translation results in GT 201-758 -> PC Z + SSN 0111. The subsequent message (message 2) from STP Y to SP Z is as follows:

MTP information:

DPC = Z
OPC = Y

SCCP information:

Cd Addr = GT + SSN, SSN routing
GT = 201-758
SSN = 0111
Cg Addr = PC + SSN, SSN routing
PC = X
SSN = 0101

2.2 Unsuccessful Routing

It is assumed here that message return on error has been requested by the sender, SP X. If message return was not requested, no UDTS message would be sent.

2.2.1 Scenario 1: Routing Problem in STP

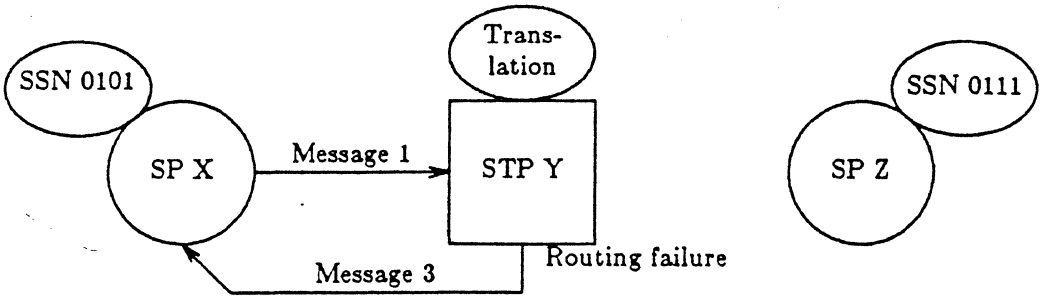


Figure 2 - Routing Failure at STP

In this case, a routing problem occurs at the STP, resulting in a Unitdata Service message (message 3) being returned to the sender with the following form:

MTP information:

DPC = X
OPC = Y

SCCP information:

Cd Addr = SSN, SSN routing
SSN = 0101
Cg Addr = GT + SSN, GT routing
GT = 201-758
SSN = 0000
Cause = No transl. for this address, or
no transl. for this type, or
network failure/congestion, or
subsystem failure

Note: The Called Party Address may also contain point code X, if the UDTS is generated by modifying the pointer values to reverse the positions of the Calling and Called Party Address parameters. The point code would not be used by SCCP routing, and could be dropped if global title translation occurs in the reverse direction.

2.2.2 Scenario 2: Routing Problem in Terminating Node

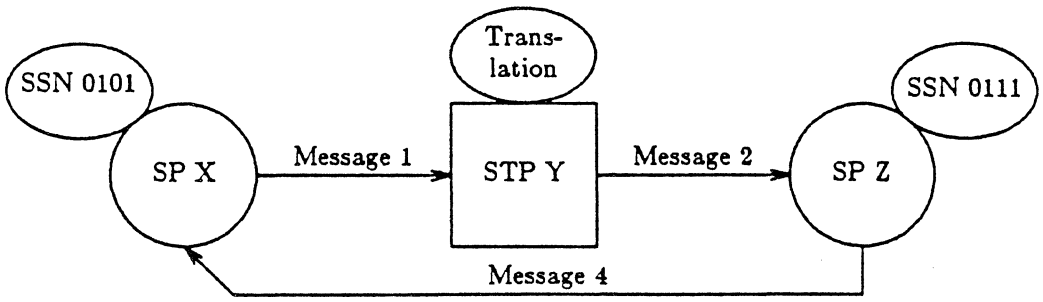


Figure 3 - Routing Problem in Terminating Node

ANNEX

In this case, a routing failure occurs in the terminating node, and if message return has been requested, the following UDTS message (message 4) is returned to the sender:

MTP information:

DPC = X
OPC = Z

SCCP information:

Cd Addr = SSN, SSN routing
SSN = 0101
Cg Addr = GT + SSN, SSN routing
GT = 201-758
SSN = 0111
Cause = Subsystem failure, or
unequipped user

Note: If the pointer modifying method is used, the Called Party Address would contain the point code X.

3. Routing to Distribute Translation Load

This section provides an example of routing where a different point does global title translation for messages with different "classes" of global titles to be translated. This allows the total global title translation load to be distributed over a number of STPs. One example of how global titles may be differentiated into classes would be to use the translation type.

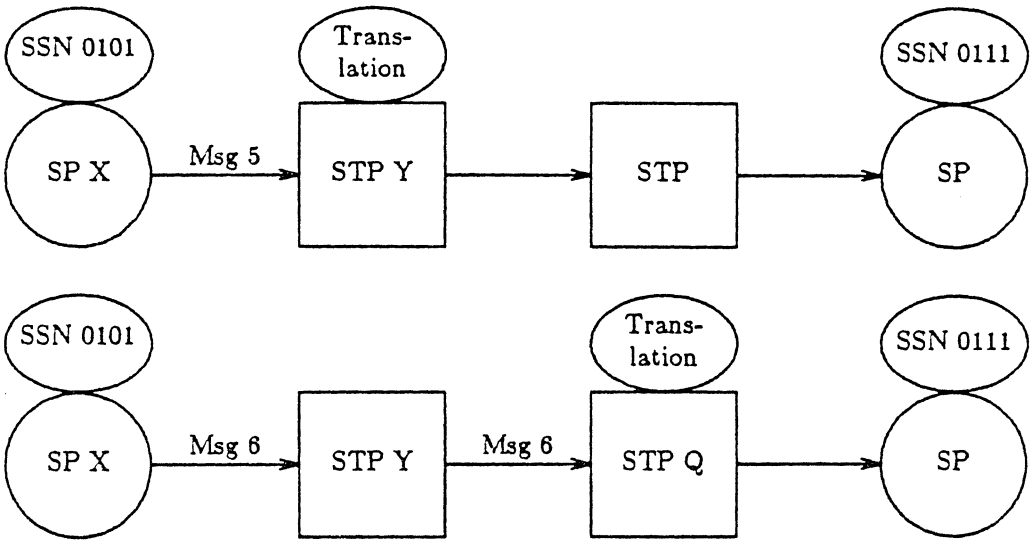


Figure 4 - Routing Model

The first message (message 5) from SP X has the address form:

ANNEX

MTP information:
DPC = Y
OPC = X
SCCP information:
Cd Addr=GT+SSN, GT routing
GT = 201-758, Type = A
SSN = 0000
Cg Addr=PC+SSN, SSN routing
PC = X
SSN = 0101

Messages with this type of address are directed toward STP Y for global title translation.

A second message (message 6) from SP X carries a global title with different translation type, as follows:

MTP information:
DPC = Q
OPC = X
SCCP information:
Cd Addr=GT+SSN, GT routing
GT = 201-758, Type = B
SSN = 0000
Cg Addr=PC+SSN, SSN routing
PC = X
SSN = 0101

In this case, the message is passed through STP Y via MTP routing. The translation of global titles follows the pattern for successful simple routing.

4. Routing with Multiple Translations

This section provides models for routing where multiple points do global title translation on a single message, from a user's perspective, during that message's transit.

4.1 Successful Routing

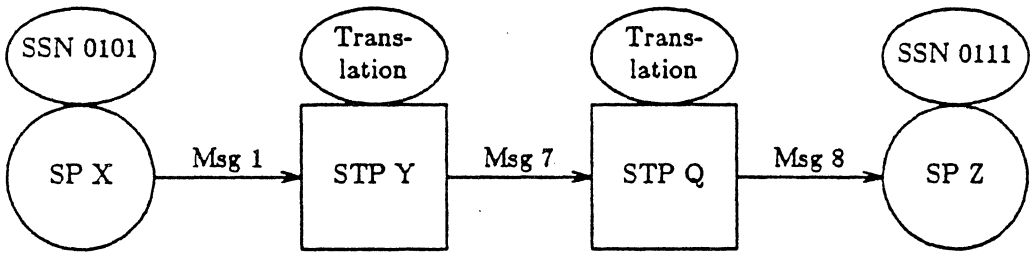


Figure 5 - Routing for Multiple Translations

Message 1 carries information as described in section 2.1 of this annex. In this case, GT translation at STP Y results in GT 201-758 -> PC Q and GTT 212, and no SSN is determined. The subsequent message (message 7) from STP Y takes this form:

ANNEX

MTP information:

DPC = Q
OPC = Y

SCCP information:

Cd Addr = GT + SSN, GT routing
GT = 212
SSN = 0000
Cg Addr = PC + SSN, SSN routing
PC = X
SSN = 0101

When this message is received at point Q, a second translation takes place with a subsystem number and point code being identified, and message 8 is forwarded to SP Z with the form:

MTP information:

DPC = Z
OPC = Q

SCCP information:

Cd Addr = GT + SSN, SSN routing
GT = 212
SSN = 0111
Cg Addr = PC + SSN, SSN routing
PC = X
SSN = 0101

ANNEX

4.2 Failure Case

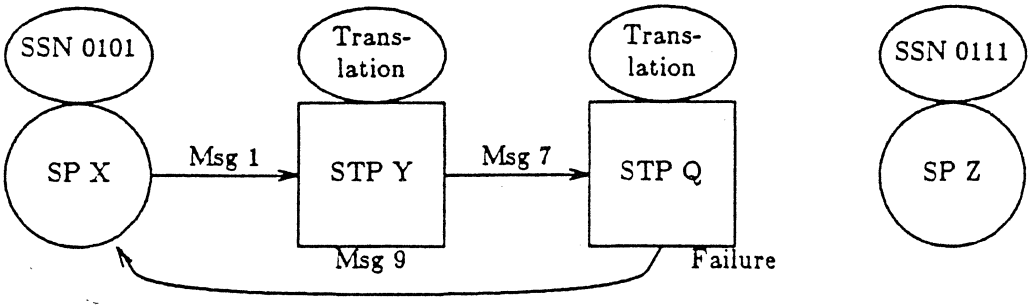


Figure 6 - Routing Problem at Second Translation Point

In this case, a routing failure has taken place at the second translation point. This failure results in the sending of a Unitdata Service message (message 9) back to the Calling Party as follows:

MTP information:

DPC = X
OPC = Q

SCCP information:

Cd Addr = SSN, SSN routing
SSN = 0101
Cg Addr = GT + SSN, GT routing
GT = 212
SSN = 0000
Cause = No translation for this address, or
no translation for this type address, or
network failure or congestion, or
subsystem failure or congestion.

In this case, the calling party cannot determine the original called party address value from the UDTS message, due to the intervening translation.