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SERIES Q: SWITCHING AND SIGNALLING

Technical Report TRQ.2141.1: Signalling requirements for the support of narrowband services via broadband transport technologies – CS-2 signalling flows

ITU-T Q-series Recommendations – Supplement 32

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Supplement 32 to ITU-T Q-series Recommendations

Technical Report TRQ.2141.1: Signalling requirements for the support of narrowband services via broadband transport technologies – CS-2 signalling flows

Summary

This Supplement to ITU-T Q-series Recommendations is a technical report on the procedures, information flows and information elements needed for supporting CS-2 signalling requirement flows for the support of narrowband services via broadband transport technologies. Its scope is limited to functionality of the Serving Node and Call Mediation Node, and the associated protocols at the call control, bearer control, and call-bearer control levels needed for Capability Set 2.

FOREWORD

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1 Scope

This Supplement provides signalling flows for the support of BICC CS-2 signalling requirements for the support of narrowband services via broadband transport technologies.

1.1 Functional reference model

Figure 1 shows the composition of the functional reference model. Refer to clause 3 for the definition of each of the functional entities. The signalling network will be used for the transport of the call control signalling. The interface from the existing network will be N-ISUP.

2 References

[1] ITU-T Recommendation Q.115 (1999), *Logic for the control of echo control devices*.

[2] ITU-T Recommendation Q.761 (1999), *Signalling System No. 7 – ISDN user part functional description*.

[3] ITU-T Recommendation Q.762 (1999), *Signalling System No. 7 – ISDN user part general functions of messages and signals*.

[4] ITU-T Recommendation Q.763 (1999), *Signalling System No. 7 – ISDN user part formats and codes*.

[5] ITU-T Recommendation Q.764 (1999), *Signalling System No. 7 – ISDN user part signalling procedures*.

[6] ITU-T Recommendation Q.766 (1993), *Performance objectives in the integrated services digital network application*.

[7] ITU-T Recommendation Q.701 (1993), *Functional description of the message transfer part (MTP) of Signalling System No. 7*.

[8] ITU-T Recommendation Q.702 (1988), *Signalling data link*.

[9] ITU-T Recommendation Q.703 (1996), *Signalling link*.

[10] ITU-T Recommendation Q.704 (1996), *Signalling network functions and messages*.

[11] ITU-T Recommendation Q.706 (1993), *Message transfer part signalling performance*.

[12] ITU-T Recommendation Q.765 (2000), *Signalling System No. 7 – Application transport mechanism*.

[13] ITU-T Recommendation Q.2210 (1996), *Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140*.

[14] ITU-T Recommendation Q.2140 (1995), *B-ISDN ATM adaptation layer – Service specific coordination function for signalling at the network node interface (SSCF at NNI)*.

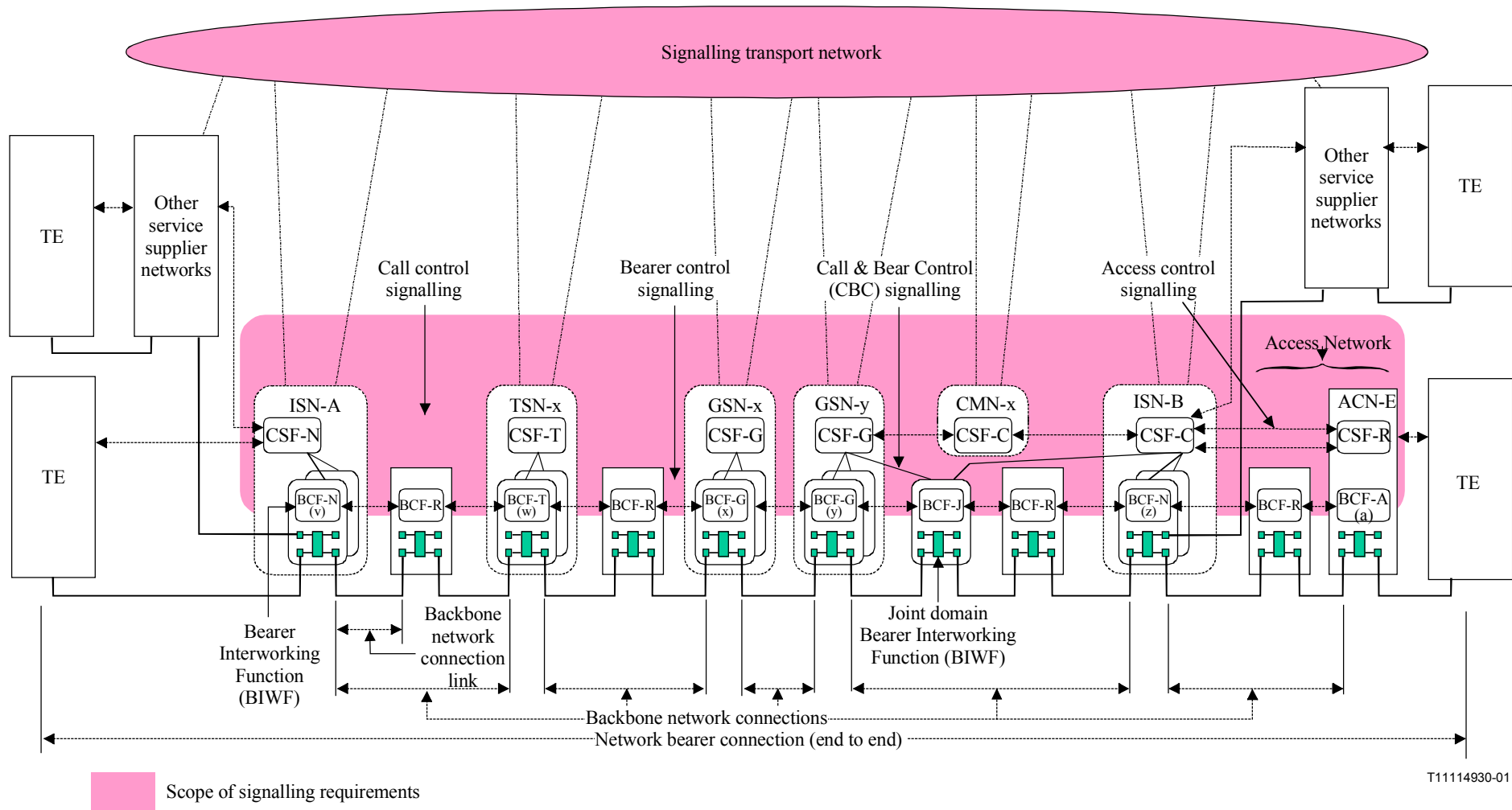[15] ITU-T Recommendation H.248.1 (2002), *Gateway control protocol: Version 2*.

Figure 1 – Composite functional reference model

3 Definitions

3.1 Functional model definitions

Definitions of the items contained in the composite functional model are as follows:

3.1.1 Backbone Network Connection (BNC): Represents the edge to edge transport connection within the backbone network, consisting of one or more Backbone Network Connection Links (BNCL). The Backbone Network Connection represents a segment of the end to end Network Bearer Connection (NBC).

3.1.2 Backbone Network Connection Link (BNCL): Represents the transport facility between two adjacent backbone network entities containing a bearer control function.

3.1.3 Bearer Control Function (BCF): Note that five types of BCFs are illustrated in the above functional model; BCF-G, BCF-J, BCF-N, BCF-R and BCF-T.

–   The Bearer Control Gateway Function (BCF-G) provides the control of the bearer switching function, the communication capability with its associated call service function (CSF-G), and the signalling capability necessary to establish and release of the backbone network connection.

–   The Bearer Control Joint Function (BCF-J) provides the control of the bearer switching function, the communication capability with two associated call service functions (CSF), and the signalling capability necessary to establish and release the backbone network connection.

–   The Bearer Control Nodal Function (BCF-N) provides the control of the bearer switching function, the communication capability with its associated call service function (CSF), and the signalling capability necessary to establish and release of the backbone network connection to its peer (BCF-N).

–   The Bearer Control Relay Function (BCF-R) provides the control of the bearer switching function and relays the bearer control signalling requests to next BCF in order to complete the edge to edge backbone network connection

–   The Bearer Control Transit Function (BCF-T) provides the control of the bearer switching function, the communication capability with its associated call service function (CSF-T), and the signalling capability necessary to establish and release of the backbone network connection.

3.1.4 Bearer Control Segment (BCS): Represents the signalling relationship between two adjacent Bearer Control Functional entities (BCF).

3.1.5 Bearer InterWorking Function (BIWF): A functional entity which provides bearer control and media mapping/switching functions within the scope of a Serving Node (ISN, TSN or GSN). A BIWF contains one Bearer Control Nodal Function (BCF-N, BCF-T or BCF-G) and one or more MCF and MMSF, and is functionally equivalent to a Media Gateway that incorporates bearer control. See General Requirements documents for the definitions for MCF and MMSF.

3.1.6 Call Control Association (CCA): Defines the peer-to-peer signalling association between Call, and Call & Bearer state machines located in different physical entities.

3.1.7 Call Service Function (CSF): Note that four types of CSFs are illustrated in the above functional model, CSF-N, CSF-T, CSF-G, and CSF-C.

–   The Call Service Nodal Function (CSF-N) provides the service control nodal actions associated with the narrowband service by interworking with narrowband and Bearer Independent Call Control (BICC) signalling, signalling to its peer (CSF-N) the characteristics of the call, and invoking the Bearer Control Nodal Functions (BCF-N)

necessary to transport the narrowband bearer service across the broadband backbone network.

–   The Call Service Transit Function (CSF-T) provides the service transit actions necessary to establish and maintain a backbone network call and its associated bearer by relaying signalling between CSF-N peers and invoking the Bearer Control Transit Functions (BCF-T) necessary to transport the narrowband bearer service across the broadband backbone network.

–   The Call Service Gateway Function (CSF-G) provides the service gateway actions necessary to establish and maintain a backbone network call and its associated bearer by relaying signalling between CSF-N peers and invoking the Bearer Control Nodal Functions (BCF-N) necessary to transport the narrowband bearer service between broadband backbone networks.

–   The Call Service Coordination Function (CSF-C) provides the call coordination and mediation actions necessary to establish and maintain a backbone network call by relaying signalling between CSF-N peers. The CSF-C has no association with any BCF. It is only a call control function.

3.1.8   Call Mediation Node (CMN): A functional entity that provides CSF-C functions without an associated BCF entity.

3.1.9   Interface Serving Node (ISN): A functional entity which provides the interface with the ISDN networks. This functional entity contains one or more call service nodal functions (CSF-N), and one or more interworking functions (BIWF) which interact with the ISDN and its peers within the broadband backbone network.

3.1.10   Gateway Serving Node (GSN): A functional entity which provides gateway functionality between two network domains. This functional entity contains one or more call service gateway functions (CSF-G), and one or more bearer interworking functions (BIWF). GSNs interact with other GSNs, in other broadband backbone network domains and other ISNs and TSNs within its own broadband backbone network domain. The network signalling flows for a GSN are equivalent as those for a TSN.

3.1.11   Network Bearer Connection (NBC): Is used to transport a user selected bearer service between two or more Terminal Equipment (TE).

3.1.12   Serving Node (SN): A generic term referring to ISN, GSN or TSN nodes.

3.1.13   Service Resource Node (SRN): The physical function that contains the IN SRF.

3.1.14   Switching Node (SWN): A functional entity which provides the switching functions within the broadband backbone network. This functional entity contains a bearer control state machine (BCF-R). SWNs interact with other SWNs, within their own broadband backbone network domain. The SWNs BCF-R also interact with the BCF-N functions contained in BIWF entities.

3.1.15   Terminal Equipment (TE): Represents the customer's access equipment used to request and terminate network associated connectivity services.

3.1.16   Transit Serving Node (TSN): A functional entity which provides transit functionality between ISNs and GSNs. This functional entity contains one or more call service transit functions (CSF-T), and one or more bearer interworking functions (BIWF). TSNs interact with other TSNs, GSNs and ISNs within their own broadband backbone network domain.

3.2 Definition of signalling flow objects

The following objects are the signalling objects to be carried in the information flow procedure definitions. These objects will be used in the set of information flows contained in this Supplement.

3.2.1 Bearer Control Segment ID (BCS-ID): Identifies the signalling association between two logically adjacent bearer control entities.

3.2.2 (BCU-ID): This signalling object uniquely identifies the BIWF control port and can be used to obtain the BIWF control address for vertical communications.

3.2.3 Backbone Network Connect (BNC) characteristics: Identifies the selected BNC type (i.e. AAL 1 or AAL 2).

3.2.4 Backbone Network Connection ID (BNC-ID): This signalling object generically equates to the Virtual Channel Connection Identifier (VCCI) if an ATM Virtual Channel connection is established between ISNs or a AAL Type 2 Connection Identifier if an AAL Type 2 connection is established between ISNs. This identifier represents the relationship between pair BNCeps.

3.2.5 Backbone Network Connection Link ID (BNCL-ID): Identifies the transport link between two SWNs, or between a SWN and a BIWF. This identifier represents the relationship between a BNCep and a BNCrp or in trunking configurations a pair of BNCeps.

3.2.6 bearer service characteristics: This signalling object specifies the user specified bearer service that shall be provided between the requesting user and the terminating user. This signalling object is contained in the initial service request received from the requesting user and is carried within the initial service requests between network nodes and the terminating user.

3.2.7 Called Party Address (Called-Party-Addr): The address of the called user.

3.2.8 Calling Party Address (Calling-Party-Addr): The address of the calling user.

3.2.9 Call Control Association ID (CCA-ID): Identifies the signalling association between two logically adjacent call control entities (between CSF-Ns). In ISDN this is a CIC.

3.2.10 Call Service Function Address (CSF-Addr): Identifies the address of CSF-N within the requesting ISN entity. This is the Point Code used by MTP to identify originating and destination CSF-Ns within ISNs.

3.2.11 Terminating InterWorking Function Address (T-BIWF-Addr): Identifies the address of the BCF-N within the terminating BIWF. At the bearer level similar to the called party address.

3.2.12 Originating InterWorking Function Address (O-BIWF-Addr): Identifies the address of the BCF-N within the originating BIWF. At the bearer level similar to the calling party address.

3.2.13 action indicator: An extended control object, indicating the requested action to be taken at a subsequent SN or an action performed at a previous SN.

3.2.14 bearer service characteristics: Specifies the user requested bearer service. Example values are voiceband services, and circuit mode data. This object equates to the resource component.

3.2.15 origination traffic group identifier (network option): An identifier associated with e.g. incoming circuits and trunk groups in traditional signalling systems like ISUP for the segregation of traffic at the origination ISN. The identifier is passed in forward direction to adjacent SNs/CMNs to enforce routing decisions and traffic differentiation based on the incoming traffic group at the previous node. The allocation of values to this identifier is typically on a traffic relation and the identifier is normally not transferred across the interface between networks.

3.2.16 destination traffic group identifier (network option): An identifier associated with e.g. the selection of outgoing circuits and trunk groups in traditional signalling systems like ISUP for the segregation of traffic at the destination ISN. The identifier is passed to adjacent SNs/CMNs to enforce routing decisions and traffic differentiation for the outgoing traffic group at the

subsequent node. The allocation of values to this identifier is typically on a traffic relation and the identifier is normally not transferred across the interface between networks. (The need for this identifier is for further study as to whether this information element can be covered with one and the same parameter for the Origination Traffic Group Identifier in the BICC protocol.)

3.2.17 call reference (network option): An identifier associated with a call instance for the correlation of call instances in different nodes associated with the same call for e.g. processing of Call Detail Records (CDRs). The identifier is unique within a network domain and is passed in forward direction to subsequent SNs/CMNs. The call reference will consist of an identification of the SN/CMN generating the call reference and a sequence number associated with the call instance. The allocation of the SN/CMN identity is within a network domain and the call reference is normally not transferred across the interface between networks.

4   Abbreviations

This Supplement uses the following abbreviations:

AAL	ATM Adaptation Layer
AESA	ATM End System Address
ATM	Asynchronous Transfer Mode
ATM VCC	ATM Virtual Channel Connection
BCF	Bearer Control Function
BCS	Bearer Control Segment
BIWF	Bearer Interworking Function
BNC	Backbone Network Connection
BNCL	Backbone Network Connection Link
CCA-ID	Call Control Association Identifier
CMN	Call Mediation Node
CSF	Call Service Function
GSN	Gateway Serving Node
IP	Internet Protocol
ISN	Interface Serving Node
NBC	Network Bearer Connection
PDU	Protocol Data Unit
SN	Serving Node
STP	Signalling Transfer Point
SWN	Switching Node
TDM	Time Division Multiplex
TE	Terminal Equipment
TMR	Transmission Medium Requirement

TSN	Transit Serving Node
USI	User Service Information
VCC	Virtual Channel Connection
VPC	Virtual Path Connection

5 Backbone network signalling flows

The method of documenting the signalling flows involves the definition of a set of information flow names. The following guidelines on defining a set of flows is to use explicit protocol message names for the call control information and use protocol independent information flows for the bearer level.

5.1 Object reference model

Figure 2 shows the composition of the object reference model. Refer to 5.3 for the definition of each of the functional entities. Figure 2 illustrates the elements of the information flow model used in the signalling flows contained in this signalling supplement. The **Call Service Function (CSF)** contains a **Call State Machine (CSM)** for each active end point associated with the local call instance. An end point may be either a line, trunk, or special resource function. For each operation initiated by an end point, the CSM associated with the requesting end point becomes the **O**wner of the request while the end point addressed by the request becomes the **T**erminating end point. Each CSM may be associated with a **Logical Port (LP)** which may contain one or more **Terminations**. The CSM can place its associated terminations into one of several communication states (see list in Figure 2). The CSM can attach its associated terminations to a **Context** as shown in Figure 2. The context can also be placed into various communication configurations dependent on the service need. Some examples of these communication configurations are: Point-to-Point Unidirectional or Bidirectional, Point-to-Multi-Point Unidirectional, Multi-Point-to-Point Unidirectional, Multi-Point-to-Multi-Point Bidirectional and variations of these combinations. The O-CSM is responsible for establishing the context configuration. The terminations and their associated context is contained within the **Bearer InterWorking Function (BIWF)**. The **Service Control Function (SCF)**, an IN entity, contains **Service Logic Profiles (SLP)** associated with each end point. These interwork with the CSM in order to provide special services. Coordination between SLPs is a function of the SCF and is outside the scope of these signalling requirements.

This signalling requirement Supplement covers the end point flows (1), high level vertical flows (2), generic bearer level signalling flows between BIWF-SWN-BIWF functional entities (3), and intra BCSM information flows (4). Service control information flows (5) will be covered when IN initiates actions affecting information flows (1), (2), (3), and/or (4).
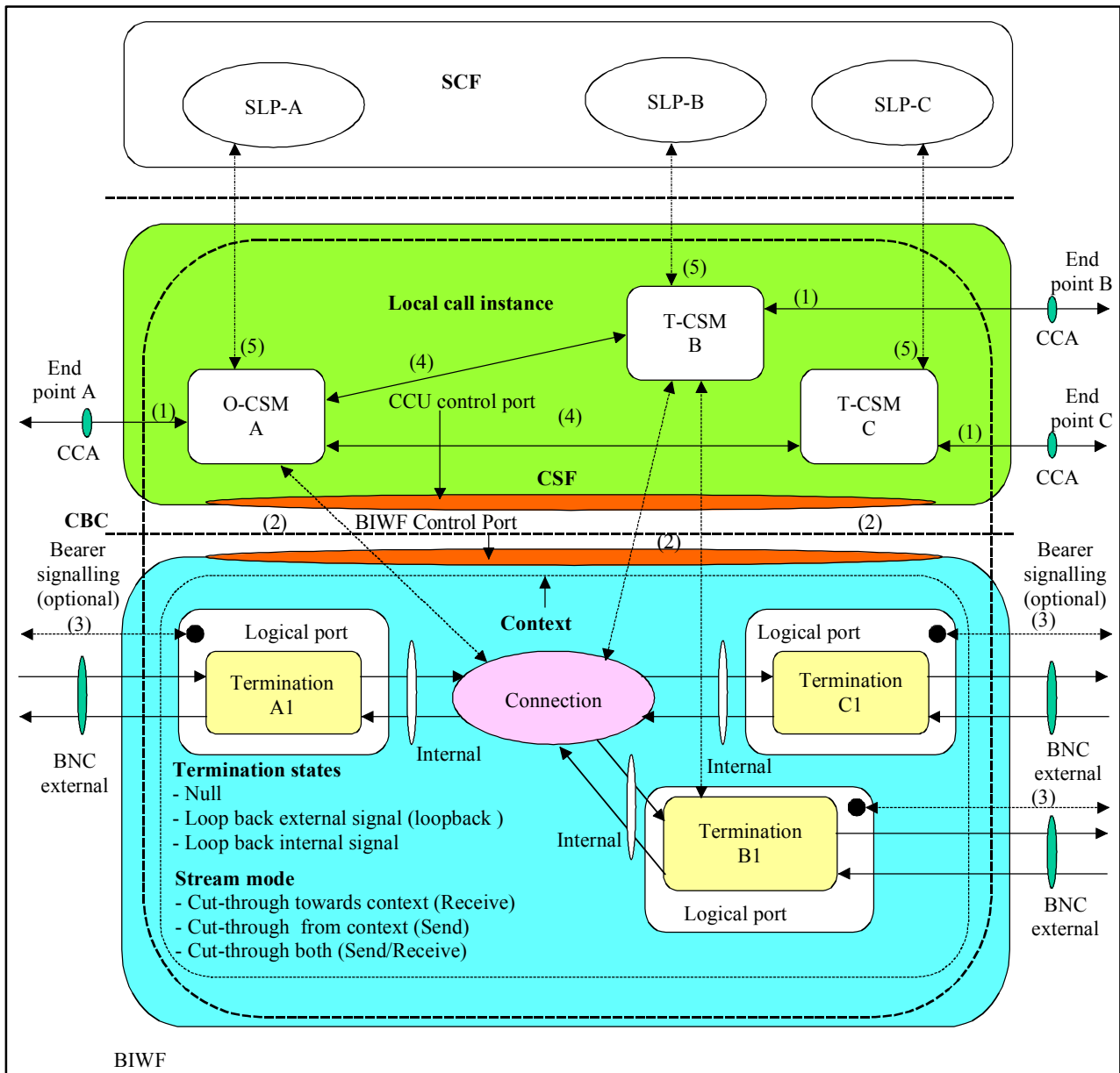
Figure 2 – CBC object reference model

NOTE – Concerning the nomenclature associated with the CSM, the present nomenclature will need to be examined when supporting multi-party and more advanced services are included in future capability sets.

5.2 Definitions

5.2.1 Object and call model definitions

NOTE – The terms BCF and BIWF can be interchangeable in this clause.

5.2.1.1 Call Bearer Control (CBC): is the interface between the Call Serving Function and the Bearer Control Function.

5.2.1.2 connection: The connection is a logical entity representing the connection topology within a single context in the BIWF. The topology of a connection can be implied by assigning streams between terminations and/or through manipulation of the context topology.

5.2.1.3 context: The context is the association between one or more terminations. The BIWF creates a context and assigns a unique context identity (contextID) to it. A context cannot exist

without at least one termination. When a context contains a single termination, this context may or may not contain a connection. Contexts containing a connection will always be associated with a local call instance, while a context containing no connection will not be associated with a Local Call Instance. See 6.1/H.248.1 [15].

5.2.1.4 end point: An end point defines the remote call or call and bearer signalling entity communicating with the CSF. This entity may be requesting actions associated with a line, trunk, or special resource function. In the object model it defines the point terminating the Call Signalling.

5.2.1.5 stream: A Stream specifies the parameters of a single bidirectional media stream/user data flow and is represented by a CSM assigned StreamID. See 7.1.6/H.248.1 [15].

5.2.1.6 stream mode: In the object model it describes the mode of the termination i.e. Send, receive, send and receive. See 7.1.7/H.248.1 [15].

5.2.1.7 termination: A Termination is a logical entity in a BIWF that sources and/or sinks media and/or control streams. In BICC, a termination sources and/or sinks a single media and/or control streams. A Termination is described by a number of characterizing Properties. Terminations have unique identities (TerminationIDs). These objects can be created "On Demand" or may be provisioned.

5.2.1.8 termination state: Defines the Service state of the termination e.g. In-service, Out-of-service. In the object model it describes the mode of the termination i.e. Null, Loop Back External Signal, Loop Back Internal Signal. See Termination State 7.1.5/H.248.1 [15] for the service state. For the mode of a stream i.e. loopback see 7.1.7/H.248.1 [15].

5.2.1.9 logical port: Defines a logical grouping of one or more media terminations and one or more signalling termination. A Logical Port may be associated with a bearer control signalling end point (indicated by reference (3) in Figure 2).

5.2.1.10 Call State Machine (CSM): Defines a CSF control entity that terminates call or call and bearer peer-to-peer signalling. The prefix "O" or "T" represents the inter-relationship of CSMs within the Local Call Instance. The "O" represents the control entity receiving an external service request, while the "T" is the control entity forwarding the request to another CSF.

5.2.1.11 local call instance: Defines the call control scope within a Serving Node. A Local Call Instance may have ZERO or more Contexts within its scope. The CSF creates and deletes local call instances. When a Local Call Instance is destroyed, each BIWF will place the termination within the Local Call Instance scope, into a NULL context or delete the termination.

5.2.1.12 CCU control port: Defines the signalling port associated with the CSF which is used to interact with the BIWF over the CBC Interface. This object has a unique address within the network service supplier domain.

5.2.1.13 BIWF control port: Defines the signalling port associated with the BIWF which is used to interact with the CCU over the CBC interface. This object has a unique address within the network service supplier domain.

5.2.1.14 Call Control Association (CCA): Defines the peer-to-peer signalling association between Call, and Call and Bearer state machines located in different physical entities.

5.2.1.15 Backbone Network Connection (BNC): Defines the peer-to-peer user plane communication association between BIWFs. Each BNC represents a single user plane stream and is associated with a single termination with each BIWF.

5.2.2 Call model

The Call model for use in describing the signalling requirements describes the logical entities, or objects, within the BIWF that can be controlled by the CSF. The main abstractions used in the call model are local call instances, contexts, terminations and streams. Figure 3 shows the Multiple BIWF Call Model. A Local Call instance can span several BIWFs. Each BIWF may have multiple contexts associated with the same Local Call Instance.
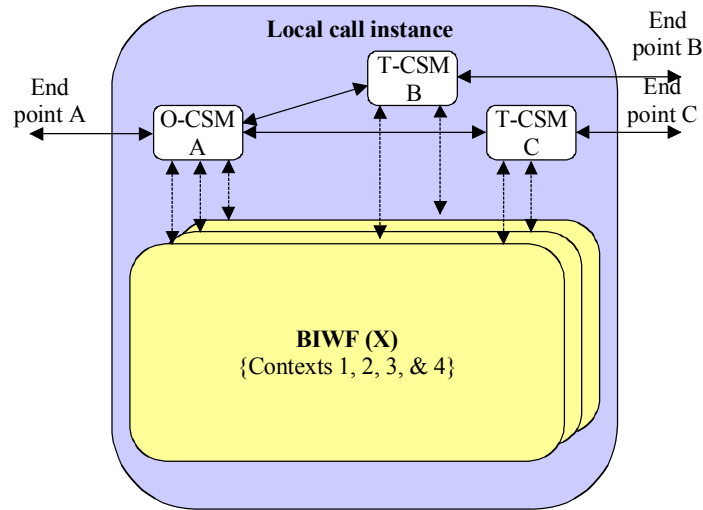
Figure 3 – Multiple BIWF call model

Figure 4 illustrates the call model from the perspective of a single BIWF in order to further define the inter-relationships of the Local Call Reference and the Contexts within its scope.
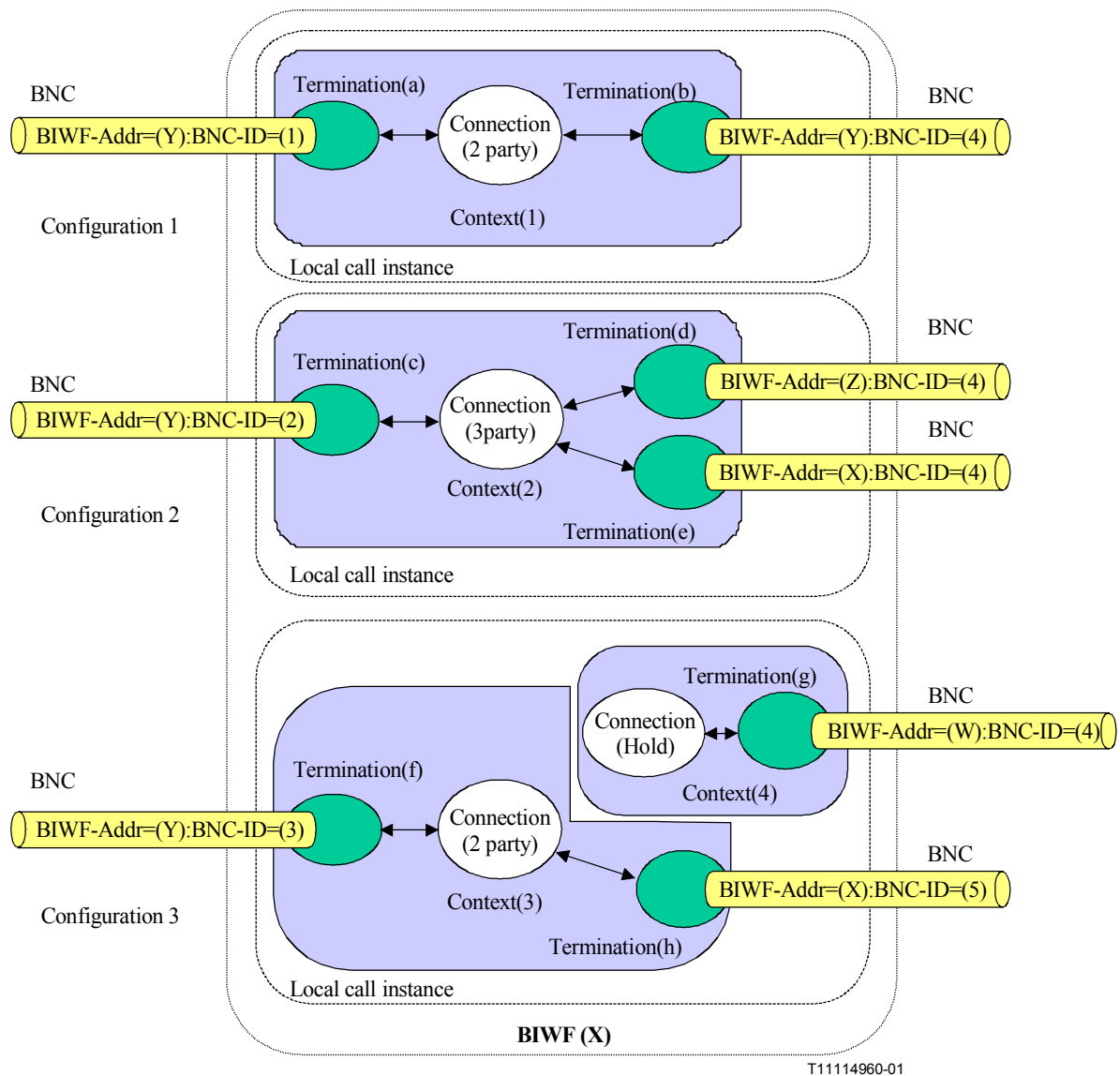
Figure 4 – Call model

Figure 4 represents the CBC interface Call Model for a single BIWF configuration. It is based on the Connection Model in 6/H.248.1 [15]. Figure 4 depicts 3 connection configurations contained in the BIWF at one particular instant.

Terminations in each of the configurations have different Termination (Indentities) as a termination can only reside in one context at any particular point in time but may be moved to another context and therefore must retain its BIWF unique identity. Streams can have the same identity across several contexts as the Context Identifier makes it globally unique. BNCs have a unique identity within the scope of the BICC network.

The stream represents the internal connection in the BIWF, whereas the BNC represents connections external to the BIWF. To maintain uniqueness, a combination of the BIWF-Addr and the BNC-ID is used to identify the bearer connection.

Configuration 1 depicts a basic 2-party call. Termination(a) representing the A endpoint and Termination(b) representing the B endpoint. The Context(1) provides the association between the terminations (a) and (b). The connection(2 party) is a logical entity which represents the connection configuration. The assignment of Stream(1) on Termination(a) and (b) defines the connection as 2 party. The actual connection configuration communication is established by a direct interaction

with the CSM who is the Local Call Instance Owner. The connection topology may be either a Type 1 Unidirectional or a Type 1 Bidirectional connection.

Configuration 2 depicts a 3-party call. Termination(c) representing the A endpoint, Termination(d) representing the B endpoint and Termination(e) representing the C endpoint. The Context(2) provides the association between the terminations (c), (d) and (e). The connection(3 party) is a logical entity which represents the connection configuration. The assignment of Stream(1) on Termination(c), (d) and (e) defines the connection as a 3 party. The actual connection configuration is established by a direct interaction with the CSM who is the Local Call Instance Owner. The connection topology may be a Type 2, Type 3, Type 4, Type 5, or a three party bridge connection.

Configuration 3 depicts a held-call scenario. Termination(f) representing the A endpoint, Termination(g) representing the B endpoint and Termination(h) representing the C endpoint. The Context(3) provides the association between the terminations (f) and (h). The Context(4) provides the association between the connection which is in the hold communication state and the termination which is on hold (Termination(g)). The connection(2 party) is a logical entity which represents the connection configuration. The assignment of Stream(1) on Termination(f) and (h) means the connection is 2 party. The Context(4) contains termination(g). The connection(hold) is a logical entity which represents the connection configuration. The assignment of Stream(1) on Termination(g) and the presence of one or more terminations and a connection object indicating HOLD, in the context represents a context associated with another context. Note that the on "hold" attribute has no affect on the communications between the terminations remaining on the held connection. Note that context 3 and 4 must be in the scope of the same Local Call Instance and within the same BIWF. This implies that the end point and possibly its associated termination must be moved to the Local Call Instance containing Context 4.

The Call model defines the topology of connections and defines the capabilities that are defined on terminations and that the function to be performed by BIWF is implicitly given by these capabilities on the termination. The CSM indicates that a connection-oriented transport service or a connectionless transport service is to be used. It also indicates the Bearer Service Characteristics that are to be supported by the termination. The BIWF(BCF) determines the BNC Characteristics associated with Termination(a) and the BNC Characteristics of Termination(b) and, if needed, establishes the transcoding option needed to allow interworking of the incoming-outgoing stream information. The CSM is not aware that transcoding is being employed within the BIWF. Figure 5 gives an example of this concept.

Implies transcoding between G.711 and G.723.1

T11114970-01
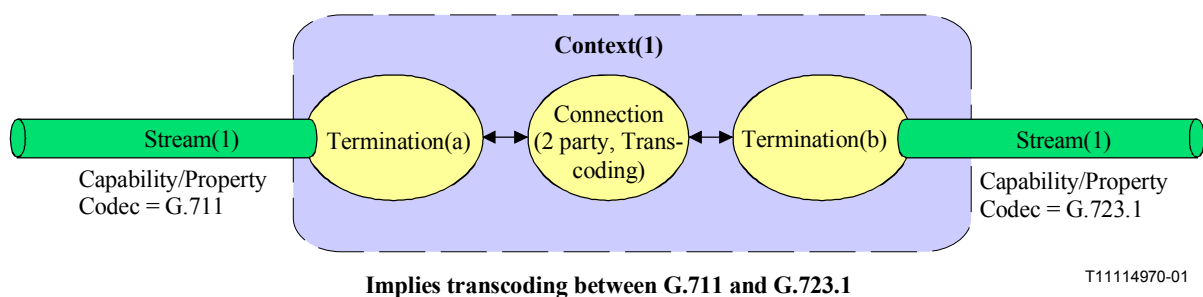
Figure 5 – Call model definition of functions

5.2.3   Command and responses

The information flow requests and reponses shown in Table 1 below are used to manipulate the logical entities within the call model.

A list of requests and responses are contained in Table 1. The direction specifies from which entity (CSF/BIWF) the information flow is initiated. These requests and responses are based on those contained in ITU-T Rec. H.248.1.

Table 1 – CBC commands

Requests and responses	Direction	
	CSM to BIWF	**BIWF to CSM**
ADD.req	✓	
ADD.resp		✓
MOD.req	✓	
MOD.resp		✓
MOV.req	✓	
MOV.resp		✓
SUB.req	✓	
SUB.resp		✓
NOTIFY.ind		✓
NOTIFY.resp	✓	

5.2.3.1 Definition of requests and responses

This clause gives a brief outline of the requests and responses associated with of the CBC interface and how they are used in BICC network signalling applications. See 7/H.248.1 [15] for a complete description of the behaviour of these requests and responses. Requests and responses may be sent at the same time. For example an ADD.resp and a NOTIFY.ind.

5.2.3.2 ADD.req

The ADD command is used used to add a Termination/s to a Context. It may also be used to modify default properties/capabilities or initiate new properties on the termination/s being added. See 7.2.1/H.248.1 [15].

5.2.3.3 ADD.resp

The ADD response is used to indicate successful or unsuccessful completion of the addition of a Termination to a Context.

5.2.3.4 MOD.req

The MODify command is used to modify the properties of an existing Termination. See 7.2.2/H.248.1 [15].

5.2.3.5 MOD.resp

The MODify response is used to indicate successful or unsuccessful completion of the modification of an existing termination.

5.2.3.6 MOV.req

The MOVe request is used to move a termination/s from one Context to another Context. This has the effect of breaking the association between the termination and the connection in the original context and establishing a new association between the termination and the connection in the new context. It may also be used to modify properties/capabilities of a termination whilst moving the termination. See 7.2.4/H.248.1 [15].

5.2.3.7 MOV.resp

The MOVe response is used to indicate successful or unsuccessful completion of the move of an existing termination to another context.

5.2.3.8   SUB.req

The SUBtract is used to remove a termination from a Context. This action places the termination into a null context if the termination is provisioned otherwise the termination is deleted. See 7.2.3/H.248.1 [15].

5.2.3.9   SUB.resp

The SUBtract response is used to indicate successful or unsuccessful completion of the subtraction of a termination from a context.

5.2.3.10   NOTIFY.req

The NOTify request is used to indicate when an external action associated with the specified termination has been detected by the BIWF. See 7.2.7/H.248.1 [15].

5.2.3.11   NOTIFY.resp

The NOTify response is used by the CSF to acknowledge the reception of the detected action request from the BIWF.

5.2.4   Definition of signalling flow objects

5.2.4.1   Nomenclature

- The CSM uses X = "?" to indicate that the CSM requests the BIWF to provide an appropriate value for signalling object (X).
- The X = Y is used to indicate that the CSM/BIWF should set the signalling object(X) to value (Y).
- Notification Requested "zzz" is used to request the BIWF to notify the CSM when event "zzz" has been detected.
- Signal Requested "www" is used to request the BIWF to send a signal "www" on the specified termination.
- Event = "vvv" is used by the BIWF to indicate that a particular event "vvv" has been detected on a termination.
- (…, Primitive) is used to indicate that this primitive can be sent in conjunction with another primitive.
- X = Y/Z, is used to indicate a choice for X: Y or (exclusive) Z.
- X = Y + Z, is used to indicate a choice for X: Y and/or (inclusive) Z.
- X = Y & Z, is used to indicate: Y and Z.
- Brackets () are used to indicate boolean priority e.g. X = (Y/Z) + (M/N)
- Some signalling objects are optional to carry in a transaction, this "optionality" is indicated by an underlined text statement before the object in the tables

5.2.4.2   Signalling request and response primitives

The term primitive is used here to indicate that a certain "procedure" or "transaction" is carried out. The term primitive is not used in its strict sense of giving an indication to drive non-standardized procedures. In the information flow the primitive carried in the request and responses is indicated as XXX.req (Primitive). Multiple primitives may be used together, this is indicated by XXX.req (…,Primitive).

The following primitives are the primitives used to indicate that a procedure is to be initiated in the BIWF. These primitives are used in the set of information flows contained in this Supplement.

Table 2 – Primitives on the CBC interface – CSF Originated

Primitive	Description
Audit_Values	This primitive is used by the CCU to audit the Packages, the Events, the Signals and the current Property Values realized by Termination(s) or the BIWF.
Audit_Capabilities	This primitive is used by the CSM to audit the Events, the Signals and the possible Property Values realized by Termination(s) or the BIWF.
CSM_Ordered_BIWF_Re-registration	The CSM uses this primitive to force a registered BIWF to reregister again.
Change_Topology	This primitive is used to change the connection topology within the BIWF. It describes the flow of user data internally to the BIWF. It may be used in cases where a monitoring is required.
Cut_Through	This is used to indicate to the BIWF that cut-through of the bearer should occur.
Detect_Digit	This primitive is used to indicate to the BIWF that it should prepare the necessary resources to detect a DTMF digit and report the occurance of the digit to the CSM.
Establish_BNC_notify	This is used to indicate to the BIWF that it should initiate a bearer setup.
Insert_Announcement	This is used to insert an announcement on a particular termination/s in the BIWF.
Insert_Digit	This is used to insert DTMF digit/s on a particular termination/s in the BIWF.
Insert_Tone	This is used to insert a tone on a particular termination/s in the BIWF.
Isolate	This primitive is used to isolate one termination from other terminations effectively stopping media flow between the isolated termination and existing terminations. This may be used in situations where services like Call Hold are needed.
Join	This primitive is used to join one or more terminations establishing media flow between the terminations. This may be used in situations where services like Conferencing or 3 party are required.
Modify_Characteristics_notify	This is used to indicate to the BIWF that it should initiate a change in the BNC characteristics. i.e. Change of codec, Bearer Service. It may have the effect that the bearer is modified.
Prepare_BNC_notify	This is used to indicate to the BIWF that it must be prepared to receive a bearer setup request.
Release_BNC	This is used to indicate to the BIWF that it should initiate a bearer release.
Reserve_BNC	This is used to indicate to the BIWF that it should reserve some resources i.e. Termination for later BNC operations.
Reuse_Idle	This is used to indicate that reuse of an idle bearer should be attempted
Tunnel	The tunnel primitive allows the: – CSM to indicate to the BIWF that Bearer Control Tunnelling is available. – BIWF to indicate to the CSM direction that Bearer Control Tunnelling shall be used for a particular termination – Passing from BIWF to CSM a Bearer Control Protocol data unit relating to a particular termination for transport to the peer termination.

BIWF originated primitives

The following primitives are the primitives used to indicate that a procedure is to be initiated in the CSF. These primitives are used in the set of information flows contained in this Supplement.

Table 3 – Primitives on the CBC interface – BIWF originated

Primitive	Description
BIWF_Capability_Change	This primitive is used by the BIWF to indicate to the CSM that the capabilities of Termination(s) or the BIWF are changed.
BIWF_Lost_Communication	This primitive is used by the BIWF to indicate to the CSM that the BIWF has lost but subsequently restored the communication with the CSM, but there is a risk that this has caused a possible information mismatch between the BIWF and the CSM.
BIWF_Registration	This primitive is used by the BIWF to register with a CSM.
BIWF_Service_Cancellation_Indication	This primitive is used by the BIWF to indicate to the CSM that Termination(s) on the BIWF or the BIWF are to be taken out of service.
BIWF_Service_Restoration_Indication	This primitive is used by the BIWF to indicate to the CSM that Termination(s) on the BIWF or the BIWF are to be taken into service.
Tunnel	The tunnel primitive allows the: – BIWF to indicate to the CSM direction that Bearer Control Tunnelling shall be used for a particular termination. – Passing from BIWF to CSM a Bearer Control Protocol data unit relating to a particular termination for transport to the peer termination.

5.2.4.3 Signalling objects

The following objects are the signalling objects to be carried in the information flow procedure definitions. These objects will be used in the set of information flows contained in this Supplement.

1) **A-BNC Characteristics**: are the BNC Characteristics of the BNC in the opposite half call to the current BNC.

2) **Announcement**: identifies that an Announcement of a certain identity be applied to a termination.

3) **Audit Token**: specifies whether Packages and/or which type of Descriptor that are to be audited. In this Supplement the following values are used:
   – Digit Map;
   – Empty (i.e. no **AuditToken**);
   – Events;
   – Media;
   – Modem;
   – Mux;
   – Packages;
   – Signals.

4) **Bearer Information Transport**: carries the tunnelled Bearer Control information.

5) **Bearer Service Characteristics**: identifies the user requested bearer service to be provided by the network. It is used by the BIWF to condition the bearer termination.

6) **BIWF Address (T-BIWF-Addr)**: the address on which the BNC is terminated. Passed from the terminating BIWF to the CSF and through the BICC horizontal.

7) **BIWF Control Port**: defines the signalling port associated with the BIWF which is used to interact with the CCU over the CBC interface. This object has a unique address within the network service supplier domain.

8) **BNC.Cut Through**: indicates when through connection of BNC has occurred.

9) **BNC.Established**: indication that a BNC has been established on a particular termination in the BIWF.

10) **BNC.Modified**: indicates when the characteristics (i.e. Codec, Bearer Service Characteristics) has been modified.

11) **BNC.Release**: an indication with a general reason for the release of a BNC (e.g. Normal Release, Interworking unspecified, …)

12) **BNC Characteristic**: identifies the type of transport to be established across the backbone network. It is carried between call control instances via BICC signalling.

13) **BNC-Cut-through Capability**: used by the BIWF to inform the CSM of the bearer cut-through capability (i.e. commits resources on the receipt of a bearer-setup-req or confirm.

14) **BNC-ID**: identifies the logical connection between a local and remote termination.

15) **CCU Control Port**: defines the signalling port associated with the CSF which is used to interact with the BIWF over the CBC Interface. This object has a unique address within the network service supplier domain.

16) **Codec**: contains the coding information (ie selected CODEC) to be used by the BIWF.

17) **Connection_Topology/Connection Configuration**: specifies the type and configuration of the connection type to be established (e.g. Type 1, Type 2, … Type 6). To specify the connection topology the connections between the terminations in a context is specified (e.g. Type-x/One-way or BothWay).

18) **Context ID**: identifies the context entity. Generated by the BIWF upon creation of the context. In this Supplement, the following values are used:

    – ALL, when referencing all contexts in use;

    – Context ID, when referencing a specific context in use.

    Null Context, which indicates a context where terminations, that have resources associated with them and are not part of a Local Call Instance, reside.

19) **Detect_Digit(x)**: indicates that a digit stimulus is detected on a termination in an BIWF. The digit/s is indicated in "x".

20) **Digit**: identifies that a DTMF digit/s of a certain value (i.e. 0 – 9, #, *, ABCD) is applied to a termination.

21) **Digit Map Descriptor**: holds Digit Map data such as Digit Map Name and Value.

22) **Event**: is an indication that there has been an occurance of the stimulus contained in a NotificationRequested request. It indicates that the stimulus has been observed on a termination in a BIWF. It may contain parameters detailing the specifics of the stimulus.

23) **Events Descriptor**: holds Event data such as Package and Event Names and Event Parameter Names and possible Values.

24) **Event ID**: provides the correlation between a request to detect an event and the notification that the event has been detected.

25) **Logical Port ID**: identifies the Logical Port entity. Provisioned value in BIWF. The type of logical port is provisioned and known in the BIWF.

26) **Local Control Descriptor**: holds Local Control data such as Package and Property Names and current and possible Property Values.

27) **Local Descriptor**: holds Local data such as Package and Property Names and current and possible Property Values.

28) **Non Standard Data**: can specify the BIWF Type, e.g. as Brand, Version and Issue.

29) **Media Descriptor**: holds Media data such as Package and Property Names and current and possible Property Values.

30) **Modem Descriptor**: holds Modem data such as Package and Property Names and current and possible Property Values.

31) **Mux Descriptor**: holds Mux data such as Mux Type and muxed Termination IDs.

32) **Packages Descriptor**: holds data about Packages such as Package Names and Versions.

33) **Notification_Requested "x"**: identifies to the BIWF that it must monitor a termination for the stimulus "x" to occur. Once the stimulus "x" is detected an event is sent from the BIWF to the CSM.

34) **Remote Descriptor**: holds Remote data such as Package and Property Names and current and possible Property Values.

35) **Service Change Address**: indicates New own CCU/BIWF Control Address to be used.

36) **Service Change Delay**: specifies the delay in seconds before the service change is activated.

37) **Service Change Method**: specifies the type of service change.

   In this Supplement the following values are used:
   – Disconnected;
   – Forced;
   – Graceful;
   – Restart.

38) **Service Change MGCID**: indicates own CCU Control Address to be used.

39) **Service Change Profile**: indicates name and version of supported protocol profile.

40) **Service Change Reason**: specifies the reason for the service change.

   In this Supplement the following values are used:
   – Cold Boot;
   – Events Capability Failure;
   – Loss of lower layer connectivity;
   – Media Capability Failure;
   – MGC Directed Change;
   – Modem Capability Failure;
   – Mux Capability Failure;
   – Service Restored;
   – Signals Capability Failure;
   – Termination Taken Out Of Service;
   – Transmission Failure;
   – Warm Boot.

41) **Service Change Version**: indicates supported Protocol Version.

42) **Service State**: specifies the overall (not stream-specific) state of a Termination/BIWF.

   In this Supplement the following values are used:
   – In Service;
   – Out Of Service;
   – Test.

43) **Signal**: indicates that the stimulus specified in it is to be applied to a termination.

44) **Signal Timing**: specifies the duration, number of cycles and stop/start of a signal to be played.

45) **Signal Completion(x)**: indicates that the stimulus applied to a termination has finished. "x" indentifies the stimulus.

46) **Signal Descriptor**: holds Signal data such as Package and Signal Names and Signal Parameter Names and possible Values.

47) **Signal Direction**: indicates the directionality of a stimulus applied to a termination. The stimulus can be placed on a termination so that none of the other terminations in the context "hear" it (external) or so that other terminations in the context "hear" it also (internal). The direction may be set to (bothway) indicating that all the terminations in the context "hear" it as well as it being sent external to the BIWF.

48) **Stream Mode**: specifies the type and configuration of the termination to be established. The termination can be placed in one of several connection states: Cut-through in the forward direction, backward direction, both directions, loopback towards remote termination, or idle.

49) **Termination ID**: identifies the Termination entity. Generated by the BIWF when a termination is created.

    In this Supplement the following values are used:

    – ALL, when referencing groups or Ephemeral Terminations not in use;

    – Root, when referencing the BIWF level;

    – Termination(s), when in use or in a Null Context.

50) **Termination State Descriptor**: holds Termination State data such as Package and Property Names and current and possible Property Values. Includes also the Service State.

51) **Time Stamp**: gives the BIWF local time at sending of command

52) **Tone**: identifies that a tone of a certain type (i.e. Alerting tone, call waiting tone) is applied to a termination.

53) **Tunnel Indication**: identifies to the BIWF that the Bearer Information Transport mechanism can be used. The CSF may request that the BIWF provide the BIT information in a Notify.ind at the same time as the response to the Tunnel Indication request. The CSF may also indicate the BIT information may be provided in a Notify.ind at a time later than the Tunnel Indication request.

54) **Transaction ID**: responses/replies between the BIWF and the BIWF are grouped into Transactions, each of which is identified by a TransactionID. Transactions consist of one or more Actions.

Table 4 details information elements from the BICC Call Control Level that may be transparently passed to/from the BICC message to signalling objects across the CBC interface.

Table 4 – BICC to CBC signalling object mapping

Information flow signalling object	Carried across CBC interface
Bearer Information Transport (BIT)	✓
BIWF-Address	✓
BNC Characteristics	✓
BNC ID	✓
Bearer Service Characteristics • Codec • TMR • USI	✓

5.3 Backbone network establishment

5.3.1 Backward backbone network establishment composite flow

The signal flow diagram in Figure 6 contains a composite flow covering the cases of backward tunnelled, non-tunnelled and idle BNC applications. In addition, the flow also covers codec negotiation.

Backward

CSF-N			CSF-N	
CSM-(O)	CSM-(T)		CSM-(O)	CSM-(T)
BIWF		SWN-1	BIWF	
SN-A	BCF-N (X)	BCF-R (1)	BCF-N (Y)	SN-B

0 New Call (Calling Party Address=User-A), (Called Party Address=User B), (Incoming BCU-ID = A, if received), (BCU-ID= ? or X or Incoming BCU-ID), (Local Call Instance = 300), (Incoming BNC Characteristic), (Bearer Service Characteristics), (Context = ? or 66), {If COT on Prev received: (COTind=Cot on Prev.)}, {If COT Required received : (COTind = COT on Prev.)}, {If Codec Negotiation: (Incoming Codec List)}, (BIWF Address = A2), (Incoming Tunnel Indication)

Add.req[Prepare BNC +Notify] **1**
(Bearer Service Characteristics), (BNC Characteristics = "?" or CSF chosen BNC Characteristics), (A-BNC Characteristics = Incoming BNC Characteristics), (Req CSM = Outgoing), (Context=? or 66), (Logical Port ID=55), (Termination-ID=?), (Tunnel Indication = No or "?" or option 1 or option 2), {If Codec Negotiation: (Preferred Codec)}

Add.resp [Prepare BNC +Notify] **2** (BNC Characteristics = CSF or BCF Chosen BNC Characteristics), (Context=66), (Termination-ID =700), (T-BIWF address=X1), (Tunnel Indication = No, or option 1 or option 2), (BNC-ID = 78), (Notify Option = No)

3 {If Tunnel indication = option 1} : Notify.ind [Tunnel](context = 66), (Termination ID = 700), (Bearer Information Transport)

Notify.resp [Tunnel] 4

5 IAM (CCA-ID=5), (O-CSF addr.=ISN-A), (D-CSF addr.=ISN-B), (Action-ID = Connect Backwards), (Tunnel Indication = No or Option 1 or Option 2) (Calling Party Addr.=User-A), (Called Party Addr.=User-B), (T-BIWF address = X1), (Bearer Service Characteristics), (BNC Characteristics), (BNC-ID = 78), {If Tunnel Indication = option 1: (Bearer Information Transport)} {If Codec Negotiation: (Codec List)}, {If [(COTind =COT on Prev) or No Connection)] : (COT on Prev.)} [Optional Parameters : (Origination Traffic Group-ID=77), (BCU-ID=X), (Destination Traffic Group ID=88), (Global Call Ref=35)]

New Call (Calling Party Addr. = User-A), (Called Party Addr. = User B), (Bearer Service Characteristics), (Local Call Instance=250), (BCU-ID= ?), (Context=?), (Incoming BCU-ID = X, if received), (Incoming BNC Characteristics), (BIWF Address = X1), (Incoming Tunnel Indication), {If COT on Prev. received: (COTind=COT on Prev.)} {If Codec Negotiation: (Incoming Codec List)}, **7**

{If no Incoming Codec Negotiation} **Context Assigned** **6**
(BCU-ID=X), (Context=66), (Local Call Instance=300), (Outgoing BNC Characteristics),

Context Assigned **8**
(BCU-ID=Y), (Context=99), (Local Call Instance =250), (Outgoing BNC Characteristics), {If Codec Negotiation: (Selected Codec), (Supported Codec List)}

{If IAM Action ID = Connect Backwards+Codec negotiation,} **APM** (CCA-ID=5), (Action-ID = Codec Selected), **9** (Selected Codec), (Supported Codecs)

{If Incoming Codec Negotiation} **Context Assigned** **10**
(BCU-ID=X) (Context = 66), (Local Call Instance=300), (Outgoing BNC Characteristics), (Selected Codec), (Supported Codec List)

Add.req [Est. BNC+Notify] (Context= 99), {Term. ID = ?), (Logical Port ID=77), (BNC Characteristics = Incoming BNC Characteristics), (A-BNC Characteristics = Outgoing BNC Characteristics) (Bearer Service Characteristics), (BNC-ID = 78), (Tunnel Indication), (T-BIWF address = X1), {If Tunnel indication = option 1: (Bearer Information Transport)} {If +Codec: (Selected Codec)} **13**

Mod.req [Modify BNC Characteristics] **11**
(Selected Codec), (Termination-ID = 700), (Context=66),

12 **Mod.resp [Modify BNC Characteristics]**

Add.resp [Est. BNC+Notify] (Re-Use Idle Indication), (Context = 99), (Termination ID = 520), {If Re-Use Idle Indication = Yes : (BNC-ID = 600)} **14**

{If Tunnel indication = option1: Notify.ind [Tunnel] (context = 99), (Termination ID = 520), (Bearer Information Transport) **15a** *Option 1 Tunnel 15a - 22a*

APM (CCA-ID = 5), (Action-ID = Tunnel), **16a** (Bearer Information Transport)

17a **Notify.resp [Tunnel]**

Mod.req [Tunnel], (Bearer Information Transport) **18a**
(Context-ID = 66), (Termination ID = 700)

19a **Mod.resp [Tunnel]**

Notify.ind [BNC Established] (Context 99), (Termination ID = 520) **23a**

20a **Notify.ind [Establish BNC Ind]** (Context = 66), (Termination ID = 700),

24a **Notify.resp [BNC Established]**

Notify.resp [Establish BNC Ind] **21a**

22a **APM** (CCA-ID = 5), (Action-ID = Connected)

{If Re-Use Idle Indication = Yes } **APM** (CCA-ID = 5), (Action ID = Use Idle), (BNC-ID = 600), (T-BIWF address = X1) **15b** *Use idle flows 15b - 18b*

Mod.req [Reuse Idle] (Context= 66), (BNC-ID=600), **16b**
(T-BIWF address = X1), (Termination ID = 700), *Non-tunnel backward flows 15c - 22c*

Mod.resp [Reuse Idle] (Context = 66), (Termination ID = 700) **17b** *Option 2 tunnel backward flows 15d - 28d*

18b **APM** (CCA-ID = 5), (Action ID = Switched)

{if Non Tunnel Bearer Establishment} **Bearer-Setup. Req** (T-BIWF = X1), (BNC-ID = 78) **16c** **Bearer-Setup. Req** (T-BIWF = X1), (BNC-ID = 78) **15c**

17c **Bearer-Setup.Confirm** **20c** **Bearer-Setup. Confirm**

18c **Notify.ind [Establish BNC Ind]** (Context = 66), (Termination ID = 700),

Notify.ind [BNC Established] (Context = 99), (Termination ID = 520) **21c**

Notify.resp [Establish BNC Ind] **19c**

22c **Notify.resp[BNC Established]**

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Figure 6 – Composite backward connection establishment flow

Figure 6 – Composite backward connection establishment flow (*concluded*)

The following numbered items describe the numbered flows shown above.

0	**New Call**		**SN-A:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
Called-Party-Address = User B	Local Call Instance = 300	Incoming BCU-ID = A if received
Calling Party Address = User A	COTind = COT on Prev. or No COT,	BIWF Address = A2
	Incoming Tunnel Indication = No, or Option 1,	BCU-ID = "?" or X or Incoming BCU-ID,
	or Option 2	Context ID = "?" or 66,
	(Origination Traffic Group ID = 77)	Incoming BNC Characteristics,
	(Destination Traffic Group ID = 88)	{If Codec Negotiation: (Incoming Codec List)}
	(Global Call Ref. = 35)	Bearer Service Characteristics

Initiation of information flow: call attempt from the CSM-O.

Processing upon receipt: when this information flow is received, the CSM-T will determine the establishment direction for the new outgoing BNC. This direction establishment method is based on the call routing selection of the next peer signalling entity within the path to the specified called party and outgoing routing characteristics between these two signaling entities.

NOTE – Some available route segments may be provisioned to only use forward establishment procedure, other available route segments may be provisioned to only use backward establishment procedures while other available route segments may be provisioned to use either method.

In this case the CSM-T determines that the Connect Backwards method of operation should be used.

When this information flow is received with a BCU-ID = "?", the CSM-T performs a BIWF Selection Analysis. This analysis takes into account the outgoing route segment availability, the CSF Bearer Optimization preferences, the BIWF Capabilities required by the BNC characteristics, the Incoming-BCU-ID (if received), the Incoming Codec List (if received), the incoming tunnelling indication, and any BIWF Bearer Service Characteristics restrictions. In this example flow, this analysis could select either BIWF(X) [BCU-ID = X] or BIWF(A)[BCU-ID = A]. It is assumed that the CSM-T chooses BIWF(X). The CSM-T then issues **information flow 1** requesting the assignment of the Context ID, the Termination ID, and the BNC-ID associated with the selected termination ID.

If the BIWF was selected by the CSM-O (BCU-ID ≠ "?"), the selected BIWF will be sent in **information flow 1** requesting the assignment of the Context ID, the Termination-ID, and the BNC-ID associated with the selected Termination ID. In this example, if the CSM-O selected the BIWF, it is assumed that BIWF(X) has been selected.

The content of **information flow 1** contains several information objects that are used by the BIWF to determine its limits on the selection of the Termination ID and the BNC characteristics. These information objects are;

- **BNC Characteristics** = "?" or CSF chosen BNC Characteristics: indicates the degree of freedom that the BIWF has in selection of the BNC Characteristics. If the BNC Characteristics value = "?" then the BIWF can chose the BNC characteristics using other information specified within the information flow. If the BNC Characteristics value is other than "?", this BNC characteristics shall be used since it was selected by the CSF.

- **A-BNC Characteristics** = Incoming BNC Characteristics; supplementary information used in the selection of the outgoing BNC Characteristics. This supplementary information indicates the BNC Characteristics on the previous BNC in order to provide a optimized bearer transport path connection within the BIWF.

- **Context ID** = "?" or 66; indicates if the BIWF has the freedom of selecting a context or if it must use a context previously selected by a CSF-CSM. If the Context ID value = "?", then the BIWF can select a context. If the Context Id value is other than "?", the specified context must be used.

- **Termination ID** = "?"; indicates the degree of freedom that the BIWF has in selection of the Termination ID. If the Termination ID value = "?", the BIWF can select the Termination ID using other information within the information flow. If the Termination ID value is other than "?", the BIWF must use the termination Id specified by the CSF.

- **Logical Port ID** = 55; specifies the selected available route segment to be used. The selected route segment consists of one or more terminations contained within the BIWF that can be used to get to the next serving node within the BICC network. The BIWF will select an idle termination within the scope of this Logical Port.

- **Tunnel Indication** = No or "?" or option 1 or option 2; indicates the degree of freedom which the BIWF has in selecting the bearer establishment mode between SN (Tunnelled or Non-Tunnelled). If the Tunnel Indication value = "No", no tunnel establishment mode is to be used. If the Tunnel Indication value is other than "No", tunnelling is allowed by the CSF. If the Tunnel Indication value = "Option 1" or "Option 2", the BIWF may choose to use the Tunnelling mode conforming to the specified tunnelling option. If the Tunnelling Indication value = "?", the BIWF may choose the Tunnelling mode of establishment conforming to option 1 or option 2. Tunnelling option 1 indicates that the Bearer Information Transport information object is to be included in the IAM information flow, while with option 2 the Bearer Information Transport information object shall only be sent after Codec Negotiation completion. This tunnel permission/non-permission will be sent to the selected BIWF since some of the bearer transport route segments may or may not be allowed to use the tunnelled

establishment mode. In this example the CSM-T has chosen to allow the BIWF to select the tunnelling mode.

- If Codec Negotiation: **Preferred Codec**: supplementary information to assist in the selection of the appropriate bearer transport technology.
- **Bearer Service Characteristics**: supplementary information to assist in the selection of the appropriate bearer transport technology.

If an Incoming Codec List is contained within the received information flow, the CSM-T will review this list and determine if all of the codecs within the list can be supported and are available for use. If the list contains codecs that can not be supported by the selected BIWF, these codecs are removed from the list. The resulting list will be sent to its peer SN in **information flow 5**.

The CSM-T will then send **information flow 1** to the selected BIWF(could be either BIWF = "A" or BIWF = "X" however, for this example BIWF = X is assumed) which contains:

- A Transaction ID = 1000 which was selected by the CSF.
- The information shown above, and
- A request that CSM-T be notified of Bearer Establishment.

The CSM-T awaits the response to the requested operation and expects the following information within this response information flow;

- If the BIWF selects a non-tunnelled establishment method, the CSM-T expects the T-BWIF-address and the BNC-ID to be used by the peer SN for the BNC establishment.
- If the BIWF selects a tunnelled established method, the CSM-T expects an indication of this choice and that the BIWF will notify the CSF when tunnelled Data is to be transported. In addition, the BIWF supplies the T-BIWF Address and the BNC-ID to be used by the Peer SN for BNC establishment.

The CSM-T awaits the response from the selected BIWF

1	ADD.req [Prepare BNC with notification]		SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 1000	BNC Characteristics = "?" or CSF chosen BNC
CCU-Control-Address of "SN-A"	Context-ID = "?" or 66	Characteristics
Requesting CSM = Outgoing	Termination ID = "?"	A-BNC Characteristics = (Incoming-BNC-
	Logical Port ID = 55	Characteristics)
	Tunnel Indication = No, or "?" or option 1 or	Bearer Service Characteristic
	option 2	{If Codec Negotiation : Preferred Codec}
	Notify option: <Termination Event>	

Initiation of information flow: reception and processing of **information flow 0**.

Processing upon receipt: when the BIWF receives **information flow 1**, it validates the request. The BIWF proceeds to select the bearer transport technology based upon the Incoming BNC characteristics, the Preferred Codec if included, and the available bearer transport types associated with the route specified by the Logical Port ID and capacity of each type of bearer transport available on the selected route. If the BIWF is requested to create a new context, a new Context ID (= 66) is created. Otherwise the BIWF will use the Context ID supplied by the CSF. It then selects the Termination ID to be "700" and adds this Termination to the Context. The BIWF selects a BNC-ID (78) and associates this value with the chosen Termination ID.

If the selected bearer transport technology is based on a non-tunnel establishment mode, the BIWF determines the bearer signalling association that should be used to establish this BNC Connection. One or more bearer control signalling associations could be used to establish a BNC within the specified Logical Port representing the outgoing route towards the destination Serving Node (SN-B). In this example, the chosen T-BIWF-Address is "X1" which represents the chosen bearer

control signalling entity to be used to establish the desired BNC. The Tunnel Indication information object to be included within **information flow 2** is set to "No".

If the selected bearer transport technology is based on a tunnel establishment mode, no explicit bearer control signalling association is required. However, a BIWF address associated with the logical port is also selected in order to assist the SN-B in selecting a BIWF in the case that no routing function is between the selected BIWF and the selected serving node. In addition, the CSF needs to be notified that Tunnelling operation is to be supported since it will need to be ready to accept the "Bearer Information Transport" information object from the BIWF and carry this information object within the SN to SN signalling flows. Setting the Tunnel Indication information object to either Option 1 or Option 2 performs this notification.

NOTE – Tunnel establishment mode can only be selected if the CSF has indicated a "?" or indicated a selected option within the Tunnel Indicator. The question mark within the received Tunnel Indication indicates that the CSF has given permission to the BIWF to select Tunnelled or non-Tunnelled operation. A "No" indication specifies that the BIWF can not select tunnelled operation, while either Option 1 or Option 2 indicates that the BIWF can select the Tunnelled operation, but must use the specified tunnel option.

The returned Tunnelled Indication will either contain a "No" or the selected tunnelling option.

The Outgoing BNC Characteristics, Context ID, Termination ID, BNC-ID, BIWF Address associated with the Logical Port, and Tunnel Indication are all returned to the CSF in **information flow 2**. If Tunnelling option 1 operation is specified, the BIWF will immediately issue **information flow 3** containing the Bearer Information Transfer information object, the BIWF Address, and the BNC-ID to the CSF and awaits the CSF's reception of **information flow 4** confirming the reception of the Bearer Information Transport information object.

Special NOTE – Since the Requesting CSM is associated with the outgoing termination, the BIWF cannot request a notify option to be sent to the peer BIWF. In this case, the Notify Option is set to No. If the Requesting CSM was associated with the incoming termination, the BIWF could request that its peer notifies it when the connection is established.

2	ADD.resp [BNC Prepared]		BIWF-X to SN-A:CSM-T

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 1000 Context-ID = 66 Termination ID = 700 Tunnel Indication = No or option 1 or option 2	BNC Characteristics = (Chosen-BNC-Characteristics) (BNC-ID = 78) BIWF Address = X1 Notify Option = No

Initiation of information flow: reception and processing of **information flow 1**.

Processing upon receipt: when the CSM-T receives **information flow 2**, CSM-T will send **information flow 6** if there is no codec negotiation procedure being conducted and the Tunnel Indication does not specify the tunnel option 1, to the CSM-O. Otherwise the CSM-T will wait for **information flow 4** before issuing **information flow 6**. **Information flow 6** will include the Context ID (66) received in **information flow 2** and the selected BIWF's control identity (BCU-ID = X), and the outgoing BNC Characteristics.

If the Tunnel Indicator does not specify Option 1, the CSM-T will issue an IAM signalling flow (**information flow 5**) to its peer CSM contained in SN-B indicating backward bearer establishment, optionally with codec negotiation, and Tunnelling indications. In addition, this IAM contains the BNC-ID, the BIWF Address, and the BNC Characteristics as received in **information flow 2**. The IAM may also contain the BCU-ID that represents the selected BIWF's control identity that was selected by the CSF. And may contain a Codec List if codec negotiation has been requested. The IAM also can indicate "COT on previous" if the following conditions are satisfied.

[If a COT on Previous has been received, or if a COT Required has been received, or that the connection within the SN has not been completed].

If the Tunnel Indicator specifies Option 1, The CSM-T will wait for the Bearer Information Transport information object that is contained in **information flow 3** before issuing **information flow 5**.

The CSM-T awaits further information concerning the call and bearer establishment either explicitly from its peer or from the selected BIWF.

3	Notify.ind [Tunnel]		BIWF-X to SN-A:CSM-T
Address Information	**Control information**		**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 7000		
CCU-Control-Address of "SN-A"	Context-ID = 66		
	Termination ID = 700		
	Bearer Information Transport		

Initiation of information flow: reception and processing of **information flow 1** and tunnel option 1 chosen by BIWF.

Processing upon receipt: when the CSM-T receives **information flow 3**, the CSM-T will send its response with **information flow 4**. It will then proceed to issue **information flow 5** to its peer CSM in SN-B containing the Bearer Information Transport information object. In addition, the CSM-T will issue **information flow 6** towards the CSM-O within in its own SN, if no codec negotiation procedure is in progress. The CSM-T awaits a response from its peer CSM within SN-B either explicitly or via an implicit indication from the BIWF.

4	Notify.resp [Tunnel]		SN-A:CSM-T to BIWF-X
Address Information	**Control information**		**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 7000		
CCU-Control-Address of "SN-A"	Context-ID = 66		
	Termination ID = 700		

Initiation of information flow: reception and processing of **information flow 3**.

Processing upon receipt: when the BIWF receives **information flow 4**, the BIWF will record acknowledgement of the previous send **information flow 3** and continues to monitor for status changes on the specified termination.

5	IAM		SN-A:CSM-T to SN-B:CSM-O
Address Information	**Control information**		**Bearer information**
Calling Party Address = User-A	CCA-ID = 5		Bearer Service Characteristics
Called Party Address = User-B	Action-ID = Connect Backwards,		BIWF Address = X1
O-CSF Address = SN-A	Tunnel Indication = No, or Option 1 or Option 2		BNC Characteristics
D-CSF Address = SN-B	(COT on Prev. = 1 or 0)		(BNC-ID = 78)
	(Origination Traffic Group ID = 77)		{If Codec Negotiation: Codec List}
	(Destination Traffic Group ID = 88)		
	(Global Call Ref. = 35)		
	(BCU-ID = X)		
	{If tunnel Indication = option 1 : Bearer Information Transport}		

Initiation of information flow: reception and processing of **information flow 2** if no tunnel or tunnel option 2 or reception and processing of **information flow 3** if tunnel option 1 is indicated in **information flow 2**.

Processing upon receipt: when SN-B receives this information flow it creates CSM-O. The CSM-O decides to defer the BIWF selection to CSM-T. Therefore, the CSM-O sends **information flow 7** to CSM-T, including:

• Incoming BCU-ID, as received in IAM;

• COTind reflecting the status of the incoming link [Circuit not available (COT on Prev.), or Circuit available (No COT)];

• Codec List (Optional), sent if received in IAM;

- • Incoming BNC Characteristics;
- • Incoming Bearer Service Characteristics;
- • Incoming Tunnel Indication;
- • A request for Context assignment (Context ID = "?") and BCU assignment (BCU-ID = "?");
- • Calling Party and Called Party Address;
- • And the Local Call Instance associating the CSMs to the incoming call request.

The CSM-O awaits the BCU and Context assignment (**information flow 8**) before continuing processing the incoming information flow.

6	Context Assigned		SN-A:CSM-T to SN-A:CSM-O
Address Information	**Control information**		**Bearer information**
	Local Call Instance = 300		BCU-ID = X
			Context ID = 66
			Outgoing BNC Characteristics

Initiation of information flow: reception and processing of **information flow 2** or **information flow 3** and no Codec Negotiation.

Processing upon receipt: the CSM-O continues the originating information flow as specified by the access flows related to the protocol interface type used on the originating side of the SN.

7	New Call		SN-B:CSM-O to SN-B:CSM-T
Address Information	**Control information**		**Bearer information**
Called-Party-Address = User B	Local Call Instance = 250		Incoming BCU-ID = X if received
Calling Party Address = User A	COTind = COT on Prev. or No COT		BIWF Address = X1
	Incoming Tunnel Indication = No, or Option 1 or Option 2		BCU-ID = "?"
			Context ID = "?"
	(Origination Traffic Group ID = 77)		Bearer Service Characteristics
	(Destination Traffic Group ID = 88)		Incoming BNC Characteristics
	(Global Call Ref. = 35)		{If Codec Negotiation: (Incoming Codec List)}

Initiation of information flow: reception and processing of the IAM (**information flow 6**).

Processing upon receipt: when the CSM-T receives this information flow, it initiates the terminating information flow specified by the access flows related to the protocol interface type used on the terminating side of the SN.

8	Context Assigned		SN-B:CSM-T to SN-B:CSM-O
Address Information	**Control information**		**Bearer information**
	Local Call Instance = 250		BCU-ID = Y,
			Context ID = 99
			Outgoing BNC Characteristics,
			{If Codec Negotiation; (Selected Codec), and (Supported Codec List)}

Initiation of information flow: CSM-T has assigned the context and BIWF for the call. Triggered by **information flow 7**.

Processing upon receipt: the CSM-O initiates the backward establishment procedure requested by **information flow 5** by issuing **information flow 9** and **information flow 13**. **Information flow 9** is only issued if a Codec Negotiation flow was requested within **information flow 5**. **Information flow 13** requests that a new BNC be created between BIWF(X) and BIWF(Y). In addition, **information flow 13** requests the creation of a new termination within the context specified by **information flow 8** if no idle BNC meet the requirements specified by the Bearer Service Characteristics, BNC Characteristics, and the Selected Codec type (**if provided in flow 13**). If a new termination is to be created, the BIWF Address and the BNC-ID are to be associated with this new termination. The Tunnel Indication information object specifies if Tunnelled or non-Tunnelled

operation should be used in the establishment operation of this new BNC. If BIWF selects an idle BNC is to be used, the termination associated with this idle BNC will be added to the context specified by **information flow 8** and the termination ID, the BNC-ID, and an indication to use this idle BNC will be returned to the CSF.

9	APM		SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	Selected Codec
	Action-ID = Codec Selected	Supported Codec List

Initiation of information flow: reception and processing of **information flow 8** and Codec Negotiation in progress.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 10** towards CSM-O within its SN notifying that the context has been assigned and the Codec has been selected. It then proceeds to modify the codec being used by the BIWF by issuing **information flow 11** towards the selected BIWF. It awaits the BIWF's acknowledgement that the codec has been modified.

10	Context Assigned		SN-A:CSM-T to SN-A:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	BCU-ID = X
		Context ID = 66
		Outgoing BNC Characteristics
		Selected Codec
		Supported Codec List

Initiation of information flow: reception and processing of **information flow 9** and Codec Negotiation in process.

Processing upon receipt: the CSM-O continues the originating information flow as specified by the access flows related to the protocol interface type used on the originating side of the SN.

11	Mod.req [Modify BNC Characteristics]		SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 6000	Selected Codec
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 9**.

Processing upon receipt: when the BIWF receives **information flow 11**, it validates the request. The BIWF proceeds to modify the codec which is associated with the specified Termination ID and responds to the CSF indicating completion by issuing **information flow 12**.

12	Mod.resp [Modify BNC Characteristics]		BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 6000	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 11**.

Processing upon receipt: when the CSM-T receives **information flow 12**, it is aware that the codec modification has been completed and awaits either the explicit indication that the BNC has been established from its peer CSM in SN-B or an implicit indication from the selected BIWF.

13   ADD.req [Est. BNC + Notify]   SN-B:CSM-T to BIWF-Y

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 5000 Context-ID = 99 Termination ID = "?" Logical Port ID = 77 Tunnel Indication = Incoming Tunnel Indication Notify option: <Termination Event> {If tunnel Indication = option 1 : Bearer Information Transport}	BNC Characteristics = (Incoming BNC Characteristics) A-BNC Characteristics = (Outgoing-BNC- Characteristics) Bearer Service Characteristic BNC-ID = 78 BIWF Address = X1 {If Codec Negotiation : Selected Codec}

Initiation of information flow: reception and processing of **information flow 8**.

Processing upon receipt: when the BIWF receives **information flow 13**, it validates the request. The BIWF proceeds to establish a BNC between itself and the specified remote BIWF(BIWF-X). It first checks for the type of bearer establishment is to be used; (Non-Tunnelled or Tunnel establishment) and the type of bearer transport to be used (AAL 1, AAL 1 Structured, AAL 2, or IP transport). The type of bearer establishment mode is specified within the Tunnel Indication. This indicator could specify no tunnelling, option 1 tunnelling, or option 2 tunnelling.

If the establishment mode is the **non-tunnelled mode**, the BIWF uses the incoming BNC characteristics, the Bearer Service Characteristics, and if available, the Selected Codec information in selecting the bearer transport characteristics to be used to convey the new BNC between itself and the BIWF-X. The Outgoing BNC characteristics are used to determine if any transcoding function is needed between the incoming termination and the outgoing termination. After the bearer transport has been determined, the BIWF determines if an existing idle BNC can be used instead of creating a new BNC.

If an **idle BNC** is available, the BIWF will create a Termination ID, move this termination into the specified Context, associate this Termination ID with the Idle BNC and reset the Idle BNC Timer. The BIWF will issue **information flow 14** to its associated CSF indicating within the Reuse Indication that an idle BNC should be used. In addition, this information flow would also indicate the BNC-ID associated with the Idle BNC. The BIWF then awaits the conformation that the Idle BNC is being used within BIWF(X).

If **no Idle BNC** can be used as a bearer transport for the selected bearer transport characteristics, the BIWF will create a Termination ID, move this termination to the specified context, issue **information flow 14** with the Reuse Indication set to no reuse. The BIWF would issue **information flow 15c** towards the SWN-1 requesting the explicit establishment of a new BNC between BIWF(X) and BIWF(Y). The BIWF then awaits a conformation of the establishment of a new BNC from SWN-1.

If the establishment mode is determined to be the Tunnelled mode of bearer establishment, the BIWF determines the tunnelling option (Option 1 or Option 2) has been requested, the BIWF will issue information flow **information flow 14** indicating no reuse of a idle BNC and if option 1 has been selected, accept the Bearer Information Transport information object contained in **information flow 13**, decode this information object, and implement the unidirectional bearer establishment indicated within the Bearer Information Transport information object, and issue **information flow 15a** containing the Bearer Information Transport information object which contains the encoded unidirectional bearer establishment request to complete the second portion of the complete bidirectional IP BNC between the two BIWFs.

If Option 2 was selected, the BIWF will issue **information flow 15d** containing the first portion of the bearer establishment request which is encoded within the Bearer Information Transport information object.

The BIWF awaits the next command from either its associated CSF or from its peer BIWF via SWN-1.

14   Add.resp [Est. BNC + Notify]   BIWF-Y to SN-B:CSM-O

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 5000 Context-ID = 99 Termination ID = 520 Reuse Indication = No or Yes {If Reuse Indication = Yes: BNC ID = 600}	

Initiation of information flow: reception and processing of **information flow 13**.

Processing upon receipt: when the CSM-O receives **information flow 14**, it is aware that either a new BNC is in progress of being established or that the BIWF has requested that a Idle BNC should be used. In the situation that a Idle BNC is to be used, the CSM-O will issue **information flow 15b** towards its peer CSM-T in SN-A requesting that the idle BNC associated with BNC-ID, BIWF address X1 be used. If no reuse is indicated, the CSM-O notes that the new BNC establishment is proceeding. In both cases the CSM-O awaits a notification from either the BIWF or its peer CSM-T in SN-A that the BNC has been established.

15a   Notify.ind [Tunnel]   BIWF-Y to SN-B:CSM-O

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 520 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 13** and tunnelling option 1 has been specified by SN-A CSM.

Processing upon receipt: when the CSM-O receives **information flow 15a**, it issues **information flow 16a** towards its peer CSM-T within SN-A indicating a tunnel operation. The received Bearer Information Transport information object is placed within this information flow. The BIWF issues **information flow 17a** toward BIWF(Y) confirming the reception of **information flow 15a.**

16a   APM   SN-B:CSM-O to SN-A:CSM-T

Address Information	Control information	Bearer information
	CCA-ID = 5 Action-ID = Tunnel Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 15a**.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 18a** towards BIWF(X) which contains the Bearer Information Transport information object and awaits confirmation for the BIWF that the command was received.

17a   Notify.resp [Tunnel]   SN-B:CSM-O to BIWF-Y

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 15a**.

Processing upon receipt: when the BIWF receives **information flow 17a**, it is aware that the CSF has received the notify indication.

18a   Mod.req (Tunnel)   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 6100 Context-ID = 66 Termination ID = 700 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 16a**.

Processing upon receipt: when the BIWF receives **information flow 18a**, it validates the request. The BIWF proceeds to decode the Bearer information Transport information object and implements the action specified within the information object. It then issues **information flow 19a** acknowledging reception of the Modify request.operation. Note the BIWF may issue a Notify indication containing a Tunnel at this point which would be delivered to its peer BIWF via a APM with action ID = tunnel. However, these flows have not been included to simply the presentation.

19a   Mod.resp [Tunnel]   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 610000 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 18a**.

Processing upon receipt: when the CSM-T receives **information flow 19a**, it is aware that the tunnel operation has been received and awaits further actions from either the BIWF or its peer CSM entities.

20a   Notify.ind [Establish BNC Ind]   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 620000 Context-ID = 66 Termination ID = 700	

Initiation of information flow: when the BIWF has actually completed the BNC establishment operation within BIWF(X). Note that multiple tunnel exchanges could occur between the peer BIWFs before BNC is actually established. In the example illustrated, only two tunnel exchanges for simplicity.

Processing upon receipt: when the CSM-T receives this notification it is aware that the BNC has been established within the BIWF. It then records this completion and acknowledges this notification by issing **information flow 21a** towards the BIWF. It continues its precessing by issuing **information flow 22a** indicating to its peer CSM within SN-B that the BNC has been connected. It also issues **information flow 31** requesting that the termination be cut through in both the Send and Receive configuration.

21a   Notify.resp [Establish BNC Ind]   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 620000 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 20a**.

Processing upon receipt: when the BIWF receives this acknowledgement it awaits further action requests from CSM-T and continues to monitor the termination for events that need to be reported to the CSM-T.

22a	APM		SN-A:CSM-T to SN-B:CSM-O
Address Information	**Control information**		**Bearer information**
	CCA-ID = 5		BNC-ID = 78
	Action-ID = Connected		BIWF Address = X1

Initiation of information flow: reception and processing of **information flow 20a** and **information flow 23a**.

Processing upon receipt: when CSM-O receives this information flows, it issues **information flow 29** towards BIWF(Y) which requests that the termination be placed into the Send + Receive communications configuration, and awaits the response from the BIWF.

23a	Notify.ind [BNC Established]		BIWF-Y to SN-B:CSM-O
Address Information	**Control information**		**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7100		
CCU-Control-Address of "SN-B"	Context-ID = 99		
	Termination ID = 520		

Initiation of information flow: when the BIWF determines that the BNC is established. It may require several tunnel exchanges to reach this state. This example only ilustrates two exchanges for simplicity.

Processing upon receipt: when the CSM-O receives **information flow 23a**, it notes that the new BNC establishment confirmation has been received. It validates this request and issues **information flow 24a** towards its BIWF acknowledging reception of the notify indication. It then issues **information flow 29** if **information flow 22a** has been received to the BIWF requesting that the termination be placed in the Send and Receive communication configuration. It then waits for the response from the BIWF.

24a	Notify.resp [BNC Established]		SN-B:CSM-O to BIWF-Y
Address Information	**Control information**		**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7100		
CCU-Control-Address of "SN-B"	Context-ID = 99		
	Termination ID = 520		

Initiation of information flow: reception and processing of **information flow 23a**.

Processing upon receipt: when the BIWF receives **information flow 23a**, it is aware that the CSF has received the notify indication. It then awaits further commands from the CSF and continues to monitor the termination for events that need to be reported to the CSM-O.

15b	APM		SN-B:CSM-O to SN-A:CSM-T
Address Information	**Control information**		**Bearer information**
	CCA-ID = 5		BNC-ID = 600
	Action-ID = Use Idle		BIWF Address = X1

Initiation of information flow: reception and processing of **information flow 14** and re-idle of idle BNC has been chosen by the BIWF.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 16b** towards BIWF(X) which requests that that the BIWF use the specified Idle BNC and associate this BNC to the previously created Termination ID. The CSM-T awaits confirmation of this request.

16b   Mod.req [Reuse Idle]   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 6200 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 15b**.

Processing upon receipt: when the BIWF receives **information flow 16b**, it validates the request. The BIWF proceeds to associate the specified Idle BNC to the specified termination. After this association has been accomplished, the BIWF issues **information flow 17b** towards the CSF.

17b   Mod.resp [Reuse Idle]   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 6200 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 16b**.

Processing upon receipt: when the CSM-T receives **information flow 17b**, it is aware that the reuse of the BNC operation has been completed and issues **information flow 18b** towards its peer CSM-O in SN-B indicating that the BNC has been switched , issues **information flow 31** towards BIWF-X requesting that the termination be placed into the Send + Receive communication configuration, and awaits the response from the BIWF.

18b   APM   **SN-A:CSM-T to SN-B:CSM-O**

Address Information	Control information	Bearer information
	CCA-ID = 5 Action-ID = Switched	

Initiation of information flow: reception and processing of **information flow 17b**.

Processing upon receipt: when CSM-O receives this information flow, it issues **information flow 29** towards BIWF(Y) which requests that the termination be placed into the Send + Receive communications configuration, and awaits the response from the BIWF.

15c   Bearer-Setup.Req   **BIWF(Y) to SWN(1)**

Address Information	Control information	Bearer information
T-BIWF Addr = X1	BCS-ID = "15"	BNC-ID: = 78 BNCL-ID = 1004 {BNCL Characteristics}

Initiation of information flow: processing of **information flow 13** and non-tunnel option has been chosen by the BIWF

Processing upon receipt: the selected switching node validates the request and determines the route and backbone transport facility used to carry the new backbone connection between SWN(1) and BIWF(X). The switching node issues **information flow 16c** towards BIWF(X). **Information flow 16c's** link information was determined from the link information received in **information flow 15c**. Switching Node 1 awaits the commitment information from BIWF(X).

16c	Bearer-Setup.Req		SWN(1) to BIWF(x)

Address Information	**Control information**	**Bearer information**
T-BIWF Addr = X1	BCS-ID = "65"	BNC-ID: = 78 BNCL-ID = 1000 {BNCL characteristics}

Initiation of information flow: processing of **information flow 15c**.

Processing upon receipt: the selected Bearer InterWorking Function validates the request and notifies its associated Call Service function that a bearer has been requested between SN-A and SN-B via **information flow 18c** and issues **information flow 17c** towards SWN-1. It then awaits the response from the CSF.

17c	Bearer-Setup.Confirm		BIWF(X) to SWN(1)

Address Information	**Control information**	**Bearer information**
	BCS-ID = "65"	BNCL-ID = 1000

Initiation of information flow: processing of **information flow 16c**.

Processing upon receipt: the switching node notes the confirmation of the establishment request and issues **information flow 20c** towards BIWF(Y).

18c	Notify.ind [Establish BNC Ind]		BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7100 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 16c**.

Processing upon receipt: when the CSM-T receives **information flow 18c**, it notes that the new BNC establishment request has been received. It validates this request and issues **information flow 19c** towards its BIWF acknowledging the establishment of the BNC. It then issues **information flow 31** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration. It then waits for the response from the BIWF.

19c	Notify.resp [Establish BNC Ind]		SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7100 Context-ID = 66 Termination ID = 700	Response Indication = Accept BNC

Initiation of information flow: reception and processing of **information flow 18c**.

Processing upon receipt: when the BIWF receives **information flow 19c**, it is aware that the CSF has received the notify indication and agrees to accept the new requested BNC. It then awaits further commands from the CSF and continues to monitor the associated termination for events that need to be reported to the CSM-T.

20c   Bearer-Setup.Confirm   **SWN(1) to BIWF(Y)**

Address Information	**Control information**	**Bearer information**
	BCS-ID = "15"	BNCL-ID = 1004

Initiation of information flow: processing of **information flow 17c**.

Processing upon receipt: the BIWF records the establishment of the backbone connection, issues **information flow 21c** notifying the CSF that the requested BNC has been established.

21c   Notify.ind [BNC Established]   **BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 20c**.

Processing upon receipt: when the CSM-O receives **information flow 21c**, it notes that the new BNC establishment confirmation has been received. It validates this request and issues **information flow 22c** towards its BIWF acknowledging reception of the notify indication. It then issues **information flow 29** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration. It then waits for the response from the BIWF.

22c   Notify.resp [BNC Established]   **SN-B:CSM-O to BIWF-Y**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 21c**.

Processing upon receipt: when the BIWF receives **information flow 22c**, it is aware that the CSF has received the notify indication. It then awaits further commands from the CSF and continues to monitor the termination for events that need to be reported to the CSM-O.

15d   Notify.ind [Tunnel]   **BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 520 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 13** and tunnelling option 2 has been chosen by the BIWF.

Processing upon receipt: when the CSM-O receives **information flow 15d**, it issues **information flow 16d** towards its peer CSM-T within SN-A indicating a tunnel operation. The received Bearer Information Transport information object is placed within this information flow. The BIWF issues **information flow 17d** toward BIWF(Y) confirming the reception of **information flow 15d**.

16d   APM   **SN-B:CSM-O to SN-A:CSM-T**

Address Information	Control information	Bearer information
	CCA-ID = 5 Action-ID = Tunnel Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 15d**.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 18d** towards BIWF(X) which contains the Bearer Information Transport information object and awaits confirmation for the BIWF that the command was received.

17d   Notify.resp [Tunnel]   **SN-B:CSM-O to BIWF-Y**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 15d**.

Processing upon receipt: when the BIWF receives **information flow 17d**, it is aware that the CSF has received the notify indication.

18d   Mod.req [Tunnel]   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 6100 Context-ID = 66 Termination ID = 700 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 16d**.

Processing upon receipt: when the BIWF receives **information flow 18d**, it validates the request. The BIWF proceeds to decode the Bearer information Transport information object and implements the action request contained within the information object. It associates this information with the specified termination. It then issues **information flow 19d** acknowledging the reception of the modify request. The BIWF then issues **information flow 20d** containing the Bearer Information Transport information object containing the encoded bearer action response to the incoming action request. This command response sequence may be repeated several times, however, these are not shown in this example for simplicity.

19d   Mod.resp [Tunnel]   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 610000 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 18d**.

Processing upon receipt: when the CSM-T receives **information flow 19d**, it aware that the modify request operation has been received by the BIWF.

20d   **Notify.ind [Tunnel]**   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7400 Context-ID = 66 Termination ID = 700 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 18d**.

Processing upon receipt: when the CSM-T receives **information flow 20d**, the CSM-T will send its response with **information flow 22d**. It will then proceed to issue **information flow 21d** to its peer CSM in SN-B containing the Bearer Information Transport information object and awaits further information flows from either the BIWF or its associated CSM-O in SN-B.

21d   **APM**   **SN-A:CSM-T to SN-B:CSM-O**

Address Information	Control information	Bearer information
	CCA-ID = 5 Action-ID = Tunnel Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 20d**.

Processing upon receipt: when CSM-O receives this information flow, it issues **information flow 25d** towards BIWF(Y) which contains the Bearer Information Transport information object and awaits the response from the BIWF.

22d   **Notify.resp [Tunnel]**   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7400 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 20d**.

Processing upon receipt: when the BIWF receives **information flow 22d**, the BIWF will record acknowledgement of the previous send **information flow 20d** and continues to monitor for status changes on the specified termination.

23d   **Notify.ind [Establish BNC Ind]**   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 620000 Context-ID = 66 Termination ID = 700	

Initiation of information flow: when the BIWF has actually completed the BNC establishment operation within BIWF(X). Note that multiple tunnel exchanges could occur between the peer BIWFs before BNC is actually established. In the example illustrated, only two tunnel exchanges for simplicity.

Processing upon receipt: when the CSM-T receives this notification it is aware that the BNC has been established within the BIWF. It then records this completion and acknowledges this notification by issing **information flow 24d** towards the BIWF. It also issues **information flow 31** requesting that the termination be cut through in both the Send and Receive configuration.

24d   Notify.resp [Establish BNC Ind]   **SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 620000	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 24d**.

Processing upon receipt: when the BIWF receives this acknowledgement it awaits further action requests from CSM-T and continues to monitor the termination for events that need to be reported to the CSM-T.

25d   Mod.req [Tunnel]   **SN-B:CSM-O to BIWF-Y**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 6500	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	
	Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 21d**.

Processing upon receipt: when the BIWF receives **information flow 21d**, it validates the request. The BIWF proceeds to decode the Bearer Information Transport information object and implements the response contained within the information object. It associates this information with the specified termination. It then issues **information flow 26d** acknowledging the reception of the modify request. In addition, the BIWF may will **information flow 27d** indicating that the new BNC establishment has been completed when the BNC has been actually established. This may require multiple tunnelling bearer exchanges between the two BIWFs. For simplicity one two exchanges have been illustrated.

26d   Mod.resp [Tunnel]   **BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 6500	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 25**.

Processing upon receipt: when the CSM-O receives **information flow 26d**, the CSM-O will record acknowledgement of the previous send **information flow 25d** and continues to wait for the indication that the BNC has been established.

27d   Notify.ind [BNC Established]   **BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7800	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: when the BNC has been established between the two BIWFs.

Processing upon receipt: when the CSM-O receives **information flow 27d**, it notes that the new BNC establishment confirmation has been received. It validates this request and issues **information flow 28d** towards its BIWF acknowledging reception of the notify indication. It then issues **information flow 29** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration. It then waits for the response from the BIWF.

28d   Notify.resp [BNC Established]   **SN-B:CSM-O to BIWF-Y**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7800	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 27d**.

Processing upon receipt: when the BIWF receives **information flow 28d**, it is aware that the CSF has received the notify indication. It then awaits further commands from the CSF and continues to monitor the termination for events that need to be reported to the CSM-O.

29   Mod.req [Cut Through]   **SN-B:CSM-O to BIWF-Y**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7500	(Send + Receive)
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 22a, 18b, 21c, or 27d**.

Processing upon receipt: when the BIWF receives **information flow 29**, it validates the request. The BIWF proceeds to place the specified Termination into the Send + Receive communication configuration and issues **information flow 30**. The BIWF continues to monitor the termination for any event that will require a notification of state change to its associated CSF.

30   Mod.resp [Cut Through]   **BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7500	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 29**.

Processing upon receipt: when the CSM-O receives **information flow 30**, the CSM-O will record acknowledgement of the previous sent modification request. If a COT on Prev. has been received from SN-A and SN-B has not received a COT information flow (**information flow 34**) it awaits the indication that the BNC is available. If no COT on Prev. was received, or if a COT has been received, the CSM-O issues **information flow 35** indicating that the previous connection is available.

31   Mod.req [Cut Through]   **SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 8500	(Send + Receive)
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 20a, 17b, 18c, or 23d**.

Processing upon receipt: when the BIWF receives **information flow 31**, it validates the request. The BIWF proceeds to place the specified Termination into the Send + Receive communication configuration and issues **information flow 32**. The BIWF continues to monitor the termination for any event that will require a notification of state change to its associated CSF.

32   Mod.resp [Cut Through]   BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 8500	
CCU-Control-Address of "SN-A"	Context-ID = 99	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 31**.

Processing upon receipt: when the CSM-T receives **information flow 32**, the CSM-T will record acknowledgement of the previous sent modification request. If **information flow 33** has been received, it requests the BIWF to connect the incoming and outgoing terminations together by issuing **information flow 36** to the BIWF and awaits the indication that the internal connection within SN-A is available. If **information flow 33** has not been received, the CSM-T will await the previous connection available indication before issuing **information flow 34**.

---

33   Connection Available   SN-A:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	
	Termination ID = 900	

Initiation of information flow: CSM-O determines that the previous BNC is available.

Processing upon receipt: the CSM-T determines if a COT operation was specified in **information flow 5** and, if this operation is in effect, it issues **information flow 34** towards its peer in SN-B. In addition, if **information flow 32** has been received, the CSM-T will issue **information flow 36** towards the BIWF requesting that the incoming and outgoing terminations are internally connected. If **information flow 32** has not been received, the CSM-T awaits this information flow before proceeding.

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34   COT   SN-A:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	

Initiation of information flow: reception and processing of **information flow 33** and COT on Prev. sent in **information flow 5**.

Processing upon receipt: when CSM-O receives this information flow and has received **information 30**, it issues **information flow 35** towards its peer CSM within SN-B indicating the BNC is available. If **information flow 30** has not been received, the CSM-O waits for this flow before proceeding.

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35   Connection Available   SN-B:CSM-O to SN-B:CSM-T

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 30** without COT on Prev. or **information flows 30** and **34** with COT on Prev.

Processing upon receipt: the CSM-T notes that the internal connection is available and proceeds with the operations still to be performed by the out going side of SN-B.

36   Mod.req [Change Topology]   SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 8500 Context-ID = 66 Termination ID = 700 Termination ID = 900	Connection Configuration = Type 1 Bidirectional

Initiation of information flow: reception and processing of **information flow 32** and **information flow 33**.

Processing upon receipt: when the BIWF receives **information flow 36**, it validates the request. The BIWF proceeds to connect the specified terminations into the specified connection configuration and issues **information flow 37**. The BIWF continues to monitor the termination for any event that will require a notification of state change to its associated CSF.

37   Mod.resp [Change Topology]   BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 8500 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 36**.

Processing upon receipt: when the CSM-O receives **information flow 37**, the CSM-T will record acknowledgement of the previous sent modification request and awaits further action requests from either its peer CSMs or from its associated BIWF.

38   Alerting   SN-B:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	Context ID = 99 Termination ID = 120

Initiation of information flow: CSM-T has detected that the addressed user is in the alerting state.

Processing upon receipt: the CSM-O records this condition and issues **information flow 39** towards its peer in SN-A.

39   ACM   SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	

Initiation of information flow: reception and processing of **information flow 38**.

Processing upon receipt: when CSM-T receives this information flow, it records the alerting condition and issues **information flow 40** towards CSM-O within SN-A.

40   Alerting   SN-A:CSM-T to SN-A:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	Context ID = 66 Termination ID = 700

Initiation of information flow: reception and processing of **information flow 39**.

Processing upon receipt: the CSM-O records the alerting condition, proceeds with the procedures associated with the incoming termination, and awaits answer.

41	Answer		SN-B:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	Context ID = 99 Termination ID = 120

Initiation of information flow: CSM-T has detected that the addressed user has answered.

Processing upon receipt: the CSM-O records this condition and issues **information flow 42** towards its peer in SN-A.

42	ANM		SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	

Initiation of information flow: reception and processing of **information flow 41**.

Processing upon receipt: when CSM-T receives this information flow, it records the answer condition and issues **information flow 43** towards CSM-O within SN-A.

43	Answer		SN-A:CSM-T to SN-A:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	Context ID = 66 Termination ID = 700

Initiation of information flow: reception and processing of **information flow 42**.

Processing upon receipt: the CSM-O records the answer condition, proceeds with the procedures associated with the incoming termination.

5.3.2 Forward composite

The signal flow diagram in Figure 7 contains a composite flow covering the cases of Forward tunnelled, non-tunnelled and idle BNC applications. In addition, the flow also covers codec negotiation.
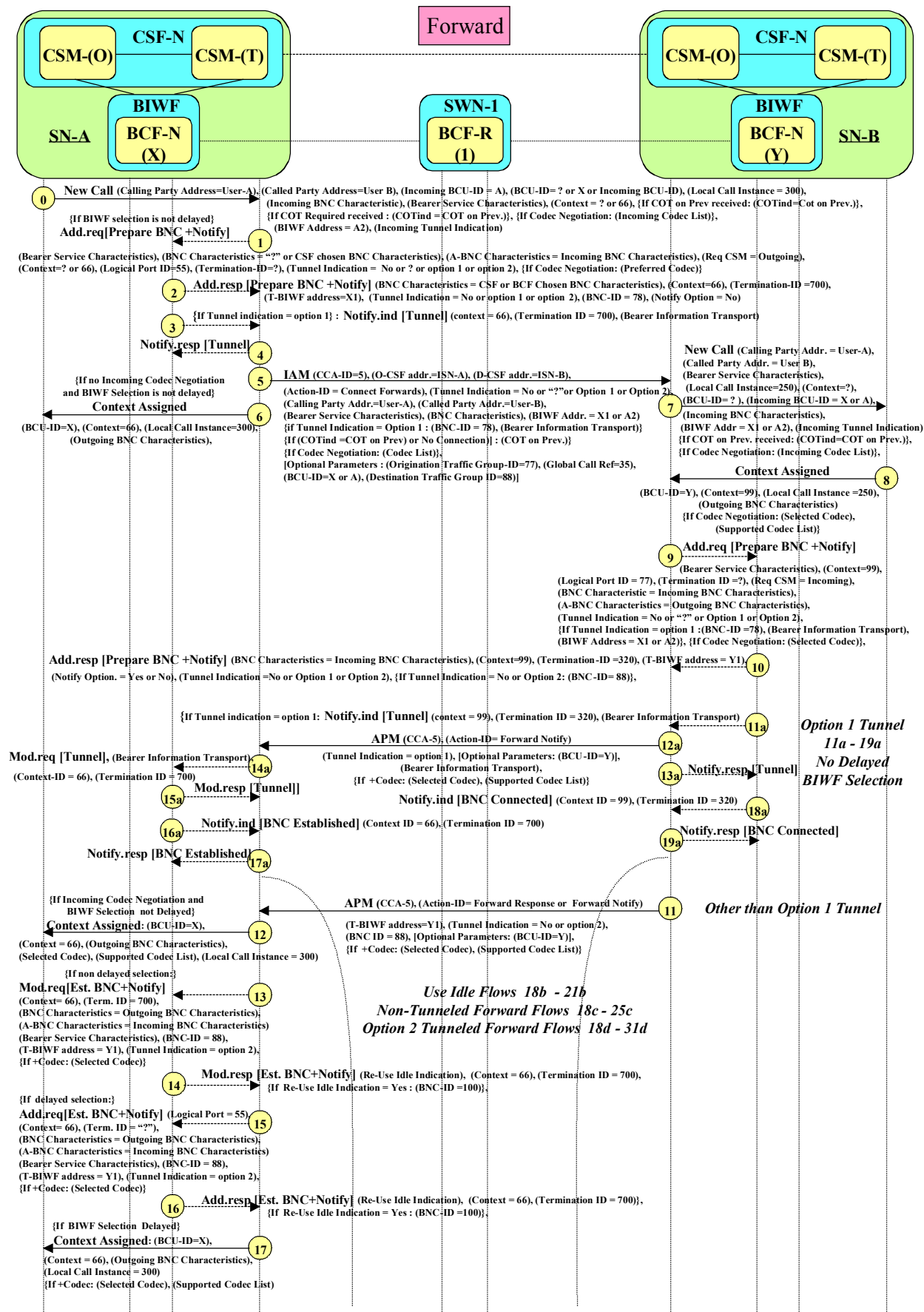
Figure 7 – Composite forward establishment flow
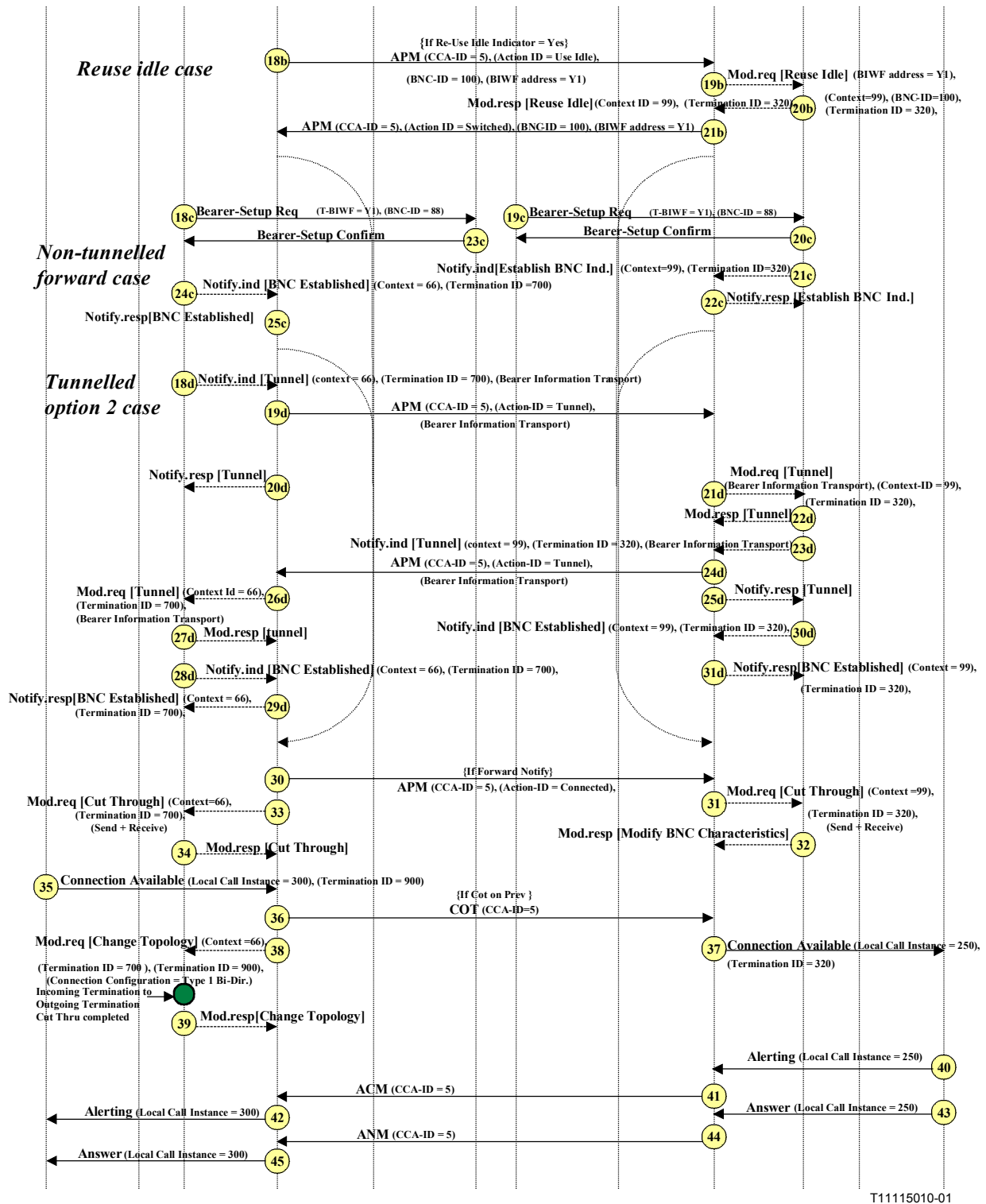
Figure 7 – Composite forward establishment flow (*concluded*)

The following numbered items describe the numbered flows shown above.

Address Information	**Control information**	**Bearer information**
Called-Party-Address = User B	Local Call Instance = 300	Incoming BCU-ID = A if received
Calling Party Address = User A	COTind = COT on Prev. or No COT	BIWF Address = A2
	Incoming Tunnel Indication = No, or Option 1 or	BCU-ID = "?" or X or Incoming BCU-ID
	Option 2	Context ID = "?" or 66
	(Origination Traffic Group ID = 77)	Incoming BNC Characteristics
	(Destination Traffic Group ID = 88)	{If Codec Negotiation: (Incoming Codec List)}
	(Global Call Ref. = 35)	Bearer Service Characteristics

Initiation of information flow: call attempt from the CSM-O.

Processing upon receipt: when this information flow is received, the CSM-T will determine the establishment direction for the new outgoing BNC. This direction establishment method is based on the call routing selection of the next peer signalling entity within the path to the specified called party and outgoing routing characteristics between these two signalling entities.

NOTE – Some available route segments may be provisioned to only use forward establishment procedure, other available route segments may be provisioned to only use backward establishment procedures while other available route segments may be provisioned to use either method.

In this case the CSM-T determines that the Connect Forwards method of operation should be used.

In the case of forward establishment, the CSM-T has two BIWF selection options if the CSM-O has not already selected a BIWF(BCU-ID = "?"). The first option is to immediately choose a BIWF or the second option is to wait until its peer has chosen a BIWF before it selects a BIWF. This latter option allows the possibility of choosing a BIWF that will optimize the BNC path.

If the **BIWF** was **selected by the CSM-O**, the selected BIWF will be sent in **information flow 1** requesting the assignment of the Context ID, the Termination-ID, and the BNC-ID associated with the selected Termination ID. In this example, if the CSM-O selected the BIWF, it is assumed that BIWF(X) has been selected.

If the **CSM-T chooses the immediate BIWF selection** option, the CSM-T performs a BIWF Selection Analysis. This analysis takes into account the outgoing route segment availability, the CSF Bearer Optimization preferences, the BIWF Capabilities required by the BNC characteristics, the Incoming-BCU-ID (if received), the Incoming Codec List (if received), the Tunnelling Indication, and any BIWF Bearer Service Characteristics restrictions. In this example flow, this analysis could select either BIWF(X) [BCU-ID = X] or BIWF(A)[BCU-ID = A]. It is assumed that the CSM-T chooses BIWF(X). The CSM-T then issues **information flow 1** requesting the assignment of the Context ID, the Termination ID, and the BNC-ID associated with the selected termination ID.

The content of **information flow 1** contains several information objects that are used by the BIWF to determine its limits on the selection of the Termination ID and the BNC characteristics. These information objects are;

- **BNC Characteristics** = "?" or CSF chosen BNC Characteristics: indicates the degree of freedom that the BIWF has in selection of the BNC Characteristics. If the BNC Characteristics value = "?" then the BIWF can choose the BNC characteristics using other information specified within the information flow. If the BNC Characteristics value is other than "?", this BNC characteristics shall be used since it was selected by the CSF.

- **A-BNC Characteristics** = Incoming BNC Characteristics; supplementary information used in the selection of the outgoing BNC Characteristics. This supplementary information indicates the BNC Characteristics on the previous BNC in order to provide an optimized bearer transport path connection within the BIWF.

- **Context ID** = "?" or 66; indicates if the BIWF has the freedom of selecting a context, or if it must use a context previously selected by a CSF-CSM. If the Context ID value = "?", then the BIWF can select a context. If the Context Id value is other than "?", the specified context must be used.

- **Termination ID** = "?"; indicates the degree of freedom that the BIWF has in selection of the Termination ID. If the Termination ID value = "?", the BIWF can select the Termination ID using other information within the information flow. If the Termination ID value is other than "?", the BIWF must use the termination Id specified by the CSF.

- **Logical Port ID** = 55; specifies the selected available route segment to be used. The selected route segment consists of one or more terminations contained within the BIWF that can be used to get to the next serving node within the BICC network. The BIWF will select an idle termination within the scope of this Logical Port.

- **Tunnel Indication** = No or "?" or option 1 or option 2; indicates the degree of freedom which the BIWF has in selecting the bearer establishment mode between SN (Tunnelled or Non-Tunnelled). If the Tunnel Indication value = "No", no tunnel establishment mode is to be used. If the Tunnel Indication value is other than "No", tunnelling is allowed by the CSF. If the Tunnel Indication value = "Option 1" or "Option 2", the BIWF may choose to use the Tunnelling mode conforming to the specified tunnelling option. If the Tunnelling Indication value = "?", the BIWF may choose the Tunnelling mode of establishment conforming to option 1 or option 2. Tunnelling option 1 indicates that the Bearer Information Transport information object is to be included in the IAM information flow, while with option 2 the Bearer Information Transport information object shall only be sent after Codec Negotiation completion. This tunnel permission/non-permission will be sent to the selected BIWF since some of the bearer transport route segments may or may not be allowed to use the tunnelled establishment mode.

- If Codec Negotiation: **Preferred Codec**: supplementary information to assist in the selection of the appropriate bearer transport technology.

- **Bearer Service Characteristics**: supplementary information to assist in the selection of the appropriate bearer transport technology.

If an Incoming Codec List is contained within the received information flow, the CSM-T will review this list and determine if all of the codecs within the list can be supported and are available for use. If the list contains codecs that cannot be supported by the selected BIWF, these codecs are removed from the list. The resulting list will be sent to its peer SN in **information flow 3**.

The CSM-T will then send **information flow 1** to the selected BIWF(could be either BIWF = "A" or BIWF = "X" however, for this example BIWF = X is assumed) which contains:

- A Transaction ID = 1000 which was selected by the CSF;

- The information shown above, and

- A request that CSM-T be notified of Bearer Establishment.

The CSM-T awaits the response to the requested operation and expects the following information within this response information flow:

- If the BIWF selects a **non-tunnelled establishment** method, the CSM-T expects the T-BWIF-address and the BNC-ID to be used by the peer SN for the BNC establishment;

- If the BIWF selects a **tunnelled established** method, the CSM-T expects an indication of this choice and that the BIWF will notify the CSF when tunnelled Data is to be transported. In addition, the BIWF supplies the T-BIWF Address and the BNC-ID to be used between the Peer SN for BNC establishment.

The CSM-T awaits the response from the selected BIWF.

If the **CSM-T chooses the delayed BIWF selection option**, the CSM-T issues **information flow 5** and awaits the response from its peer (**information flow 11**) before selecting the BIWF to be used. Information objects contained in **information flow 5** will be selected by the CSM-T without contacting any BIWF. Specifically the CSM-T will choose the BNC Characteristics, Tunnelling Indication values (No or option 2), BIWF Address (Null), and the miscellaneous parameter BCU-ID. In this case, the Action ID would be Forward Establishment. **Information flow 5** may specify Codec negotiation by including a Codec List.

1	ADD.req [Prepare BNC with notification]	SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A" Requesting CSM = Outgoing	Transaction ID = 1000 Context-ID = "?" or 66 Termination ID = "?" Logical Port ID = 55 Tunnel Indication = No or "?" or Option 1 or Option 2 Notify option: <Termination Event>	BNC Characteristics = "?" or CSF chosen BNC Characteristics A-BNC Characteristics = (Incoming-BNC- Characteristics) Bearer Service Characteristic {If Codec Negotiation : Preferred Codec}

Initiation of information flow: reception and processing of **information flow 0** and immediate BIWF selection chosen by CSF.

Processing upon receipt: when the BIWF receives **information flow 1**, it validates the request. The BIWF proceeds to select the bearer transport technology based upon the Incoming BNC characteristics, the Preferred Codec if included, and the available bearer transport types associated with the route specified by the Logical Port ID and capacity of each type of bearer transport available on the selected route. If the BIWF is requested to create a new context, a new Context ID (= 66) is created. Otherwise the BIWF will use the Context ID supplied by the CSF. It then selects the Termination ID to be "700" and adds this Termination to the Context. The BIWF selects a BNC-ID (78) and associates this value with the chosen Termination ID.

If the selected bearer transport technology is based on a **non-tunnel establishment** mode, the BIWF determines the bearer signalling association that should be used to establish this BNC Connection. One or more bearer control signalling associations could be used to establish a BNC within the specified Logical Port representing the outgoing route towards the destination Serving Node (SN-B). In this example, the chosen T-BIWF-Address is "X1" which represents the chosen bearer control signalling entity to be used to establish the desired BNC. The Tunnel Indication information object to be included within **information flow 2** is set to "**No**".

If the selected bearer transport technology is based on a **tunnel establishment mode**, no explicit bearer control signalling association is required. However, a BIWF address associated with the logical port is also selected in order to differentiate the chosen BNC-ID value from other BNC-ID values generated by different BIWFs. In addition, the CSF needs to be notified that Tunnelling operation is to be supported since it will need to be ready to accept the "Bearer Information Transport" information object from the BIWF and carry this information object within the SN to SN signalling flows. Setting the Tunnel Indication information object to either Option 1 or Option 2 performs this notification.

NOTE – Tunnel establishment mode can only be selected if the CSF has indicated a "?" or indicated a selected option within the Tunnel Indicator. The question mark within the received Tunnel Indication indicates that the CSF has given permission to the BIWF to select Tunnelled or non-Tunnelled operation. A "No" indication specifies that the BIWF can not select tunnelled operation, while either Option 1 or Option 2 indicates that the BIWF can select the Tunnelled operation, but must use the specified tunnel option.)

The returned Tunnelled Indication will either contain a "No" or the selected tunnelling option.

The Outgoing BNC Characteristics, Context ID, Termination ID, BNC-ID, BIWF Address associated with the Logical Port, and Tunnel Indication are all returned to the CSF in **information flow 2**. If Tunnelling option 1 operation is specified, the BIWF will immediately issue another information flow **(information flow 3).** This information flow contains the Bearer Information

Transfer information object, the BIWF Address, and the BNC-ID to the CSF, and the BIWF awaits the CSF's acknowledgement flow confirming the reception of the Bearer Information Transport information object.

Special NOTE – Since the Requesting CSM is associated with the outgoing termination, the BIWF cannot request that the completion of the connection within the addressed SN-B is notified back to SN-A. Therefore the Notify option is set to "No".

2	**ADD.resp [BNC Prepared]**		**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 1000	BNC Characteristics = (Chosen-BNC-
CCU-Control-Address of "SN-A"	Context-ID = 66	Characteristics)
	Termination ID = 700	BNC-ID = 78
	Tunnel Indication = No or option 1 or option 2	BIWF Address = X1
		Notify Option = No

Initiation of information flow: reception and processing of **information flow 1** and immediate BIWF selection chosen by CSF.

Processing upon receipt: when the CSM-T receives **information flow 2**, CSM-T will send **information flow 6** if there is no codec negotiation procedure being conducted and the Tunnel Indication does not specify the tunnel option 1, to the CSM-O. Otherwise the CSM-T will wait for **information flow 4** before issuing **information flow 6**. **Information flow 6** will include the Context ID (66) received in **information flow 2** and the selected BIWF's control identity designation (BCU-ID = X), and the outgoing BNC Characteristics.

If the Tunnel Indicator does not specify Option 1, the CSM-T will issue an IAM signalling flow (**information flow 5**) to its peer CSM contained in SN-B indicating forward bearer establishment, optionally with codec negotiation, and with the appropriate Tunnelling indication. In addition, this IAM contains the BNC-ID, the BIWF Address, and the BNC Characteristics as received in **information flow 2**. The IAM may also contain the BCU-ID that represents the selected BIWF's control identity that was selected by the CSF. And may contain a Codec List if codec negotiation has been requested. The IAM also can indicate "COT on previous" if the following conditions are satisfied.

[If a COT on Previous has been received, or if a COT Required has been received, or that the connection within the SN has not been completed].

If the Tunnel Indicator specifies Option 1, The CSM-T will wait for the Bearer Information Transport information object that is contained in **information flow 3** before issuing **information flow 5**.

The CSM-T awaits further information concerning the call and bearer establishment either explicitly from its peer or from the selected BIWF.

3	**Notify.ind [Tunnel]**		**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 7000	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	
	Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 1** and immediate BIWF selection chosen by CSF.

Processing upon receipt: when the CSM-T receives **information flow 3**, the CSM-T will send its response with **information flow 4**. It will then proceed to issue **information flow 5** to its peer CSM in SN-B containing the Bearer Information Transport information object. In addition, the CSM-T will issue **information flow 6** towards the CSM-O within in its own SN, if no codec negotiation

procedure is in progress. The CSM-T awaits a response from its peer CSM within SN-B either explicitly or via an implicit indication from the BIWF.

4	Notify.resp [Tunnel]	SN-A:CSM-T to BIWF-X

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7000 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 3** and immediate BIWF selection chosen by CSF.

Processing upon receipt: when the BIWF receives **information flow 4**, the BIWF will record acknowledgement of the previous send **information flow 3** and continues to monitor for status changes on the specified termination.

5	IAM	SN-A:CSM-T to SN-B:CSM-O

Address Information	Control information	Bearer information
Calling Party Address = User-A Called Party Address = User-B O-CSF Address = SN-A D-CSF Address = SN-B	CCA-ID = 5 Action-ID = Connect Forwards Tunnel Indication = No or Option 1 or Option 2 (COT on Prev. = 1 or 0) (Origination Traffic Group ID = 77) (Destination Traffic Group ID = 88) (Global Call Ref. = 35) (BCU-ID = X or A) {If Tunnel Indication = option 1 : (Bearer Information Transport)}	Bearer Service Characteristics BNC Characteristics BIWF Address = X1 or A2) {If Codec Negotiation: (Codec List)} {If Tunnel Indication = option 1: (BNC-ID = 78)}

Initiation of information flow: reception and processing of **information flow 0** if delayed BIWF selection has been chosen, or **information flow 2** if no tunnel or tunnel option 2 is contained in **information flow 2** or **information flow 3** if the tunnel option 1 is contained in **information flow 2**.

Processing upon receipt: when SN-B receives this information flow it creates CSM-O. The CSM-O decides to defer the BIWF selection to CSM-T. Therefore, the CSM-O sends **information flow 5** to CSM-T, including:

- Incoming BCU-ID, as received in IAM;

- COTind reflecting the status of the incoming link [Circuit not available (COT on Prev.), or Circuit available (No COT)];

- Codec List (Optional), sent if received in IAM;

- Incoming BNC Characteristics;

- Incoming Bearer Service Characteristics;

- Incoming Tunnel Indication;

- A request for Context assignment (Context ID = "?") and BCU assignment (BCU-ID = "?");

- Calling Party and Called Party Address;

- And the Local Call Instance associating the CSMs to the incoming call request.

The CSM-O awaits the BCU and Context assignment (**information flow 8**) before continuing processing the incoming information flow.

6   Context Assigned   SN-A:CSM-T to SN-A:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	BCU-ID = X Context ID = 66 Outgoing BNC Characteristics

Initiation of information flow: reception and processing of **information flow 2** and no Codec Negotiation and immediate BIWF selection.

Processing upon receipt: the CSM-O continues the originating information flow as specified by the access flows related to the protocol interface type used on the originating side of the SN.

7   New Call   SN-B:CSM-O to SN-B:CSM-T

Address Information	**Control information**	**Bearer information**
Called-Party-Address = User B Calling Party Address = User A	Local Call Instance = 250 COTind = COT on Prev. or No COT Incoming Tunnel Indication = No, or Option 1 or Option 2 (Origination Traffic Group ID = 77) (Destination Traffic Group ID = 88) (Global Call Ref. = 35)	Incoming BCU-ID = X if received BIWF Address = X1, or A2 BCU-ID = "?" Context ID = "?" Bearer Service Characteristics Incoming BNC Characteristics {If Codec Negotiation: (Incoming Codec List)}

Initiation of information flow: reception and processing of the IAM (**information flow 5**).

Processing upon receipt: when the CSM-T receives this information flow, it initiates the terminating information flow specified by the access flows related to the protocol interface type used on the terminating side of the SN.

8   Context Assigned   SN-B:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	BCU-ID = Y Context ID = 99 Outgoing BNC Characteristics {If Codec Negotiation; Selected Codec, and Supported Codec List}

Initiation of information flow: CSM-T has assigned the context and BIWF for the call. Triggered by **information flow 5**.

Processing upon receipt: the CSM-O initiates the backward establishment procedure requested by **information flow 5** by issuing **information flow 9**. This information flow requests the selection of a Termination ID, a BNC ID, a BIWF Address which are used in the forward establishment of the BNC. In addition, the CSM-O provides the Tunnelling Indication, the incoming BNC Characteristics, and the Outgoing BNC Characteristics. The CSM-O also performs a route selection between SN-A or SN-B. The selected route segment is also provided to the BIWF in order to guide the termination selection procedure.

If a Codec Negotiation procedure is in process, the CSM-O includes the selected codec in **information flow 9**.

| 9 | ADD.req [Prepare BNC with notification] | SN-B:CSM-O to BIWF-Y |

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 2000	BNC Characteristics = Incoming BNC
CCU-Control-Address of "SN-B"	Context-ID = 99	Characteristics
Requesting CSF = Incoming	Termination ID = "?"	A-BNC Characteristics = (Outgoing-BNC-
	Logical Port ID = 77	Characteristics)
	Tunnel Indication = No or "?" or Option 1 or	Bearer Service Characteristic
	Option 2	{If Codec Negotiation : (Selected Codec)}
	{If Tunnel Indication = Option1 : (Bearer	{If Tunnel Indication = Option 1: (BIWF
	Information Transport)}	Address = X1 or A2), (BNC-ID = 78)}
	Notify option: <Termination Event>	

Initiation of information flow: reception and processing of **information flow 8**.

Processing upon receipt: when the BIWF receives **information flow 9**, it validates the request. The BIWF proceeds to select the bearer transport technology based upon the Incoming BNC characteristics, the Selected Codec if included, and the available bearer transport types associated with the route specified by the Logical Port ID and capacity of each type of bearer transport available on the selected route. The BIWF will use the Context ID supplied by the CSF. It then selects the Termination ID to be "320" and adds this Termination to the Context. The BIWF selects a BNC-ID (88) if the tunnel indication does not indicate option 1 and associates this value and the BIWF Address with the chosen Termination ID. If the tunnel indication specifies option 1, the BNC-ID contained in **information flow 9** will be used (BNC-ID = 78).

If the selected bearer transport technology is based on a **non-tunnel establishment mode**, the BIWF determines the bearer signalling association that should be used to establish this BNC Connection. One or more bearer control signalling associations could be used to establish a BNC within the specified Logical Port representing the outgoing route towards the destination Serving Node (SN-A). In this example, the chosen T-BIWF-Address is "Y1" which represents the chosen bearer control signalling entity to be used to establish the desired BNC. The Tunnel Indication information object to be included within **information flow 8** is set to "**No**".

If the selected bearer transport technology is based on a **tunnel establishment mode**, no explicit bearer control signalling association is required. However, a BIWF address associated with the logical port is also selected in order to differentiate the chosen BNC-ID value from other BNC-ID values generated by different BIWFs. In addition, the CSF needs to be notified that Tunnelling operation is to be supported since it will need to be ready to accept the "Bearer Information Transport" information object from the BIWF and carry this information object within the SN to SN signalling flows. Setting the Tunnel Indication information object to either Option 1 or Option 2 performs this notification.

NOTE – Tunnel establishment mode can only be selected if the CSF has indicated a "?" or indicated a selected option within the Tunnel Indicator. The question mark within the received Tunnel Indication indicates that the CSF has given permission to the BIWF to select Tunnelled or non-Tunnelled operation. A "No" indication specifies that the BIWF can not select tunnelled operation, while either Option 1 or Option 2 indicates that the BIWF can select the Tunnelled operation, but must use the specified tunnel option.

The returned Tunnelled Indication will either contain a "No" or the selected tunnelling option.

The BNC Characteristics to be used, the Context ID, the Termination ID, the BNC-ID, the BIWF Address associated with the Logical Port, and the Tunnel Indication are all returned to the CSF in **information flow 10**. If Tunnelling option 1 operation is specified, the BIWF will immediately issue another information flow (**information flow 11a**) containing the Bearer Information Transfer information object and the BIWF Address to the CSF. The BIWF awaits the CSF's acknowledgement flow confirming the reception of the Bearer Information Transport information object.

Special NOTE – Since the requesting CSM is associated with the incoming termination, the BIWF can request that SN-A will notify SN-B when the connection within its domain has been established. This request can be based on the cut-through characteristics of the bearer transport entities (Early or Late Cut-through), or the Tunnelling option chosen (Option 1 or Option 2). If Late Cut-Through or Tunnel option 1 is being used, the Notifiy option = Yes will be chosen. This value will cause the CSF to use the Forward notify Action ID in response to the IAM information flow **(information flow 12a or 11)**. The Notify option = No will cause the CSF to use the Forward response Action ID in response to the IAM information flow **(information flow 11)**.

10	ADD.resp [BNC Prepared]		BIWF-Y to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 2000	BNC Characteristics = (Incoming-BNC-Characteristics)
CCU-Control-Address of "SN-B"	Context-ID = 99	{If Tunnel Indication = No or Option 2: (BNC-ID = 88)}
	Termination ID = 320	BIWF Address = Y1
	Tunnel Indication = No or Option 1 or Option 2	{If Tunnel Indication = Option 1 or If Cut-Through Characteristics = Late: Notify option = Yes otherwise Notify option = No}

Initiation of information flow: reception and processing of **information flow 9**.

Processing upon receipt: when the CSM-T receives **information flow 10**, the CSM-O will send **information flow 11** if the tunnelling indication does not indicate option 1 tunnelling.

In the case of non-option 1 tunnelling, **information flow 11**, contains the action ID that the CSM-O has selected (Forward Response or Forward Notify) based on the characteristics of the BIWF(bearer stage by stage cut-through during reception of the bearer setup or during bearer confirmation operation) which have been provisioned for each bearer type within the selected BIWF. In addition, this information flow contains the BNC-ID, BNC Characteristics, BIWF Address selected by BIWF-Y. If Codec Negotiation is in progress, the flow will contain the selected Codec and the supported Codec list.

In the case of option 1 tunnelling, the CSM-O will wait for **information flow 11a** before issuing a reply to its peer CSM in SN-A. This information flow is **information flow 12a**. The CSM-O will specify the Action ID of Forward Notify in order to be notified of the BNC completion. If Codec Negotiation is in progress, the flow will contain the selected Codec and the supported Codec list.

11	APM		SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	BNC-ID = 88
	Action-ID = Forward Response or Forward Notify	BIWF Address = Y1
	Tunnel Indication = No or option 2	{If Codec Negotiation: (Selected Codec), (Supported Codec List)}
	(BCU-ID = Y)	

Initiation of information flow: reception and processing of **information flow 10** and no tunnel option 1 requested.

Processing upon receipt: when CSM-T receives this information flow, if Codec Negotiation is in progress and the BIWF selection has not been delayed, the CSM-T issues **information flow 12** towards CSM-O within its SN notifying that the context has been assigned and the Codec has been selected. It then proceeds to modify the codec being used by the BIWF by issuing **information flow 13** towards the selected BIWF. It awaits the BIWF's acknowledgement that the codec has been modified.

If BIWF selection has been delayed, the CSM-O begins BIWF selection process. This selection procedure uses the BIWF Address and if supplied, the BCU-ID to make this selection. In this example, BIWF-X is selected. The CSM-T then issues **information flow 15** towards the selected BIWF requesting that it establish a BNC to the specified BIWF within SN-B.

12	Context Assigned		SN-A:CSM-T to SN-A:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	BCU-ID = X
		Context ID = 66
		Outgoing BNC Characteristics
		Selected Codec
		Supported Codec List

Initiation of information flow: reception and processing of **information flow 11** and no delayed BIWF selection and Codec Negotiation in process.

Processing upon receipt: the CSM-O continues the originating information flow as specified by the access flows related to the protocol interface type used on the originating side of the SN.

13	Mod.req [Est. BNC + Notify]		SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 6000	BNC Characteristics = (Outgoing BNC
CCU-Control-Address of "SN-A"	Context-ID = 66	Characteristics)
	Termination ID = 700	A-BNC Characteristics = (Incoming-BNC-
	Tunnel Indication = No or option 2	Characteristics)
		Bearer Service Characteristic
		BNC-ID = 88
		BIWF Address = Y1
		Selected Codec

Initiation of information flow: reception and processing of **information flow 11** and no delayed BIWF selection.

Processing upon receipt: when the BIWF receives **information flow 13**, it validates the request. The BIWF proceeds to establish a BNC between itself and the specified remote BIWF(BIWF Y). It first checks for the type of bearer establishment is to be used; (Non-Tunnelled or Tunnel establishment) and the type of bearer transport to be used (AAL 1, AAL 1 Structured, AAL 2, or IP transport). The type of bearer establishment mode is specified within the Tunnel Indication. This indicator could specify no tunnelling, or option 2 tunnelling.

If the establishment mode is the **non-tunnelled mode**, the BIWF uses the incoming BNC characteristics, the Bearer Service Characteristics, and if available, the Selected Codec information in selecting the bearer transport characteristics to be used to convey the new BNC between itself and the BIWF Y. The Outgoing BNC characteristics are used to determine if any transcoding function is needed between the incoming termination and the outgoing termination. After the bearer transport has been determined, the BIWF determines if an existing idle BNC can be used instead of creating a new BNC.

If an **idle BNC** is available, the BIWF will associate the Termination ID with the Idle BNC and reset the Idle BNC Timer. The BIWF will issue **information flow 14** to its associated CSF indicating within the Reuse Indication that an idle BNC should be used. In addition, this information flow would also indicate the BNC-ID associated with the Idle BNC. The BIWF then awaits the confirmation that the Idle BNC is being used within BIWF(Y).

If **no Idle BNC** can be used as a bearer transport for the selected bearer transport characteristics, the BIWF will issue **information flow 14** with the Reuse Indication set to no reuse. The BIWF would issue **information flow 18c** towards the SWN-1 requesting the explicit establishment of a new BNC between BIWF(X) and BIWF(Y). The BIWF then awaits a conformation of the establishment of a new BNC from SWN-1.

If the establishment mode is determined to be the Tunnelled mode of bearer establishment, the BIWF determines the tunnelling option has been requested, the BIWF will issue information flow **information flow 14** indicating no reuse of a idle BNC and will issue **information flow 18d** containing the first portion of the bearer establishment request which is encoded within the Bearer Information Transport information object.

The BIWF awaits the next command from either its associated CSF or from its peer BIWF via SWN-1.

| 14 | Mod.resp [Est. BNC + Notify] | BIWF-X to SN-A:CSM-T |

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 6000	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	
	Reuse Indication = No or Yes	
	{If Reuse Indication = Yes : (BNC-ID = 100)}	

Initiation of information flow: reception and processing of **information flow 13** and no delayed BIWF selection.

Processing upon receipt: when the CSM-T receives **information flow 14**, it is aware that either a new BNC is in progress of being established, or that the BIWF has requested that an Idle BNC should be used. In the situation that a Idle BNC is to be used, the CSM-T will issue **information flow 18b** towards its peer CSM-O in SN-B requesting that the idle BNC associated with BNC-ID, BIWF address Y1 be used. If no reuse is indicated, the CSM-T notes that the new BNC establishment is proceeding. In both cases, the CSM-O awaits a notification from either the BIWF or its peer CSM-T in SN-B that the BNC has been established.

| 15 | Add.req [Est. BNC + Notify] | SN-A:CSM-T to BIWF-X |

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 6100	BNC Characteristics = (Outgoing BNC Characteristics)
CCU-Control-Address of "SN-A"	Context-ID = 66	A-BNC Characteristics = (Incoming-BNC-Characteristics)
	Termination ID = 700	Bearer Service Characteristic
	Tunnel Indication = No or option 2	BNC-ID = 88
		BIWF Address = Y1
		{If Codec Negotiation: (Selected Codec)}

Initiation of information flow: reception and processing of **information flow 11** and delayed BIWF selection.

Processing upon receipt: when the BIWF receives **information flow 15**, it validates the request. The BIWF proceeds to establish a BNC between itself and the specified remote BIWF(BIWF Y). It first checks for the type of bearer establishment is to be used; (Non-Tunnelled or Tunnel establishment) and the type of bearer transport to be used (AAL 1, AAL 1 Structured, AAL 2, or IP transport). The type of bearer establishment mode is specified within the Tunnel Indication. This indicator could specify no tunnelling, or option 2 tunnelling.

If the establishment mode is the **non-tunnelled mode**, the BIWF uses the incoming BNC characteristics, the Bearer Service Characteristics, and if available, the Selected Codec information in selecting the bearer transport characteristics to be used to convey the new BNC between itself and the BIWF Y. The Outgoing BNC characteristics are used to determine if any transcoding function is needed between the incoming termination and the outgoing termination. After the bearer transport has been determined, the BIWF determines if an existing idle BNC can be used instead of creating a new BNC.

If an **idle BNC** is available, the BIWF will associate the Termination ID with the Idle BNC and reset the Idle BNC Timer. The BIWF will issue **information flow 16** to its associated CSF indicating within the Reuse Indication that an idle BNC should be used. In addition, this information flow would also indicate the BNC-ID associated with the Idle BNC. The BIWF then awaits the conformation that the Idle BNC is being used within BIWF(Y).

If **no Idle BNC** can be used as a bearer transport for the selected bearer transport characteristics, the BIWF will issue **information flow 16** with the Reuse Indication set to no reuse. The BIWF would issue **information flow 18c** towards the SWN-1 requesting the explicit establishment of a new

BNC between BIWF(X) and BIWF(Y). The BIWF then awaits a conformation of the establishment of a new BNC from SWN-1.

If the establishment mode is determined to be the Tunnelled mode of bearer establishment, the BIWF determines the tunnelling option has been requested, the BIWF will issue information flow **information flow 16** indicating no reuse of a idle BNC and will issue **information flow 18d** containing the first portion of the bearer establishment request which is encoded within the Bearer Information Transport information object.

The BIWF awaits the next command from either its associated CSF or from its peer BIWF via SWN-1.

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16   Add.resp [Est. BNC + Notify]   **BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 6100	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	
	Reuse Indication = No or Yes	
	{If Reuse Indication = Yes : (BNC-ID = 100)}	

Initiation of information flow: reception and processing of **information flow 13** and delayed BIWF selection.

Processing upon receipt: when the CSM-T receives **information flow 14**, it is aware that either a new BNC is in progress of being established or that the BIWF has requested that a Idle BNC should be used. In the situation that a Idle BNC is to be used, the CSM-T will issue **information flow 18b** towards its peer CSM-O in SN-B requesting that the idle BNC associated with BNC-ID, BIWF address Y1 be used. If no reuse is indicated, the CSM-T notes that the new BNC establishment is proceeding. In both cases the CSM-O issues **information flow 17** towards its peer CSM within SN-A and awaits a notification from either the BIWF or its peer CSM-T in SN-B that the BNC has been established.

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17   Context Assigned   **SN-A:CSM-T to SN-A:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	BCU-ID = X
		Context ID = 66
		Outgoing BNC Characteristics
		{If Codec Negotiation : Selected Codec
		Supported Codec List}

Initiation of information flow: reception and processing of **information flow 16** and delayed BIWF selection.

Processing upon receipt: the CSM-O continues the originating information flow as specified by the access flows related to the protocol interface type used on the originating side of the SN.

11a   Notify.ind [Tunnel]   **BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7100	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	
	Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 10,** no delayed BIWF selection, and tunnel option 1 is in affect.

Processing upon receipt: when the CSM-O receives **information flow 11a**, it issues **information flow 12a** towards its peer CSM-T within SN-A indicating a tunnel operation. The received Bearer Information Transport information object is placed within this information flow. The BIWF issues **information flow 13a** toward BIWF(Y) confirming the reception of **information flow 11a.**

12a	**APM**		**SN-B:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	BIWF Address = X1
	Action-ID = Forward Notify	{If Codec Negotiation : Selected Codec
	Tunnel Indication = option 1	Supported Codec List,}
	Bearer Information Transport	
	(BCU-ID = Y)	

Initiation of information flow: reception and processing of **information flow 11a**.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 14a** towards BIWF(X) which contains the Bearer Information Transport information object. If codec negotiation is in progress thee CSM-T issues **information flow 12** towards its peer within SN-A. The CSM-T awaits confirmation for the BIWF that the command was received.

13a	**Notify.resp [Tunnel]**	**SN-B:CSM-O to BIWF-Y**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7100	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 11a**.

Processing upon receipt: when the BIWF receives **information flow 13a**, it is aware that the CSF has received the notify indication. The BIWF awaits further action requests from the CSM-O and continues to monitor the termination for events to be reported to the CSM-O.

14a	**Mod.req [Tunnel]**	**SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 6100	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	
	Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 12a**.

Processing upon receipt: when the BIWF receives **information flow 14a**, it validates the request. The BIWF proceeds to decode the Bearer information Transport information object and implements the action contained within the information object. It then issues **information flow 15a** indicating the reception of the tunnel information. The BIWF could send additional tunnel information to its peer BIWF. When sufficient information has been exchanged, the BIWF will indicate to the CSM-T that the BNC has been established by issuing **information flow 16a**. However, for this example only two exchanges are illustrated for simplicity.

15a	**Mod.resp [Tunnel]**	**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 610000	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 14a**.

Processing upon receipt: when the CSM-T receives **information flow 15a**, it is aware that the tunnel operation has been received. The CSM-T awaits **information flow 16a** indicating that the connection has been established. In the meantime it is ready to receive tunnel information from either its peer or from its associated BIWF.

16a   Notify.ind [BNC Established]   BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 7100	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: the BIWF has determined that the requested BNC has been established. This may require several exchanges of tunnel information between the peer BIWFs. However, for this example, only two exchanges are shown for simplicity.

Processing upon receipt: when the CSM-O receives **information flow 16a**, it notes that the new BNC establishment confirmation has been received. It validates this request and issues **information flow 17a** towards its BIWF acknowledging reception of the notify indication. It then issues **information flow 33** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration. The CSM-T issues **information flow 30** towards its peer CSM within SN-B. It then waits for the response from the BIWF.

17a   Notify.resp [BNC Established]   SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 7100	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 16a**.

Processing upon receipt: when the BIWF receives **information flow 17a**, it is aware that the CSF has received the notify indication. It then awaits further commands from the CSF and continues to monitor the termination for events that need to be reported to the CSM-T.

18a   Notify.ind [BNC Connected Ind]   BIWF-Y to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7100	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 320	

Initiation of information flow: when the BIWF has determined that the BNC has been connected. Several tunnel exchanges may have occurred prior to this event. However, for this example, only two exchanges have been illustrated for simplicity.

Processing upon receipt: when the CSM-O receives **information flow 18a**, it notes that the new BNC establishment request has been received. It validates this request and issues **information flow 19a** towards its BIWF indicating that it has received the indication. The CSM-T awaits **information flow 30** before issuing **information flow 31**.

19a   Notify.resp [Establish BNC Ind]   SN-B:CSM-O to BIWF-Y

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7100	Response Indication = Accept BNC
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 320	

Initiation of information flow: reception and processing of **information flow 18a**.

Processing upon receipt: when the BIWF receives **information flow 21c**, it is aware that the CSF has received the notify indication. It awaits further commands from the CSF and continues to monitor the termination for events that need to be reported to the CSM-O.

18b   APM   SN-A:CSM-T to SN-B:CSM-O

Address Information	Control information	Bearer information
	CCA-ID = 5	BNC-ID = 100
	Action-ID = Use Idle	BIWF Address = Y1

Initiation of information flow: reception and processing of **information flow 14** or **16** and a reuse BNC indication has been received from the BIWF.

Processing upon receipt: when CSM-O receives this information flow, it issues **information flow 19b** towards BIWF(Y) which requests that that the BIWF use the specified Idle BNC and associate this BNC to the previously created Termination ID. The CSM-O awaits confirmation of this request.

19b   Mod.req [Reuse Idle]   SN-B:CSM-O to BIWF-Y

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y"	Transaction ID = 6200	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 320	

Initiation of information flow: reception and processing of **information flow 18b**.

Processing upon receipt: when the BIWF receives **information flow 19b**, it validates the request. The BIWF proceeds to associate the specified Idle BNC to the specified termination. After this association has been accomplished, the BIWF issues **information flow 20b** towards the CSF.

20b   Mod.resp [Reuse Idle]   BIWF-Y to SN-B:CSM-O

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y"	Transaction ID = 6200	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 320	

Initiation of information flow: reception and processing of **information flow 19b**.

Processing upon receipt: when the CSM-O receives **information flow 20b**, it is aware that the reuse of the BNC operation has been completed and issues **information flow 21b** towards its peer CSM-T in SN-A indicating that the BNC has been switched. If the forward notify mode was requested in **information 11**, the CSM-O awaits **information flow 30** before it issues **information flow 31** towards BIWF-Y requesting that the termination be placed into the send + Receive communication configuration, and awaits the response from the BIWF. If the forward response mode was selected in **information flow 11**, the CSM-O will issue **information flow 31** towards BIWF-Y requesting that the termination be placed into the send + receive communication configuration, and awaits the response from the BIWF.

21b   APM   SN-B:CSM-O to SN-A:CSM-T

Address Information	Control information	Bearer information
	CCA-ID = 5,	BNC-ID = 100,
	Action-ID = Switched	BIWF Address = Y1

Initiation of information flow: reception and processing of **information flow 20b**.

Processing upon receipt: when CSM-T receives this information flow, it determines the response mode contained in **information flow 11**. If the response mode was Forward Notify, the CSM-T will issue **information flow 30** and then follow with **information flow 33** towards BIWF-X requesting that the termination be placed into the send and receive communication configuration. If the response mode in **information flow 11** was the Forward Response, the CSM-T will issues **information flow 33** towards BIWF(X) which requests that the termination be placed into the Send + Receive communications configuration. In either case the CSM-T will await the response from the BIWF.

18c   **Bearer-Setup.Req**   **BIWF(X) to SWN(1)**

Address Information	**Control information**	**Bearer information**
T-BIWF Addr = Y1	BCS-ID = "15"	BNC-ID: = 88
		BNCL-ID = 1004
		{BNCL Characteristics}

Initiation of information flow: processing of **information flow 13** or **15**.

Processing upon receipt: the selected switching node validates the request and determines the route and backbone transport facility used to carry the new backbone connection between SWN(1) and BIWF(Y). The switching node issues **information flow 19c** towards BIWF(Y). **Information flow (19c)**'s link information was determined from the link information received in **information flow 18c**. Switching Node 1 awaits the commitment information from BIWF(Y).

19c   **Bearer-Setup.Req**   **SWN(1) to BIWF(Y)**

Address Information	**Control information**	**Bearer information**
T-BIWF Addr = Y1	BCS-ID = "65"	BNC-ID: = 88
		BNCL-ID = 1000
		{BNCL characteristics}

Initiation of information flow: processing of **information flow 18c**.

Processing upon receipt: the selected Bearer Interworking Function validates the request and notifies its associated Call Service function that a bearer has been requested between SN-A and SN-B via **information flow 21c** and issues **information flow 20c** toward SMN-1 indicating acceptance of the BNC establishment request and awaits the response from the CSF.

20c   **Bearer-Setup.Confirm**   **BIWF(Y) to SWN(1)**

Address Information	**Control information**	**Bearer information**
	BCS-ID = "65"	BNCL-ID = 1000

Initiation of information flow: processing of **information flow 19c**.

Processing upon receipt: the switching node notes the confirmation of the establishment request and issues **information flow 23c** towards BIWF(X).

21c   **Notify.ind [Establish BNC Ind]**   **BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7100	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 320	

Initiation of information flow: reception and processing of **information flow 19c**.

Processing upon receipt: when the CSM-O receives **information flow 21c**, it notes that the new BNC establishment request has been received. It validates this request and issues **information flow 22c** towards its BIWF to acknowledge this establishment notification. It then issues **information flow 31** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration if the response mode in **information flow 11** was Forward Response. If the response mode in **information flow 11** was Forward Notify, the CSM-T awaits **information flow 30** before issuing **information flow 31**. In either case, the CSM-T then waits for the response from the BIWF.

22c   Notify.resp [Establish BNC Ind]   **SN-B:CSM-O to BIWF-Y**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 320	Response Indication = Accept BNC

Initiation of information flow: reception and processing of **information flow 21c**.

Processing upon receipt: when the BIWF receives **information flow 22c**, it is aware that the CSF has received the notify indication and agrees to accept the new requested BNC. The BIWF then awaits further commands from the CSF and continues to monitor the termination for events that need to be reported to the CSM-T.

23c   Bearer-Setup.Confirm   **SWN(1) to BIWF(X)**

Address Information	Control information	Bearer information
	BCS-ID = "15"	BNCL-ID = 1004

Initiation of information flow: processing of **information flow 20c**.

Processing upon receipt: the BIWF records the establishment of the backbone connection, issues **information flow 24c** notifying the CSF that the requested BNC has been established.

24c   Notify.ind [BNC Established]   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7100 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 23c**.

Processing upon receipt: when the CSM-O receives **information flow 24c**, it notes that the new BNC establishment confirmation has been received. It validates this request and issues **information flow 25c** towards its BIWF acknowledging reception of the notify indication. It then issues **information flow 33** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration. If the response mode contained in **information flow 11** was Forward Notify, the CSM-T issues **information flow 30** towards its peer CSM within SN-B. It then waits for the response from the BIWF.

25c   Notify.resp [BNC Established]   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7100 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 21c**.

Processing upon receipt: when the BIWF receives **information flow 25c**, it is aware that the CSF has received the notify indication. It then awaits further commands from the CSF.

18d   Notify.ind [Tunnel]   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7100 Context-ID = 66 Termination ID = 700 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 13** or **15**.

Processing upon receipt: when the CSM-O receives **information flow 18d**, it issues **information flow 19d** towards its peer CSM-T within SN-A indicating a tunnel operation. The received Bearer Information Transport information object is placed within this information flow. The BIWF issues **information flow 20d** toward BIWF(X) confirming the reception of **information flow 18d**.

19d   APM   **SN-A:CSM-T to SN-B:CSM-O**

Address Information	Control information	Bearer information
	CCA-ID = 5 Action-ID = Tunnel Bearer Information Transport	BNC-ID = 88 BIWF Address = Y1

Initiation of information flow: reception and processing of **information flow 18d**.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 21d** towards BIWF(Y) which contains the Bearer Information Transport information object and awaits confirmation from the BIWF that the command was received.

20d   Notify.resp [Tunnel]   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 18d**.

Processing upon receipt: when the BIWF receives **information flow 20d**, it is aware that the CSF has received the notify indication.

21d   Mod.req (Tunnel)   **SN-B:CSM-O to BIWF-Y**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 6100 Context-ID = 99 Termination ID = 320 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 19d**.

Processing upon receipt: when the BIWF receives **information flow 21d**, it validates the request. The BIWF proceeds to decode the Bearer information Transport information object and implements the unidirectional bearer establishment request contained within the information object. It associates this information with the specified termination. It then issues **information flow 22d** acknowledging the reception of the modify request. The BIWF then issues **information flow 23d** containing the Bearer Information Transport information object containing the encoded bearer establishment request for the additional unidirectional portion of the new BNC.

22d   Mod.resp [Tunnel]   **BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 610000 Context-ID = 99 Termination ID = 320 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 21d**.

Processing upon receipt: when the CSM-T receives **information flow 22d**, it is aware that the tunnel operation has not been completed and awaits **information flow 23d** before issuing **information flow 24d** towards its peer CSM-T in SN-A containing the additional Bearer Information Transport information object.

23d   Notify.ind [Tunnel]   **BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7400 Context-ID = 99 Termination ID = 320 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 21d**.

Processing upon receipt: when the CSM-T receives **information flow 23d**, the CSM-O will send its response with **information flow 25d**. It will then issue **information flow 24d** to its peer CSM in SN-A containing the Bearer Information Transport information object. The CSM-O will wait for the notification that the BNC has been established.

24d   APM   **SN-B:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5 Action-ID = Tunnel Bearer Information Transport	BNC-ID = 88 BIWF Address = Y1

Initiation of information flow: reception and processing of **information flow 23d**.

Processing upon receipt: when CSM-O receives this information flow, it issues **information flow 26d** towards BIWF(X) which contains the Bearer Information Transport information object and awaits the response from the BIWF.

25d   Notify.resp [Tunnel]   **SN-B:CSM-O to BIWF-Y**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7400 Context-ID = 99 Termination ID = 320	

Initiation of information flow: reception and processing of **information flow 23d**.

Processing upon receipt: when the BIWF receives **information flow 25d**, the BIWF will record acknowledgement of the previous send **information flow 23d** and continues to monitor for status changes on the specified termination.

26d   Mod.req [Tunnel]   **SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 6500 Context-ID = 66 Termination ID = 700 Bearer Information Transport	

Initiation of information flow: reception and processing of **information flow 24d**.

Processing upon receipt: when the BIWF receives **information flow 26d**, it validates the request. The BIWF proceeds to decode the Bearer Information Transport information object and implements the action contained within the information object. It associates this information with the specified termination. It then issues **information flow 27d** acknowledging the reception of the modify request. In addition, the BIWF may issue **information flow 28d** indicating that the new BNC establishment has been completed. It may require multiple exchanges of the Bearer Information transport object before the BNC is established. However, in this case, only two exchanges are illustrated for simplicity.

27d	**Mod.resp [Tunnel]**	**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 6500 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 26d**.

Processing upon receipt: when the CSM-T receives **information flow 27d**, the CSM-T will record acknowledgement of the previous send **information flow 26d** and continues to wait for the indication that the BNC has been established.

28d	**Notify.ind [BNC Established]**	**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7800 Context-ID = 66 Termination ID = 700	

Initiation of information flow: when the BIWF determines that the BNC has been established. This may take several exchanges of the Bearer Information Transport object before the BNC is completed. However, in this example, only two exchanges have been illustrated for simplicity.

Processing upon receipt: when the CSM-T receives **information flow 28d**, it notes that the new BNC establishment confirmation has been received. It validates this request and issues **information flow 29d** towards its BIWF acknowledging reception of the notify indication. It then issues **information flow 33** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration. If the response mode contained in **information flow 11** was Forward Notify, the CSM-T also issues **information flow 30**. It then waits for the response from the BIWF.

29d	**Notify.resp [BNC Established]**	**SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7800 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 28d**.

Processing upon receipt: when the BIWF receives **information flow 29d**, it is aware that the CSF has received the notify indication. It then awaits further commands from the CSF.

30d	**Notify.ind [Establish BNC Ind]**	**BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 320	

Initiation of information flow: when the BIWF determines that the BNC has been established. This may require multiple exchanges of the Bearer Information Transport object before this condition is reached. However, for this example, two exchanges are illustrated for simplicity.

Processing upon receipt: when the CSM-O receives **information flow 30d**, it notes that the new BNC establishment request has been received. It validates this request and issues **information flow 31d** towards its BIWF to acknowledge this establishment notification. It then issues **information flow 31** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration if the response mode in **information flow 11** was Forward Response. If the response mode in **information flow 11** was Forward Notify, the CSM-T awaits **information flow 30** before issuing **information flow 31**. In either case, the CSM-T then waits for the response from the BIWF.

31d	Notify.resp [Establish BNC Ind]		SN-B:CSM-O to BIWF-Y

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7100	Response Indication = Accept BNC
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 320	

Initiation of information flow: reception and processing of **information flow 30d**.

Processing upon receipt: when the BIWF receives **information flow 31d**, it is aware that the CSF has received the notify indication and agrees to accept the new requested BNC. The BIWF then awaits further commands from the CSF and continues to monitor the termination for events that need to be reported to the CSM-T.

30	APM		SN-A:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	BNC-ID = 78, or 88 or 100
	Action-ID = Connected	BIWF Address = X1 or Y1

Initiation of information flow: reception and processing of **information flow 16a, 21b, 24c, or 28d** and response mode = Forward Notify.

Processing upon receipt: when CSM-O receives this information flow, it issues **information flow 31** towards BIWF(Y) which requests that the termination be placed into the Send + Receive communications configuration, and awaits the response from the BIWF.

31	Mod.req [Cut Through]		SN-B:CSM-O to BIWF-Y

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7500	(Send + Receive)
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow (18a, 20b, 21c, or 30d)**. If Notify was requested, the SN-B must wait until **information flow 30** is received.

Processing upon receipt: when the BIWF receives **information flow 31**, it validates the request. The BIWF proceeds to place the specified Termination into the Send + Receive communication configuration and issues **information flow 32**. The BIWF continues to monitor the termination for any event that will require a notification of state change to its associated CSF.

32	Mod.resp [Cut Through]		BIWF-Y to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 7500	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 31**.

Processing upon receipt: when the CSM-O receives **information flow 31**, the CSM-O will record acknowledgement of the previous sent modification request. If a COT on Prev. has been received from SN-A and SN-B has not received a COT information flow (**information flow 36**) it awaits the

indication that the BNC is available. If no COT on Prev. was received or if a COT has been received, the CSM-O issues **information flow 37** indicating that the previous connection is available.

33	Mod.req [Cut Through]		SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 8500	(Send + Receive)
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 16a, 21b, 24c,** or **28d**.

Processing upon receipt: when the BIWF receives **information flow 33**, it validates the request. The BIWF proceeds to place the specified Termination into the Send + Receive communication configuration and issues **information flow 34**. The BIWF continues to monitor the termination for any event that will require a notification of state change to its associated CSF.

34	Mod.resp [Cut Through]		BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 8500	
CCU-Control-Address of "SN-A"	Context-ID = 99	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 33**.

Processing upon receipt: when the CSM-T receives **information flow 34**, the CSM-T will record acknowledgement of the previous sent modification request. If **information flow 35** has been received, it requests the BIWF to connect the incoming and outgoing terminations together by issuing **information flow 38** to the BIWF and awaits the indication that the internal connection within SN-A is available. If **information flow 35** has not been received, the CSM-T will await the previous connection available indication before issuing **information flow 38**.

35	Connection Available		SN-A:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	
	Termination ID = 900	

Initiation of information flow: CSM-O determines that the previous BNC is available.

Processing upon receipt: the CSM-T determines if a COT operation was specified in **information flow 5** and if this operation is in effect it issues **information flow 36** towards its peer in SN-B. In addition, if **information flow 34** has been received, the CSM-T will issue **information flow 38** towards the BIWF requesting that the incoming and outgoing terminations are internally connected. If **information flow 34** has not been received, the CSM-T awaits this information flow before proceeding.

36	COT		SN-A:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	

Initiation of information flow: reception and processing of **information flow 35** and COT on Prev. sent in **information flow 5**.

Processing upon receipt: when CSM-O receives this information flow and has received **information 32**, it issues **information flow 37** towards its peer CSM within SN-B indicating the BNC is available. If **information flow 32** has not been received, the CSM-O waits for this flow before proceeding.

37	**Connection Available**		**SN-B:CSM-O to SN-B:CSM-T**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	
	Termination ID = 320	

Initiation of information flow: reception and processing of **information flow 32** without COT on Prev. or **information flows 32** and **36** with COT on Prev.

Processing upon receipt: the CSM-T notes that the internal connection is available and proceeds with the operations still to be performed by the out going side of SN-B.

38	**Mod.req [Change Topology]**		**SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 8500	Connection Configuration = Type 1 Bidirectional
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	
	Termination ID = 900	

Initiation of information flow: reception and processing of **information flow 34** and **information flow 35**.

Processing upon receipt: when the BIWF receives **information flow 38**, it validates the request. The BIWF proceeds to connect the specified terminations into the specified connection configuration and issues **information flow 39**. The BIWF continues to monitor the termination for any event that will require a notification of state change to its associated CSF.

39	**Mod.resp [Change Topology]**		**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 8500	
CCU-Control-Address of "SN-B"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 38**.

Processing upon receipt: when the CSM-O receives **information flow 39**, the CSM-T will record acknowledgement of the previous sent modification request and awaits further action requests from either its peer CSMs or form its associated BIWF.

40	**Alerting**		**SN-B:CSM-T to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	Context ID = 99
		Termination ID = 120

Initiation of information flow: CSM-T has detected that the addressed user is in the alerting state.

Processing upon receipt: the CSM-O records this condition and issues **information flow 41** towards its peer in SN-A.

41	**ACM**		**SN-B:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	

Initiation of information flow: reception and processing of **information flow 40**.

Processing upon receipt: when CSM-T receives this information flow, it records the alerting condition and issues **information flow 42** towards CSM-O within SN-A.

42   Alerting   **SN-A:CSM-T to SN-A:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	Context ID = 66 Termination ID = 700

Initiation of information flow: reception and processing of **information flow 41**.

Processing upon receipt: the CSM-O records the alerting condition, proceeds with the procedures associated with the incoming termination, and awaits answer.

---

43   Answer   **SN-B:CSM-T to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	Context ID = 99 Termination ID = 120

Initiation of information flow: CSM-T has detected that the addressed user has answered.

Processing upon receipt: the CSM-O records this condition and issues **information flow 44** towards its peer in SN-A.

---

44   ANM   **SN-B:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	

Initiation of information flow: reception and processing of **information flow 43**.

Processing upon receipt: when CSM-T receives this **information flow**, it records the answer condition and issues **information flow 45** towards CSM-O within SN-A.

---

45   Answer   **SN-A:CSM-T to SN-A:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	Context ID = 66 Termination ID = 700

Initiation of information flow: reception and processing of **information flow 44**.

Processing upon receipt: the CSM-O records the answer condition, proceeds with the procedures associated with the incoming termination.

5.3.3 Backward composite with CMN
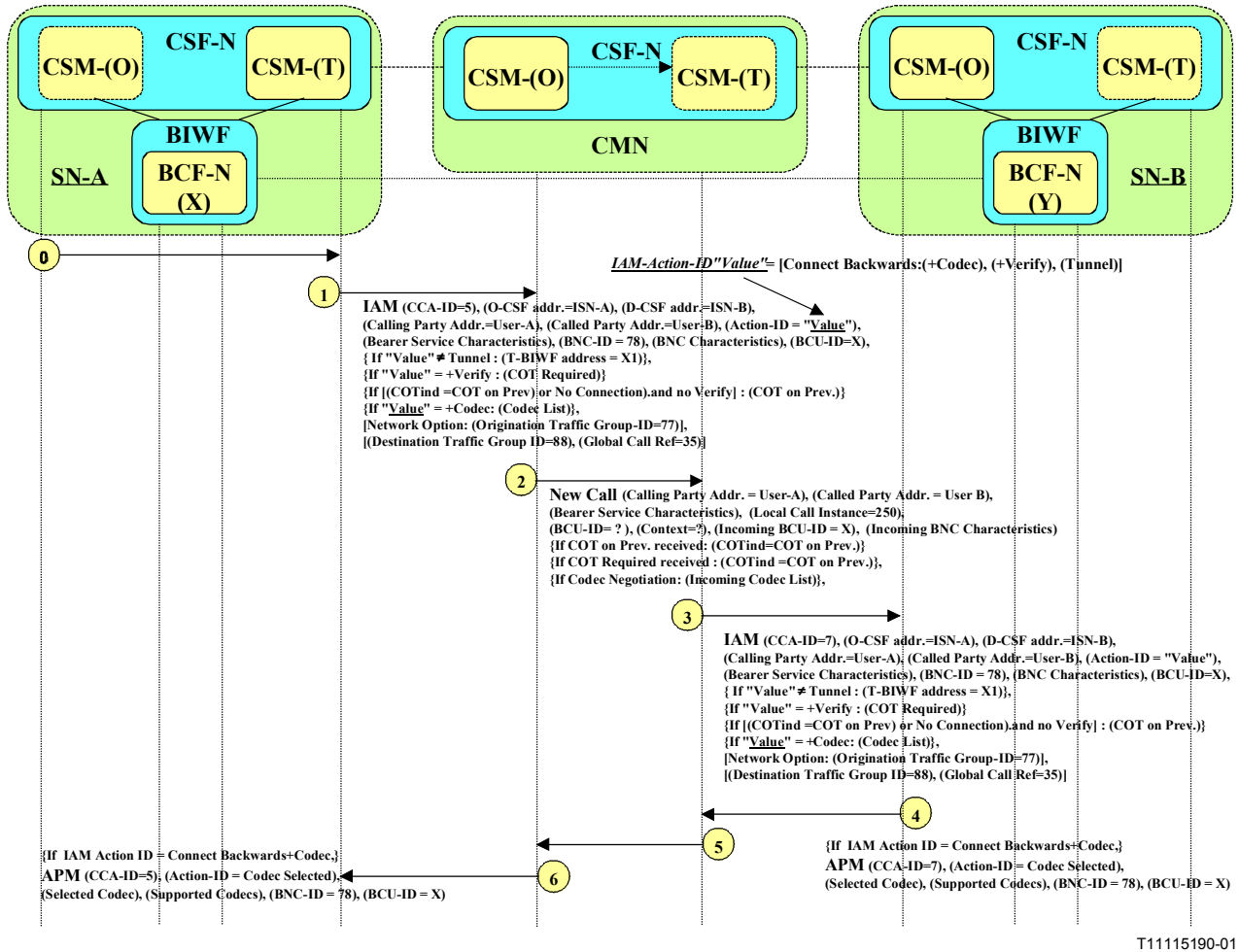
Figure 8 – Backward composite CMN flow

The following numbered items describe the numbered flows shown above.

0	**New Call**		**SN-A:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
Called-Party-Address = User B	Local Call Instance = 300	Incoming BCU-ID = A if received
Calling Party Address = User A	COTind = COT on Prev. or No COT,	BIWF Address = A2
	Incoming Tunnel Indication = No, or Option 1 or	BCU-ID = "?" or X or Incoming BCU-ID
	Option 2	Context ID = "?" or 66
	(Origination Traffic Group ID = 77)	Incoming BNC Characteristics,
	(Destination Traffic Group ID = 88)	{If Codec Negotiation: (Incoming Codec List)}
	(Global Call Ref. = 35)	Bearer Service Characteristics

Initiation of information flow: call attempt from the CSM-O.

Processing upon receipt: see **information flows 0**, **2**, and/or **3** from 5.3.1, Backward composite flow.

1   IAM   **SN-A:CSM-T to CMN:CSM-O**

Address Information	**Control information**	**Bearer information**
Calling Party Address = User-A	CCA-ID = 5	Bearer Service Characteristics
Called Party Address = User-B	Action-ID = Connect Backwards, (+Codec)	BNC-ID = 78
O-CSF Address = SN-A	(Tunnel)	BIWF Address = X1
D-CSF Address = CMN	(COT on Prev. = 1 or 0)	BNC Characteristics
	(Origination Traffic Group ID = 77)	{If Codec Negotiation: Codec List}
	(Destination Traffic Group ID = 88)	
	(Global Call Ref. = 35)	
	(BCU-ID = X)	
	{If tunnel Indication = option 1 : Bearer	
	Information Transport}	

Initiation of information flow: see **information flows 0**, **2**, and/or **3** from 5.3.1, Backward composite flow.

Processing upon receipt: when CMN receives this information flow it creates CSM-O. CSM-O sends **information flow 2** to CSM-T, including:

- Incoming BCU-ID, as received in IAM;

- COTind reflecting the status of the incoming link [Circuit not available (COT on Prev.), or Circuit available (No COT)];

- Codec List (Optional), sent if received in IAM;

- Incoming BNC Characteristics;

- Incoming Bearer Service Characteristics;

- Incoming Tunnel Indication;

- A request for Context assignment (Context ID = "?") and BCU assignment (BCU-ID = "?");

- Calling Party and Called Party Address;

- And the Local Call Instance associating the CSMs to the incoming call request.

2   New Call   **CMN:CSM-O to CMN:CSM-T**

Address Information	**Control information**	**Bearer information**
Called-Party-Address = User B	Local Call Instance = 250	Incoming BCU-ID = X if received
Calling Party Address = User A	COTind = COT on Prev. or No COT	BIWF Address = X1
	Incoming Tunnel Indication = No, or Option 1 or	BCU-ID = "?"
	Option 2	Context ID = "?"
	(Origination Traffic Group ID = 77)	Bearer Service Characteristics
	(Destination Traffic Group ID = 88)	Incoming BNC Characteristics
	(Global Call Ref. = 35)	{If Codec Negotiation: (Incoming Codec List)}

Initiation of information flow: reception and processing of the IAM (**information flow 1**).

Processing upon receipt: CSM-T will issue an IAM signalling flow to its peer CSM in SN-B.

3   IAM   CMN:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
Calling Party Address = User-A	CCA-ID = 7	Bearer Service Characteristics
Called Party Address = User-B	Action-ID = Connect Backwards, (+Codec)	BNC-ID = 78
O-CSF Address = CMN	(Tunnel)	BIWF Address = X1
D-CSF Address = SN-B	(COT on Prev. = 1 or 0)	BNC Characteristics
	(Origination Traffic Group ID = 77)	{If Codec Negotiation: Codec List}
	(Destination Traffic Group ID = 88)	
	(Global Call Ref. = 35)	
	(BCU-ID = X)	
	{If tunnel Indication = option 1 : Bearer	
	Information Transport}	

Initiation of information flow: reception and processing of **information flow 2**.

Processing upon receipt: when SN-B receives this information flow it creates CSM-O. The CSM-O decides to defer the BIWF selection to CSM-T. Therefore, the CSM-O sends **information flow 7** as in 5.3.1 to CSM-T, including:

• Incoming BCU-ID, as received in IAM;

• COTind reflecting the status of the incoming link [Circuit not available (COT on Prev.), or Circuit available (No COT)];

• Codec List (Optional), sent if received in IAM;

• Incoming BNC Characteristics;

• Incoming Bearer Service Characteristics;

• Incoming Tunnel Indication;

• A request for Context assignment (Context ID = "?") and BCU assignment (BCU-ID = "?");

• Calling Party and Called Party Address;

• And the Local Call Instance associating the CSMs to the incoming call request.

4   APM   SN-B:CSM-O to CMN:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 7	BNC-ID = 78
	Action-ID = Codec Selected	BIWF Address = X1
		Selected Codec
		Supported Codec List

Initiation of information flow: see 5.3.1.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 5** towards CSM-O.

5   CMN:CSM-T to SN-A:CSM-O

Address Information	**Control information**	**Bearer information**
		BNC-ID = 78
	Action-ID = Codec Selected	BIWF Address = X1
		Selected Codec
		Supported Codec List

Initiation of information flow: reception and processing of **information flow 4**.

Processing upon receipt: when CSM-O receives this information flow, it issues **information flow 6**.

6	APM		SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	BNC-ID = 78
	Action-ID = Codec Selected	BIWF Address = X1
		Selected Codec
		Supported Codec List

Initiation of information flow: reception and processing of **information flow 5**.

Processing upon receipt: see 5.3.1.

5.3.4 Forward composite with CMN
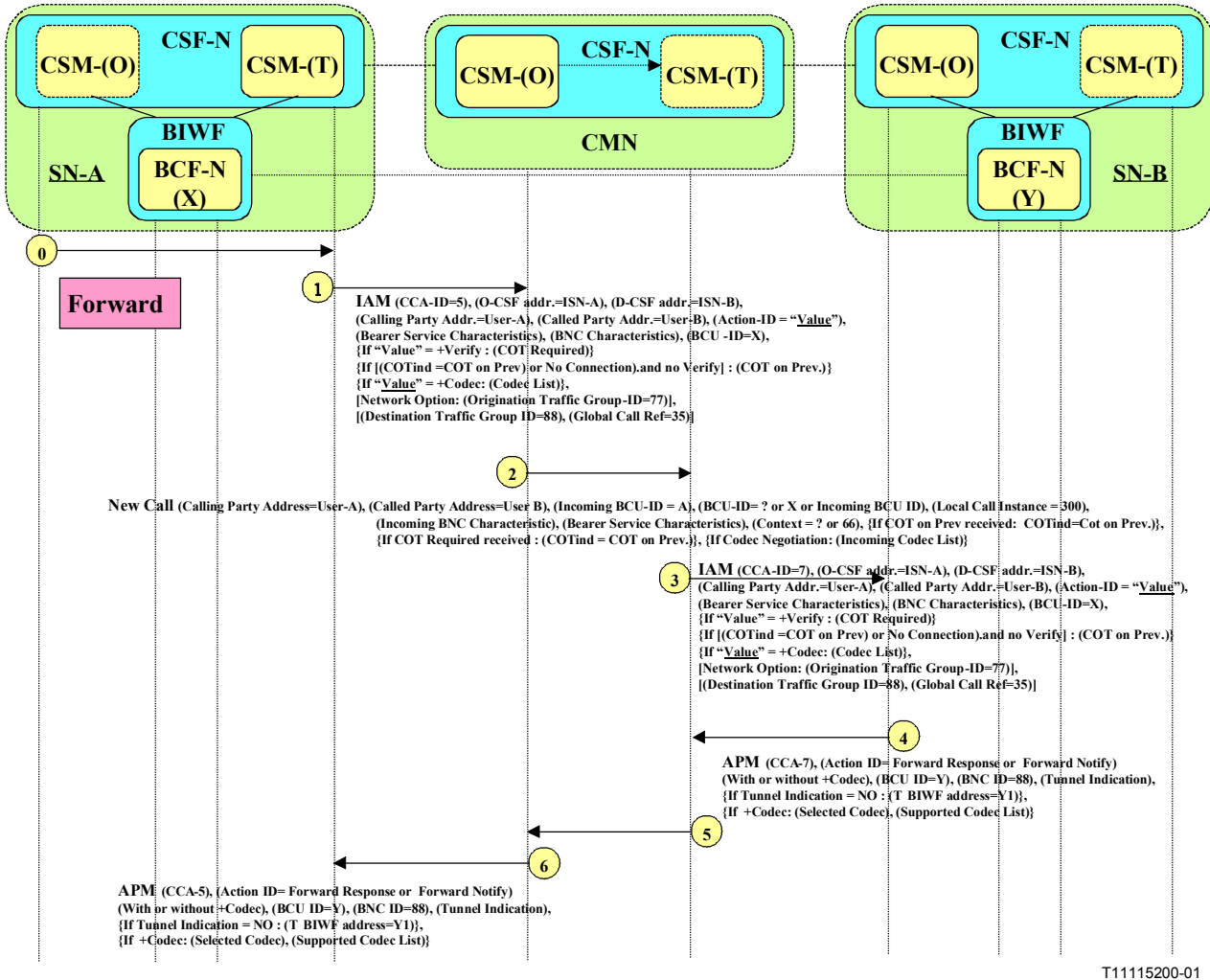
Figure 9 – Forward composite CMN flow

The following numbered items describe the numbered flows shown above.

0	**New Call**		SN-A:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
Called-Party-Address = User B	Local Call Instance = 300	Incoming BCU-ID = A if received
Calling Party Address = User A	COTind = COT on Prev. or No COT	BIWF Address = A2
	Incoming Tunnel Indication = No, or Option 1 or Option 2	BCU-ID = "?" or X or Incoming BCU-ID
		Context ID = "?" or 66
	(Origination Traffic Group ID = 77)	Incoming BNC Characteristics
	(Destination Traffic Group ID = 88)	{If Codec Negotiation: (Incoming Codec List)}
	(Global Call Ref. = 35)	Bearer Service Characteristics

Initiation of information flow: call attempt from the CSM-O.

Processing upon receipt: see **information flows 0**, **2** and/or **3** from 5.3.2, forward composite flow.

1	IAM		SN-A:CSM-T to CMN:CSM-O

Address Information	**Control information**	**Bearer information**
Calling Party Address = User-A	CCA-ID = 5	Bearer Service Characteristics
Called Party Address = User-B	Action-ID = Connect Forwards, (+Codec)	BNC Characteristics
O-CSF Address = SN-A	(Tunnel)	BIWF Address = X1 or A2)
D-CSF Address = CMN	(COT on Prev. = 1 or 0)	{If Codec Negotiation: Codec List}
	(Origination Traffic Group ID = 77)	
	(Destination Traffic Group ID = 88)	
	(Global Call Ref. = 35)	
	(BCU-ID = X or A)	
	{If Tunnel Indication = option 1 : Bearer Information Transport}	

Initiation of information flow: see **information flows 0**, **2** and/or **3** from 5.3.2.

Processing upon receipt: when CMN receives this information flow it creates CSM-O and sends **information flow 2** to CSM-T, including:

- Incoming BCU-ID, as received in IAM;
- COTind reflecting the status of the incoming link [Circuit not available (COT on Prev.), or Circuit available (No COT)];
- Codec List (Optional), sent if received in IAM;
- Incoming BNC Characteristics;
- Incoming Bearer Service Characteristics;
- Incoming Tunnel Indication;
- A request for Context assignment (Context ID = "?") and BCU assignment (BCU-ID = "?");
- Calling Party and Called Party Address;
- And the Local Call Instance associating the CSMs to the incoming call request.

2	New Call		CMN:CSM-O to CMN:CSM-T

Address Information	**Control information**	**Bearer information**
Called-Party-Address = User B	Local Call Instance = 250	Incoming BCU-ID = X if received
Calling Party Address = User A	COTind = COT on Prev. or No COT	BIWF Address = X1, or A2
	Incoming Tunnel Indication = No, or Option 1 or Option 2	BCU-ID = "?"
	(Origination Traffic Group ID = 77)	Context ID = "?"
	(Destination Traffic Group ID = 88)	Bearer Service Characteristics
	(Global Call Ref. = 35)	Incoming BNC Characteristics
		{If Codec Negotiation: (Incoming Codec List)}

Initiation of information flow: reception and processing of the IAM (**information flow 1**).

Processing upon receipt: CSM-T will issue an IAM signalling flow to its peer CSM in SN-B.

3	IAM		CMN:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
Calling Party Address = User-A	CCA-ID = 7	Bearer Service Characteristics
Called Party Address = User-B	Action-ID = Connect Forwards, (+Codec)	BNC Characteristics
O-CSF Address = CMN	(Tunnel)	BIWF Address = X1 or A2)
D-CSF Address = SN-B	(COT on Prev. = 1 or 0)	{If Codec Negotiation: Codec List}
	(Origination Traffic Group ID = 77)	
	(Destination Traffic Group ID = 88)	
	(Global Call Ref. = 35)	
	(BCU-ID = X or A)	
	{If Tunnel Indication = option 1 : Bearer Information Transport}	

Initiation of information flow: reception and processing of **information flow 2**.

Processing upon receipt: when SN-B receives this information flow it creates CSM-O. The CSM-O decides to defer the BIWF selection to CSM-T. Therefore, the CSM-O sends **information flow 5** to CSM-T, including:

- Incoming BCU-ID, as received in IAM;
- COTind reflecting the status of the incoming link [Circuit not available (COT on Prev.), or Circuit available (No COT)];
- Codec List (Optional), sent if received in IAM;
- Incoming BNC Characteristics;
- Incoming Bearer Service Characteristics;
- Incoming Tunnel Indication;
- A request for Context assignment (Context ID = "?") and BCU assignment (BCU-ID = "?");
- Calling Party and Called Party Address;
- And the Local Call Instance associating the CSMs to the incoming call request.

4	APM		SN-B:CSM-O to CMN:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 7	BNC-ID = 78
	Action-ID = Forward Notify	BIWF Address = X1
	Tunnel Indication = option1	{If Codec Negotiation : (Selected Codec)
	Bearer Information Transport	Supported Codec List,}
	(BCU-ID = Y)	

Initiation of information flow: reception and processing of **information flow 11a,** shown in 5.3.2 of the forward composite flow.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 5** towards CSM-O.

5		CMN:CSM-O to CMN:CSM-T

Address Information	**Control information**	**Bearer information**
		BNC-ID = 78
	Action-ID = Forward Notify	BIWF Address = X1
	Tunnel Indication = option1	{If Codec Negotiation : (Selected Codec)
	Bearer Information Transport	(Supported Codec List)}
	(BCU-ID = Y)	

Initiation of information flow: reception and processing of **information flow 4**.

Processing upon receipt: when CSM-O receives this information flow, it issues **information flow 6** towards CSM-T of SN-A.

6	APM		CMN:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	BNC-ID = 78
	Action-ID = Forward Notify	BIWF Address = X1
	Tunnel Indication = option1	{If Codec Negotiation : (Selected Codec)
	Bearer Information Transport	(Supported Codec List)}
	(BCU-ID = Y)	

Initiation of information flow: reception and processing of **information flow 5**.

Processing upon receipt: see 5.3.2.

5.4 Call modification flows

5.4.1 Mid-call codec modification
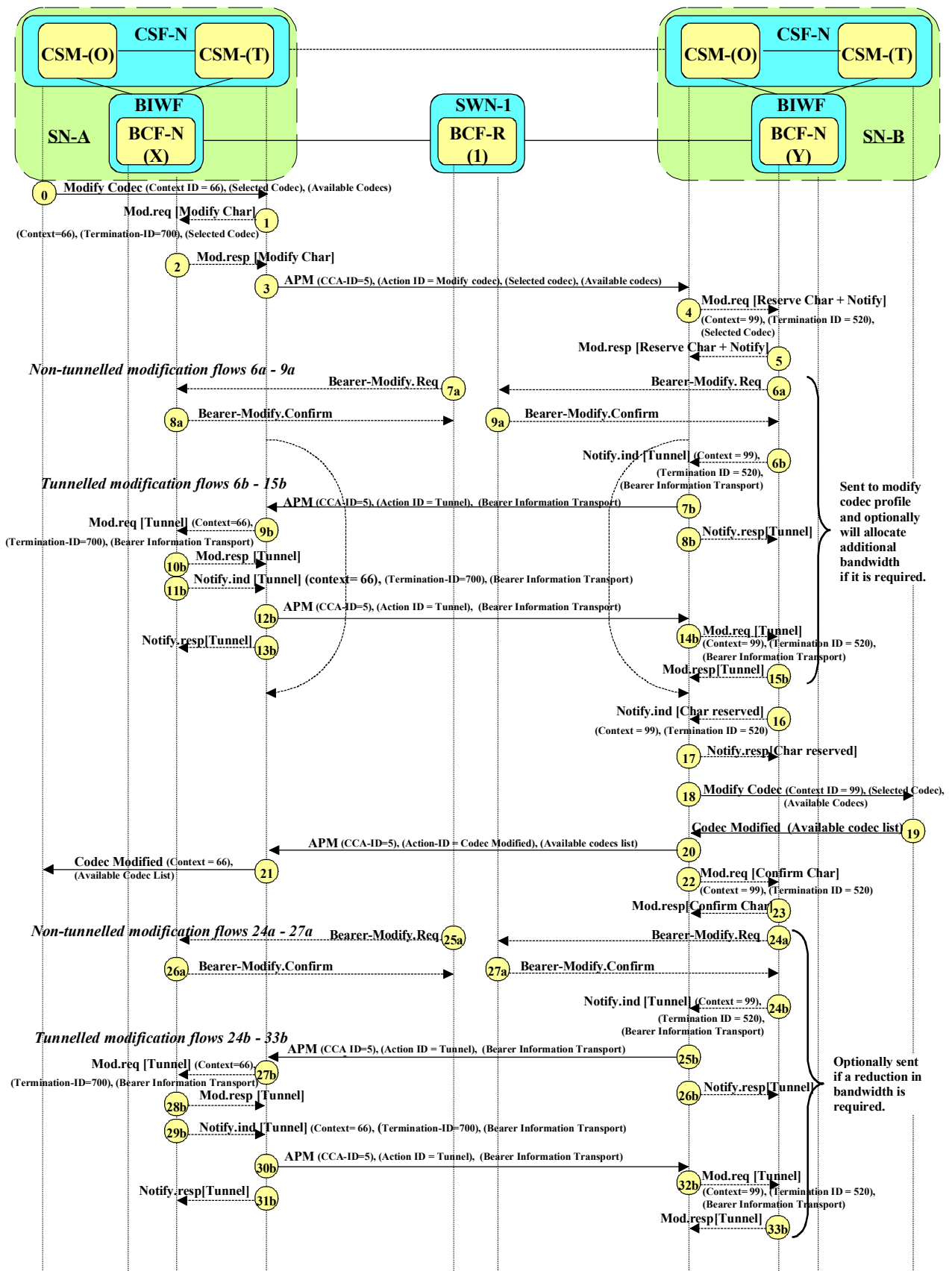
Figure 10 – Mid-call codec modification

The following numbered items describe the numbered flows shown in Figure 10.

0	**Modify Codec**		**SN-A:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	Local Call Control Segment = 15	Available Codecs
	Action ID = "Modify Codec"	Selected Codec

Initiation of information flow: codec modification attempt from originating side.

Processing upon receipt: when the CSM-T receives this information flow, it checks that the received "Available Codecs" list is either the same or a subset of the current "Available Codecs" list for the call. It also ensures that the Selected Codec is listed in the received "Available Codecs" list. If the selected codec is different to the one already active, CSM-T issues **flow 1** towards BIWF-X to allocate any new resources required to support this new codec. Otherwise, only the available codecs list is to be modified and **flow 3** is sent to SN-B.

1	**MODIFY.req [Modify Char]**		**SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
	Transaction ID = 1000	Selected Codec
	Context = 66	
	Termination ID = "700"	

Initiation of information flow: processing of **information flow 0**.

Processing upon receipt: BIWF(X) checks that the new voice encoding scheme can be supported by the specified termination and takes relevant actions to ensure smooth transition to the new encoding scheme. BIWF(X) sends **information flow 2** to SN-A to confirm the modification.

2	**MODIFY.resp**		**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	Transaction ID = 1000	

Initiation of information flow: processing of **information flow 1**.

Processing upon receipt: CSM-T initiates **flow 3** to SN-B.

3	**APM**		**SN-A:CSM-T to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	Available Codecs
	Action ID = "Modify Codec"	Selected Codec

Initiation of information flow: **flow 0** if only the available codec list is being modified otherwise **flow 2**.

Processing upon receipt: when CSM-O receives this information flow, it checks that the received "Available Codecs" list is either the same or a subset of the current "Available Codecs" list for the call. It also ensures that the Selected Codec is listed in the received "Available Codecs" list.

If the selected codec is different to the one already active, CSM-O issues **flow 4** towards BIWF-Y to allocate any new resources required to support this new codec.

Otherwise, if the selected codec is the same as the one already active and the succeeding network supports codec modification, **flow 18** is sent to SN-B:CSM-T. If the succeeding network does not support codec modification, SN-B:CSM-O stores the new available codecs list and issues **flow 20** to SN-A:CSM-T.

4	MODIFY.req [Reserve Char + Notify]		SN-B:CSM-O to BIWF(Y)

Address Information	**Control information**	**Bearer information**
	Transaction ID = 1001 NotificationRequested = "BNC modified/BNC Mod failure". Signal = "BNC Modify" Context = 99 Termination ID = "520"	Selected Codec

Initiation of information flow: processing of **information flow 3**.

Processing upon receipt: BIWF(X) checks that the new voice encoding scheme can be supported by the specified termination and takes relevant actions to ensure smooth transition to the new encoding scheme. BIWF(X) sends **information flow 5** to SN-B to acknowledge the modification request and sends **information flow 6** (**a** or **b**) to modify the codec profile being used on the connection and if applicable increase the bandwidth required by this new encoding scheme.

5	MODIFY.resp		BIWF(Y) to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Transaction ID = 1001	

Initiation of information flow: processing of **information flow 4**.

Processing upon receipt: SN-B waits for **information flow 16**.

6a	Bearer-Modify.Req		BIWF-Y to SWN-1

Address Information	**Control information**	**Bearer information**
T-BIWF Addr = X	BCS-ID = "20"	BNCL-ID = 1000 BNCL Characteristics

Initiation of information flow: processing of **information flow 4**.

Processing upon receipt: the SWN-1 validates the request, reserves the resources required by the modified connection and forwards the modification request to BIWF(X). Switching Node 1 awaits the commitment information from BIWF(X).

7a	Bearer-Modify.Req		SWN-1 to BIWF-X

Address Information	**Control information**	**Bearer information**
T-BIWF Addr = X	BCS-ID = "30"	BNCL-ID = 1001 BNCL Characteristics

Initiation of information flow: processing of **information flow 6a**.

Processing upon receipt: BIWF(X) validates the request, allocates the resources required by the modified connection and sends **information flow 8a** to SWN-1.

8a	Bearer-Modify.Confirm		BIWF-X to SWN-1

Address Information	**Control information**	**Bearer information**
	BCS-ID = "30"	BNCL-ID = 1001

Initiation of information flow: processing of **information flow 7a**.

Processing upon receipt: SWN-1 allocates the resources for the connection and sends **information flow 9a** to BIWF(Y).

9a   **Bearer-Modify.Confirm**   **SWN-1 to BIWF-Y**

Address Information	Control information	Bearer information
	BCS-ID = "20"	BNCL-ID = 1000

Initiation of information flow: processing of **information flow 8a**.

Processing upon receipt: BIWF(Y) allocates the resources to the connection and notifies SN-B, via **information flow 16**, that the BNC has been prepared.

6b   **NOTIFY.ind**   **BIWF-Y to SN-B:CSM-O**

Address Information	Control information	Bearer information
	Transaction ID = 1010	Bearer Information Transport
	Context = 99	
	Termination ID = "520"	
	Event = "Bearer Information Transport"	

Initiation of information flow: processing of **information flow 4**.

Processing upon receipt: CSM-O passes the Bearer Information Transport information transparently to SN-A:CSM-T in **flow 7b** and sends **flow 8b** to acknowledge the notification.

7b   **APM**   **SN-B:CSM-O to SN-A:CSM-T**

Address Information	Control information	Bearer information
	CCA-ID = 5	Bearer Information Transport
	Action ID = "Tunnel"	

Initiation of information flow: processing of **information flow 6b**.

Processing upon receipt: when CSM-T receives this information flow, it passes the Bearer Information Transport information transparently to BIWF-X in **flow 9b**.

8b   **NOTIFY.resp**   **SN-B:CSM-O to BIWF-Y**

Address Information	Control information	Bearer information
	Transaction ID = 1010	

Initiation of information flow: processing of **information flow 6b**.

Processing upon receipt: –.

9b   **MODIFY.req**   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
	Transaction ID = 2000	Bearer Information Transport
	Action ID = "Bearer Information Transport"	
	Context = 66	
	Termination ID = "700"	

Initiation of information flow: processing of **information flow 8b**.

Processing upon receipt: BIWF(X) validates the request, allocates the resources required by the modified connection and sends **information flow 11b** to SN-A:CSM-T. It also sends **information flow 10b** to acknowledge the request.

10b   **MODIFY.resp**   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
	Transaction ID = 2000	

Initiation of information flow: processing of **information flow 9b**.

Processing upon receipt: –.

11b   NOTIFY.ind   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
	Transaction ID = 2010 Context = 66 Termination ID = "700" Event = "Bearer Information Transport"	Bearer Information Transport

Initiation of information flow: processing of **information flow 9b**.

Processing upon receipt: CSM-T passes the Bearer Information Transport information transparently to SN-B:CSM-O in **flow 12b** and acknowledges the notification with **flow 13b**.

12b   APM   **SN-A:CSM-T to SN-B:CSM-O**

Address Information	Control information	Bearer information
	CCA-ID = 5 Action ID = "Tunnel"	Bearer Information Transport

Initiation of information flow: processing of **information flow 11b**.

Processing upon receipt: when CSM-O receives this information flow, it passes the Bearer Information Transport information transparently to BIWF-Y in **flow 14b**.

13b   NOTIFY.resp   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
	Transaction ID = 2010	

Initiation of information flow: processing of **information flow 11b**.

Processing upon receipt: –.

14b   MODIFY.req   **SN-B:CSM-O to BIWF-Y**

Address Information	Control information	Bearer information
	Transaction ID = 3000 Action ID = "Bearer Information Transport" Context = 99 Termination ID = "520"	Bearer Information Transport

Initiation of information flow: processing of **information flow 12b**.

Processing upon receipt: BIWF(Y) allocates the resources to the connection and notifies SN-B, via **information flow 16**, that the BNC has been prepared. **Flow 15b** is also sent to acknowledge the request.

15b   MODIFY.resp   **BIWF-Y to SN-B:CSM-O**

Address Information	Control information	Bearer information
	Transaction ID = 3000	

Initiation of information flow: processing of **information flow 14b**.

Processing upon receipt: –.

16	NOTIFY.ind	BIWF-Y to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Transaction ID = 3010	
	Context = 99	
	Termination ID = "520"	
	Event = "Characteristics prepared"	

Initiation of information flow: processing of **information flow 9a** or **14b**.

Processing upon receipt: CSM-O records the successful outcome of the modification.

If the succeeding network supports codec modification **flow 18** is sent to SN-B:CSM-T.

Otherwise, the new available codec list is stored and **flow 20** is sent to SN-A:CSM-T to indicate successful modification. **Flow 22** also is sent to BIWF(Y) to confirm the modification of the bearer resources.

In either case, **flow 17** is returned to BIWF(Y) to acknowledge the notification.

17	NOTIFY.resp	SN-B:CSM-O to BIWF-Y

Address Information	**Control information**	**Bearer information**
	Transaction ID = 3010	

Initiation of information flow: processing of **information flow 16**.

Processing upon receipt: –.

18	Modify Codec (optional)	SN-B:CSM-O to SN-B:CSM-T

Address Information	**Control information**	**Bearer information**
	Local Call Control Segment = 19	Available Codecs
	Action Id = "Modify Codec"	Selected Codec

Initiation of information flow: processing of **information flow 3** or **flow 16**.

Processing upon receipt: CSM-T shall initiated codec modification in the succeeding network using the Selected Codec and Available Codecs list received in this information flow. Once codec modification has been successfully done in the succeeding network, CSM-T issues **information flow 19** toward CSM-O.

19	Codec Modified (optional)	SN-B:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Control Segment = 19	Available Codecs
	Action Id= "Codec Modified"	

Initiation of information flow: modification completed in succeeding network.

Processing upon receipt: CSM-O stores the new available codecs list and sends **flow 20** to SN-A:CSM-T indicating successful modification. It also sends **flow 22** to BIWF(Y) to confirm the modification of the bearer resources.

20	APM	SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	Available Codecs
	Action ID = "Codec Modified"	

Initiation of information flow: processing of **information flow 3** or **16** if the network connected to SN-B:CSM-T does not support codec negotiation. Processing of **information flow 19** otherwise.

Processing upon receipt: the CSM-T stores the new available codecs list and sends **information flow 21** to CSM-O informing of the successful codec modification.

21   Codec Modified   **SN-A:CSM-T to SN-A:CSM-O**

Address Information   **Control information**   **Bearer information**
                                   Local Call Control Segment = 15   Available Codecs
                                   Action Id = "Codec Modified"

Initiation of information flow: processing of **information flow 20**.

Processing upon receipt: the actions depend on the procedures in CSM-O (i.e. outside the scope of this Supplement).

---

22   MODIFY.req [Confirm Char]   **SN-B:CSM-O to BIWF-Y**

Address Information   **Control information**   **Bearer information**
                                   Transaction ID = 4001
                                   Signal = "BNC Modify"
                                   Context = 99
                                   Termination ID = 520

Initiation of information flow: processing of **information flow 16** if the network connected to SN-B:CSM-T does not support codec negotiation. Processing of **information flow 19** otherwise.

Processing upon receipt: **flow 23** is returned to SN-B:CSM-O to acknowledge the request. BIWF(Y) then determines if the bandwidth allocated for the connection needs to be reduced. If the reduction of bandwidth is required, **flow 24** (**a** or **b**) is sent when the transition to the new encoding scheme is completed.

---

23   MODIFY.resp   **BIWF-Y to SN-B:CSM-O**

Address Information   **Control information**   **Bearer information**
                                   Transaction ID = 4001

Initiation of information flow: processing of **information flow 22**.

Processing upon receipt: –.

24a   Bearer-Modify.Req   **BIWF-Y to SWN-1**

Address Information   **Control information**   **Bearer information**
T-BIWF Addr = X   BCS-ID = "20"   BNCL-ID = 1000
                                                                      BNCL Characteristics

Initiation of information flow: **flow 22** and when the transition to the new encoding scheme is completed.

Processing upon receipt: the SWN-1 validates the request and forwards the modification request to BIWF(Y). Switching Node 1 awaits the commitment information from BIWF(X).

25a   Bearer-Modify.Req   **SWN-1 to BIWF-X**

Address Information   **Control information**   **Bearer information**
T-BIWF Addr = X   BCS-ID = "30"   BNCL-ID = 1001
                                                                      BNCL Characteristics

Initiation of information flow: receipt of **information flow 24a**.

Processing upon receipt: BIWF(X) validates the request, reduces the bandwidth allocated to the connection and sends **information flow 26a** to SWN-1.

26a	**Bearer-Modify.Confirm**		**BIWF-X to SWN-1**
Address Information	**Control information**	**Bearer information**	
	BCS-ID = "30"	BNCL-ID = 1001	

Initiation of information flow: processing of **information flow 25a**.

Processing upon receipt: SWN-1 reduces the bandwidth allocated to the connection and sends **information flow 27a** to BIWF(Y).

27a	**Bearer-Modify.Confirm**		**SWN-1 to BIWF-Y**
Address Information	**Control information**	**Bearer information**	
	BCS-ID = "20"	BNCL-ID = 1000	

Initiation of information flow: processing of **information flow 26a**.

Processing upon receipt: BIWF(Y) reduces the bandwidth allocated to the connection.

24b	**NOTIFY.ind**		**BIWF-Y to SN-B:CSM-O**
Address Information	**Control information**	**Bearer information**	
	Transaction ID = 5010	Bearer Information Transport	
	Context = 99		
	Termination ID = "520"		
	Event = "Bearer Information Transport"		

Initiation of information flow: **flow 22** and when the transition to the new encoding scheme is completed.

Processing upon receipt: CSM-O passes the Bearer Information Transport information transparently to SN-A:CSM-T in **flow 25b** and send **flow 26b** to acknowledge the notification.

25b	**APM**		**SN-B:CSM-O to SN-A:CSM-T**
Address Information	**Control information**	**Bearer information**	
	CCA-ID = 5	Bearer Information Transport	
	Action ID = "Tunnel"		

Initiation of information flow: processing of **information flow 24b**.

Processing upon receipt: when CSM-T receives this information flow, it passes the Bearer Information Transport information transparently to BIWF-X in **flow 27b**.

26b	**NOTIFY.resp**		**SN-B:CSM-O to BIWF-Y**
Address Information	**Control information**	**Bearer information**	
	Transaction ID = 5010		

Initiation of information flow: processing of **information flow 24b**.

Processing upon receipt: –.

27b	**MODIFY.req**		**SN-A:CSM-T to BIWF-X**
Address Information	**Control information**	**Bearer information**	
	Transaction ID = 6000	Bearer Information Transport	
	Action ID = "Bearer Information Transport"		
	Context = 66		
	Termination ID = "700"		

Initiation of information flow: processing of **information flow 26b**.

Processing upon receipt: BIWF(X) validates the request, reduces the bandwidth allocated to the connection and sends **information flows 28b** and **29b** to SN-A:CSM-T.

28b   MODIFY.resp   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
	Transaction ID = 6000	

Initiation of information flow: processing of **information flow 27b**.

Processing upon receipt: –.

29b   NOTIFY.ind   **BIWF-X to SN-A:CSM-T**

Address Information	Control information	Bearer information
	Transaction ID = 6010	Bearer Information Transport
	Context = 66	
	Termination ID = "700"	
	Event = "Bearer Information Transport"	

Initiation of information flow: processing of **information flow 27b**.

Processing upon receipt: CSM-T passes the Bearer Information Transport information transparently to SN-B:CSM-O in **flow 30b**. **Flow 31b** is also sent to BIWF-X to acknowledge the notification.

30b   APM   **SN-A:CSM-T to SN-B:CSM-O**

Address Information	Control information	Bearer information
	CCA-ID = 5	Bearer Information Transport
	Action ID = "Tunnel"	

Initiation of information flow: processing of **information flow 29b**.

Processing upon receipt: when CSM-O receives this information flow, it passes the Bearer Information Transport information transparently to BIWF-Y in **flow 32b**.

31b   NOTIFY.resp   **SN-A:CSM-T to BIWF-X**

Address Information	Control information	Bearer information
	Transaction ID = 6010	

Initiation of information flow: processing of **information flow 29b**.

Processing upon receipt: –.

32b   MODIFY.req   **SN-B:CSM-O to BIWF-Y**

Address Information	Control information	Bearer information
	Transaction ID = 7000	Bearer Information Transport
	Action ID = "Bearer Information Transport"	
	Context = 99	
	Termination ID = "520"	

Initiation of information flow: processing of **information flow 30b**.

Processing upon receipt: BIWF(Y) reduces the resources allocated to the connection and sends **information flow 33b** to SN-B:CSM-O.

33b   MODIFY.resp   **BIWF-Y to SN-B:CSM-O**

Address Information	Control information	Bearer information
	Transaction ID = 7000	

Initiation of information flow: processing of **information flow 32b**.

Processing upon receipt: –.

5.4.2   Mid-call codec negotiation

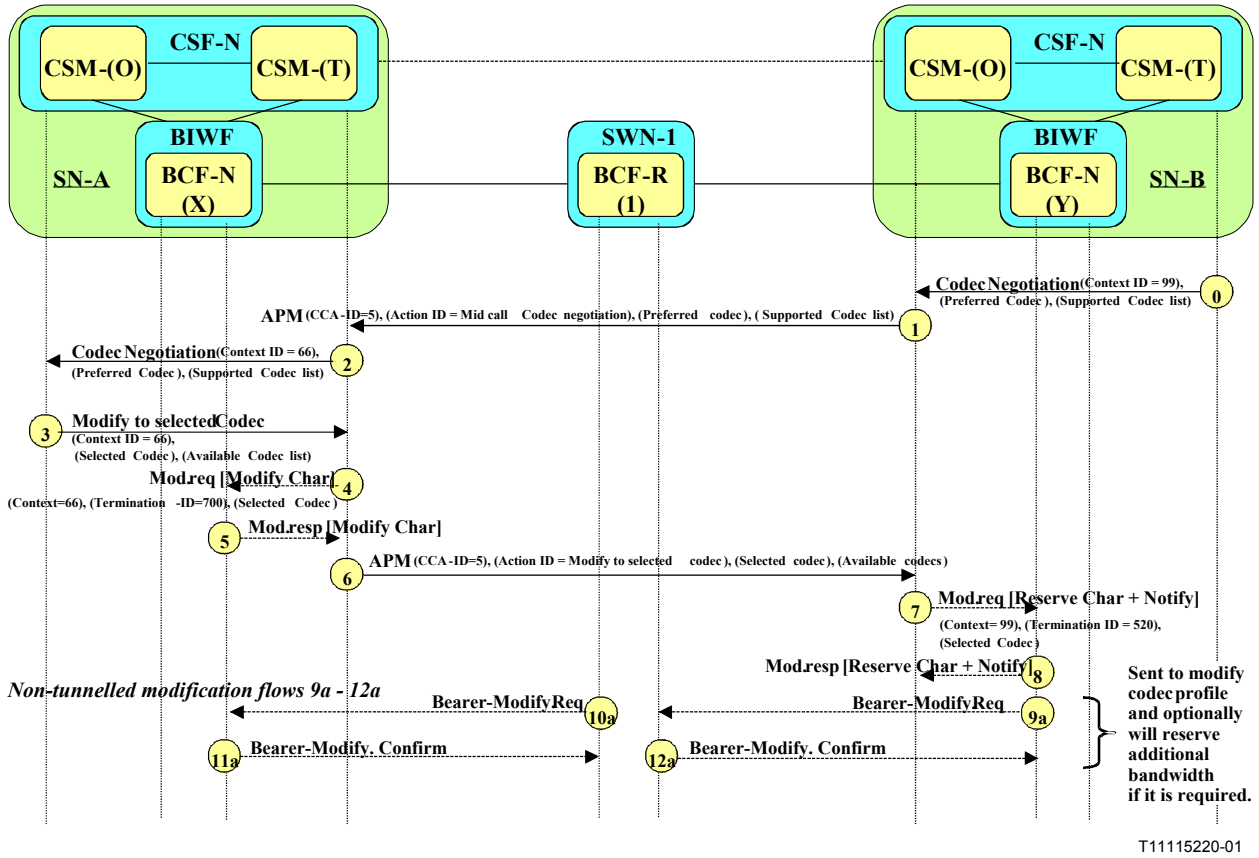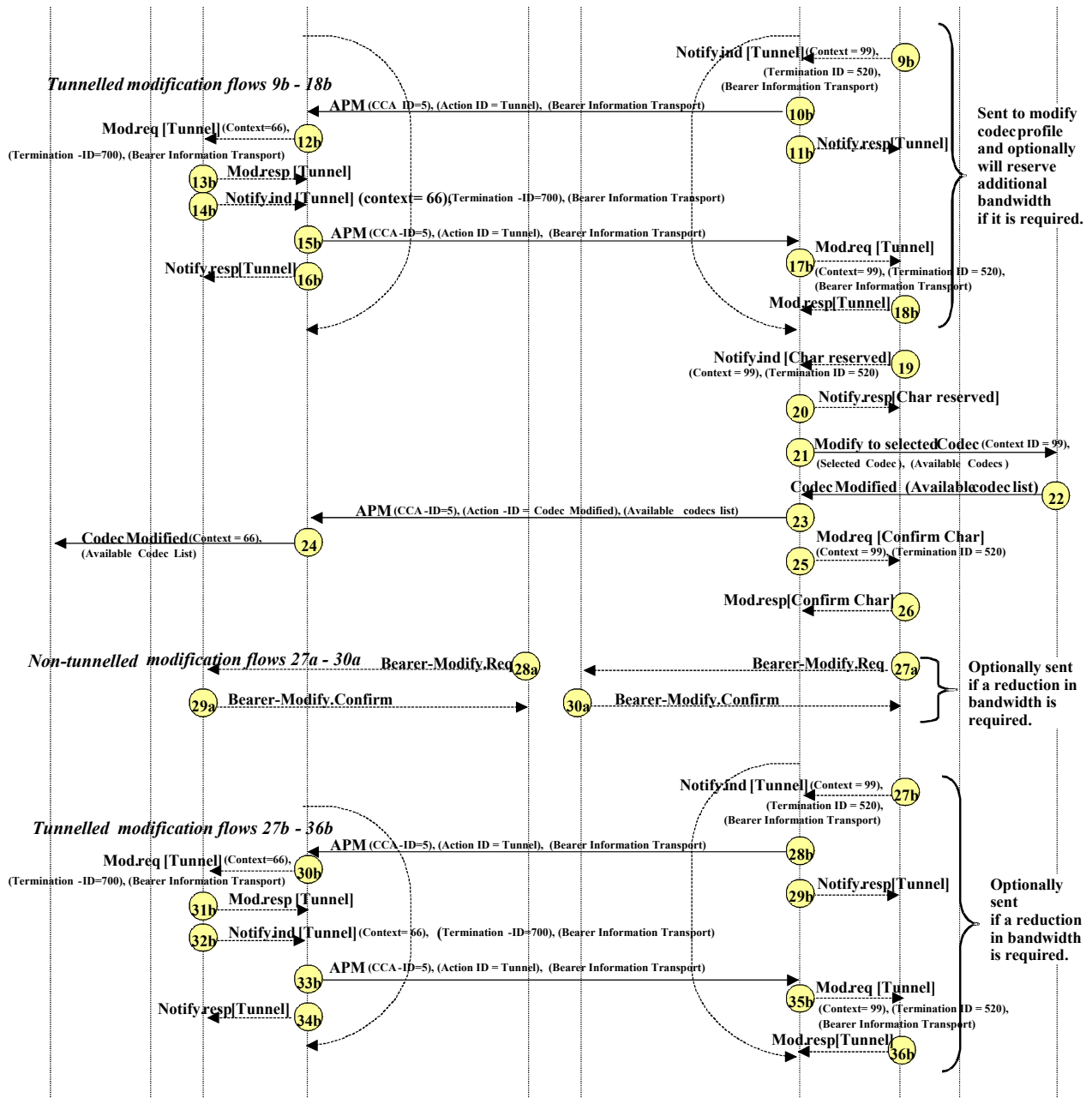**Figure 11 – Mid-call codec negotiation**

Figure 11 – Mid-call codec negotiation (*concluded*)

The following numbered items describe the numbered flows shown above.

0	**Codec Negotiation**		SN-B:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Control Segment = 19	Supported Codecs
	Action ID = "Codec negotiation"	Preferred Codec

Initiation of information flow: codec negotiation attempt from terminating side.

Processing upon receipt: when the CSM-O receives this information flow, it checks the received list of supported codecs. If any of the codecs cannot be supported by this CSM-O they are removed from the list. The updated list is included in **flow 1** sent to SN-A:CSM-T.

1   APM   SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5 Action ID = "Mid-call Codec negotiation"	Supported Codecs Preferred Codec

Initiation of information flow: processing of **information flow 0**.

Processing upon receipt: when the CSM-T receives this information flow, it checks the received list of supported codecs. If any of the codecs cannot be supported by this CSM-T they are removed from the list.

If the preceding network supports mid-call codec negotiation, the updated list is included in **flow 2** sent to SN-A:CSM-O.

Otherwise, it selects the codec to be used by the call giving preference to the preferred codec. If this selected codec is different to the one already active on the call it issues **information flow 4** to BIWF(X). If the selected codec is the same as the active one, the updated available codec list and the selected codec are passed to SN-B in **information flow 6**.

2   Codec Negotiation (optional)   SN-A:CSM-T to SN-A:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Control Segment = 15 Action Id = "Mid-call codec negotiation"	Supported Codecs Preferred Codec

Initiation of information flow: processing of **information flow 1**.

Processing upon receipt: the request for codec negotiation is processed according to the procedures of the incoming access technology. When a codec is selected to be used from the supported list, the incoming access will send the selected codec and the list of available codecs to the SN-A:CSM-T in **information flow 3**.

3   Modify to selected Codec information (optional)   SN-A:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	Local Call Control Segment = 15 Action ID = "Modify to selected Codec information"	Available Codecs Selected Codec

Initiation of information flow: codec is selected by incoming access.

Processing upon receipt: when the CSM-T receives this information flow, if the selected codec is different to the one already active for the call, it issues **flow 4** towards BIWF-X. Otherwise if the selected codec is the same as the one already active for the call, **information flow 6** is issued to SN-B.

4   MODIFY.req [Modify Char]   SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
	Transaction ID = 1000 Context = 66 Termination ID = "700"	Selected Codec

Initiation of information flow: processing of **information flow 3** if preceding network supports mid call codec negotiation. Otherwise processing of **information flow 1**.

Processing upon receipt: BIWF(X) checks that the new voice encoding scheme can be supported by the specified termination and takes relevant actions to ensure smooth transition to the new encoding scheme. BIWF(X) sends **information flow 2** to SN-A to confirm the modification.

5	**MODIFY.resp**		**BIWF-X to SN-A:CSM-T**
Address Information	**Control information**	**Bearer information**
	Transaction ID = 1000	

Initiation of information flow: processing of **information flow 4**.

Processing upon receipt: CSM-T initiates **flow 6** to SN-B.

6	**APM**		**SN-A:CSM-T to SN-B:CSM-O**
Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	Available Codecs
	Action ID = "Modify to selected codec information"	Selected Codec

Initiation of information flow: **flow 1** or **3** or **5**.

Processing upon receipt: when CSM-O receives this information flow and the selected codec is different to the one already active for the call, it issues **flow 7** towards BIWF-Y. If the selected codec is the same as the one that is already active, **flow 21** is sent to SN-B:CSM-T.

7	**MODIFY.req [Reserve Char + Notify]**		**SN-B:CSM-O to BIWF(Y)**
Address Information	**Control information**	**Bearer information**
	Transaction ID = 1001	Selected Codec
	NotificationRequested = "BNC modified/BNC Mod failure"	
	Signal = "BNC Modify"	
	Context = 99	
	Termination ID = "520"	

Initiation of information flow:processing of **information flow 6**.

Processing upon receipt: BIWF(X) checks that the new voice encoding scheme can be supported by the specified termination and takes relevant actions to ensure smooth transition to the new encoding scheme. BIWF(X) sends **information flow 8** to SN-B to acknowledge the modification request and sends **information flow 9** (**a** or **b**) to modify the codec profile being used on the connection and if applicable increase the bandwidth required by this new encoding scheme.

8	**MODIFY.resp**		**BIWF(Y) to SN-B:CSM-O**
Address Information	**Control information**	**Bearer information**
	Transaction ID = 1001	

Initiation of information flow: processing of **information flow 7**.

Processing upon receipt: SN-B waits for **information flow 19**.

9a	**Bearer-Modify.Req**		**BIWF-Y to SWN-1**
Address Information	**Control information**	**Bearer information**
T-BIWF Addr = X	BCS-ID = "20"	BNCL-ID = 1000
		BNCL Characteristics

Initiation of information flow: processing of **information flow 7**.

Processing upon receipt: the SWN-1 validates the request, reserves the resources required by the modified connection and forwards the modification request to BIWF(X). Switching Node 1 awaits the commitment information from BIWF(X).

10a	Bearer-Modify.Req		SWN-1 to BIWF-X

Address Information	**Control information**	**Bearer information**
T-BIWF Addr = X	BCS-ID = "30"	BNCL-ID = 1001
		BNCL Characteristics

Initiation of information flow: processing of **information flow 9a**.

Processing upon receipt: BIWF(X) validates the request, allocates the resources required by the modified connection and sends **information flow 11a** to SWN-1.

11a	Bearer-Modify.Confirm		BIWF-X to SWN-1

Address Information	**Control information**	**Bearer information**
	BCS-ID = "30"	BNCL-ID = 1001

Initiation of information flow: processing of **information flow 10a**.

Processing upon receipt: SWN-1 allocates the resources for the connection and sends **information flow 12a** to BIWF(Y).

12a	Bearer-Modify.Confirm		SWN-1 to BIWF-Y

Address Information	**Control information**	**Bearer information**
	BCS-ID = "20"	BNCL-ID = 1000

Initiation of information flow: processing of **information flow 11a**.

Processing upon receipt: BIWF(Y) allocates the resources to the connection and notifies SN-B, via **information flow 19**, that the BNC has been prepared.

9b	NOTIFY.ind		BIWF-Y to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Transaction ID = 1010	Bearer Information Transport
	Context = 99	
	Termination ID = "520"	
	Event = "Bearer Information Transport"	

Initiation of information flow: processing of **information flow 7**.

Processing upon receipt: CSM-O passes the Bearer Information Transport information transparently to SN-A:CSM-T in **flow 10b** and sends **flow 11b** to acknowledge the notification.

10b	APM		SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	Bearer Information Transport
	Action ID = "Tunnel"	

Initiation of information flow: processing of **information flow 9b**.

Processing upon receipt: when CSM-T receives this information flow, it passes the Bearer Information Transport information transparently to BIWF-X in **flow 12b**.

11b	NOTIFY.resp		SN-B:CSM-O to BIWF-Y

Address Information	**Control information**	**Bearer information**
	Transaction ID = 1010	

Initiation of information flow: processing of **information flow 9b**.

Processing upon receipt: –.

12b   MODIFY.req   SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
	Transaction ID = 2000	Bearer Information Transport
	Action ID = "Bearer Information Transport"	
	Context = 66	
	Termination ID = "700"	

Initiation of information flow: processing of **information flow 10b**.

Processing upon receipt: BIWF(X) validates the request, allocates the resources required by the modified connection and sends **information flow 14b** to SN-A:CSM-T. It also sends **information flow 13b** to acknowledge the request.

13b   MODIFY.resp   BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	Transaction ID = 2000	

Initiation of information flow: processing of **information flow 12b**.

Processing upon receipt: –.

14b   NOTIFY.ind   BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	Transaction ID = 2010	Bearer Information Transport
	Context = 66	
	Termination ID = "700"	
	Event = "Bearer Information Transport"	

Initiation of information flow: processing of **information flow 12b**.

Processing upon receipt: CSM-T passes the Bearer Information Transport information transparently to SN-B:CSM-O in **flow 15b** and acknowledges the notification with **flow 16b**.

15b   APM   SN-A:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	Bearer Information Transport
	Action ID = "Tunnel"	

Initiation of information flow: processing of **information flow 14b**.

Processing upon receipt: when CSM-O receives this information flow, it passes the Bearer Information Transport information transparently to BIWF-Y in **flow 17b**.

16b   NOTIFY.resp   SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
	Transaction ID = 2010	

Initiation of information flow: processing of **information flow 14b**.

Processing upon receipt: –.

17b   **MODIFY.req**   **SN-B:CSM-O to BIWF-Y**

Address Information	Control information	Bearer information
	Transaction ID = 3000 Action ID = "Bearer Information Transport" Context = 99 Termination ID = "520"	Bearer Information Transport

Initiation of information flow: processing of **information flow 15b**.

Processing upon receipt: BIWF(Y) allocates the resources to the connection and notifies SN-B, via **information flow 19**, that the BNC has been prepared. **Flow 18b** is also sent to acknowledge the request.

18b   **MODIFY.resp**   **BIWF-Y to SN-B:CSM-O**

Address Information	Control information	Bearer information
	Transaction ID = 3000	

Initiation of information flow: processing of **information flow 17b**.

Processing upon receipt: –.

---

19   **NOTIFY.ind**   **BIWF-Y to SN-B:CSM-O**

Address Information	Control information	Bearer information
	Transaction ID = 3010 Context = 99 Termination ID = "520" Event = "Characteristics prepared"	

Initiation of information flow: processing of **information flow 12a** or **17b**.

Processing upon receipt: CSM-O records the successful outcome of the modification.

Flow 21 is sent to SN-B:CSM-T and **flow 20** is returned to BIWF(Y) to acknowledge the notification.

---

20   **NOTIFY.resp**   **SN-B:CSM-O to BIWF-Y**

Address Information	Control information	Bearer information
	Transaction ID = 3010	

Initiation of information flow: processing of **information flow 19**.

Processing upon receipt: –.

---

21   **Modify to selected Codec information**   **SN-B:CSM-O to SN-B:CSM-T**

Address Information	Control information	Bearer information
	Local Call Control Segment = 19 Action Id = "Modify to selected Codec information"	Available Codecs Selected Codec

Initiation of information flow: processing of **information flow 19**.

Processing upon receipt: the procedures depend on the access technology and are beyond the scope of this Supplement. Once the access has successfully performed the modification in the succeeding network, CSM-T issues **information flow 22** toward CSM-O.

22	Codec Modified		SN-B:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Control Segment = 19 Action Id = "Codec Modified"	Available Codecs

Initiation of information flow: modification completed in succeeding network.

Processing upon receipt: CSM-O stores the new available codecs list and sends **flow 23** to SN-A:CSM-T indicating successful modification. It also sends **flow 25** to BIWF(Y) to confirm the modification of the bearer resources if a change to a new codec is in progress.

23	APM		SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5 Action ID = "Codec Modified"	Available Codecs

Initiation of information flow: processing of **information flows 22**.

Processing upon receipt: the available codecs list is stored in CSM-T and if the preceding network supports mid-call codec negotiation **information flow 24** is issued to CSM-O informing of the successful codec modification.

24	Codec Modified (optional)		SN-A:CSM-T to SN-A:CSM-O

Address Information	**Control information**	**Bearer information**
	Local Call Control Segment = 15 Action Id = "Codec Modified"	Available Codecs

Initiation of information flow: processing of **information flow 23**.

Processing upon receipt: the actions depend on the procedures in CSM-O (i.e. outside the scope of this Supplement).

25	MODIFY.req [Confirm Char]		SN-B:CSM-O to BIWF-Y

Address Information	**Control information**	**Bearer information**
	Transaction ID = 4001 Signal = "BNC Modify" Context = 99 Termination ID = 520	

Initiation of information flow: processing of **information flow 22**.

Processing upon receipt: **flow 26** is returned to SN-B:CSM-O. BIWF(Y) determines if the bandwidth allocated for the connection should be reduced. If the reduction of bandwidth is required, **flow 27** (**a** or **b**) is sent when the transition to the new encoding scheme is completed.

26	MODIFY.resp		BIWF-Y to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Transaction ID = 4001	

Initiation of information flow: processing of **information flow 25**.

Processing upon receipt: –.

27a	**Bearer-Modify.Req**		**BIWF-Y to SWN-1**

Address Information	**Control information**	**Bearer information**
T-BIWF Addr = X	BCS-ID = "20"	BNCL-ID = 1000
		BNCL Characteristics

Initiation of information flow: **flow 25**

Processing upon receipt: the SWN-1 validates the request and forwards the modification request to BIWF(Y). Switching Node 1 awaits the commitment information from BIWF(X).

28a	**Bearer-Modify.Req**		**SWN-1 to BIWF-X**

Address Information	**Control information**	**Bearer information**
T-BIWF Addr = X	BCS-ID = "30"	BNCL-ID = 1001
		BNCL Characteristics

Initiation of information flow: receipt of **information flow 27a**.

Processing upon receipt: BIWF(X) validates the request, reduces the bandwidth allocated to the connection and sends **information flow 29a** to SWN-1.

29a	**Bearer-Modify.Confirm**		**BIWF-X to SWN-1**

Address Information	**Control information**	**Bearer information**
	BCS-ID = "30"	BNCL-ID = 1001

Initiation of information flow: processing of **information flow 28a**.

Processing upon receipt: SWN-1 reduces the bandwidth allocated to the connection and sends **information flow 30a** to BIWF(Y).

30a	**Bearer-Modify.Confirm**		**SWN-1 to BIWF-Y**

Address Information	**Control information**	**Bearer information**
	BCS-ID = "20"	BNCL-ID = 1000

Initiation of information flow: processing of **information flow 29a**.

Processing upon receipt: BIWF(Y) reduces the bandwidth allocated to the connection.

27b	**NOTIFY.ind**		**BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
	Transaction ID = 5010	Bearer Information Transport
	Context = 99	
	Termination ID = "520"	
	Event = "Bearer Information Transport"	

Initiation of information flow: **flow 25**.

Processing upon receipt: CSM-O passes the Bearer Information Transport information transparently to SN-A:CSM-T in **flow 28b** and send **flow 29b** to acknowledge the notification.

28b	**APM**		**SN-B:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	Bearer Information Transport
	Action ID = "Tunnel"	

Initiation of information flow: processing of **information flow 27b**.

Processing upon receipt: when CSM-T receives this information flow, it passes the Bearer Information Transport information transparently to BIWF-X in **flow 30b**.

29b   NOTIFY.resp   SN-B:CSM-O to BIWF-Y

Address Information	Control information	Bearer information
	Transaction ID = 5010	

Initiation of information flow: processing of **information flow 27b**.

Processing upon receipt: –.

30b   MODIFY.req   SN-A:CSM-T to BIWF-X

Address Information	Control information	Bearer information
	Transaction ID = 6000 Action ID = "Bearer Information Transport" Context = 66 Termination ID = "700"	Bearer Information Transport

Initiation of information flow: processing of **information flow 28b**.

Processing upon receipt: BIWF(X) validates the request, reduces the bandwidth allocated to the connection and sends information **flows 31b** and **32b** to SN-A:CSM-T.

31b   MODIFY.resp   BIWF-X to SN-A:CSM-T

Address Information	Control information	Bearer information
	Transaction ID = 6000	

Initiation of information flow: processing of **information flow 30b**.

Processing upon receipt: –.

32b   NOTIFY.ind   BIWF-X to SN-A:CSM-T

Address Information	Control information	Bearer information
	Transaction ID = 6010 Context = 66 Termination ID = "700" Event = "Bearer Information Transport"	Bearer Information Transport

Initiation of information flow: processing of **information flow 30b**.

Processing upon receipt: CSM-T passes the Bearer Information Transport information transparently to SN-B:CSM-O in **flow 33b**. **Flow 34b** is also sent to BIWF-X to acknowledge the notification.

33b   APM   SN-A:CSM-T to SN-B:CSM-O

Address Information	Control information	Bearer information
	CCA-ID = 5 Action ID = "Tunnel"	Bearer Information Transport

Initiation of information flow: processing of **information flow 32b**.

Processing upon receipt: When CSM-O receives this information flow, it passes the Bearer Information Transport information transparently to BIWF-Y in **flow 35b**.

34b   NOTIFY.resp   SN-A:CSM-T to BIWF-X

Address Information	Control information	Bearer information
	Transaction ID = 6010	

Initiation of information flow: processing of **information flow 32b**.

Processing upon receipt: –.

35b	MODIFY.req		SN-B:CSM-O to BIWF-Y

Address Information	**Control information**	**Bearer information**
	Transaction ID = 7000	Bearer Information Transport
	Action ID = "Bearer Information Transport"	
	Context = 99	
	Termination ID = "520"	

Initiation of information flow: processing of **information flow 33b**.

Processing upon receipt: BIWF(Y) reduces the resources allocated to the connection and sends **information flow 36b** to SN-B:CSM-O.

36b	MODIFY.resp		BIWF-Y to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
	Transaction ID = 7000	

Initiation of information flow: processing of **information flow 35b**.

Processing upon receipt: –.

5.4.3   Redirection flows
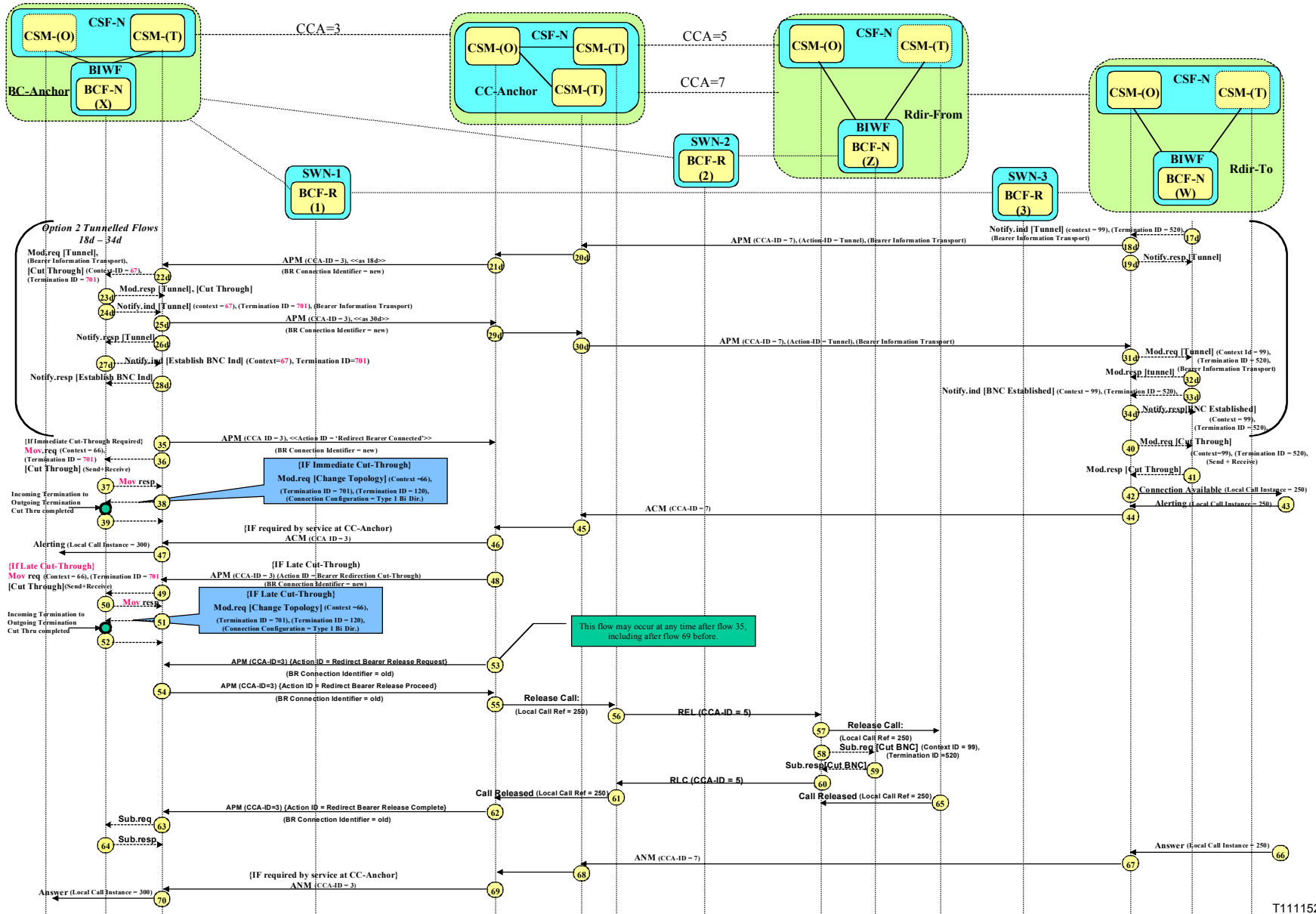
5.4.3.1   Backward bearer redirection flows
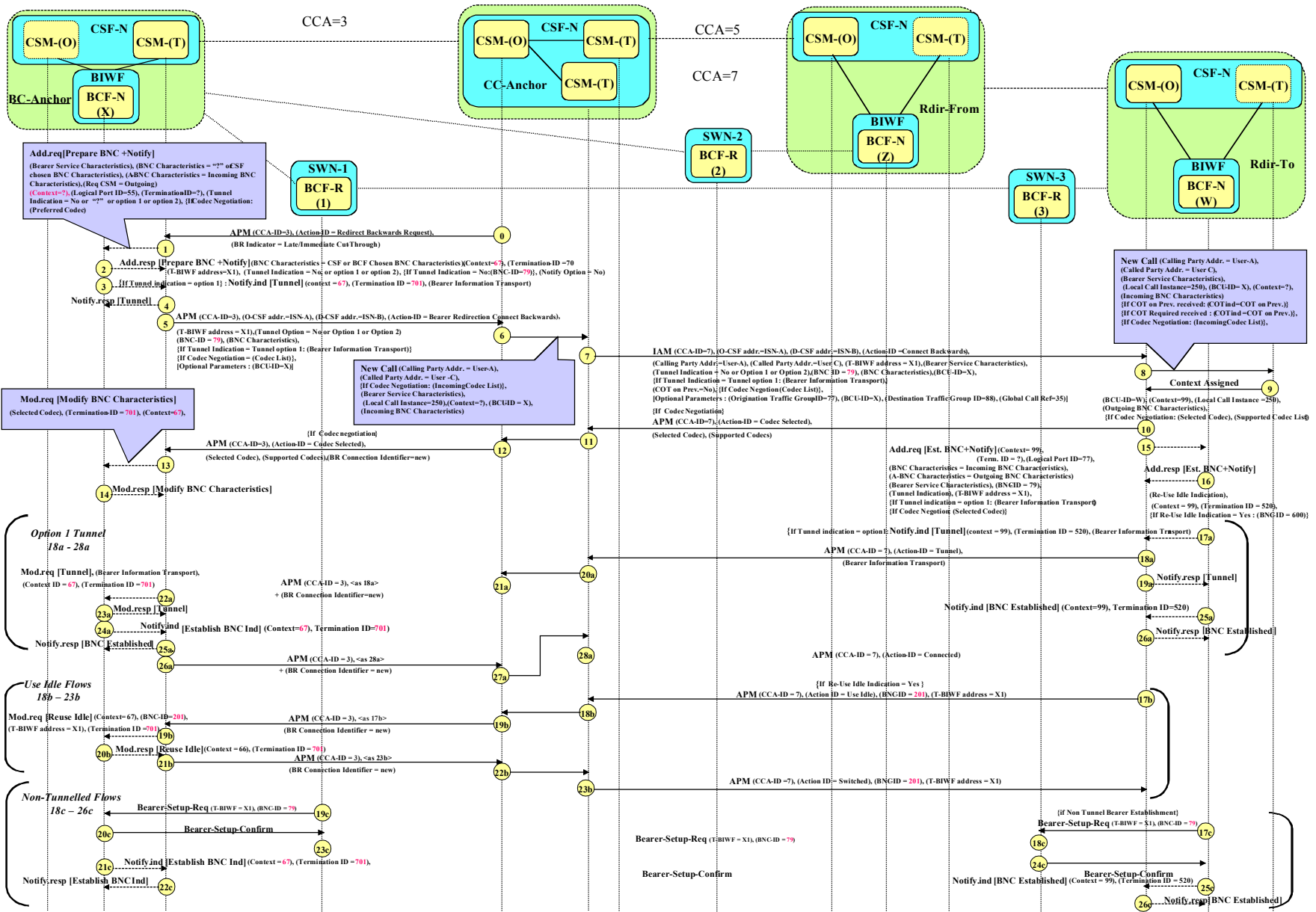
Figure 12 - Redirection backward composite flows

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Figure 12 – Redirection backward composite flows (*concluded*)

NOTE – The information flows defined here are largely defined through reference and exceptions to the main Composite establishment flows. Note that the information describing the subsequent flows in the "Processing On Receipt" section from the Composite Establishment flows does not apply here as the flow numbering is different. Which flows are caused by a given flow below is defined by the "Initiation of information flow" heading, which specifies for each flow the circumstances, or flows, which cause it to be initiated.

---

0   Bearer Redirection Request   **CC-Anchor (CSM-O) to BC-Anchor (CSM-T)**

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor	CCA-ID = 3	
D-CSF Address = BC-Anchor	Action Indicator = Bearer Redirection Request	
	Bearer Redirection indicator [Late Cut-Through = 'yes' or 'no']	

Initiation of information flow: application determines that bearer redirection should be performed.

Processing upon receipt: see backwards composite flows **information flow 0**.

1

As composite **information flow 1** except 'Context = ?'.

Initiation of information flow: **1**

2

As composite **information flow 2**.

Initiation of information flow: **2**

3

As composite **information flow 3**.

Initiation of information flow: **1**

4

As composite **information flow 4**.

Initiation of information flow: **3**

---

5   APM   **BC-Anchor (CSM-T) to CC-Anchor (CSM-O)**

Address Information	**Control information**	**Bearer information**
O-CSF Address = BC-Anchor	CCA-ID = 3	Bearer Service Characteristics
D-CSF Address = CC-Anchor	Action-ID = Bearer Redirection Connect Backwards	BIWF Address = X1
	Tunnel Indication = No, or Option 1 or Option 2 (COT on Prev. = 0),	BNC Characteristics
	(BCU-ID = X)	{If Tunnel Indication = No: (BNC-ID = 79)}
	{If tunnel Indication = option 1 : Bearer Information Transport}	{If Codec Negotiation: Codec List}

Initiation of information flow: **3**

Processing upon receipt: the CC-Anchor uses the received Bearer Information to initiate a new call leg to the Redirecting-To node according to the requirements of the service at the CC-Anchor node.

6   New Call

See backwards composite **information flow 0** except:

Address Information	**Control information**	**Bearer information**
Called Party Address = User-C	(COT on Prev. = 0)	{If Tunnel Indication = No: (BNC-ID = 79)}

Initiation of information flow: **5**

7   IAM

See backwards composite **information flow 5** except:

Address Information	**Control information**	**Bearer information**
Called Party Address = User-C	CCA-ID = 7	{If Tunnel Indication = No: (BNC-ID = 79)}
O-CSF Address = CC-Anchor,	(COT on Prev. = 0)	
D-CSF Address = Redirecting-To		

Initiation of information flow: **6**

8

See backwards composite **information flow 7**.

Initiation of information flow: **7**

9

See backwards composite **information flow 8**.

10

See backwards composite **information flow 9** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=7	

Initiation of information flow: **9**

11

This is an internal CMN primitive equivalent to **flow 9** above.

Initiation of information flow: **10**

12

As **flow 10** above except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor	CCA-ID=3	New connection Indicator
D-CSF Address = BC-Anchor		

Initiation of information flow: **11**

Processing on Receipt: in the case that the Selected Codec differs from that in use on the incoming leg, the BC-Anchor node may either instruct the BIWF to perform transcoding, or initiate the codec modification procedures.

13

See backwards composite **information flow 11** except:

Address Information	Control information	Bearer information
	Context ID = 67	
	Termination ID = 701	

Initiation of information flow: **12**

14

See backwards composite **information flow 12**.

Initiation of information flow: **13**

15

See backwards composite **information flow 13**.

Initiation of information flow: **9**

16

See backwards composite **information flow 14**.

Initiation of information flow: **14**

17a

See backwards composite **information flow 15a**.

Initiation of information flow: **15**

18a

See backwards composite **information flow 16a** except:

Address Information	Control information	Bearer information
	CCA-ID=7	

Initiation of information flow: **17a**

19a

See backwards composite **information flow 17a**.

Initiation of information flow: **17a**

20a

This is an internal CMN primitive equivalent to **flow 18a** above.

Initiation of information flow: **18a**

21a

See backwards composite **information flow 16a** except:

Address Information	Control information	Bearer information
	CCA-ID=3	New connection identifier

Initiation of information flow: **20a**

22a

See backwards composite **information flow 18a** except:

Address Information	**Control information**	**Bearer information**
	Context = 67	
	Termination Id = 701	

Initiation of information flow: **21a**

23a

See backwards composite **information flow 19a**.

Initiation of information flow: **22a**

24a

See backwards composite **information flow 20a** except:

Address Information	**Control information**	**Bearer information**
	Context = 67	
	Termination Id = 701	

Initiation of information flow: **22a**

25a

See backwards composite **information flow 21a**.

Initiation of information flow: **24a**

26a

See backwards composite **information flow 22a** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=3	New Connection Identifier

Initiation of information flow: **24a**

27a

This is an internal CMN primitive equivalent to backwards composite **information flow 22a**.

Initiation of information flow: **26a**

28a

See backwards composite **information flow 22a** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=7	

Initiation of information flow: **27a**

17b

See backwards composite **information flow 15b** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=7	

Initiation of information flow: **16**

18b

This is an internal CMN primitive equivalent to backwards composite **information flow 15b**.

Initiation of information flow: **17b**

19b

See backwards composite **information flow 15b** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=3	New Connection Identifier

Initiation of information flow: **18b**

20b

See backwards composite **information flow 16b**.

Initiation of information flow: **19b**

21b

See backwards composite **information flow 17b** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=3	New Connection Identifier

Initiation of information flow: **20b**

22b

See backwards composite **information flow 18b** except:

Address Information	**Control information**	**Bearer information**
		New Connection Identifier

Initiation of information flow: **21b**

23b

This is an internal CMN primitive equivalent to backwards composite **information flow 18b** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=7	

Initiation of information flow: **22b**

24b

See backwards composite **information flow 18b**.

Initiation of information flow: **23b**

17c

See backwards composite **information flow 15c** except:

Address Information	**Control information**	**Bearer information**
		BNC-ID = 79

Initiation of information flow: **15**

18c

See backwards composite **information flow 15c** except:

Address Information	**Control information**	**Bearer information**
		BNC-ID = 79

Initiation of information flow: **17c**

19c

See backwards composite **information flow 16c** except:

Address Information	**Control information**	**Bearer information**
		BNC-ID = 79

Initiation of information flow: **18c**

20c

See backwards composite **information flow 17c**.

Initiation of information flow: **19c**

21c

See backwards composite **information flow 18c** except:

Address Information	**Control information**	**Bearer information**
	Context ID = 67 Termination ID=701	

Initiation of information flow: **19c**

22c

See backwards composite **information flow 19c**.

Initiation of information flow: **21c**

23c

See backwards composite **information flow 20c**.

Initiation of information flow: **20c**

24c

See backwards composite **information flow 20c**.

Initiation of information flow: **23c**

25c

See backwards composite **information flow 21c**.

Initiation of information flow: **24c**

26c

See backwards composite **information flow 22c**.

Initiation of information flow: **25c**

17d

See backwards composite **information flow 15d**.

Initiation of information flow: **15**

18d

See backwards composite **information flow 16d** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=7	

Initiation of information flow: **17d**

19d

See backwards composite **information flow 17d**.

Initiation of information flow: **17d**

20d

See backwards composite **information flow 16d** (internal primitive).

Initiation of information flow: **18d**

21d

See backwards composite **information flow 16d** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=3	New Connection Identifier

Initiation of information flow: **20d**

22d

See backwards composite **information flow 18d** + Context = 67, Termination = 701.

Initiation of information flow: **21d**

23d

See backwards composite **information flow 19d**.

Initiation of information flow: **22d**

24d

See backwards composite **information flow 20d**.

Initiation of information flow: **22d**

25d

See backwards composite **information flow 21d** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=3	New Connection Identifier

Initiation of information flow: **24d**

26d

See backwards composite **information flow 22d**.

Initiation of information flow: **24d**

27d

See backwards composite **information flow 23d**.

Initiation of information flow: **20d**

28d

See backwards composite **information flow 24d**.

Initiation of information flow: **27d**

29d

See backwards composite **information flow 21d** (internal primitive).

Initiation of information flow: **25d**

30d

See backwards composite **information flow 21d** except:

Address Information	Control information	Bearer information
	CCA-ID=7	

Initiation of information flow: **29d**

31d

See backwards composite **information flow 25d**.

Initiation of information flow: **30d**

32d

See backwards composite **information flow 26d**.

Initiation of information flow: **31d**

33d

See backwards composite **information flow 27d**.

Initiation of information flow: **31d**

34d

See backwards composite **information flow 28d**.

Initiation of information flow: **33d**

---

35   Redirect Bearer Connected

Address Information	Control information	Bearer information
O-CSF Address = BC-Anchor	CCA-ID=3	New connection information
D-CSF Address = CC-Anchor	Action ID = Redirect Bearer Connected	

Initiation of information flow: **24a, 20b, 21c** or **27d**.

---

36   Mov.request

See backwards composite **information flow 31** except:

Address Information	Control information	Bearer information
	Termination ID = 701	(Send + Receive)

Initiation of information flow: 'late cut-through = no' indicated in **flow 0** above and receipt of **information flow 24a**, **20b**, **21c** or **27d**.

Processing on receipt: the BIWF moves the new termination into the same context as the original bearer and performs cut-through of the new connection.

37 Mov.response

See backwards composite **information flow 32**.

Initiation of information flow: **36**

38

See backwards composite **information flow 36**.

Initiation of information flow: 'Late cut-through = no' indicated in **flow 0** above and receipt of **information flow 37**.

39

See backwards composite **information flow 37**.

Initiation of information flow: **38**

40

See backwards composite **information flow 29**.

Initiation of information flow: **26a, 23b, 26c** or **34d**

41

See backwards composite **information flow 30**.

Initiation of information flow: **40**

42

See backwards composite **information flow 35**.

Initiation of information flow: **41**

43

See backwards composite **information flow 38**.

Initiation of information flow: alerting indication from subsequent entity.

44

See backwards composite **information flow 39** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=7	

Initiation of information flow: **43**

45

See backwards composite **information flow 40**.

Initiation of information flow: **44**

46

See backwards composite **information flow 39** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=3	

Initiation of information flow: service at CC-Anchor requires Alerting indication to be sent backwards and receipt of **flow 45**.

47

See backwards composite **information flow 40**.

Initiation of information flow: 46

---

48   APM (Bearer Redirection Cut-Through   CC-Anchor:CSM-O to BC-Anchor:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 3	New connection identifier
	Action-ID = Bearer Redirection Cut-Through	

Initiation of information flow: 'Late Cut-Through = yes' indicated in **information flow 0**, Receipt of **information flow 35** and determination by the Service at the CC-Anchor that cut-through of the new connection should take place.

49

As **flow 36** above.

Initiation of information flow: **48**

50

As **flow 37** above.

Initiation of information flow: **49**

51

As **flow 38** above.

Initiation of information flow: **50**

52

As **flow 39** above.

Initiation of information flow: **51**

---

53   APM [Bearer Redirection Release Request]   CC-Anchor:CSM-O to BC-Anchor:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 3	New connection identifier
	Action-ID = Bearer Redirection Release Request	

Initiation of information flow: receipt of **flow 35**, determination by the Service at the CC-Anchor node that the old connection should be released, and, if 'Late Cut-Through = yes' indicated in **flow 0**, then sending of **flow 48**.

---

54   APM [Bearer Redirection Release Proceed]   BC-Anchor:CSM-T to CC-Anchor:CSM-O

Address Information	**Control information**	**Bearer information**
	CCA-ID = 3	New connection identifier
	Action-ID = Bearer Redirection Release Proceed	

Initiation of information flow: **53**

55

See Call Release Composite without CMN **flow 0**.

Initiation of information flow: **54**

56

See Call Release Composite without CMN **flow 1** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=5	

Initiation of information flow: **55**

57

See Call Release Composite without CMN **flow 2**.

Initiation of information flow: **56**

58

See Call Release Composite without CMN **flow 3**.

Initiation of information flow: **56**

59

See Call Release Composite without CMN **flow 4**.

Initiation of information flow: **58**

60

See Call Release Composite without CMN **flow 5** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=5	

Initiation of information flow: **59**

61

See Call Release Composite without CMN **flow 8**.

Initiation of information flow: **60**

62 APM [Bearer Redirection Release Complete]   CC-Anchor:CSM-O to BC-Anchor:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 3 Action-ID = Bearer Redirection Release Complete	New connection identifier

Initiation of information flow: **61**

63

See Call Release Composite without CMN **flow 6**.

Initiation of information flow: **62**

64

See Call Release Composite without CMN **flow 7**.

Initiation of information flow: **63**

65

See Call Release Composite without CMN **flow 9**.

66

See backwards composite **information flow 41**.

67

See backwards composite **information flow 42** except:

| **Address Information**	**Control information**	**Bearer information**
	CCA-ID=7	

Initiation of information flow:

68

See backwards composite **information flow 43**.

69

See backwards composite **information flow 42** except:

Address Information	**Control information**	**Bearer information**
	CCA-ID=3	

Initiation of information flow: service at CC-Anchor requires transit of Answer indication and receipt of **information flow 68**.

70

See backwards composite **information flow 43**.

Initiation of information flow: **69**

5.4.3.2 Forward bearer redirection flows
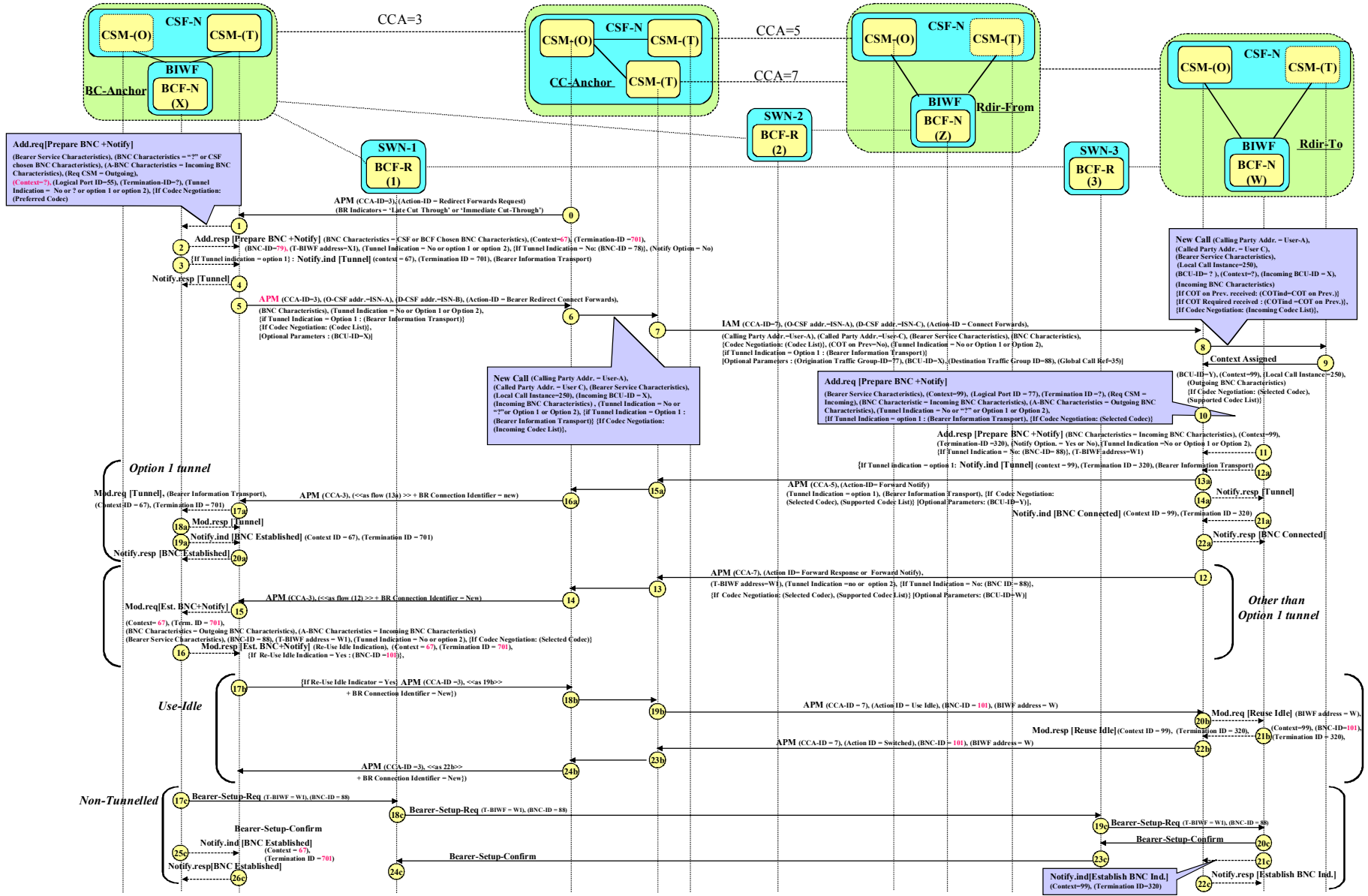
Figure 13 – Forward redirection composite flow
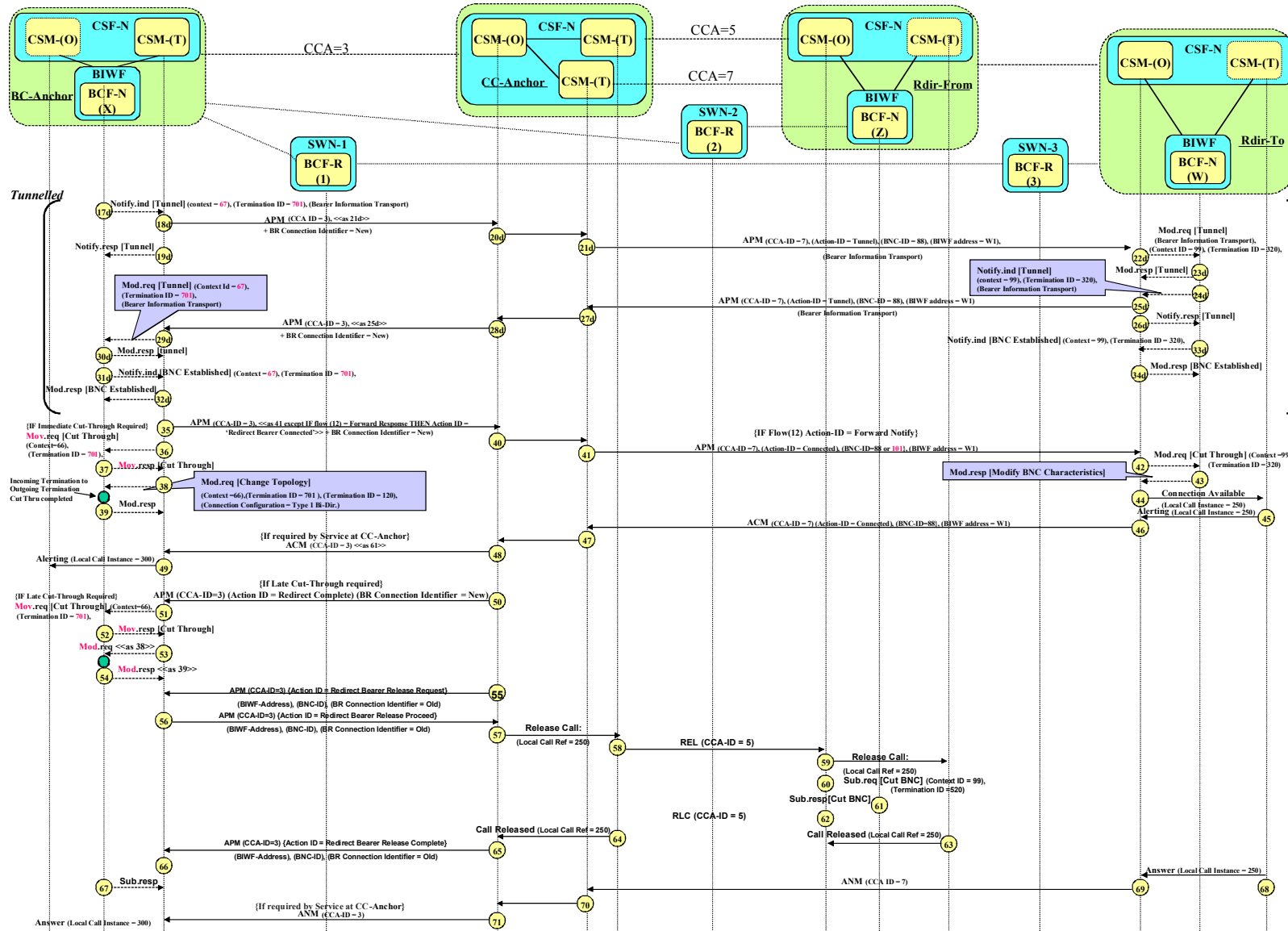
Figure 13 – Forward redirection composite flow (*concluded*)

NOTE – The information flows defined here are largely defined through reference and exceptions to the main Composite establishment flows. Note that the information describing the subsequent flows in the 'Processing On Receipt' section from the Composite Establishment flows does not apply here as the flow numbering is different. Which flows are caused by a given flow below is defined by the 'Initiation of information flow' heading, which specifies for each flow the circumstances, or flows, which cause it to be initiated.

0 Bearer Redirection Request		CC-Anchor (CSM-O) to BC-Anchor (CSM-T)
Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor	CCA-ID = 3	
D-CSF Address = BC-Anchor	Action Indicator = Bearer Redirection Forwards Request	
	Bearer Redirection indicator [Late Cut-Through = 'yes' or 'no']	

Initiation of information flow: application determines that bearer redirection should be performed.

Processing upon receipt: see forwards composite flows **information flow 0**.

1		

As composite **information flow 1** except 'Context = ?'

Initiation of information flow: **0**

2		

As composite **information flow 2** except:

Address Information	**Control information**	**Bearer information**
	Context = 67	
	Termination ID = 701	

Initiation of information flow: **1**

3		

As composite **information flow 3**.

Initiation of information flow: **1**

4		

As composite **information flow 4**.

Initiation of information flow: **3**

5 APM		BC-Anchor (CSM-T) to CC-Anchor (CSM-O)
Address Information	**Control information**	**Bearer information**
O-CSF Address = BC-Anchor	CCA-ID = 3	Bearer Service Characteristics
D-CSF Address = CC-Anchor	Action-ID = Bearer Redirection Connect Forwards	BIWF Address = X1
	Tunnel Indication = No, or Option 1 or Option 2	BNC Characteristics
	(COT on Prev. = 0)	{If Codec Negotiation: Codec List}
	(BCU-ID = X)	
	{If Tunnel Indication = option 1 : Bearer Information Transport}	

Initiation of information flow: receipt of **information flow 2** and, if Tunnel Indication = Option 1, **information flow 3**.

Processing upon receipt: the CC-Anchor uses the received Bearer and Control Information to initiate a new call leg to the Redirecting-To node according to the requirements of the service at the CC-Anchor node.

6   New Call

See forwards composite **information flow 0** except:

Address Information	Control information	Bearer information
Called Party Address = User-C	(COT on Prev. = 0),	

Initiation of information flow: **5**

7   IAM

See forwards composite **information flow 5** except:

Address Information	Control information	Bearer information
Called Party Address = User-C	CCA-ID = 7	
O-CSF Address = CC-Anchor	(COT on Prev. = 0)	
D-CSF Address = Redirecting-To		

Initiation of information flow: **6**

8

See forwards composite **information flow 7**.

Initiation of information flow: **7**

9

See forwards composite **information flow 8**.

10

See forwards composite **information flow 9**.

Initiation of information flow: **9**

11

See forwards composite **information flow 10**.

Initiation of information flow: **10**

12a

See forwards composite **information flow 11a**.

Initiation of information flow: processing of **flow 10** if Tunnel Indication = Option 1

13a

See forwards composite **information flow 12a** except:

Address Information	Control information	Bearer information
O-CSF Address = Redirecting-To	CCA-ID=7	
D-CSF Address = CC-Anchor		

Initiation of information flow: tunnel Indication = Option 1 and processing of **flow 11** and **flow 12a**.

14a

See forwards composite **information flow 13a**.

Initiation of information flow: **12a**

15a

Internal CMN primitive equivalent to **flow 10** above.

Initiation of information flow: **10**

16a

As **flow 10** above except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor D-CSF Address = BC-Anchor	CCA-ID=3	BR Connection Identifier = New

Initiation of information flow: **15a**

Processing on Receipt: in the case that the Selected Codec differs from that in use on the incoming leg, the BC-Anchor node may either instruct the BIWF to perform transcoding, or initiate the codec modification procedures.

17a

See forwards composite **information flow 14a** except:

Address Information	**Control information**	**Bearer information**
	Context ID = 67 Termination ID = 701	

Initiation of information flow: **12**

18a

See forwards composite **information flow 15a**.

Initiation of information flow: **13**

19a

See forwards composite **information flow 16a** except:

Address Information	**Control information**	**Bearer information**
	Context ID = 67 Termination ID = 701	

Initiation of information flow: **13**

20a

See forwards composite **information flow 17a**.

Initiation of information flow: **15**

21a

See forwards composite **information flow 18a**.

Initiation of information flow: **14a**

22a

See forwards composite **information flow 19a**.

Initiation of information flow: **21a**

12

See forwards composite **information flow 11** except:

Address Information	Control information	Bearer information
O-CSF Address = Redirecting-To	CCA-ID=7	
D-CSF Address = CC-Anchor		

Initiation of information flow: processing of **flow 0** and Tunnel Indication is not Option 1.

13

Internal CMN primitive equivalent to **flow 12** above.

Initiation of information flow: **12**

14

As **flow 12** above except:

Address Information	Control information	Bearer information
O-CSF Address = CC-Anchor	CCA-ID=3	BR Connection Identifier = New
D-CSF Address = BC-Anchor		

Initiation of information flow: **11**

Processing on Receipt: in the case that the Selected Codec differs from that in use on the incoming leg, the BC-Anchor node may either instruct the BIWF to perform transcoding, or initiate the codec modification procedures.

15

See forwards composite **information flow 13** except:

Address Information	Control information	Bearer information
	Context ID = 67	
	Termination ID = 701	

Initiation of information flow: **14**

16

See forwards composite **information flow 14**.

Initiation of information flow: **15**

17b

See forwards composite **information flow 18b** except:

Address Information	Control information	Bearer information
O-CSF Address = BC-Anchor	CCA-ID=3	BR Connection Identifier = New
D-CSF Address = CC-Anchor		

Initiation of information flow: processing of **flow 0** and Reuse idle indicator = Yes.

18b

This is an internal CMN primitive equivalent to **flow 17a** above.

Initiation of information flow: **17a**

19b

See forwards composite **information flow 18b** except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor D-CSF Address = Redirecting-To	CCA-ID=7	

Initiation of information flow: **18b**

20b

See forwards composite **information flow 19b**.

Initiation of information flow: **18a**

21b

See forwards composite **information flow 20b**.

Initiation of information flow: **20b**

22b

See forwards composite **information flow 21b** except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = Redirecting-To D-CSF Address = CC-Anchor	CCA-ID=7	

Initiation of information flow: **21a**

23b

This is an internal CMN primitive equivalent to **flow 22a** above.

Initiation of information flow: **22a**

24b

See forwards composite **information flow 21b** except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor D-CSF Address = BC-Anchor	CCA-ID=3	BR Connection Identifier = New

Initiation of information flow: **23b**

17c

See forwards composite **information flow 18c**.

Initiation of information flow: **15**

18c

See forwards composite **information flow 18c**.

Initiation of information flow: **17c**

19c

See forwards composite **information flow 19c**.

Initiation of information flow: **18c**

20c

See forwards composite **information flow 20c**.

Initiation of information flow: **19c**

21c

See forwards composite **information flow 21c**.

Initiation of information flow: **19c**

22c

See forwards composite **information flow 22c**.

Initiation of information flow: **21c**

23c

See forwards composite **information flow 20c**.

Initiation of information flow: **20c**

24c

See forwards composite **information flow 20c**.

Initiation of information flow: **23c**

25c

See forwards composite **information flow 24c** except:

Address Information	Control information	Bearer information
	Context ID = 67 Termination ID = 701	

Initiation of information flow: **24c**

26c

See forwards composite **information flow 25c**.

Initiation of information flow: **25c**

17d

See forwards composite **information flow 18d** except:

Address Information	Control information	Bearer information
	Context ID = 67 Termination ID = 701	

Initiation of information flow: **15**

18d

See forwards composite **information flow 19d** except:

Address Information	Control information	Bearer information
O-CSF Address = BC-Anchor D-CSF Address = CC-Anchor	CCA-ID=3	

Initiation of information flow: **17d**

19d

See forwards composite **information flow 20d**.

Initiation of information flow: **17d**

20d

See forwards composite **information flow 19d** (internal primitive).

Initiation of information flow: **18d**

21d

See forwards composite **information flow 19d** except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor D-CSF Address = Redirecting-To	CCA-ID=7	BR Connection identifier = New

Initiation of information flow: **20d**

22d

See forwards composite **information flow 21d**.

Initiation of information flow: **21d**

23d

See forwards composite **information flow 22d**.

Initiation of information flow: **22d**

24d

See forwards composite **information flow 23d**.

Initiation of information flow: **22d**

25d

See forwards composite **information flow 24d** except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = Redirecting-To D-CSF Address = CC-Anchor	CCA-ID=7	New Connection Identifier

Initiation of information flow: **24d**

26d

See forwards composite **information flow 25d**.

Initiation of information flow: **24d**

27d

See forwards composite **information flow 24d** (internal primitive).

Initiation of information flow: **25d**

28d

See forwards composite **information flow 24d** except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor	CCA-ID=3	
D-CSF Address = BC-Anchor		

Initiation of information flow: **29d**

29d

See forwards composite **information flow 26d** except:

Address Information	**Control information**	**Bearer information**
	Context ID = 67	
	Termination ID = 701	

Initiation of information flow: **30d**

30d

See forwards composite **information flow 27d**.

Initiation of information flow: **31d**

31d

See forwards composite **information flow 28d** except:

Address Information	**Control information**	**Bearer information**
	Context ID = 67	
	Termination ID = 701	

Initiation of information flow: **31d**

32d

See forwards composite **information flow 29d** except:

Address Information	**Control information**	**Bearer information**
	Context ID = 67	
	Termination ID = 701	

Initiation of information flow: **33d**

33d

See forwards composite **information flow 30d** except:

Initiation of information flow: **24d**

34d

See forwards composite **information flow 31d** except:

Initiation of information flow: **33d**

35   Redirect Bearer Connected *or* Connected

Address Information	Control information	Bearer information
O-CSF Address = BC-Anchor	CCA-ID=3	BR Connection Identifier = 'New'
D-CSF Address = CC-Anchor	*IF (Tunnel Indication = Option 1) OR (Action ID of flow 12 = 'Forward Notify') THEN*	
	Action ID = 'Connected'	
	ELSE	
	Action ID = 'Redirect Bearer Connected'	

Initiation of information flow: **15, 23a, 25c** or **33d**.

36   Mov.request

See forwards composite **information flow 33** except:

Address Information	Control information	Bearer information
	Termination ID = 701	

Initiation of information flow: 'Late cut-through = no' indicated in **flow 0** above and receipt of **information flow 15, 23a, 25c** or **33d**.

Processing on receipt: the BIWF moves the new termination into the same context as the original bearer and performs cut-through of the new connection.

37   Mov.response

See forwards composite **information flow 34**.

Initiation of information flow: **36**

38

See forwards composite **information flow 38**.

Initiation of information flow: 'Late cut-through = no' indicated in **flow 0** above and receipt of **information flow 37**.

39

See forwards composite **information flow 39**.

Initiation of information flow: **38**

40

Internal Primitive equivalent to forward composite **information flow 30**.

Initiation of information flow: **35**

41

See forwards composite **information flow 0**.

Initiation of information flow: tunnelling Indication is not Option 1 and Action ID of **flow 12** above = 'Forward Notify' and processing of **flow 40**.

42

See forwards composite **information flow 31**.

Initiation of information flow: processing of **flow 21a, 21b, 21c** or **33d**, and, if Notify Option = Yes, processing of **flow 41**.

43

See forwards composite **information flow 32**.

Initiation of information flow: **40**

44

See forwards composite **information flow 37**.

Initiation of information flow: **41**

45

See forwards composite **information flow 40**.

Initiation of information flow: alerting indication from subsequent entity.

46

See forwards composite **information flow 39** except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = Redirecting-To D-CSF Address = CC-Anchor	CCA-ID=7	

Initiation of information flow: **43**

47

See forwards composite **information flow 40**.

Initiation of information flow: **44**

48

See forwards composite **information flow 39** except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor D-CSF Address = BC-Anchor	CCA-ID=3	

Initiation of information flow: service at CC-Anchor requires Alerting indication to be sent backwards and receipt of **flow 45**.

49

See forwards composite **information flow 40**.

Initiation of information flow: **46**

---

50   APM [Bearer Redirection Cut-Through]   CC-Anchor:CSM-O to BC-Anchor:CSM-T

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor D-CSF Address = BC-Anchor	CCA-ID = 3 Action-ID = Bearer Redirection Cut-Through	BR connection identifier = New

Initiation of information flow: 'Late Cut-Through = yes' indicated in **information flow 35**, Receipt of **information flow 0** and determination by the Service at the CC-Anchor that cut-through of the new connection should take place.

51

As **flow 36** above.

Initiation of information flow: **48**

52

As **flow 37** above.

Initiation of information flow: **49**

53

As **flow 38** above.

Initiation of information flow: **50**

54

As **flow 39** above.

Initiation of information flow: **51**

---

55   APM (Bearer Redirection Release Request)   CC-Anchor:CSM-O to BC-Anchor:CSM-T

Address Information	Control information	Bearer information
O-CSF Address = CC-Anchor	CCA-ID = 3	BR Connection Identifier = Old
D-CSF Address = BC-Anchor	Action-ID = Bearer Redirection Release Request	

Initiation of information flow: receipt of **flow 35**, determination by the Service at the CC-Anchor node that the old connection should be released, and, if 'Late Cut-Through = yes' indicated in **flow 0**, then sending of **flow 48**.

---

56   APM (Bearer Redirection Release Proceed)   BC-Anchor:CSM-T to CC-Anchor:CSM-O

Address Information	Control information	Bearer information
O-CSF Address = BC-Anchor	CCA-ID = 3	BR Connection Identifier = Old
D-CSF Address = CC-Anchor	Action-ID = Bearer Redirection Release Proceed	

Initiation of information flow: **53**

57

See Call Release Composite without CMN **flow 0**.

Initiation of information flow: **54**

58

See Call Release Composite without CMN **flow 1** except:

Address Information	Control information	Bearer information
O-CSF Address = CC-Anchor	CCA-ID=5	
D-CSF Address = Redirecting-From		

Initiation of information flow: **55**

59

See Call Release Composite without CMN **flow 2**.

Initiation of information flow: **56**

60

See Call Release Composite without CMN **flow 3**.

Initiation of information flow: **59**

61

See Call Release Composite without CMN **flow 4**.

Initiation of information flow: **58**

62

See Call Release Composite without CMN **flow 5** except:

Address Information	Control information	Bearer information
O-CSF Address = Redirecting-From D-CSF Address = CC-Anchor	CCA-ID=5	

Initiation of information flow: **59**

63

See Call Release Composite without CMN **flow 9**.

Initiation of information flow: call Released from Subsequent node.

64

See Call Release Composite without CMN **flow 9**.

Initiation of information flow: **60**

---

65   APM (Bearer Redirection Release Complete)   CC-Anchor:CSM-O to BC-Anchor:CSM-T

Address Information	Control information	Bearer information
O-CSF Address = CC-Anchor D-CSF Address = BC-Anchor	CCA-ID = 3 Action-ID = Bearer Redirection Release Complete	New connection identifier

Initiation of information flow: **64**

66

See Call Release Composite without CMN **flow 6**.

Initiation of information flow: **62**

67

See Call Release Composite without CMN **flow 7**.

Initiation of information flow: **63**

68

See forwards composite **information flow 43**.

69

See forwards composite **information flow 44** except:

Address Information	Control information	Bearer information
O-CSF Address = Redirecting-To D-CSF Address = CC-Anchor	CCA-ID=7	

Initiation of information flow: **68**

70

See forwards composite **information flow 43**.

71

See forwards composite **information flow 42** except:

Address Information	**Control information**	**Bearer information**
O-CSF Address = CC-Anchor D-CSF Address = BC-Anchor	CCA-ID=3	

Initiation of information flow: service at CC-Anchor requires transit of Answer indication and receipt of **information flow 68**.
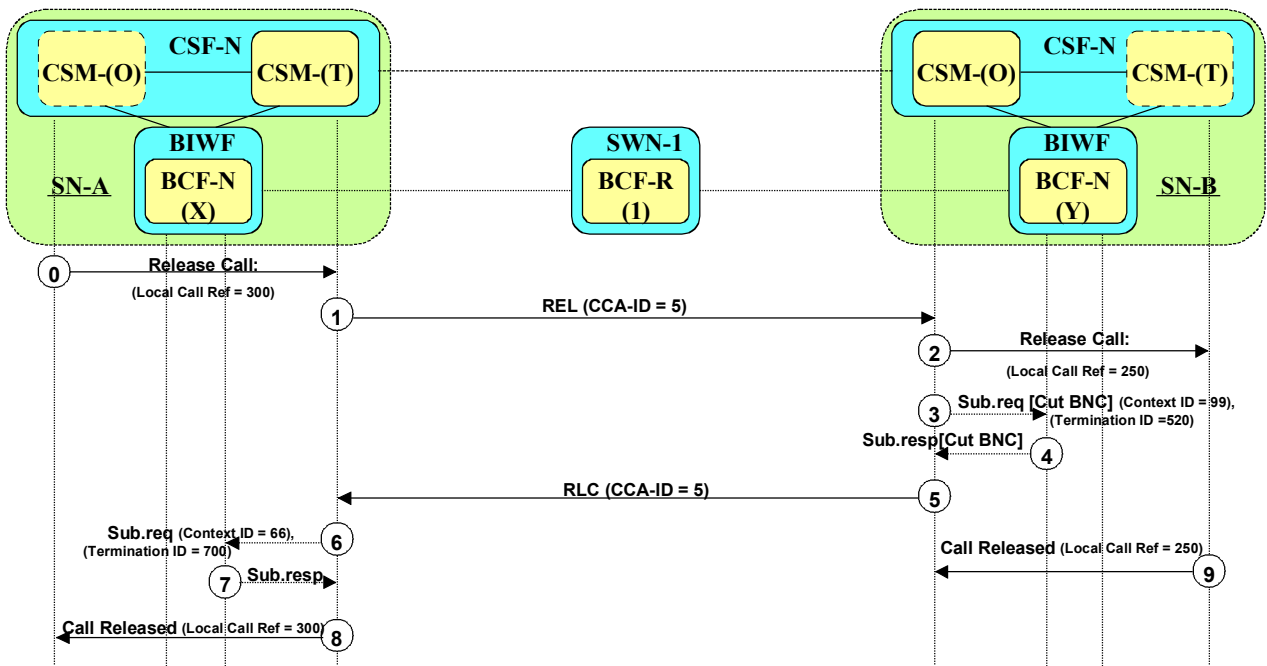
72

See forwards composite **information flow 45**.

Initiation of information flow: **69**

5.5 Call release

The following two flows cover the cases without and with a CMN node in the signalling path between two SNs.

5.5.1 Call release composite without CMN

Figure 14 – Call release without a CMN node

The following numbered items describe the numbered flows shown above.

---

0   **Release Call**   **SN-A:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	

Initiation of information flow: release Call request from the CSM-O.

Processing upon receipt: when this information flow is received, the CSM-T will initiate call release by issuing **information flow 1** and wait for a response from SN-B:CSM-O.

1	REL		SN-A:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
O-CSF Address = SN-A	CCA-ID = 5	
D-CSF Address = SN-B		

Initiation of information flow: reception and processing of **information flow 0**.

Processing upon receipt: when SN-B receives this information flow it notifies its peer CSM within the SN-B by issuing **information flow 2** and removes the termination from the context within BIWF-Y by issuing **information flow 3** towards the BIWF.

2	Release Call		SN-B:CSM-O to SN-B:CSM-T

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	

Initiation of information flow: reception and processing of **information flow 1**.

Processing upon receipt: when this information flow is received, the CSM-T will initiate call release on the facilities that it is associated and await the information flow from its peer outside of SN-B indicating call clearing. It then would proceed to clear the CSM and respond with **information flow 9**.

3	SUB.req [Cut BNC]		SN-B:CSM-T to BIWF-Y

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 1000	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 1**.

Processing upon receipt: when the BIWF receives **information flow 3**, it validates the request. The BIWF proceeds to subtract the specified termination from the specified context, thereby severing the communication from the rest of the terminations associated with the context. It may start an idle bearer timer associated with this termination if the BIWF initially established the BNC. When the timer expires, the BIWF could begin bearer removal if the bearer was initially established by this BIWF. The BIWF issues **information flow 4** indicating reception of the SUB request.

Special NOTE – The Idle Bearer Timer can be provisioned to have a value between "0" and infinity. A BNC established by a tunnel-based protocol in essence has a timer value of "0" since the BNC will be immediately released without any peer-to-peer action.

4	SUB.resp [BNC Prepared]		BIWF-Y to SN-B:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 1000	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 3**.

Processing upon receipt: when the CSM-O receives **information flow 4**, CSM-T is aware that the incoming BNC has been removed from the context. It will send **information flow 5** indicating that the call is in process of being released and that the CCA-ID can be reused.

5   **RLC**   **SN-B:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	

Initiation of information flow: reception and processing of **information flow 5**.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 6** towards the BIWF requesting that the termination be removed from the context. The CSM awaits confirmation of this request.

---

6   **SUB.req**   **SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 1000	
CCU-Control-Address of "SN-A"	Context-ID = "?" or 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 5**.

Processing upon receipt: when the BIWF receives **information flow 6**, it validates the request. The BIWF proceeds to subtract the specified termination from the specified context, thereby severing the communication from the rest of the terminations associated with the context. It may start an idle bearer timer associated with this termination if the BIWF initially established the BNC. When the timer expires, the BIWF could begin bearer removal if the bearer was initially established by this BIWF. The BIWF issues **information flow 7** indicating reception of the SUB request.

Special NOTE – The Idle Bearer Timer can be provisioned to have a value between "0" and infinity A BNC established by a tunnel-based protocol in essence has a timer value of "0" since the BNC will be immediately released without any peer-to-peer action.

---

8   **Call Released**   **SN-A:CSM-T to SN-A:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	

Initiation of information flow: reception and processing of **information flow 7**.

Processing upon receipt: the CSM-O initiates "Kills" the state machine when this information flow is received. The Call is cleared within this SN.

---

9   **Call Released**   **SN-B:CSM-T to SN-B:CSM-O**

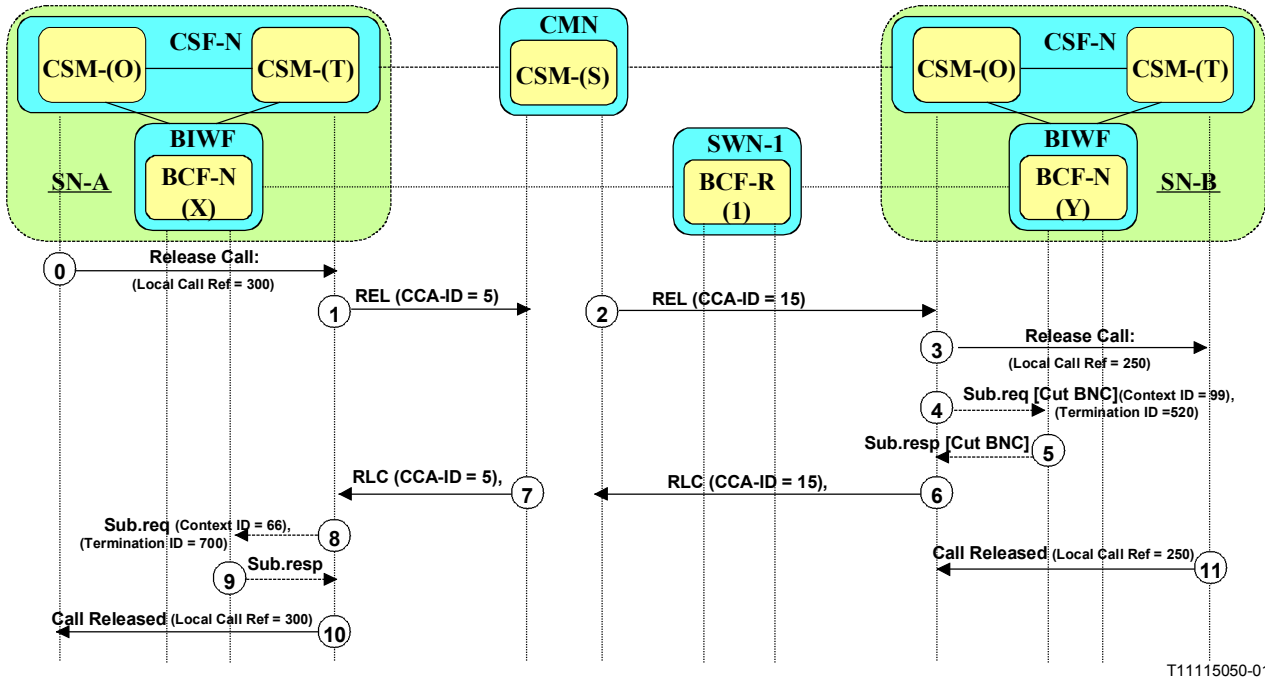| **Address Information**	**Control information**	**Bearer information**
	Local Call Instance = 250	

Initiation of information flow: the CSM-T has indicated by **information flow 9** that the call state machine has been "Killed".

Processing upon receipt: the CSM-O initiates "Kills" the state machine when this information flow is received. The Call is cleared within this SN.

5.5.2   Call release composite with CMN

Figure 15 – Call release with a CMN node

The following numbered items describe the numbered flows shown above.

0	**Release Call**		**SN-A:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	

Initiation of information flow: release Call request from the CSM-O.

Processing upon receipt: when this information flow is received, the CSM-T will initiate call release by issuing **information flow 1** and wait for a response from SN-B:CSM-O.

1	**REL**		**SN-A:CSM-T to CMN:CSM-S**

Address Information	**Control information**	**Bearer information**
O-CSF Address = SN-A	CCA-ID = 5	
D-CSF Address = SN-B		

Initiation of information flow: reception and processing of **information flow 0**.

Processing upon receipt: when CMN:CSM-S receives this information flow it records the call release request and forwards the request to SN-B by issuing **information flow 2** and awaits the release complete information from SN-B.

2	**REL**		**CMN:CSM-S to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
O-CSF Address = SN-A	CCA-ID = 15	
D-CSF Address = SN-B		

Initiation of information flow: reception and processing of **information flow 1**.

Processing upon receipt: when SN-B receives this information flow it notifies its peer CSM within the SN-B by issuing **information flow 3** and removes the termination from the context within BIWF-Y by issuing **information flow 4** towards the BIWF.

3	Release Call		SN-B:CSM-O to SN-B:CSM-T

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	

Initiation of information flow: reception and processing of **information flow 2**.

Processing upon receipt: when this information flow is received, the CSM-T will initiate call release on the facilities that it is associated and await the information flow from its peer outside of SN-B indicating call clearing. It then would proceed to clear the CSM and respond with **information flow 11**.

4	SUB.req [Cut BNC]		SN-B:CSM-T to BIWF-Y

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 1000	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 2**.

Processing upon receipt: when the BIWF receives **information flow 4**, it validates the request. The BIWF proceeds to subtract the specified termination from the specified context, thereby severing the communication from the rest of the terminations associated with the context. It may start an idle bearer timer associated with this termination if the BIWF initially established the BNC. When the timer expires, the BIWF could begin bearer removal if the bearer was initially established by this BIWF. The BIWF issues **information flow 5** indicating reception of the SUB request.

Special NOTE – The Idle Bearer Timer can be provisioned to have a value between "0" and infinity. A BNC established by a tunnel-based protocol in essence has a timer value of "0" since the BNC will be immediately released without any peer-to-peer action.

5	SUB.resp [BNC Prepared]		BIWF-Y to SN-B:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 1000	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 4**.

Processing upon receipt: when the CSM-O receives **information flow 5**, CSM-T is aware that the incoming BNC has been removed from the context. It will send **information flow 6** indicating that the call is in process of being released and that the CCA-ID can be reused.

6	RLC		SN-B:CSM-O to CMN:CSM-S

Address Information	**Control information**	**Bearer information**
	CCA-ID = 15	

Initiation of information flow: reception and processing of **information flow 5**.

Processing upon receipt: when CSM-S receives this information flow, it issues **information flow 7** towards SN-A, and "Kills" the state machine thereby clearing the call.

7	RLC		CMN:CSM-S to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	

Initiation of information flow: reception and processing of **information flow 6**.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 8** towards the BIWF requesting that the termination be removed from the context. The CSM awaits confirmation of this request.

8   SUB.req   **SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 1000 Context-ID = "?" or 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 7**.

Processing upon receipt: when the BIWF receives **information flow 8**, it validates the request. The BIWF proceeds to subtract the specified termination from the specified context, thereby severing the communication from the rest of the terminations associated with the context. It may start an idle bearer timer associated with this termination if the BIWF initially established the BNC. When the timer expires, the BIWF could begin bearer removal if the bearer was initially established by this BIWF. The BIWF issues **information flow 9** indicating reception of the SUB request.

Special NOTE – The Idle Bearer Timer can be provisioned to have a value between "0" and infinity A BNC established by a tunnel-based protocol in essence has a timer value of "0" since the BNC will be immediately released without any peer-to-peer action.

---

9   SUB.resp   **BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 1000 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 8**.

Processing upon receipt: when the CSM-T receives **information flow 7**, CSM-T will send **information flow 10** to its peer within SN-A indicating that the call has been cleared. It then "Kills" the state machine. Note that this action releases the associations with its peers and the BIWF.

---

10   Call Released   **SN-A:CSM-T to SN-A:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	

Initiation of information flow: reception and processing of **information flow 9**.

Processing upon receipt: the CSM-O initiates "Kills" the state machine when this information flow is received. The Call is cleared within this SN.

---

11   Call Released   **SN-B:CSM-T to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	

Initiation of information flow: the CSM-T has indicated by **information flow 9** that the call state machine has been "Killed".

Processing upon receipt: the CSM-O initiates "Kills" the state machine when this information flow is received. The Call is cleared within this SN.
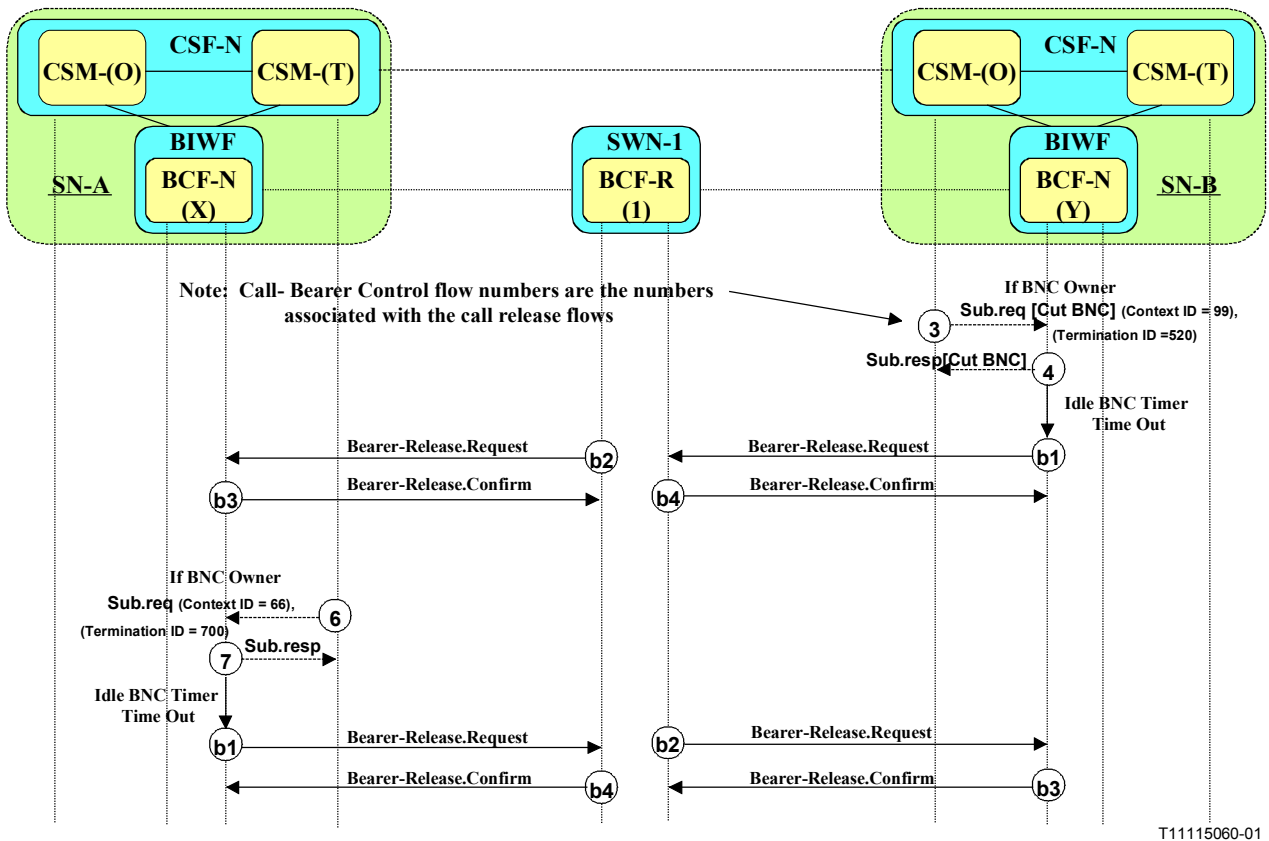
5.6 Bearer release

Figure 16 – Non-tunnel bearer release

The following numbered items describe the numbered flows shown above.

---

3   SUB.req [Cut BNC]   SN-B:CSM-T to BIWF-Y

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 1000 Context-ID = 99 Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 1**.

Processing upon receipt: when the BIWF receives **information flow 3**, it validates the request. The BIWF proceeds to subtract the specified termination from the specified context, thereby severing the communication from the rest of the terminations associated with the context. It may start an idle bearer timer associated with this termination if the BIWF initially established the BNC. When the timer expires, the BIWF could begin bearer removal if the bearer was initially established by this BIWF. The BIWF issues **information flow 4** indicating reception of the SUB request.

Special NOTE – The Idle Bearer Timer can be provisioned to have a value between "0" and infinity. A BNC established by a tunnel-based protocol in essence has a timer value of "0" since the BNC will be immediately released without any peer-to-peer action.

4	SUB.resp [BNC Prepared]		BIWF-Y to SN-B:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 1000 Context-ID = 99 Termination ID = 520	

Initiation of information flow: reception and processing of **information flow 3**.

Processing upon receipt: when the CSM-O receives **information flow 4**, CSM-T is aware that the incoming BNC has been removed from the context. It will send **information flow 5** indicating that the call is in process of being released and that the CCA-ID can be reused.

b1	Bearer-Release.Req		BIWF(Y) to SWN(1)

Address Information	**Control information**	**Bearer information**
	BCS-ID = "15",	

Initiation of information flow: idle BNC Timer Time out and BIWF initially established the BNC and non-tunnel option has been chosen by the BIWF

Processing upon receipt: the selected switching node validates the request, breaks the internal connection, and issues **information flow b2** towards BIWF(X) and **information flow b4** towards BIWF(Y), and awaits bearer release confirm from BIWF(X).

b2	Bearer-Release.Req		SWN(1) to BIWF(x)

Address Information	**Control information**	**Bearer information**
	BCS-ID = "65"	

Initiation of information flow: processing of **information flow b1**.

Processing upon receipt: the selected Bearer Interworking Function releases the BNC, and issues the **information flow b3** towards SWN-1 and since this example assumes that the bearer control has already subtracted the termination from the context, clears the termination and its associated information.

b3	Bearer-Release.Confirm		BIWF(X) to SWN(1)

Address Information	**Control information**	**Bearer information**
	BCS-ID = "65"	

Initiation of information flow: processing of **information flow b2**.

Processing upon receipt: the switching node notes the confirmation of the release request clears the connection state machines. No further action is required.

b4	Bearer-Release.Confirm		SWN(1) to BIWF(Y)

Address Information	**Control information**	**Bearer information**
	BCS-ID = "15"	

Initiation of information flow: processing of **information flow b1**.

Processing upon receipt: the selected Bearer Interworking Function validates the request and clears the termination state machine and its associated information. No further action is required.

6	SUB.req		SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 1000	
CCU-Control-Address of "SN-A"	Context-ID = "?" or 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 5**.

Processing upon receipt: when the BIWF receives **information flow 6**, it validates the request. The BIWF proceeds to subtract the specified termination from the specified context, thereby severing the communication from the rest of the terminations associated with the context. It may start an idle bearer timer associated with this termination if the BIWF initially established the BNC. When the timer expires, the BIWF could begin bearer removal if the bearer was initially established by this BIWF. The BIWF issues **information flow 7** indicating reception of the SUB request.

Special NOTE – The Idle Bearer Timer can be provisioned to have a value between "0" and infinity A BNC established by a tunnel-based protocol in essence has a timer value of "0" since the BNC will be immediately released without any peer-to-peer action.

7	SUB.resp		BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 1000	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 6**.

Processing upon receipt: when the CSM-T receives **information flow 7**, CSM-T will send **information flow 8** to its peer within SN-A indicating that the call has been cleared. It then "Kills" the state machine. Note that this action releases the associations with its peers and the BIWF.

b1	Bearer-Release.Req		BIWF(X) to SWN(1)

Address Information	**Control information**	**Bearer information**
	BCS-ID = "15"	

Initiation of information flow: idle BNC Timer Time out and BIWF initially established the BNC and non-tunnel option has been chosen by the BIWF

Processing upon receipt: the selected switching node validates the request, breaks the internal connection, and issues **information flow b2** towards BIWF(Y) and **information flow b4** towards BIWF(X), and awaits bearer release confirm from BIWF(X).

b2	Bearer-Release.Req		SWN(1) to BIWF(Y)

Address Information	**Control information**	**Bearer information**
	BCS-ID = "65"	

Initiation of information flow: processing of **information flow b1**.

Processing upon receipt: the selected Bearer Interworking Function releases the BNC, and issues the **information flow b3** towards SWN-1 and since this example assumes that the bearer control has already subtracted the termination from the context, clears the termination and its associated information.

b3   **Bearer-Release.Confirm**   **BIWF(Y) to SWN(1)**

Address Information	**Control information**	**Bearer information**
	BCS-ID = "65"	

Initiation of information flow: processing of **information flow b2**.

Processing upon receipt: the switching node notes the confirmation of the release request clears the connection state machines. No further action is required.

---

b4   **Bearer-Release.Confirm**   **SWN(1) to BIWF(X)**

Address Information	**Control information**	**Bearer information**
	BCS-ID = "15"	

Initiation of information flow: processing of **information flow b1**.

Processing upon receipt: the selected Bearer Interworking Function validates the request and clears the termination state machine and its associated information. No further action is required

---

Annex A

Composite structured AAL 1 signalling flows

For networks that provide for the use of structured AAL 1 bearers, each BCF manages pools of bearer network connections to adjacent SNs. Within each pool there are two sets of bearers: those set up (and thus "owned") by this BCF, and those set up by the remote BCF (and thus not "owned" by this BCF). Both sets are further divided into subsets, each subset associated with a structured AAL 1 bearer. At any moment in time, any of these pools may be non-existent or empty. The management of bearers within the pools, sets and subsets, i.e. what bearers are in which pools, sets and subsets, is not subject to standardization.

The bearers within the pools are labeled with BNC-IDs. For bearers owned by this BCF the BNC-ID was allocated by the far BCF, and for those bearers owned by the far BCF the BNC-ID was allocated by this BCF.

For a bearer network connection associated with a structured AAL 1 bearer, the BNC-ID is four octets long and structured as (X, n). The first three octets (X) are used to identify the structured AAL 1 connection. The fourth octet (n) is used to identify a particular channel within the structured AAL 1 bearer. The fourth octet is interpreted as a binary number indicating the channel within the structured AAL 1 bearer. The values of 0000 0000 and 1111 1111 within the fourth octet are reserved and should not be used to indicate channels within a structured AAL 1 bearer.

During the call setup procedure, when a new bearer connection is to be set up, a structured AAL 1 bearer consisting of 'n' channels is set up, 'n' being the value coded in the fourth octet of the BNC-ID, (X, n), carried in the BICC protocol. The call is associated with the BNC-ID, (X, n), and the remaining (n-1) BNC-Ids are marked as corresponding to idle bearer network connections associated with the structured AAL 1. In other words, the BNC-Ids (X, 1) to (X, n-1) are idle and can be used for new calls.

During the call set up procedure, when an idle bearer network connection associated with a structured AAL 1 bearer is to be reused, the corresponding BNC-ID is transferred by the BICC protocol to indicate to the remote BCF which bearer network connection is to be reused for the call. A BCF can only select a bearer network connection for reuse that it originally set up, i.e. one that it owns.

Example of BNC-ID usage

The BNC-ID value of 3846 is used to illustrate how the BNC-ID is used for structured AAL 1 bearer. The first three octets are used to identify the structured AAL 1 bearer and the fourth octet identifies the channel within the AAL 1 structure that is to be used for the call. In the example below the value of 16390 is derived from a backbone connection identifier of:

0000 0000

0000 0000

0000 1111

(3840)

This is combined with the channel identifier value of:

0000 0110

(6)

These four octets combine to form the BNC-ID and have a value of 3846.

For the purpose of this Supplement, the BNC-ID value of 7938 is used as an example of a reuse of an idle channel within a Structured AAL 1 Bearer. The BNC-ID value of 16528 is used as an example of another value that can used as a new Structured AAL 1 Bearer.

A.1 Changes to "Backward Backbone Network Establishment Composite Flow" procedures necessary to support structured AAL 1 bearers

Structured AAL 1 Composite Flows for Backward Backbone Network Establishment are identical to the flows in 5.3.1 with the following exceptions. In the following flows, text that is removed is shown with a strike through, text that is added is shown with an underline.

Flow 0: **no change**.

1	ADD.req [Prepare BNC with notification]	SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 1000	BNC Characteristics = "?" or CSF chosen BNC
CCU-Control-Address of "SN-A"	Context-ID = "?" or 66	Characteristics
Requesting CSM = Outgoing	Termination ID = "?"	A-BNC Characteristics = (Incoming-BNC-
	Logical Port ID = 55	Characteristics)
	Tunnel Indication = No, ~~or "?" or option 1 or~~	Bearer Service Characteristic
	~~option 2~~	~~{If Codec Negotiation : Preferred Codec}~~
	Notify option: <Termination Event>	

Initiation of information flow: reception and processing of **information flow 0**.

Processing upon receipt: when the BIWF receives **information flow 1**, it validates the request. The BIWF proceeds to select the bearer transport technology based upon the Incoming BNC characteristics~~, the Preferred Codec if included,~~ and the available bearer transport types associated with the route specified by the Logical Port ID and capacity of each type of bearer transport available on the selected route. If the BIWF is requested to create a new context, a new Context ID (= 66) is created. Otherwise the BIWF will use the Context ID supplied by the CSF. It then selects the Termination ID to be "700" and adds this Termination to the Context. ~~If the received tunnel indication specifies "No" tunnelling, or if the BIWF does not select tunnelling, the BIWF selects a BNC-ID (78) and associates this value with the chosen Termination ID.~~ The BIWF selects Structured AAL 1 Bearer and uses a four octet BNC-ID and selects the value BNC-ID = 3846 and associates this value and the BIWF Address with the chosen Termination ID. The selection of this BNC-ID value also causes the BCF to assign BNC-IDs to the other channels within the Structured AAL 1. These channels are not marked as idle until the reception of **flow 16c**.

~~If the selected bearer transport technology is based on a non-tunnel establishment mode, the~~ The BIWF determines the bearer signalling association that should be used to establish this BNC Connection. One or more bearer control signalling associations could be used to establish a BNC within the specified Logical Port representing the outgoing route towards the destination Serving Node (SN-B). In this example the chosen T-BIWF-Address is "X1" which represents the chosen bearer control signalling entity to be used to establish the desired BNC. The Tunnel Indication information object to be included within **information flow 2** is set to "No".

~~If the selected bearer transport technology is based on a tunnel establishment mode, no explicit bearer control signalling association is required. However, a BIWF address associated with the logical port is also selected in order to differentiate the chosen BNC-ID value from other BNC-ID values generated by different BIWFs. In addition, the CSF needs to be notified that Tunnelling operation is to be supported since it will need to be ready to accept the "Bearer Information Transport" information object from the BIWF and carry this information object within the SN to SN signalling flows. Setting the Tunnel Indication information object to either Option 1 or Option 2 performs this notification. (Note: Tunnel establishment mode can only be selected if the CSF has indicated a "?" or indicated a selected option within the Tunnel Indicator. The question mark within the received Tunnel Indication indicates that the CSF has given permission to the BIWF to select Tunnelled or non-Tunnelled operation. A "No" indication specifies that the BIWF can not select tunnelled operation, while either Option 1 or Option 2 indicates that the BIWF can select the Tunnelled operation, but must use the specified tunnel option.) The returned Tunnelled Indication will either contain a "No" or the selected tunnelling option.~~

The Outgoing BNC Characteristics, Context ID, Termination ID, BNC-ID, BIWF Address associated with the Logical Port, and Tunnel Indication are all returned to the CSF in **information flow 2**. The Outgoing BNC Characteristics is set to "Structured AAL 1" and the Tunnel Indication is set to "No". ~~If Tunnelling option 1 operation is specified, the BIWF will immediately issue~~ **~~information flow 3~~** ~~containing the Bearer Information Transfer information object, the BIWF Address, and the BNC-ID to the CSF and awaits the CSF's reception of~~ **~~information flow 4~~** ~~confirming the reception of the Bearer Information Transport information object.~~

Special NOTE – Since the Requesting CSM is associated with the outgoing termination, the BIWF cannot request a notify option to be sent to the peer BIWF. In this case, the Notify Option is set to No. If the Requesting CSM was associated with the incoming termination, the BIWF could request that its peer notifies it when the connection is established.

2	**ADD.resp [BNC Prepared]**	**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 1000	BNC Characteristics = (Chosen-BNC-Characteristics)
CCU-Control-Address of "SN-A"	Context-ID = 66	BNC-ID = ~~78~~ 3846
	Termination ID = 700	BIWF Address = X1
	Tunnel Indication = No ~~or option 1 or option 2~~	Notify Option = No

Initiation of information flow: reception and processing of **information flow 1**.

Processing upon receipt: when the CSM-T receives **information flow 2**, CSM-T will send **information flow 6** ~~if there is no codec negotiation procedure being conducted and the Tunnel Indication does not specify the tunnel option 1~~, to the CSM-O. ~~Otherwise the CSM-T will wait for information flow 4 before issuing information flow 6.~~ **Information flow 6** will include the Context ID (66) received in **information flow 2** and the selected BIWF's control identity (BCU-ID = X), and the outgoing BNC Characteristics.

~~If the Tunnel Indicator does not specify Option 1, the~~ The CSM-T will issue an IAM signalling flow (**information flow 5**) to its peer CSM contained in SN-B indicating backward bearer establishment, ~~optionally with codec negotiation~~, and Tunnelling indications. In addition, this IAM contains the BNC-ID, the BIWF Address, and the BNC Characteristics as received in **information flow 2**. The

IAM may also contain the BCU-ID that represents the selected BIWF's control identity that was selected by the CSF. ~~And may contain a Codec List if codec negotiation has been requested.~~ The IAM also can indicate "COT on previous" if the following conditions are satisfied.

[If a COT on Previous has been received, or if a COT Required has been received, or that the connection within the SN has not been completed].

~~If the Tunnel Indicator specifies Option 1, The CSM-T will wait for the Bearer Information Transport information object that is contained in **information flow 3** before issuing **information flow 5**.~~

The CSM-T awaits further information concerning the call and bearer establishment either explicitly from its peer or from the selected BIWF.

Flows 3-4: **not applicable**.

5	IAM		SN-A:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
Calling Party Address = User-A	CCA-ID = 5	Bearer Service Characteristics
Called Party Address = User-B	Action-ID = Connect Backwards	BNC-ID = ~~78~~ 3846
O-CSF Address = SN-A	Tunnel Indication = No	BIWF Address = X1
D-CSF Address = SN-B	(COT on Prev. = 1 or 0),	BNC Characteristics
	(Origination Traffic Group ID = 77)	~~{If Codec Negotiation: Codec List}~~
	(Destination Traffic Group ID = 88)	
	(Global Call Ref. = 35)	
	(BCU-ID = X)	
	~~{If tunnel Indication = option 1 : Bearer~~	
	~~Information Transport}~~	

Initiation of information flow: reception and processing of **information flow 2** ~~if no tunnel or tunnel option 2 or reception and processing of **information flow 3** if tunnel option 1 is indicated in information flow 2~~.

Processing upon receipt: when SN-B receives this information flow it creates CSM-O. The CSM-O decides to defer the BIWF selection to CSM-T. Therefore, the CSM-O sends **information flow 7** to CSM-T, including:

• Incoming BCU-ID, as received in IAM;

• COTind reflecting the status of the incoming link [Circuit not available (COT on Prev.), or Circuit available (No COT)];

• Codec List (Optional), sent if received in IAM;

• Incoming BNC Characteristics;

• Incoming Bearer Service Characteristics;

• Incoming Tunnel Indication;

• A request for Context assignment (Context ID = "?") and BCU assignment (BCU-ID = "?");

• Calling Party and Called Party Address;

• And the Local Call Instance associating the CSMs to the incoming call request.

The CSM-O awaits the BCU and Context assignment (**information flow 8**) before continuing processing the incoming information flow.

6   Context Assigned   **SN-A:CSM-T to SN-A:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 300	BCU-ID = X
		Context ID = 66
		Outgoing BNC Characteristics

Initiation of information flow: reception and processing of **information flow 2** ~~or information flow 3~~ ~~and no Codec Negotiation.~~

Processing upon receipt: the CSM-O continues the originating information flow as specified by the access flows related to the protocol interface type used on the originating side of the SN.

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7   New Call   **SN-B:CSM-O to SN-B:CSM-T**

Address Information	**Control information**	**Bearer information**
Called-Party-Address = User B	Local Call Instance = 250	Incoming BCU-ID = X if received
Calling Party Address = User A	COTind = COT on Prev. or No COT	BIWF Address = X1
	Incoming Tunnel Indication = No~~, or Option 1, or Option 2~~	BCU-ID = "?"
		Context ID = "?"
	(Origination Traffic Group ID = 77)	Bearer Service Characteristics
	(Destination Traffic Group ID = 88)	Incoming BNC Characteristics
	(Global Call Ref. = 35)	~~{If Codec Negotiation: (Incoming Codec List)},~~

Initiation of information flow: reception and processing of the IAM (**information flow 6**).

Processing upon receipt: when the CSM-T receives this information flow, it initiates the terminating information flow specified by the access flows related to the protocol interface type used on the terminating side of the SN.

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8   Context Assigned   **SN-B:CSM-T to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
	Local Call Instance = 250	BCU-ID = Y
		Context ID = 99
		Outgoing BNC Characteristics,
		~~{If Codec Negotiation: Selected Codec, and Supported Codec List}~~

Initiation of information flow: CSM-T has assigned the context and BIWF for the call. Triggered by **information flow 7**.

Processing upon receipt: the CSM-O initiates the backward establishment procedure requested by **information flow 5** by issuing **information flow 13**. ~~Information flow 9 is only issued if a Codec Negotiation flow was requested within **information flow 5**.~~ **Information flow 13** requests that a new <u>Structured AAL 1 Bearer</u> ~~BNC~~ be created between BIWF(X) and BIWF(Y). In addition, **information flow 13** requests the creation of a new termination within the context specified by **information flow 8** if no idle <u>channel within an existing Structured AAL 1 Bearer</u> ~~BNC~~ meet the requirements specified by the Bearer Service Characteristics, BNC Characteristics.~~, and the Selected Codec type (**if provided in flow 13**).~~ If a new termination is to be created, the BIWF Address and the BNC-ID are to be associated with this new termination. The Tunnel Indication information object specifies if Tunnelled or non-Tunnelled operation should be used in the establishment operation of this new BNC. If BIWF selects an idle <u>channel</u> ~~BNC~~ is to be used, the termination associated with this idle <u>channel</u> ~~BNC~~ will be added to the context specified by **information flow 8** and the termination ID, the BNC-ID, and an indication to use this idle <u>channel</u> ~~BNC~~ will be returned to the CSF.

Flows 9-12: **not applicable**.

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 5000	BNC Characteristics = (Incoming BNC
CCU-Control-Address of "SN-B"	Context-ID = 99	Characteristics)
	Termination ID = "?"	A-BNC Characteristics = (Outgoing-BNC-
	Logical Port ID = 77	Characteristics)
	Tunnel Indication = Incoming Tunnel Indication	Bearer Service Characteristic
	Notify option: <Termination Event>	BNC-ID = ~~78~~3846
	{If tunnel Indication = option 1 : Bearer	BIWF Address = X1
	Information Transport}	{If Codec Negotiation : Selected Codec}

Initiation of information flow: reception and processing of **information flow 8**.

Processing upon receipt: when the BIWF receives **information flow 13**, it validates the request. The BIWF proceeds to establish a BNC between itself and the specified remote BIWF(BIWF-X). It first checks for the type of bearer establishment is to be used. ~~(Non Tunnelled or Tunnel establishment) and the type of bearer transport to be used (AAL 1, AAL 1 Structured, AAL 2, or IP transport). The type of bearer establishment mode is specified within the Tunnel Indication. This indicator could specify no tunnelling, option 1 tunnelling, or option 2 tunnelling.~~ In this case, the type of bearer establishment is Non-Tunnelled and the bearer transport to be used is Structured AAL 1.

~~If the establishment mode is the~~ **~~non-tunnelled mode~~**~~, the~~ The BIWF uses the incoming BNC characteristics~~,~~ and the Bearer Service Characteristics, ~~and if available, the Selected Codec information~~ in selecting the bearer transport characteristics to be used to convey the new BNC between itself and the BIWF-X. The Outgoing BNC characteristics are used to determine if any transcoding function is needed between the incoming termination and the outgoing termination. After the bearer transport has been determined, the BIWF determines if an existing idle channel within an existing Structured AAL 1 Bearer ~~BNC~~ can be used instead of creating a new ~~BNC~~Structured AAL 1 Bearer.

If an **idle** ~~BNC~~ channel is available, the BIWF will create a Termination ID, move this termination into the specified Context, associate this Termination ID with the Idle ~~BNC~~ channel and reset the Idle ~~BNC~~ Bearer Timer (if all of the channels in the Structured AAL 1 Bearer had been idle). The BIWF will issue **information flow 14** to its associated CSF indicating within the Reuse Indication that an idle ~~BNC~~ channel within an existing Structured AAL 1 Bearer should be used. In addition, this information flow would also indicate the BNC-ID associated with the Idle ~~BNC~~ channel. The BIWF then awaits the conformation that the Idle ~~BNC~~ channel is being used within BIWF(X).

If **no Idle** ~~BNC~~ channel can be used as a bearer transport for the selected bearer transport characteristics, the BIWF will create a Termination ID, move this termination to the specified context, issue **information flow 14** with the Reuse Indication set to no reuse. The BIWF would issue **information flow 15c** towards the SWN-1 requesting the explicit establishment of a new ~~BNC~~ Structured AAL 1 Bearer between BIWF(X) and BIWF(Y). The BIWF then awaits a conformation of the establishment of a new ~~BNC~~ Structured AAL Bearer from SWN-1.

~~If the establishment mode is determined to be the Tunnelled mode of bearer establishment, the BIWF determines the tunnelling option (Option 1 or Option 2)has been requested, the BIWF will issue information flow~~ **~~information flow 14~~** ~~indicating no reuse of a idle BNC and if option 1 has been selected, accept the Bearer Information Transport information object contained in~~ **~~information flow 13~~**~~, decode this information object, and implement the unidirectional bearer establishment indicated within the Bearer Information Transport information object, and issue~~ **~~information flow 15a~~** ~~containing the Bearer Information Transport information object which contains the encoded unidirectional bearer establishment request to complete the second portion of the complete bidirectional IP BNC between the two BIWFs.~~

If Option 2 was selected, the BIWF will issue **information flow 15d** containing the first portion of the bearer establishment request which is encoded within the Bearer Information Transport information object.

The BIWF awaits the next command from either its associated CSF or from its peer BIWF via SWN-1.

14	**Add.resp [Est. BNC + Notify]**		**BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 5000	
CCU-Control-Address of "SN-B"	Context-ID = 99	
	Termination ID = 520	
	Reuse Indication = No or Yes	
	{If Reuse Indication = Yes: BNC ID = 7938}	

Initiation of information flow: reception and processing of **information flow 13**.

Processing upon receipt: when the CSM-O receives **information flow 14**, it is aware that either a new BNC is in progress of being established or that the BIWF has requested that a Idle channel ~~BNC~~ should be used. In the situation that a Idle channel ~~BNC~~ is to be used, the CSM-O will issue **information flow 15b** towards its peer CSM-T in SN-A requesting that the idle channel ~~BNC~~ associated with BNC-ID, BIWF address X1 be used. If no reuse is indicated, the CSM-O notes that the new BNC establishment is proceeding. In both cases the CSM-O awaits a notification from either the BIWF or its peer CSM-T in SN-A that the BNC has been established.

Flows 15a-24a: **not applicable**.

15b	**APM**		**SN-B:CSM-O to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5	BNC-ID = ~~600~~ 7938
	Action-ID = Use Idle	BIWF Address = X1

Initiation of information flow: reception and processing of **information flow 14**.

Processing upon receipt: when CSM-T receives this information flow, it issues **information flow 16b** towards BIWF(X) which requests that that the BIWF use the specified Idle channel ~~BNC~~ and associate this BNC to the previously created Termination ID. The CSM-T awaits confirmation of this request.

16b	**Mod.req [Reuse Idle]**		**SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 6200	BNC-ID = 7938
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 15b**.

Processing upon receipt: when the BIWF receives **information flow 16b**, it validates the request. The BIWF proceeds to associate the specified Idle ~~BNC~~ Structured AAL 1 channel to the specified termination. After this association has been accomplished, the BIWF issues **information flow 17b** towards the CSF and deletes the BNC-ID associations created in **flow 1**.

17b	**Mod.resp [Reuse Idle]**		**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 6200	
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 16b**.

Processing upon receipt: when the CSM-T receives **information flow 17b**, it is aware that the reuse of the <u>idle channel</u> ~~BNC~~ operation has been completed and issues **information flow 18b** towards its peer CSM-O in SN-B indicating that the <u>idle channel</u> ~~BNC~~ has been switched, issues **information flow 31** towards BIWF-X requesting that the termination be placed into the send + Receive communication configuration, and awaits the response from the BIWF.

18b   **APM**   **SN-A:CSM-T to SN-B:CSM-O**

<u>**Address Information**</u>   <u>**Control information**</u>   <u>**Bearer information**</u>
                              CCA-ID = 5
                              Action-ID = Switched

Initiation of information flow: reception and processing of **information flow 17b**.

Processing upon receipt: when CSM-O receives this information flow, it issues **information flow 29** towards BIWF(Y) which requests that the termination be placed into the Send + Receive communications configuration, and awaits the response from the BIWF.

15c   **Bearer-Setup.Req**   **BIWF(Y) to SWN(1)**

<u>**Address Information**</u>   <u>**Control information**</u>   <u>**Bearer information**</u>
T-BIWF Addr = X1   BCS-ID = "15"   BNC-ID: = ~~78~~, <u>3846</u>
                                                                   BNCL-ID = 1004
                                                                   {BNCL Characteristics}

Initiation of information flow: processing of **information flow 13**.

Processing upon receipt: the selected switching node validates the request and determines the route and backbone transport facility used to carry the new backbone connection between SWN(1) and BIWF(X). The switching node issues **information flow 16c** towards BIWF(X). **Information flow 16c's** link information was determined from the link information received in **information flow 15c**. Switching Node 1 awaits the commitment information from BIWF(X).

16c   **Bearer-Setup.Req**   **SWN(1) to BIWF(x)**

<u>**Address Information**</u>   <u>**Control information**</u>   <u>**Bearer information**</u>
T-BIWF Addr = X1   BCS-ID = "65"   BNC-ID: = ~~78~~<u>3846</u>
                                                                   BNCL-ID = 1000
                                                                   {BNCL characteristics}

Initiation of information flow: processing of **information flow 15c**.

Processing upon receipt: the selected Bearer Interworking Function validates the request and notifies its associated Call Service function that a ~~bearer~~ <u>Structured AAL 1 Bearer</u> has been requested between SN-A and SN-B via **information flow 18c** and awaits the response from the CSF. <u>The remaining channels in the Structured AAL 1 Bearer which had BNC-IDs assigned in response to **flow 1**, are marked as idle.</u>

Flow 17c: **no change**.

18c   **Notify.ind [Establish BNC Ind]**   **BIWF-X to SN-A:CSM-T**

<u>**Address Information**</u>   <u>**Control information**</u>   <u>**Bearer information**</u>
BCU-Control-Address of "BIWF-X"   Transaction ID = 7100
CCU-Control-Address of "SN-A"   Context-ID = 66
                                   Termination ID = 700

Initiation of information flow: reception and processing of **information flow 16c**.

Processing upon receipt: when the CSM-T receives **information flow 18c**, it notes that the new <u>Structured AAL 1 Bearer</u> ~~BNC~~ establishment request has been received. It validates this request and issues **information flow 19c** towards its BIWF acknowledging the establishment of the bearer. It

then issues **information flow 31** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration. It then waits for the response from the BIWF.

19c	**Notify.resp [Establish BNC Ind]**	**SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 7100	Response Indication = Accept BNC
CCU-Control-Address of "SN-A"	Context-ID = 66	
	Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 18c**.

Processing upon receipt: when the BIWF receives **information flow 19c**, it is aware that the CSF has received the notify indication and agrees to accept the new requested Structured AAL 1 Bearer ~~BNC~~. It then awaits further commands from the CSF and continues to monitor the associated termination for events that need to be reported to the CSM-T.

Flow 20c-22c: **no change**.

Flow 15d-28d: **not applicable**.

Flow 29-43: **no change**.

A.2 Changes to the "Forward Composite" flows necessary to support structured AAL 1 bearers

Structured AAL 1 Composite Flows for Forward Backbone Network Establishment are identical to the flows in 5.3.2 with the following exceptions. In the following flows, text that is removed is shown with a strike through, text that is added is shown with an underline.

Flow 0: **no change**.

1	**ADD.req [Prepare BNC with notification]**	**SN-A:CSM-T to BIWF-X**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 1000	BNC Characteristics = "?" or CSF chosen BNC
CCU-Control-Address of "SN-A"	Context-ID = "?" or 66	Characteristics
Requesting CSM = Outgoing	Termination ID = "?"	A-BNC Characteristics = (Incoming-BNC-
	Logical Port ID = 55	Characteristics)
	Tunnel Indication = No or "?" or Option 1 or	Bearer Service Characteristic
	Option 2	~~[If Codec Negotiation : Preferred Codec]~~
	Notify option: <Termination Event>	

Initiation of information flow: reception and processing of **information flow 0** and immediate BIWF selection chosen by CSF.

Processing upon receipt: when the BIWF receives **information flow 1**, it validates the request. The BIWF proceeds to select the bearer transport technology based upon the Incoming BNC characteristics~~, the Preferred Codec if included,~~ and the available bearer transport types associated with the route specified by the Logical Port ID and capacity of the ~~each type of~~ bearer transport available on the selected route. If the BIWF is requested to create a new context, a new Context ID (= 66) is created. Otherwise the BIWF will use the Context ID supplied by the CSF. It then selects the Termination ID to be "700" and adds this Termination to the Context. ~~If the received tunnel indication specifies "No" tunnelling, or if the BIWF does not select tunnelling, the BIWF selects a BNC-ID (78) and associates this value with the chosen Termination ID.~~ The BIWF selects Structured AAL 1 Bearer and uses a four octet BNC-ID and selects the value BNC-ID = 16390 and associates this value and the BIWF Address with the chosen Termination ID. The selection of this BNC-ID value also causes the BCF to assign BNC-IDs to the other channels within the Structured AAL 1 Bearer. These channels are not marked as idle until this Structured AAL 1 bearer connection is actually established.

~~If the selected bearer transport technology is based on a **non-tunnel establishment** mode, the~~ The BIWF determines the bearer signalling association that should be used to establish this

BNC Connection. One or more bearer control signalling associations could be used to establish a BNC within the specified Logical Port representing the outgoing route towards the destination Serving Node (SN-B). In this example the chosen T-BIWF-Address is "X1" which represents the chosen bearer control signalling entity to be used to establish the desired BNC. The Tunnel Indication information object to be included within **information flow 2** is set to "**No**".

~~If the selected bearer transport technology is based on a~~ **~~tunnel establishment mode~~**~~, no explicit bearer control signalling association is required. However, a BIWF address associated with the logical port is also selected in order to differentiate the chosen BNC-ID value from other BNC-ID values generated by different BIWFs. In addition, the CSF needs to be notified that Tunnelling operation is to be supported since it will need to be ready to accept the "Bearer Information Transport" information object from the BIWF and carry this information object within the SN to SN signalling flows. Setting the Tunnel Indication information object to either Option 1 or Option 2 performs this notification. (Note: Tunnel establishment mode can only be selected if the CSF has indicated a "?" or indicated a selected option within the Tunnel Indicator. The question mark within the received Tunnel Indication indicates that the CSF has given permission to the BIWF to select Tunnelled or non-Tunnelled operation. A "No" indication specifies that the BIWF can not select tunnelled operation, while either Option 1 or Option 2 indicates that the BIWF can select the Tunnelled operation, but must use the specified tunnel option.) The returned Tunnelled Indication will either contain a "No" or the selected tunnelling option.~~

The Outgoing BNC Characteristics, Context ID, Termination ID, BNC-ID, BIWF Address associated with the Logical Port, and Tunnel Indication are all returned to the CSF in **information flow 2**. The Outgoing BNC Characteristics is set to "Structured AAL 1" and the Tunnel Indication is set to "**No**". ~~If Tunnelling option 1 operation is specified, the BIWF will immediately issue another information flow~~ **(information flow 3).** ~~This information flow contains the Bearer Information Transfer information object, the BIWF Address, and the BNC-ID to the CSF and the BIWF awaits the CSF's acknowledgement flow confirming the reception of the Bearer Information Transport information object.~~

Special NOTE – Since the Requesting CSM is associated with the outgoing termination, the BIWF cannot request that the completion of the connection within the addressed SN-B is notified back to SN-A. Therefore the Notify option is set to "No".

2	**ADD.resp [BNC Prepared]**	**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X"	Transaction ID = 1000	BNC Characteristics = (Chosen-BNC-
CCU-Control-Address of "SN-A"	Context-ID = 66	Characteristics)
	Termination ID = 700	BNC-ID = ~~78~~ 16390
	Tunnel Indication = No ~~or option 1 or option 2~~	BIWF Address = X1

Initiation of information flow: reception and processing of **information flow 1** and immediate BIWF selection chosen by CSF.

Processing upon receipt: when the CSM-T receives **information flow 2**, CSM-T will send **information flow 6** ~~if there is no codec negotiation procedure being conducted and the Tunnel Indication does not specify the tunnel option 1~~, to the CSM-O. ~~Otherwise the CSM-T will wait for information flow 4 before issuing information flow 6~~. **Information flow 6** will include the Context ID (66) received in **information flow 2** and the selected BIWF's control identity designation (BCU-ID = X), and the outgoing BNC Characteristics.

~~If the Tunnel Indicator does not specify Option 1, the~~ The CSM-T will issue an IAM signalling flow (**information flow 5**) to its peer CSM contained in SN-B indicating forward bearer establishment~~, optionally with codec negotiation,~~ and with the appropriate Tunnelling indication. In addition, this IAM contains the BNC-ID, the BIWF Address, and the BNC Characteristics as received in **information flow 2**. The IAM may also contain the BCU-ID that represents the selected BIWF's

control identity that was selected by the CSF. ~~And may contain a Codec List if codec negotiation has been requested.~~ The IAM also can indicate "COT on previous" if the following conditions are satisfied.

[If a COT on Previous has been received, or if a COT Required has been received, or that the connection within the SN has not been completed].

~~If the Tunnel Indicator specifies Option 1, The CSM-T will wait for the Bearer Information Transport information object that is contained in **information flow 3** before issuing **information flow 5**.~~

The CSM-T awaits further information concerning the call and bearer establishment either explicitly from its peer or from the selected BIWF.

Flows 3-4: **not applicable**.

5	IAM		SN-A:CSM-T to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
Calling Party Address = User-A	CCA-ID = 5	Bearer Service Characteristics
Called Party Address = User-B	Action-ID = Connect Forwards	BNC Characteristics
O-CSF Address = SN-A	Tunnel Indication = No ~~or option 1 or option 2~~	BIWF Address = X1 or A2)
D-CSF Address = SN-B	(COT on Prev. = 1 or 0)	~~{If Codec Negotiation: Codec List}~~
	(Origination Traffic Group ID = 77)	~~{If Tunnel Indication = option 1: (BNC-ID=78)}~~
	(Destination Traffic Group ID = 88)	
	(Global Call Ref. = 35)	
	(BCU-ID = X or A)	
	~~{If Tunnel Indication = option 1 : Bearer Information Transport}~~	

Initiation of information flow: reception and processing of ~~**information flow 0** if delayed BIWF selection has been chosen, or~~ **information flow 2** ~~if no tunnel or tunnel option 2 is contained in **information flow 2** or **information flow 3** if the tunnel option 1 is contained in **information flow 2**~~.

Processing upon receipt: when SN-B receives this information flow it creates CSM-O. The CSM-O decides to defer the BIWF selection to CSM-T. Therefore, the CSM-O sends **information flow 5** to CSM-T, including:

• Incoming BCU-ID, as received in IAM;

• COTind reflecting the status of the incoming link [Circuit not available (COT on Prev.), or Circuit available (No COT)];

• Codec List (Optional), sent if received in IAM;

• Incoming BNC Characteristics:

• Incoming Bearer Service Characteristics;

• Incoming Tunnel Indication;

• A request for Context assignment (Context ID = "?") and BCU assignment (BCU-ID = "?");

• Calling Party and Called Party Address;

• And the Local Call Instance associating the CSMs to the incoming call request.

The CSM-O awaits the BCU and Context assignment (**information flow 8**) before continuing processing the incoming information flow.

6   Context Assigned   SN-A:CSM-T to SN-A:CSM-O

Address Information	Control information	Bearer information
	Local Call Instance = 300	BCU-ID = X Context ID = 66 Outgoing BNC Characteristics

Initiation of information flow: reception and processing of **information flow 2** and no Codec Negotiation and immediate BIWF selection.

Processing upon receipt: when CSM-O continues the originating information flow as specified by the access flows related to the protocol interface type used on the originating side of the SN.

---

7   New Call   SN-B:CSM-O to SN-B:CSM-T

Address Information	Control information	Bearer information
Called-Party-Address = User B Calling Party Address = User A	Local Call Instance = 250 COTind = COT on Prev. or No COT Incoming Tunnel Indication = No~~, or Option 1, or Option 2~~ (Origination Traffic Group ID = 77) (Destination Traffic Group ID = 88) (Global Call Ref. = 35)	Incoming BCU-ID = X if received BIWF Address = X1, or A2 BCU-ID = "?" Context ID = "?" Bearer Service Characteristics, Incoming BNC Characteristics ~~{If Codec Negotiation: (Incoming Codec List)},~~

Initiation of information flow: reception and processing of the IAM (**information flow 5**).

Processing upon receipt: when the CSM-T receives this information flow, it initiates the terminating information flow specified by the access flows related to the protocol interface type used on the terminating side of the SN.

---

8   Context Assigned   SN-B:CSM-T to SN-B:CSM-O

Address Information	Control information	Bearer information
	Local Call Instance = 250	BCU-ID = Y Context ID = 99 Outgoing BNC Characteristics, ~~{If Codec Negotiation; Selected Codec, and Supported Codec List}~~

Initiation of information flow: CSM-T has assigned the context and BIWF for the call. Triggered by **information flow 5**.

Processing upon receipt: the CSM-O initiates the forward establishment procedure requested by **information flow 5** by issuing **information flow 9**. This information flow requests the selection of a Termination ID, a BNC ID, a BIWF Address which are used in the forward establishment of the BNC. In addition, the CSM-O provides the Tunnelling Indication, the incoming BNC Characteristics, and the Outgoing BNC Characteristics. The CSM-O also performs a route selection between SN-A or SN-B. The selected route segment is also provided to the BIWF in order to guide the termination selection procedure.

~~If a Codec Negotiation procedure is in process, the CSM-O includes the selected codec in information flow 9.~~

---

9   ADD.req [Prepare BNC with notification]   SN-B:CSM-O to BIWF-Y

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y CCU-Control-Address of "SN-B" Requesting CSF = Incoming	Transaction ID = 2000 Context-ID = 99 Termination ID = "?" Logical Port ID = 77 Tunnel Indication = No ~~or "?" or Option 1 or Option 2~~ ~~{If Tunnel Indication = Option1 : (Bearer Information Transport)}~~ Notify option: <Termination Event>	BNC Characteristics = Incoming BNC Characteristics A-BNC Characteristics = (Outgoing-BNC-Characteristics) Bearer Service Characteristic ~~{If Codec Negotiation : Selected Codec}~~ ~~{If Tunnel Indication = option 1: (BIWF Addr = X1 or A2), (BNC ID=78)}~~

Initiation of information flow: reception and processing of **information flow 8**.

Processing upon receipt: when the BIWF receives **information flow 9**, it validates the request. The BIWF proceeds to select the bearer transport technology based upon the Incoming BNC characteristics~~, the Selected Codec if included~~, and the available bearer transport types associated with the route specified by the Logical Port ID and capacity of each type of bearer transport available on the selected route. The BIWF will use the Context ID supplied by the CSF. It then selects the Termination ID to be "320" and adds this Termination to the Context. ~~The BIWF selects a BNC-ID (88) if the tunnel indication does not indicate option 1and associates this value and the BIWF Address with the chosen Termination ID. If the tunnel indication specifies option 1, the BNC-ID contained in information flow 9 will be used (BNC-ID = 78).~~ The BIWF uses a four-octet BNC-ID and selects the value BNC-ID = 3846 and associates this value and the BIWF Address with the chosen Termination ID. The selection of this BNC-ID value also causes the BCF to assign BNC-IDs to the other channels within the Structured AAL 1. These channels are not marked as idle until the reception of **flow 19c**.

~~If the selected bearer transport technology is based on a **non-tunnel establishment mode**, the~~ The BIWF determines the bearer signalling association that should be used to establish this BNC Connection. One or more bearer control signalling associations could be used to establish a BNC within the specified Logical Port representing the outgoing route towards the destination Serving Node (SN-A). In this example, the chosen T-BIWF-Address is "Y1" which represents the chosen bearer control signalling entity to be used to establish the desired BNC. The Tunnel Indication information object to be included within **information flow 8** is set to "**No**".

~~If the selected bearer transport technology is based on a **tunnel establishment mode**, no explicit bearer control signalling association is required. However, a BIWF address associated with the logical port is also selected in order to differentiate the chosen BNC-ID value from other BNC-ID values generated by different BIWFs. In addition, the CSF needs to be notified that Tunnelling operation is to be supported since it will need to be ready to accept the "Bearer Information Transport" information object from the BIWF and carry this information object within the SN to SN signalling flows. Setting the Tunnel Indication information object to either Option 1 or Option 2 performs this notification. (Note: Tunnel establishment mode can only be selected if the CSF has indicated a "?" or indicated a selected option within the Tunnel Indicator. The question mark within the received Tunnel Indication indicates that the CSF has given permission to the BIWF to select Tunnelled or non-Tunnelled operation. A "No" indication specifies that the BIWF can not select tunnelled operation, while either Option 1 or Option 2 indicates that the BIWF can select the Tunnelled operation, but must use the specified tunnel option.) The returned Tunnelled Indication will either contain a "No" or the selected tunnelling option.~~

The BNC Characteristics to be used, the Context ID, the Termination ID, the BNC-ID, the BIWF Address associated with the Logical Port, and the Tunnel Indication are all returned to the CSF in **information flow 10**. ~~If Tunnelling option 1 operation is specified, the BIWF will immediately issue another information flow (**information flow 11a**) containing the Bearer Information Transfer information object, the BIWF Address, and the BNC-ID to the CSF. The BIWF awaits the CSF's acknowledgement flow confirming the reception of the Bearer Information Transport information object.~~ **Information flow 10** will contain BNC-ID = 3846 and BIWF Address = Y1.

Special NOTE – Since the requesting CSM is associated with the incoming termination, the BIWF can request that SN-A will notify SN-B when the connection within its domain has been established. This request can be based on the cut-through characteristics of the bearer transport entities (Early or Late Cut-through). ~~or the Tunnelling option chosen (Option 1 or Option 2)~~. If Late Cut-Through ~~or Tunnel option 1~~ is being used, the Notifiy option = Yes will be chosen. This value will cause the CSF to use the Forward notify Action ID in response to the IAM information flow (**information flow ~~12a or~~ 11**). The Notify option = No will cause the CSF to use the Forward response Action ID in response to the IAM information flow (**information flow 11**).

10	ADD.resp [BNC Prepared]		BIWF-Y to SN-B:CSM-O

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y"	Transaction ID = 2000	BNC Characteristics = (Incoming-BNC-
CCU-Control-Address of "SN-B"	Context-ID = 99	Characteristics),
	Termination ID = 320	{If Tunnel Indication = No or option 2: (BNC-ID
	Tunnel Indication = No ~~or Option 1 or Option 2~~	= 3846 ~~88~~)}
		BIWF Address = Y1
		{If Tunnel Indication = Option 1 or If Cut-
		Through Characteristics = Late: Notify option =
		Yes otherwise Notify option = No}

Initiation of information flow: reception and processing of **information flow 9**.

Processing upon receipt: when the CSM-T receives **information flow 10**, the CSM-O will send **information flow 11** ~~if the tunnelling indication does not indicate option 1 tunnelling~~.

~~In the case of non option 1 tunnelling,~~ **Information flow 11**, contains the action ID that the CSM-O has selected (Forward Response or Forward Notify) based on the characteristics of the BIWF (bearer stage-by-stage cut-through during reception of the bearer setup or during bearer confirmation operation) which have been provisioned for each bearer type within the selected BIWF. In addition, this information flow contains the BNC-ID, BNC Characteristics, BIWF Address selected by BIWF-Y. ~~If Codec Negotiation is in progress, the flow will contain the selected Codec and the supported Codec list.~~

~~In the case of option 1 tunnelling, the CSM-O will wait for **information flow 11a** before issuing a reply to its peer CSM in SN-A. This information flow is information flow 12a. The CSM-O will specify the Action ID of Forward Notify in order to be notified of the BNC completion. This information flow also will contain the BNC ID value chosen by BIWF-X and the BIWF Address of BIWF-X. If Codec Negotiation is in progress, the flow will contain the selected Codec and the supported Codec list.~~

11	APM		SN-B:CSM-O to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5,	BNC-ID = ~~88~~, 3846
	Action-ID = Forward Response or Forward	BIWF Address = Y1
	Notify	{If Codec Negotiation: Selected Codec,
	Tunnel Indication = No ~~or option 2~~	Supported Codec List}
	(BCU-ID = Y)	

Initiation of information flow: reception and processing of **information flow 10** ~~and no tunnel option 1 requested~~.

Processing upon receipt: ~~when CSM-T receives this information flow, if Codec Negotiation is in progess and the BIWF selection has not been delayed, the CSM-T issues **information flow 12** towards CSM-O within its SN notifying that the context has been assigned and the Codec has been selected. It then proceeds to modify the codec being used by the BIWF by issuing **information flow 13** towards the selected BIWF. It awaits the BIWF's acknowledgement that the codec has been modified.~~

~~If BIWF selection has been delayed, the CSM-O begins BIWF selection process. This selection procedure uses the BIWF Address and if supplied, the BCU-ID to make this selection. In this example, BIWF-X is selected. The CSM-T then issues **information flow 15** towards the selected BIWF requesting that it establish a BNC to the specified BIWF within SN-B.~~

Flow 13 is initiated.

Flow 12: **not applicable.**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 6000 Context-ID = 66 Termination ID = 700 Tunnel Indication = No ~~or option 2~~	BNC Characteristics = (Outgoing BNC Characteristics) A-BNC Characteristics = (Incoming-BNC-Characteristics) Bearer Service Characteristic BNC-ID = ~~88~~, <u>3846</u> BIWF Address = Y1 ~~Selected Codec~~

Initiation of information flow: reception and processing of **information flow 11** and no delayed BIWF selection.

Processing upon receipt: when the BIWF receives **information flow 13**, it validates the request. The BIWF proceeds to establish a BNC between it self and the specified remote BIWF(BIWF-Y). It first checks for the type of bearer establishment is to be used; (Non-Tunnelled or Tunnel establishment) and the type of bearer transport to be used (AAL 1, AAL 1 Structured, AAL 2, or IP transport). The type of bearer establishment mode is specified within the Tunnel Indication. This indicator could specify no tunnelling, or option 2 tunnelling. <u>In this case the bearer establishment to be used is Non-Tunnelled and the type of bearer to be used is Structured AAL 1.</u>

~~If the establishment mode is the **non-tunnelled mode**, the~~ <u>The</u> BIWF uses the incoming BNC characteristics, the Bearer Service Characteristics~~, and if available, the Selected Codec information~~ in selecting the bearer transport characteristics to be used to convey the new BNC between itself and the BIWF-Y. The Outgoing BNC characteristics are used to determine if any transcoding function is needed between the incoming termination and the outgoing termination. After the bearer transport has been determined, the BIWF determines if an existing idle <u>channel within an existing Structured AAL 1 Bearer</u> ~~BNC~~ can be used instead of creating a new ~~BNC.~~<u>Structured AAL 1 Bearer.</u>

If an **idle** ~~BNC~~ <u>channel</u> is available, the BIWF will associate the Termination ID with the Idle ~~BNC~~ <u>channel</u> and reset the Idle ~~BNC~~ <u>Bearer</u> Timer (<u>if all of the channels in the Structured AAL 1 Bearer had been idle</u>). The BIWF will issue **information flow 14** to its associated CSF indicating within the Reuse Indication that an idle ~~BNC~~ <u>channel within an existing Structured AAL 1 Bearer</u> should be used. In addition, this information flow would also indicate the BNC-ID associated with the Idle ~~BNC~~ <u>channel</u>. The BIWF then awaits the conformation that the Idle ~~BNC~~ <u>channel</u> is being used within BIWF(Y).

If **no Idle** ~~BNC~~ <u>channel</u> can be used as a bearer transport for the selected bearer transport characteristics, the BIWF will issue **information flow 14** with the Reuse Indication set to no reuse. The BIWF would issue **information flow 18c** towards the SWN-1 requesting the explicit establishment of a new ~~BNC~~ <u>Structured AAL 1 Bearer</u> between BIWF(X) and BIWF(Y). The BIWF then awaits a conformation of the establishment of a new ~~BNC~~ <u>Structured AAL 1 Bearer</u> from SWN-1.

~~If the establishment mode is determined to be the Tunnelled mode of bearer establishment, the BIWF determines the tunnelling option has been requested, the BIWF will issue information flow **information flow 14** indicating no reuse of a idle BNC and will issue **information flow 18d** containing the first portion of the bearer establishment request which is encoded within the Bearer Information Transport information object.~~

The BIWF awaits the next command from either its associated CSF or from its peer BIWF via SWN-1.

14	**Mod.resp [Est. BNC + Notify]**		**BIWF-X to SN-A:CSM-T**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 6000 Context-ID = 66 Termination ID = 700 Reuse Indication = No or Yes {If Reuse Indication = Yes : BNC-ID = ~~100~~ <u>7938</u>}	

Initiation of information flow: reception and processing of **information flow 13** and no delayed BIWF selection.

Processing upon receipt: when the CSM-T receives **information flow 14**, it is aware that either a new ~~BNC~~ <u>Structured AAL 1 Bearer</u> is in progress of being established or that the BIWF has requested that an Idle ~~BNC~~ <u>channel within an existing Structured AAL 1 Bearer (BNC-ID = 7938)</u> should be used. In the situation that an Idle ~~BNC~~ <u>channel</u> is to be used, the CSM-T will issue **information flow 18b** towards its peer CSM-O in SN-B requesting that the idle ~~BNC~~ <u>channel</u> associated with BNC-ID, BIWF address Y1 be used. If no reuse is indicated, the CSM-T notes that the new ~~BNC~~ <u>Structured AAL 1 Bearer</u> establishment is proceeding. In both cases the CSM-O awaits a notification from either the BIWF or its peer CSM-T in SN-B that the BNC has been established.

Flow 15-17: **not applicable.**

Flow 11a-19a: **not applicable.**

18b	**APM**		**SN-A:CSM-T to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
	CCA-ID = 5 Action-ID = Use Idle	BNC-ID = ~~100~~<u>7938</u> BIWF Address = Y1

Initiation of information flow: reception and processing of **information flow 14** ~~or 16~~ and a reuse BNC indication has been received from the BIWF.

Processing upon receipt: when CSM-O receives this information flow, it issues **information flow 19b** towards BIWF(Y) which requests that that the BIWF use the specified Idle <u>channel</u> ~~BNC~~ and associate this BNC to the previously created Termination ID. The CSM-O awaits confirmation of this request.

19b	**Mod.req [Reuse Idle]**		**SN-B:CSM-O to BIWF-Y**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 6200 Context-ID = 99 Termination ID = 320	BNC-ID = ~~100~~<u>7938</u>

Initiation of information flow: reception and processing of **information flow 18b**.

Processing upon receipt: when the BIWF receives **information flow 19b**, it validates the request. The BIWF proceeds to associate the specified Idle ~~BNC~~ <u>channel</u> to the specified termination. After this association has been accomplished, the BIWF issues **information flow 20b** towards the CSF.

20b	**Mod.resp [Reuse Idle]**		**BIWF-Y to SN-B:CSM-O**

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 6200 Context-ID = 99 Termination ID = 320	

Initiation of information flow: reception and processing of **information flow 19b**.

Processing upon receipt: when the CSM-O receives **information flow 20b**, it is aware that the reuse of the ~~BNC~~ <u>idle channel</u> operation has been completed and issues **information flow 21b** towards its peer CSM-T in SN-A indicating that the BNC has been switched. If the forward notify mode was requested in **information 11**, the CSM-O awaits **information flow 30** before it issues **information flow 31** towards BIWF-Y requesting that the termination be placed into the send + Receive communication configuration, and awaits the response from the BIWF. If the forward response mode was selected in **information flow 11**, the CSM-O will issue **information flow 31** towards BIWF-Y requesting that the termination be placed into the send + receive communication configuration, and awaits the response from the BIWF.

21b	**APM**	**SN-B:CSM-O to SN-A:CSM-T**
Address Information	**Control information**	**Bearer information**
	CCA-ID = 5,	BNC-ID = ~~1007~~938
	Action-ID = Switched	BIWF Address = Y1

Initiation of information flow: reception and processing of **information flow 20b**.

Processing upon receipt: when CSM-T receives this information flow, it determines the response mode contained in **information flow 11**. If the response mode was Forward Notify, the CSM-T will issue **information flow 30** and then follow with **information flow 33** towards BIWF-X requesting that the termination be placed into the send and receive communication configuration. If the response mode in **information flow 11** was the Forward Response, the CSM-T will issues **information flow 33** towards BIWF(X) which requests that the termination be placed into the Send + Receive communications configuration. In either case the CSM-T will await the response from the BIWF.

18c	**Bearer-Setup.Req**	**BIWF(X) to SWN(1)**
Address Information	**Control information**	**Bearer information**
T-BIWF Addr = Y1	BCS-ID = "15"	BNC-ID: = ~~88~~3846
		BNCL-ID = 1004,
		{BNCL Characteristics}

Initiation of information flow: processing of **information flow 13** or **15**.

Processing upon receipt: the selected switching node validates the request and determines the route and backbone transport facility used to carry the new backbone connection between SWN(1) and BIWF(Y). The switching node issues **information flow 19c** towards BIWF(Y). **Information flow19c's** link information was determined from the link information received in **information flow 18c**. Switching Node 1 awaits the commitment information from BIWF(Y).

19c	**Bearer-Setup.Req**	**SWN(1) to BIWF(Y)**
Address Information	**Control information**	**Bearer information**
T-BIWF Addr = Y1	BCS-ID = "65"	BNC-ID: = ~~88~~3846
		BNCL-ID = 1000
		{BNCL characteristics}

Initiation of information flow: processing of **information flow 18c**.

Processing upon receipt: the selected Bearer Interworking Function validates the request and notifies its associated Call Service function that a bearer has been requested between SN-A and SN-B via **information flow 21c, issues information flow 20c** towards SWN-1 indicating acceptance of the BNC establishment request, and awaits the response from the CSF. <u>The remaining channels in the Structured AAL 1 Bearer that had been assigned BNC-ID in response to **flow 9**, are marked as idle.</u>

21c   **Notify.ind [Establish BNC Ind]**   **BIWF-Y to SN-B:CSM-O**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 320	

Initiation of information flow: reception and processing of **information flow 19c**.

Processing upon receipt: when the CSM-O receives **information flow 21c**, it notes that the new Structured AAL 1 Bearer ~~BNC~~ establishment request has been received. It validates this request and issues **information flow 22c** towards its BIWF to acknowledge this establishment notification. It then issues **information flow 31** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration if the response mode in **information flow 11** was Forward Response. If the response mode in **information flow 11** was Forward Notify, the CSM-T awaits **information flow 30** before issuing **information flow 31**. In either case, the CSM-T then waits for the response from the BIWF.

22c   **Notify.resp [Establish BNC Ind]**   **SN-B:CSM-O to BIWF-Y**

Address Information	Control information	Bearer information
BCU-Control-Address of "BIWF-Y" CCU-Control-Address of "SN-B"	Transaction ID = 7100 Context-ID = 99 Termination ID = 320	Response Indication = Accept BNC

Initiation of information flow: reception and processing of **information flow 20c**.

Processing upon receipt: when the BIWF receives **information flow 21c**, it is aware that the CSF has received the notify indication and agrees to accept the new requested ~~BNC~~ Structured AAL 1 Bearer. It then awaits further commands from the CSF and continues to monitor the termination for events that need to be reported to the CSM-T.

20c   **Bearer-Setup.Confirm**   **BIWF(Y) to SWN(1)**

Address Information	Control information	Bearer information
	BCS-ID = "65"	BNCL-ID = 1000

Initiation of information flow: processing of **information flow 19c**.

Processing upon receipt: the switching node notes the confirmation of the establishment request and issues **information flow 23c** towards BIWF(X).

23c   **Bearer-Setup.Confirm**   **SWN(1) to BIWF(X)**

Address Information	Control information	Bearer information
	BCS-ID = "15"	BNCL-ID = 1004

Initiation of information flow: processing of **information flow 20c**.

Processing upon receipt: the BIWF records the establishment of the backbone connection, issues **information flow 24c** notifying the CSF that the requested ~~BNC~~ Structured AAL 1 Bearer has been established.

24c	Notify.ind [BNC Established]		BIWF-X to SN-A:CSM-T

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7100 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 23c**.

Processing upon receipt: when the CSM-O receives **information flow 24c**, it notes that the new ~~BNC~~ <u>Structured AAL 1 Bearer</u> establishment confirmation has been received. It validates this request and issues **information flow 25c** towards its BIWF acknowledging reception of the notify indication. It then issues **information flow 33** to the BIWF requesting that the termination be placed in the Send and Receive communication configuration. If the response mode contained in **information flow 11** was Forward Notify, the CSM-T issues **information flow 30** towards its peer CSM within SN-B. It then waits for the response from the BIWF.

25c	Notify.resp [BNC Established]		SN-A:CSM-T to BIWF-X

Address Information	**Control information**	**Bearer information**
BCU-Control-Address of "BIWF-X" CCU-Control-Address of "SN-A"	Transaction ID = 7100 Context-ID = 66 Termination ID = 700	

Initiation of information flow: reception and processing of **information flow 24c**.

Processing upon receipt: when the BIWF receives **information flow 25c**, it is aware that the CSF has received the notify indication. It then awaits further commands from the CSF.

Flow 18d-31d: **not applicable.**

Flow 30-45: **no change.**

Annex B

ISUP "NNI" access establishment and release flows

Introduction

This annex contains a set of ISUP "nni" Access Establishment and Release flows which complements the composite flows illustrated in the main body of these signalling requirements. In CS-1 the signalling flows covered the BICC application where the only interface to another service supplier network was via a "nni" interface that used the ISUP signalling protocol. In CS-2 the signalling flows were separated into BICC network flows and Access & Access Network flows. In CS-2 additional "nni" protocols were added, however, Access & Network signalling flows for these protocol interfaces were not completed. It was felt that an example ISUP protocol interface was needed to provide a bridge between CS-1 and CS-2. The scope of this annex is illustrated in Figure B.1.

Scope BICC network standardization activity
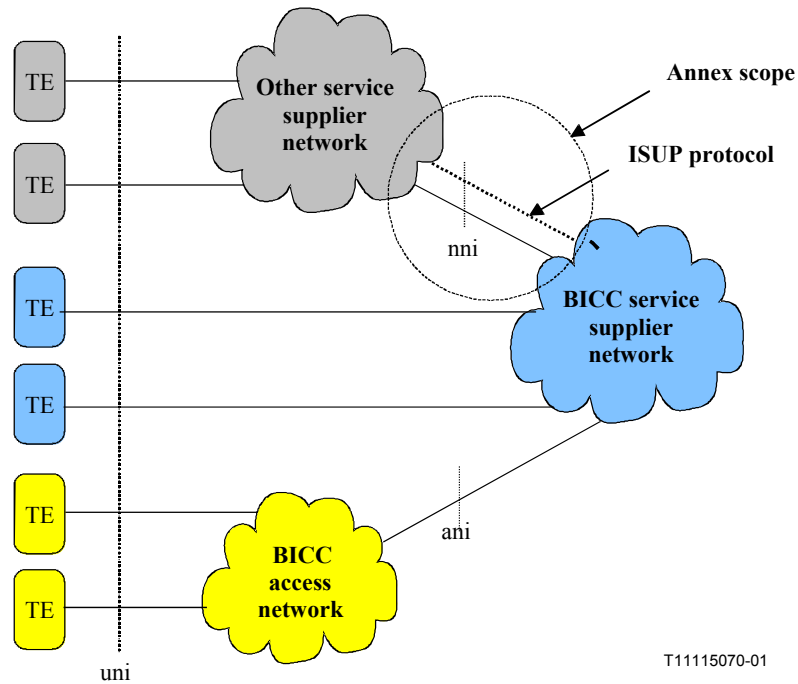
Figure B.1 – BICC reference interface reference model

Since the signalling flows for CS-2 were spilt into two categories, Figure B.2 attempts to illustrates the relationship between these two flow categories. The Access & Access Network flows are separated into originating access flows and terminating access flows. These flows then complement the BICC network flows. Note that the double-headed arrows in the Figure indicate the merging of the two sets of flow diagrams. Note that the information flows between the CSM-O and the CSM-T within a SN are identical in both sets of flows, thereby providing the connectivity between the BICC CSMs and the Access & Access Network CSMs.
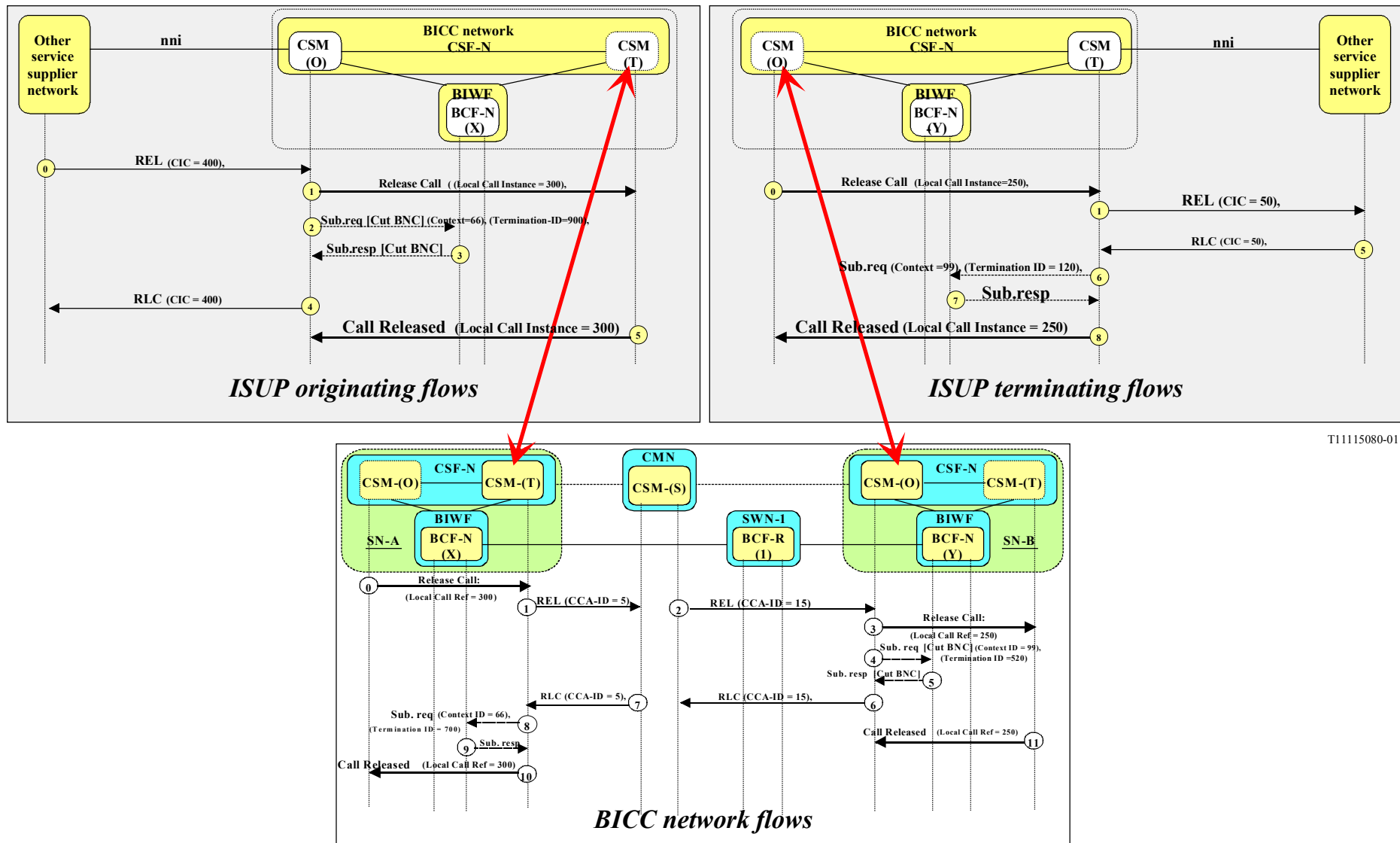
Figure B.2 – Relationship between BICC flows and access & access network flows

Figures B.3 to B.6 are for information only in CS-2. The next capability set will include these flows along with functional entity action definitions.
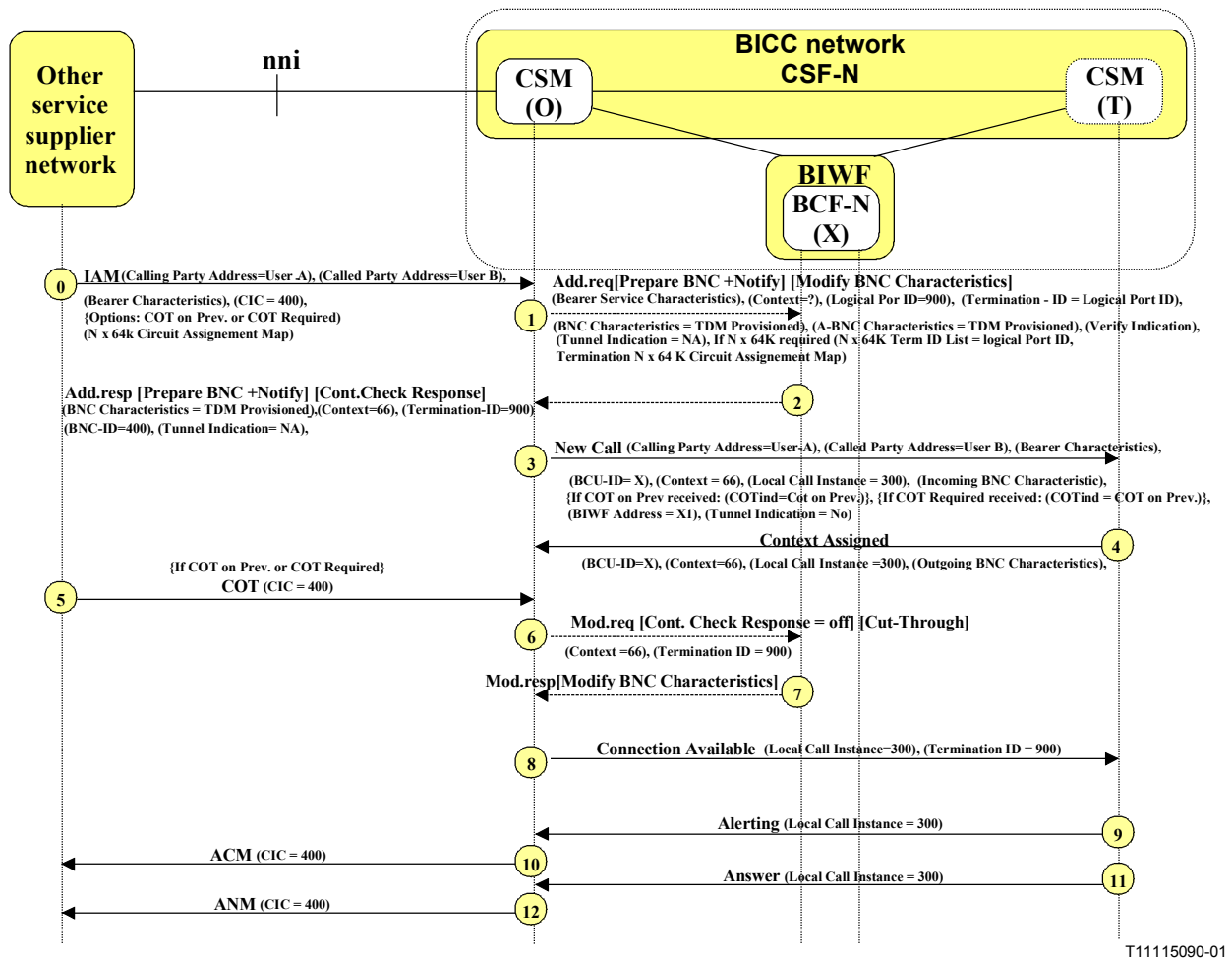
Figure B.3 – ISUP originating access call and bearer establishment flows
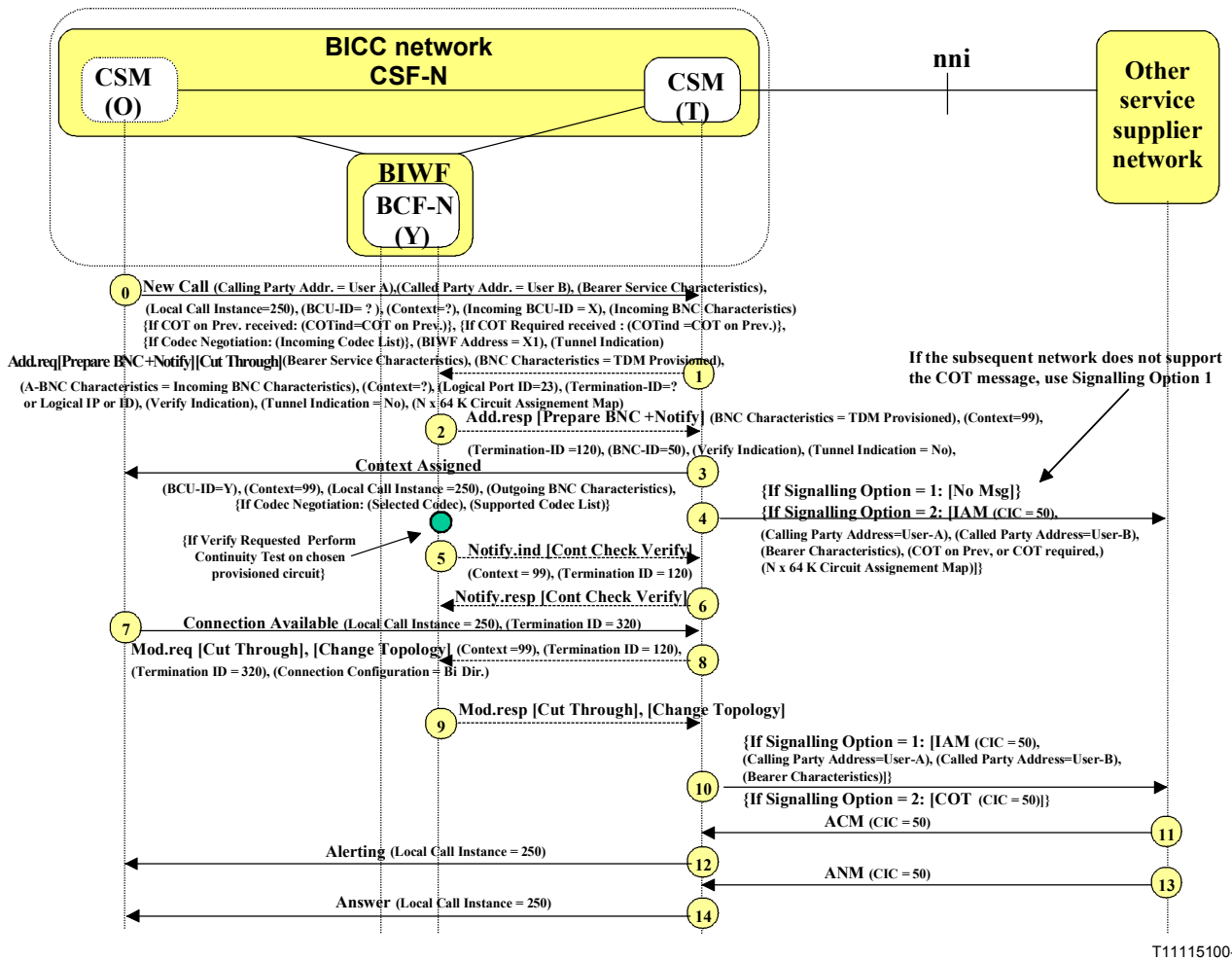
Figure B.4 – ISUP terminating access call and bearer establishment flows
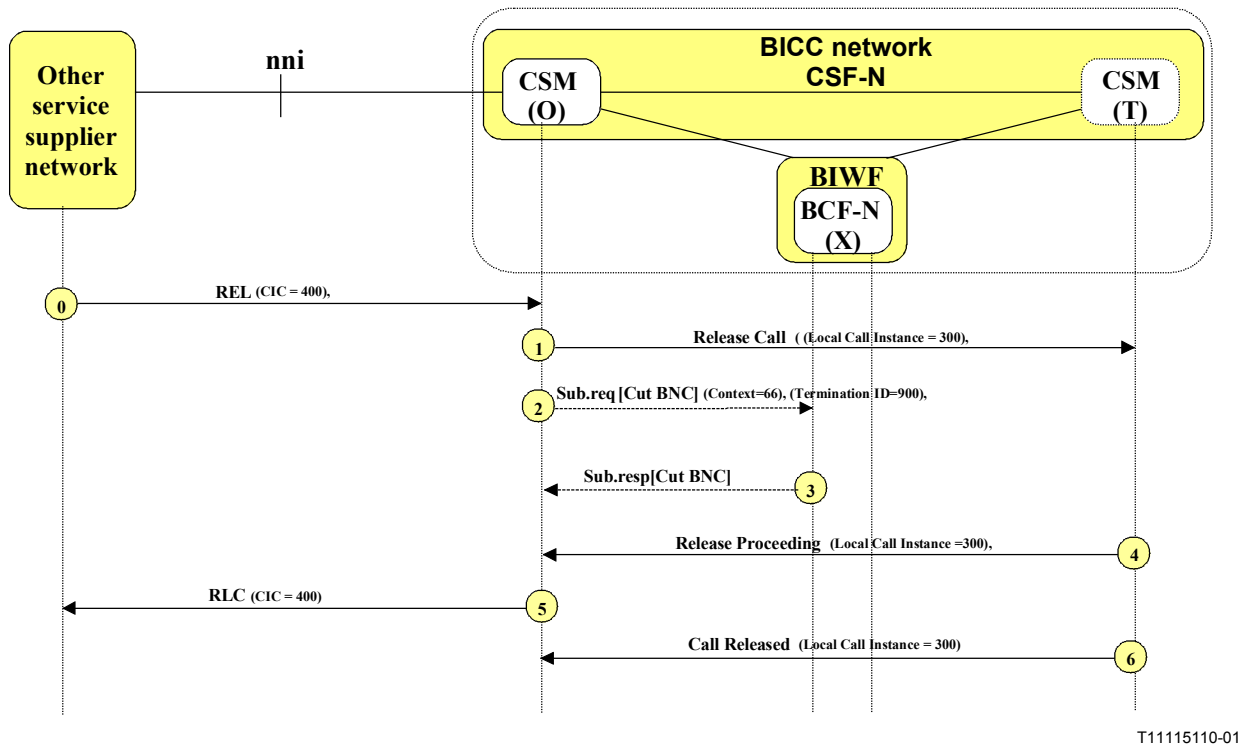
Figure B.5 – ISUP originating access call release flows
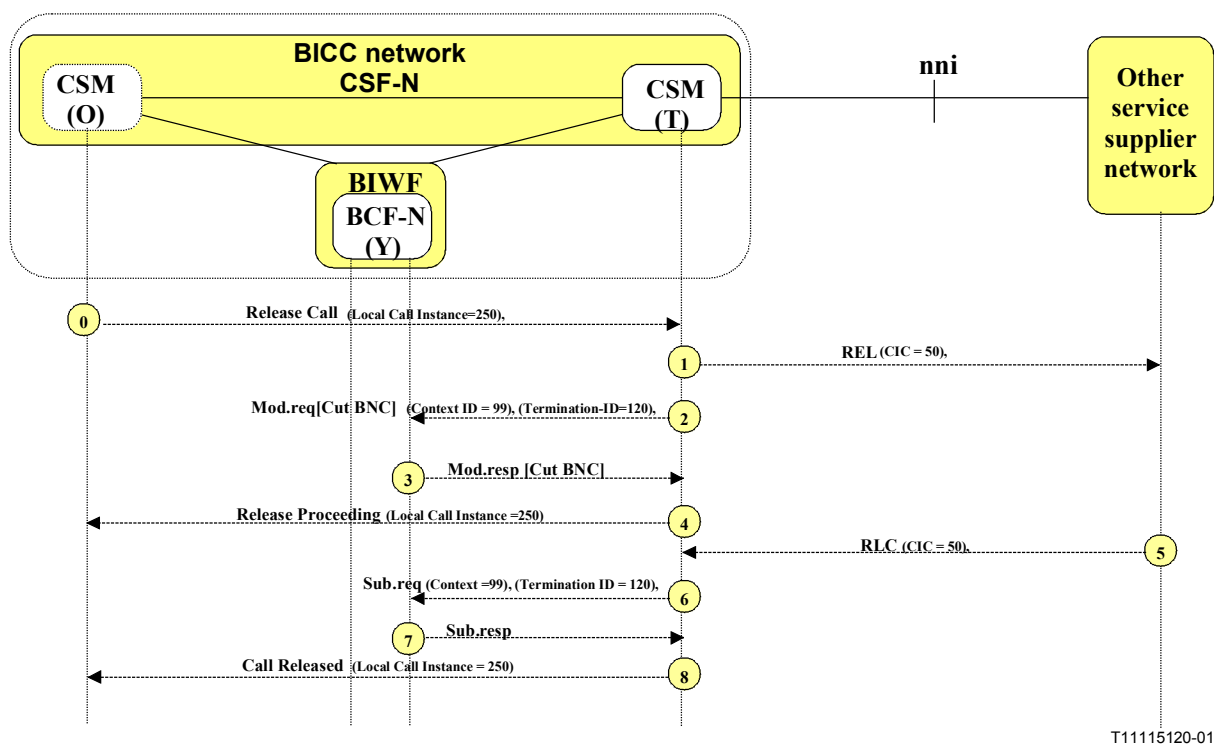
Figure B.6 – ISUP terminating access call release flows

Annex C

Overview of bearer redirection

C.1 Bearer redirection

Bearer redirection is modeled using four types of node, each of which provides a particular piece of functionality required for performing redirection. The four node types are as follows:

CC-Anchor node: an SN or CMN which serves as an anchor point for the call control during the redirection procedure. CC-anchor-nodes typically remain in the call path for the duration of the call. Local exchanges, gateways and exchanges which serve as control points for services will often be CC-anchor-nodes. The CC-anchor is the deciding or controlling node for the redirection. How the CC-anchor decides that redirection is required is beyond the scope of this Supplement.

BC-Anchor node: an SN which serves as an anchor point for the bearer control during the redirection procedure. Local SNs and gateways will often be BC-anchor-nodes.

Redirecting-from node: an SN, away from which the bearer path will be redirected.

Redirecting-to node: an SN, towards which the bearer path will be redirected.

The node types are functional entities and some may be combined together in a physical node. The modelling shown here covers the most general case where all of the functional entities are located in separate physical nodes. Different scenarios can be derived from the most general case by combining functional entities. Figures C.1-C.5 show the general case and some of the possible combinations. The BC-anchor, CC-anchor, redirecting-to-node and redirecting-from-node are depicted as ISN-BC, ISN-CC, ISN-RT and ISN-RF respectively.

By modelling the redirection in this way, a completely generic mechanism is obtained which meets a range of possible service scenarios. It is also possible to incorporate existing redirection

mechanisms, such as pivot routing (which involves call rather than bearer redirection), within the model which allow interactions between such mechanisms to be cleanly defined.

When functional entities are combined, the links between them are simply collapsed. From a protocol point of view this simply means that the signalling which would have taken place between such entities is internalized in the physical node. Thus, to cover all cases, it is sufficient to consider the general four-node case.
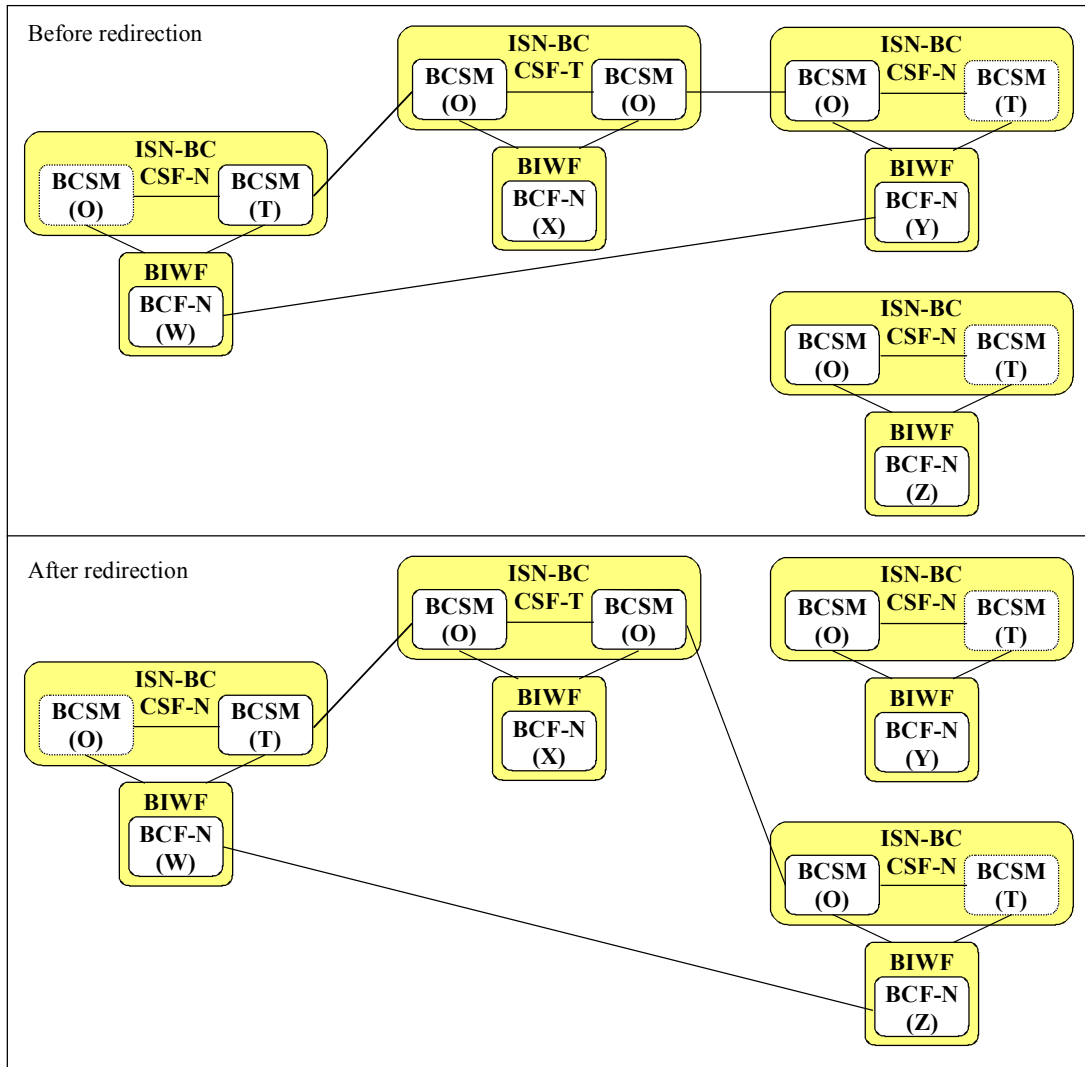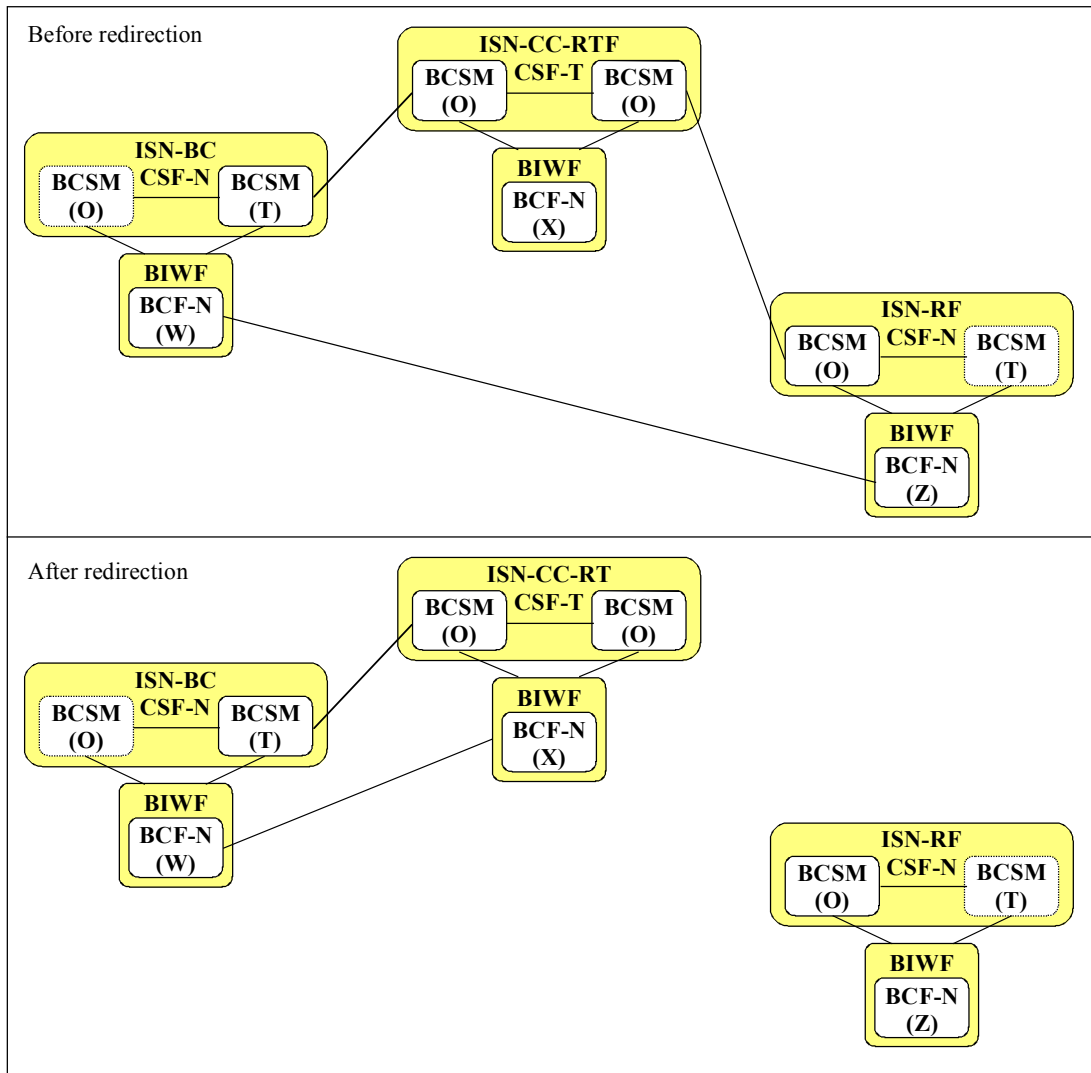

Figure C.1 – Separate functional entities
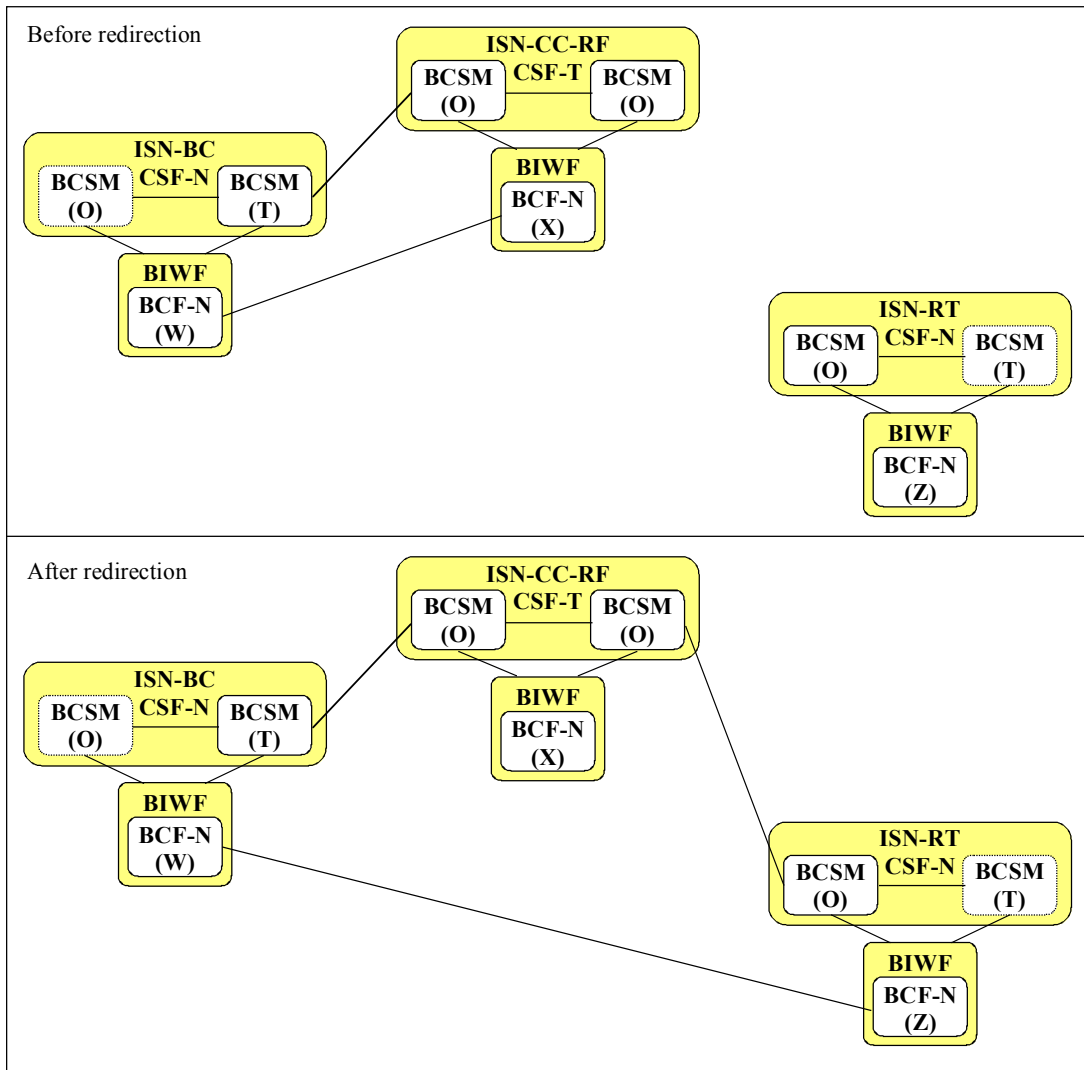
Figure C.2 – Combined CC-anchor and redirecting-from-node

Figure C.3 – Combined CC-anchor and redirecting-to-node
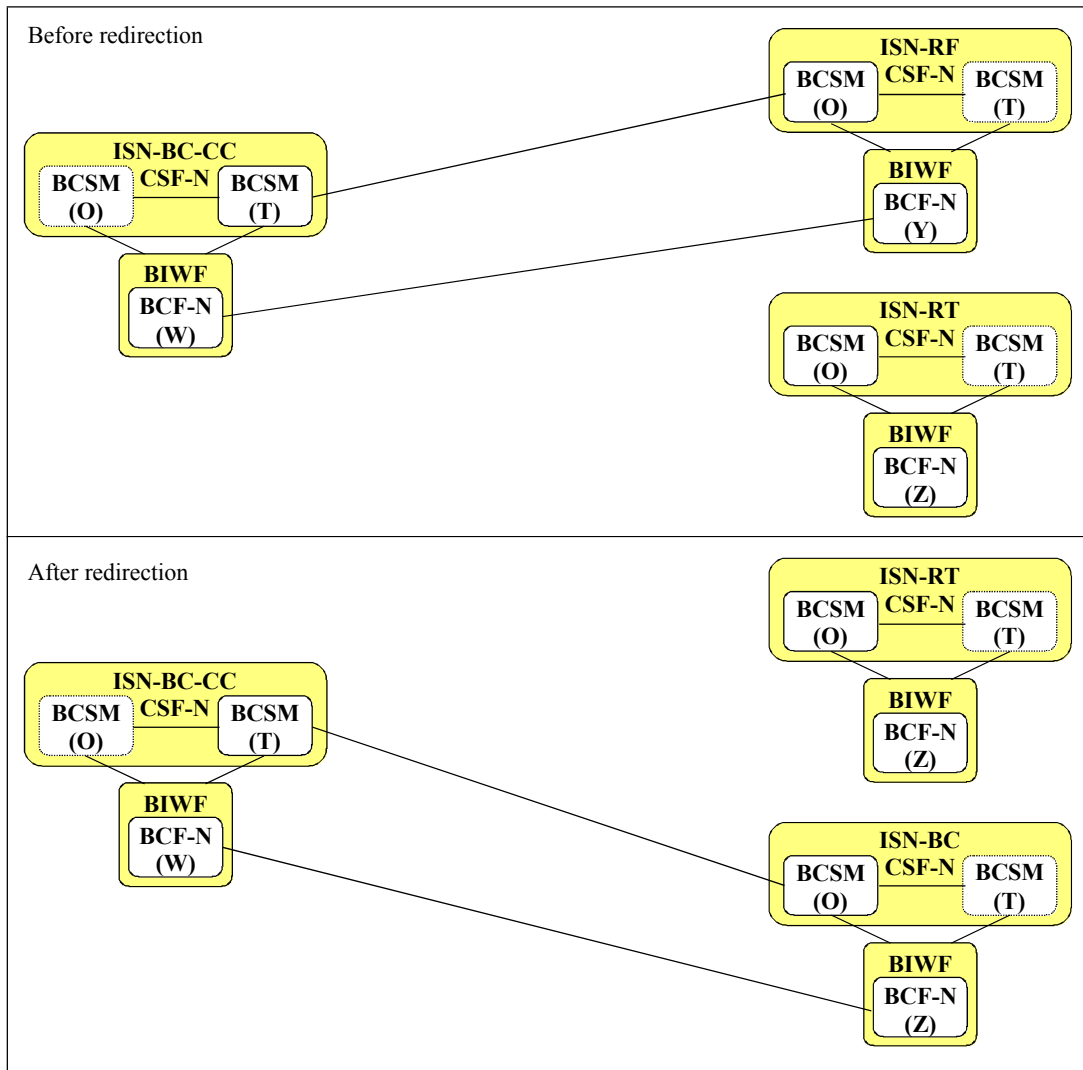
Figure C.4 – Combined BC-anchor and CC-anchor (corresponds to pivot routing)
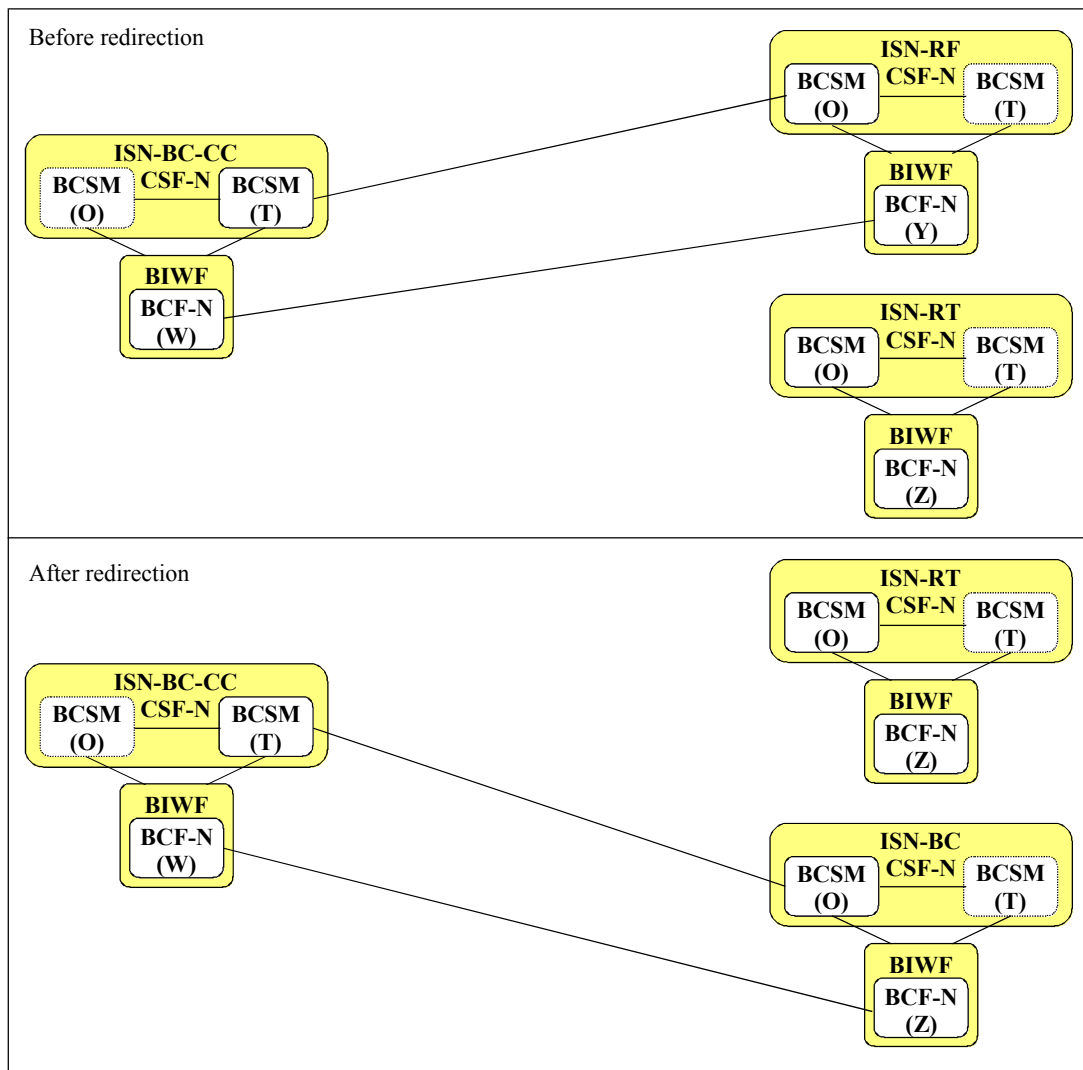
Figure C.5 – Combined redirecting-from-node and redirecting-to-node

C.2 Redirection Schema

For the general case, the preconditions for redirection can be summarized as follows:

1) There is a Call Control leg from the BC-anchor to the CC-anchor (this may be null if BC-anchor and CC-anchor are combined).

2) There is a Call Control leg from the CC-anchor to the redirecting-from-CC-node (this may be null if CC-anchor and redirecting-from-CC-node are combined).

3) There is a Bearer Control leg from the BC-anchor to the redirecting-from-CC-node (this may be null if BC-anchor and redirecting-from-CC-node are combined).

Redirection proceeds by:

1) The CC-Anchor node requesting redirection of the BC-anchor node; and receiving a response, followed by;

2) Establishing a new Call between the CC-Anchor node and the Redirecting-To node; and

3) Establishing a new bearer between the BC-anchor node and the Redirecting-To node;

4) Removing the Call between the CC-Anchor and the Redirecting-From node; and

5) Removing the Bearer between the BC-anchor node and the Redirecting-From node.

Hence, the resulting redirection post-conditions are the following:

1) There is a Call Control leg from the BC-anchor to the CC-anchor (this may be null if BC-anchor and CC-anchor are combined).

2) There is a Call Control-leg from the CC-anchor to the Redirecting-to node (this may be null).

3) There is a Bearer Control leg from the BC-anchor to the Redirecting-to node (this will not be null).

4) The Call Control leg from the CC-Anchor to the Redirecting-from node (if this was not null) will have been cleared.

5) The Bearer Control leg from the BC-Anchor to the Redirecting-from node (if this was not null) will have been cleared.

Annex D

Overview of "Tunnelling"

D.1   Introduction

BICC CS-1 operated by means of coordination between the Call Control layer, the BICC protocol itself, and independent 'Bearer Control Protocols' carried over separate signalling transport between the Bearer Control Functions at the SNs and the intervening transport network elements. For example, in the case of AAL 2 networks, AAL 2 signalling (ITU-T Rec. Q.2630.1) is used between BCFs at the SNs (BCF-Ns) and at the AAL 2 switches within the network (BCF-Rs).

In CS-2, a new bearer technology has been introduced, namely IP, which does not make use of call by call switching within the bearer network. IP datagrams are individually routed within the IP network from the BIWF at one SN to the BIWF at the next.

To support this technology, a Bearer Control Tunnelling mechanism is introduced supporting transport of Bearer Control PDUs from one SN to the other, by means of encapsulation within the BICC messages themselves.

The CSF procedures do not make assumptions about the contents of the Bearer Control PDUs, and the procedures for receipt and processing and generation of these PDUs are the responsibility of the BCF.
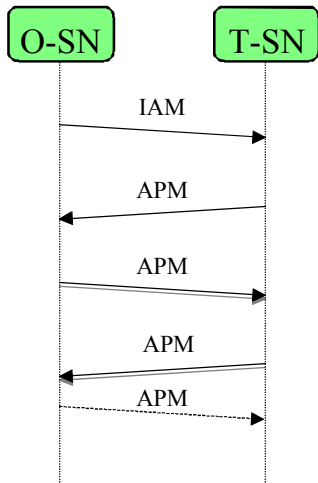
D.2   Operation of the mechanism

Three variants of call setup using Bearer Control Tunnelling are defined:

• Delayed Forwards Setup;
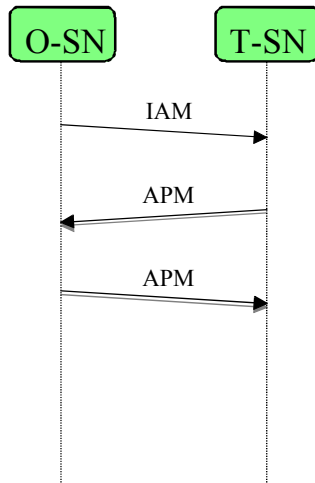
• Backwards Setup;

• Fast Setup.

The message flow for each of these is illustrated in Figure D.1. Certain messages are optional and are shown with dotted arrows. Messages containing encapsulated Bearer Control PDUs are shown as heavier arrows (in red if viewed in color).

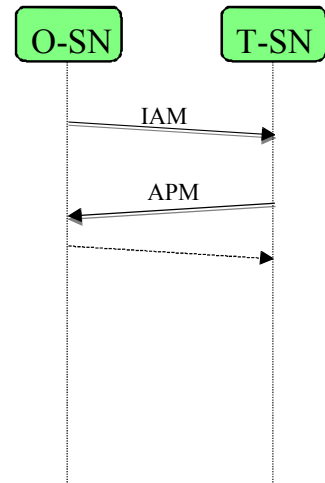The three mechanisms are described in more detail below.

Figure D.1 – Overview setup flows for bearer control tunnelling

D.2.1 Delayed forwards setup

In this procedure, Bearer Control PDU information is not available at the point at which the IAM is sent. This may be because BIWF selection is delayed, or because the Bearer Control Setup procedures cannot be started until information from the T-SN (e.g. selected codec) is known.

Instead, an IAM is first sent from O-SN to T-SN containing no Bearer Control PDU. An APM is then returned. This may include, for example, details of the Selected Codec, if codec negotiation is being used, or the BCU-ID of the BCU selected at the T-SN.

At this point, the O-SN sends an APM message containing the first Bearer Control PDU from the originating BFC. This is responded to with an APM containing a Bearer Control PDU from the terminating BCF.

Optionally, a final APM is sent forwards to confirm that the bearer connection has been successfully established. This is only required for bearer technologies which do not cut through the backwards speech path until a complete exchange of Bearer Control PDUs has taken place.

D.2.2 Backwards setup

In this procedure, again Bearer Control PDU information is not available at the point at which the IAM is sent. This may be because BIWF selection is delayed, or the network may simply be configured to operate in this way.

Instead, an IAM is first sent from O-SN to T-SN containing no Bearer Control PDU. An APM is returned from T-SN to O-SN containing the Bearer Control PDU from the T-BCF. On receipt of the APM at the O-SN, this PDU is delivered to the O-BCF.

A further APM is then sent from O-SN to T-SN containing a Bearer Control PDU from the O-BCF. On receipt of this APM at the T-SN, the Bearer Control PDU is delivered to the T-BCF, completing the setup procedure.

D.2.3 Fast setup

In this procedure, a Bearer Control PDU is supplied by the O-BCF at initial setup and included within the IAM.

On receipt of the IAM at the T-SN, the Bearer Control PDU is delivered to the T-BCF. The T-BCF supplies a Bearer Control PDU in return, which is included in an APM back to the O-SN, where it is delivered to the O-BCF.

As with the delayed forwards mechanism, optionally a further forwards APM is used to confirm completion of the connection.

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