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Interface Recommendation for Intelligent Network Capability Set 4: SCF-SRF interface

ITU-T Recommendation Q.1248.3

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Interface Recommendation for Intelligent Network Capability Set 4: SCF-SRF interface

Summary

The Q.1248.x family of ITU-T Recommendations define the Intelligent Network (IN) Application Protocol (INAP) for IN Capability Set 4 (IN CS-4). This definition is based upon IN CS-3 ITU-T Q.1238 (2000) and upon the general rules for INAP provided in ITU-T Q.1208, and is consistent with the scope of IN CS-4 as defined in ITU-T Q.1241.

Within the Q.124x series of ITU-T Recommendations, the Q.1248.x family of ITU-T Recommendations describes the protocol realizing the Q.1244 Distributed Functional Plane in a service and vendor implementation independent manner, as constrained by the capabilities of the embedded base of network technology. This provides the flexibility to allocate distributed functionality into multiple physical network configurations and to evolve IN from IN CS-4 to some future CS-N.

This Recommendation belongs to the Q.1248.x family of ITU-T Recommendations for IN Capability Set 4. It covers the SCF-SRF interface including the description of the aspects of the SCF and SRF Functional Entities which are relevant to this interface.

This Recommendation includes an electronic attachment containing Annex A, ASN.1 definitions.

Source

ITU-T Recommendation Q.1248.3 was prepared by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 13 July 2001.

Keywords

IN, CS-4, INAP, SRF, SCF, IP.

FOREWORD

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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

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ITU-T Recommendation Q.1248.3

Interface Recommendation for Intelligent Network Capability Set 4: SCF-SRF interface¹

1 Scope

This Recommendation belongs to the Q.1248.x family of ITU-T Recommendations for IN CS-4. It covers the SCF-SRF interface including the description of the aspects of the Functional Entities SRF and SCF which are relevant to this interface.

2 References

All references are identified in ITU-T Q.1248.1.

3 Abbreviations and acronyms

All abbreviations and acronyms used in this text are defined in ITU-T Q.1248.1.

4 Relationships

4.1 SRF-CCF relationship

At present, it is considered that the CCF is under control of the SSF: a SRF-SSF/CCF relationship exists for connection control to specialized resources.

The relationship between the SRF and the CCF is not defined (e.g. in the case of releasing a connection on which a resource is used). The SRF may contain functionality similar to the CCF to manage bearer connections to specialized resources, but no call model is specified.

4.2 SCF-SRF relationship

This SCF-SRF relationship is used when the SCF sends instructions to the SRF.

The SCF-SRF relationship could be a direct link or established via a relay through the SSF.

In some cases, this SCF-SRF relationship is used when the SCF delegates some of the service logic to the SRF, which executes a specialized type of service logic, known as *User Interaction scripts*. This can avoid long response times, which are unavoidable if functions are physically distributed over two network nodes: the SCP and the IP.

In assisting scenarios the SRF establishes the relationship towards the SCF.

5 SCF FE model

The prime function of the Service Control Function (SCF) is the execution of service logic. Service logics interface and interact with the Service Switching and Call Control Function for establishing end user interaction to send and receive information. Specialized resources used in the context of end user interaction are managed by the Specialized Resource Function (SRF) and controlled by the Service Control functionality.

¹ This Recommendation includes an electronic attachment containing Annex A, ASN.1 definitions.

6 SRF FE model

This clause describes the various components found within an SRF. It is noted that this shows a conceptual model of SRF and is not intended to imply an actual implementation of the SRF.

Main SRF components are:

- a) Functional Entity Access Manager (FEAM);
- b) SRF Resource Manager (RM);
- c) Resources.

The SRF Resource Manager is contained in a block called Resource Control Part along with the Resource Logic Library and the Resource Logic Instances; it is possible to split the Resources in the following blocks:

- a) Resource Function Part (RFP);
- b) Data Part (DP).

Enhancements of the SRF components are described in the following subclauses and in Figure 1.

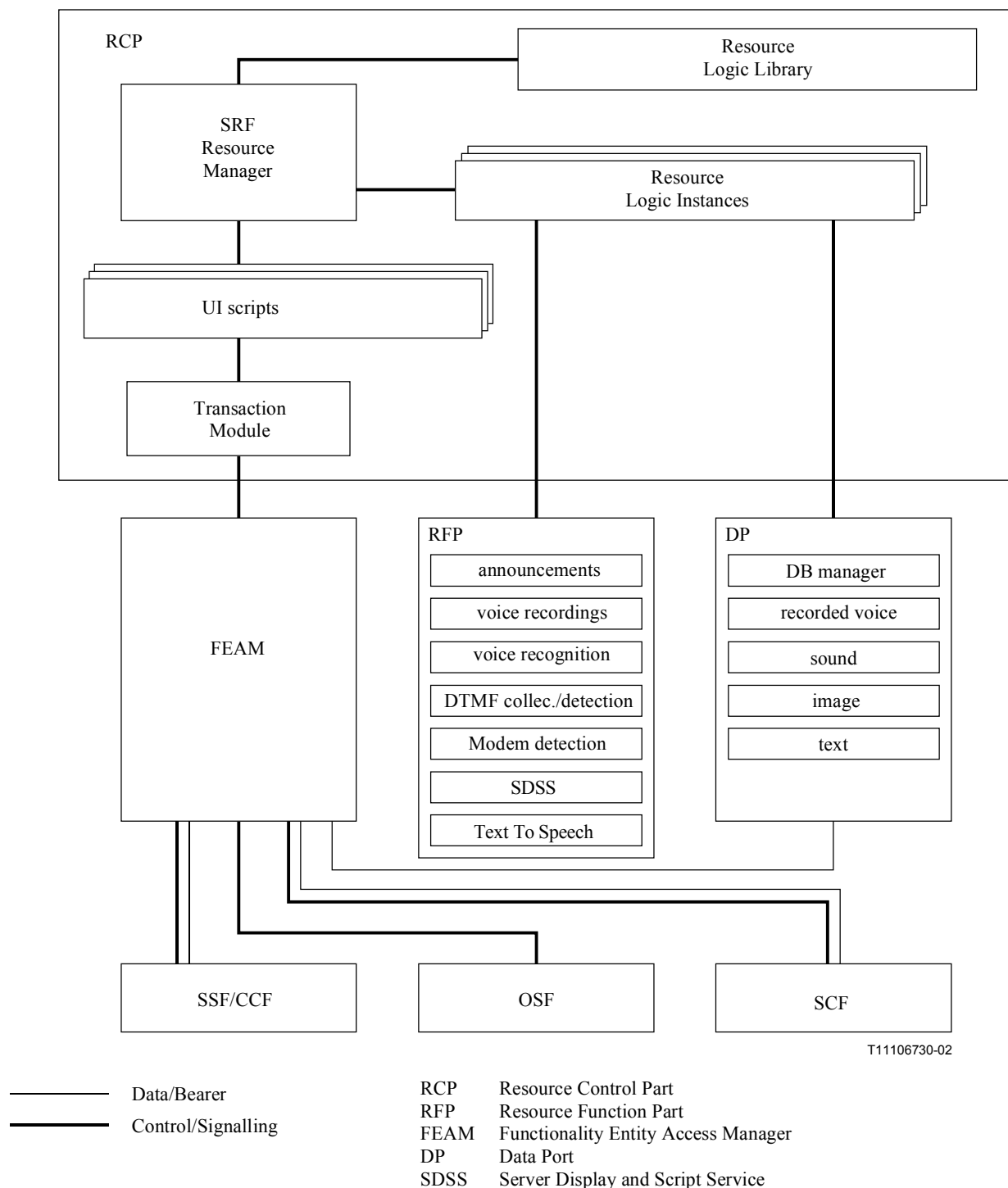


Figure 1/Q.1248.3 – SRF FE model

6.1 Resource Control Part (RCP)

The RCP contains SRF service logic, and controls the service procedure using the capabilities of other blocks. To offer a specialized resource, RCP uses resource-function pair in the RFP and data in the DP.

Whenever RCP receives a call requesting a specialized resource-function pair, it invokes the internal resource controller, which manages the first needed resource function pair to make a decision of admission or rejection of the call. The SRF sends ACK or NACK messages according to the decision by the resource controller.

There are as many controllers as there are special resource function types. The controllers accept or reject calls requesting a resource-function pair on the basis of characteristic parameters. A controller consists of an interface unit and a decision unit. First one encodes and decodes messages from/to the FEAM, and makes the input patterns for the decision unit; the characteristic parameter permitting the acceptance or rejection of the call controlled by an algorithm within the decision unit, and is based on the parameters from the interface unit.

6.1.1 SRF Resource Manager

The RM provides the functionality which is necessary for the SRF to manage the resources contained in it. The RM contains the capabilities to search for a resource, to allocate or de-allocate it, to manage the status of a resource, and to control its actions.

6.1.2 Transaction Module

The Transaction Module provides the functionality necessary for:

- detection of transactions from the communication links;
- routing of transactions to the right applications scripts.

6.1.3 User Interaction scripts (UI Script)

It provides to the SCF a vision of the different specialized resources functions that the SRF can perform. A User Interaction script is an aggregation of Resource Function.

6.1.4 Resource Logic Library

It indicates the SRF Logic and Physic Resources that are necessary for a given User Interaction script.

6.1.5 Resource Logic Instances

It instances the SRF resources that are necessary for the correct execution of the invoked specialized resource.

6.2 Resource Function Part (RFP)

The RFP is a collection of resource-function pairs or functional elements of resources. Resources in a resource-function pair for a service procedure are allocated and released together.

6.3 Data Part (DP)

The DP is composed of a database manager and a database containing recorded voice, sound, image, text, etc.

7 SRF application entity procedures

As described in ITU-T Q.1248.1, the SRF FSM handles interactions with the SSF FSM and the SCF FSM entity. The SRME-control interfaces to the various SRF call state models (SRSM) and the functional entity access manager (FEAM). The SRF FSM structure is described in Figure 2. The FEAM is described in ITU-T Q.1248.1.

General tasks of the SRME-control are defined in ITU-T Q.1248.1. In addition to the general tasks, the SRME-control checks the existence of a SCF-SRF relationship by receiving an Activitytest operation from the SCF and returns the result to the SCF.

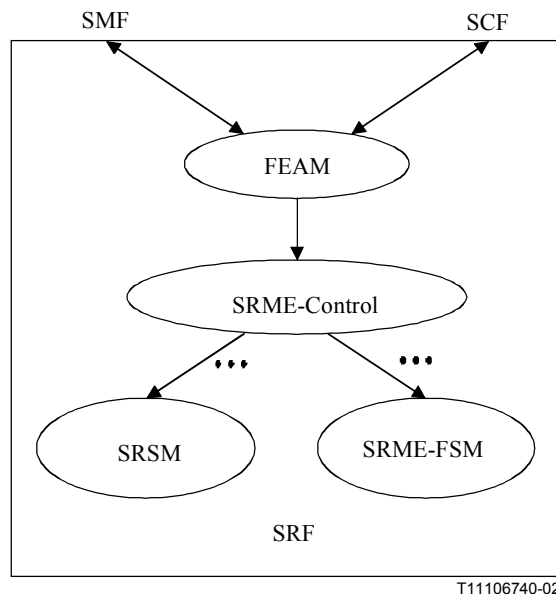


Figure 2/Q.1248.3 – SRF FSM structure

The SRS and SRME-FSM are described in the following subclauses.

7.1 The SRF management finite state model (SRME FSM)

The SRME handles the following operation:

- **sRFCallGap.**

The sRFCallGap operation is issued within a context of an existing relationship and does not cause state transitions in the SRME.

All other operations have no effect on the SRME-FSMs; the operations are passed by the SRME-Control to the relevant FSM.

7.2 The SRF call State Model: SRS

The SRS is presented in Figure 3. In what follows, each state is described in a separate subclause together with the events that cause a transition out of this state. Finally, the outputs are presented within smaller rectangles than the states are; unlike the states and events, the outputs are not enumerated.

an event would be the completion of the operation being executed, or the reception of an external event).

- If there is an error in processing one of the operations in the sequence, the SRF FSM processes the error (see below) and discards all remaining operations in the sequence.
- If an operation is not understood or is out of context (i.e. it violates the SACF rules defined by the SRSF) as described above, the SRF FSM processes the error according to the rules given in ITU-T Q.1248.1 (using TC-U-REJECT or the operation error UnexpectedComponentSequence).

In any state, if there is an error in a received operation, the maintenance functions are informed. Generally, the SRSF remains in the same state in which it received the erroneous operations; however, different error treatments are possible in specific cases as described in ITU-T Q.1248.1; depending on the class of the operation, the error could be reported by the SRF to the SCF using the appropriate component (see ITU-T Q.774).

In any state, if the dialogue with the SCF (direct SCF-SRF case) is terminated, then the SRSF returns to idle state after ensuring that all resources allocated to the dialogue have been de-allocated. The SRF shall remain connected to the SSF as long as it has PlayAnnouncement operations active or buffered. Depending on the type of script, the SRF may also remain connected when a script is active or when a ScriptRun is buffered. The resources allocated to the call will be de-allocated when all announcements are completed or when the SSF disconnects the bearer connection (i.e. call party release).

In any state (except "Idle"), if the SSF disconnects the bearer connection to the SRF before the SRF completes the user interaction, then the SRSF clears the call and ensures that all SRF resources allocated to the call have been de-allocated. Then it transits to the "Idle" state.

The SRSF has an application timer, T_{SRF} , whose purpose is to prevent excessive unnecessary resource allocation. This timer is set when the SRF sends Setup Response bearer message to the SSF (SSF relay case) or the AssistRequestInstructions operation (Direct SCF-SRF case). This timer is stopped when a request is received from the SCF. The SRF may reset T_{SRF} on transmission of the SpecializedResourceReport, ScriptEvent and ScriptClose operation, the return result for the PromptAndCollectUserInformation operation or the return result for the PromptAndReceiveMessage operation when there is no queued user interaction operation. On the expiration of T_{SRF} , the SRSF transits to the "Idle" state, ensuring that all SRF resources allocated to the call have been de-allocated.

7.2.1 State 1: "Idle"

The "Idle" state represents the condition prior to, or at the completion of, an instance of user interaction. This state is entered as a result of events E3, e4, E10, e11 and e12.

- (E3) Connection_Released_from_SSF: This event takes place when the SRSF receives a release message from the SSF in connected state. The SRSF goes to the state "Idle";
- (e4) SRF_Sanity_Timeout: This event occurs when the SRSF has been in connected state for a network-operator-defined period of time (timer T_{SRF}) without having an SCF-initiated operation to execute. The SRF initiates a bearer channel disconnect sequence to the SSF using the applicable bearer channel signalling system. The SRSF goes to the state "Idle";
- (E10) Connection_Released_from_SSF: This event takes place when the SRSF receives a release message from the SSF in "user interaction" state. The SRSF goes to the state "Idle";
- (e11) Disconnect_to_SSF: This event occurs when the SCF has enabled SRF-initiated disconnect by:
 - the last PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage/ScriptRun from SCF (E18) or (E2) with the parameter disconnectFromIPForbidden set to false. The SRSF initiates a bearer channel disconnect

sequence to the SSF using the applicable bearer channel signalling system after sending the last SpecializedResourceReport operation, a return result for PromptAndCollectUserInformation or a return result for PromptAndReceiveMessage or last ScriptEvent operation to the SCF. The SRSR goes to state the "Idle";

- (e12) SRF_Sanity_Timeout: This event occurs when the SRSR has been in User interaction state for a network-operator-defined period of time (timer T_{SRF}) without having an SCF-initiated operation to execute. The SRF initiates a bearer channel disconnect sequence to the SSF using the applicable bearer channel signalling system. The SRSR goes to the state "Idle".

The following event may be received and leads to exit the current state:

- (E1) Connect_Request_from_SSF: This event corresponds to a bearer signalling connection request message from the SSF. The details of the bearer signalling state machine related to establishing the connection are not of interest to the FSM. The SRSR goes to the state "Connected".

7.2.2 State 2: "Connected"

This state represents the condition of the SRSR when a bearer channel has been established between a user and the SRF but the initial PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage/ScriptRun has not yet been received (e.g. when EstablishTemporaryConnection procedures are used). The method used to provide this bearer channel is not of interest in the FSM.

This state is entered as a result of:

- (E1) Connect_Request_from_SSF: This event corresponds to a bearer signalling connection request message from the SSF in the "Idle" state.
- (E14) ScriptClose_from_SCF: This event takes place when the ScriptClose operation from the SCF is received.
- (e15) Final_implicit_ScriptEvent_to_SCF: This event takes place when the final Result of the User Interaction script execution is sent from the SRF to the SCF. It covers the implicit termination case when automatic disconnection is either not allowed or not specified. The SRSR state moves to the state "Connected".

In this state, the following events may be received and do not lead to FSM state change state:

- (e5) Assist_Request_Instructions_Needed: This event occurs when the AssistRequestInstructions operation is sent from the SRSR to the SCF in the absence of an operation concatenated with the Setup request from SSF (E1) (Direct SCF-SRF case). No state change occurs as a result of this event.
- (E14) ScriptClose_from_SCF: This event takes place when the ScriptClose operation from the SCF is received. The SRSR remains in the state "Connected".

Note that this state transition is permitted only if the SRSR received ScriptRun operation from SCF previously.

This state is exited as a result of one of the following events:

- (E2) First_Instruction_from_SCF: This event takes place when the first PlayAnnouncement, PromptAndCollectUserInformation or PromptAndReceiveMessage or ScriptRun operation from the SCF is received. The SRSR goes to the state "User interaction".
- (E3) Connection_Released_from_SSF: This event takes place when the SRF receives a release message from the SSF. The SRSR goes to the state "Idle".
- (e4) SRF_Sanity_Timeout: This event occurs when the SRSR has been connected for a network-operator-defined period of time (timer T_{SRF}) without having an SCF-initiated

operation to execute. The SRSR initiates a bearer channel disconnect sequence to the SSF using the applicable bearer channel signalling system. The SRSR goes to the state "Idle".

- (E13) ScriptRun_from_SCF: This event takes place when the ScriptRun operation from the SCF is received. The SRSR goes to the state "User interaction".

7.2.3 State 3: "User interaction"

The "User interaction" state indicates that communication is occurring between the user and the SRF via the bearer channel established at the "Connected" state.

This state is entered as a result of events E2 and E13:

- (E2) First_Instruction_from_SCF: This event takes place when the first PlayAnnouncement, PromptAndCollectUserInformation or PromptAndReceiveMessage or ScriptRun operation from the SCF is received.
- (E13) ScriptRun_from_SCF: This event takes place when the ScriptRun operation from the SCF is received.

In this state, the following events may be received and do not lead to FSM state change:

- (E18) Subsequent_Instruction_from_SCF: This event takes place when subsequent PlayAnnouncement, PromptAndCollectUserInformation, or PromptAndReceiveMessage operation(s) from the SCF are received. The SRSR remains in the state "User interaction". Event E18 also represents additional PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage operations which are buffered as discussed in the procedures.
- (E6) Cancel_from_SCF (for PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage): This event takes place when the corresponding PlayAnnouncement, PromptAndCollectUserInformation or PromptAndReceiveMessage operation is received from the SCF. The indicated interaction is terminated if it is presently running; otherwise, it is deleted from the buffer. The SRSR remains in the state "User interaction".
- (e7) SRF_Report_to_SCF: This event takes place when a SpecializedResourceReport, a return result for PromptAndCollectUserInformation or a return result for PromptAndReceiveMessage operation is sent to the SCF. The SRSR remains in the state "User interaction".
- (e8) PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage_Cancelled_to_SCF: This event takes place when the PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage error caused by the Cancel (for PlayAnnouncement, PromptAndCollectUserInformation or PromptAndReceiveMessage) operation is sent to the SCF. This event represents the successful cancellation of an active or buffered PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage operation. The SRSR remains in the state "User interaction".
- (e9) Cancel_Error_to_SCF: This event takes place when the cancel error (for PlayAnnouncement, PromptAndCollectUserInformation or PromptAndReceiveMessage) is sent to the SCF. This event represents the unsuccessful cancellation of a PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage operation. The SRSR remains in the state "User interaction".
- (e19) Intermediate_ScriptEvent_to_SCF: This event takes place when a partial result is sent from a SRF to the SCF in case the SRF needs additional information. The SRSR remains in the state "User interaction".
- (E16) ScriptInformation_from_SCF: This event takes place when the ScriptInformation operation from the SCF is received. The SRSR remains in the state "User interaction".

- (E17) `ScriptRun_from_SCF`: This event takes place when the `ScriptRun` operation from the SCF is received. The SRSR remains in the state "User interaction". It follows a `PlayAnnouncement`, `PromptAndCollectUserInformation` or `PromptAndReceiveMessage` which is terminated. No other User Interaction Script shall be already active for the call.
Note that a subsequent `ScriptRun` operation from the SCF is not permitted in this state.
- (e20) `Final_explicit_ScriptEvent_to_SCF`: this event takes place when the final Result of the User Interaction script execution is sent from the SRF to the SCF. It covers the explicit termination case. The SRSR remains in the state "User interaction".

This state is exited as a result of one of the following events:

- (E10) `Connection_Released_from_SSF`: This event takes place when the SRSR receives a release message from the SSF. The SRSR goes to the state "Idle".
- (e11) `Disconnect_to_SSF`: This event occurs when the SCF has enabled SRF-initiated disconnect by:
 - the last `PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage/ScriptRun` from SCF (E18) or (E2) with the parameter `disconnectFromIPForbidden` set to false. The SRSR initiates a bearer channel disconnect sequence to the SSF using the applicable bearer channel signalling system after sending the last `SpecializedResourceReport` operation, a return result for `PromptAndCollectUserInformation` or a return result for `PromptAndReceiveMessage` or last `ScriptEvent` operation to the SCF. The SRSR goes to the state "Idle".
- (e12) `SRF_Sanity_Timeout`: This event occurs when the SRSR has been in user interaction state for a network-operator-defined-period of time (timer T_{SRF}) without having a `PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage` operation to execute. The SRSR initiates a bearer channel disconnect sequence to the SSF using the applicable bearer channel signalling system. The SRSR goes to the state "Idle".
- (E14) `ScriptClose_from_SCF`: This event takes place when the `ScriptClose` operation from the SCF is received. The SRSR goes to the state "Connected".
Note that this state transition is permitted only if the SRSR received `ScriptRun` operation from SCF previously.
- (e15) `Final_implicit_ScriptEvent_to_SCF`: This event takes place when the final Result of the User Interaction script execution is sent from the SRF to the SCF. It covers the implicit termination case when automatic disconnection is either not allowed or not specified. The SRSR moves to the state "Connected".

In addition to these explicitly marked transitions, failure of a user-SRF bearer connection will cause the SRSR to transit to "Idle" from any state. These transitions are not shown on Figure 3 for the purpose of visual clarity.

7.3 SRF control procedures using CTR/ETC

This clause provides a detailed description of the SRF procedures. Arrow diagrams are used for the description of the connect, interaction with the end user, and disconnect stages.

The SRF control procedures are based on various physical allocation patterns of SRF.

The service assist procedure is also described in this clause as an example.

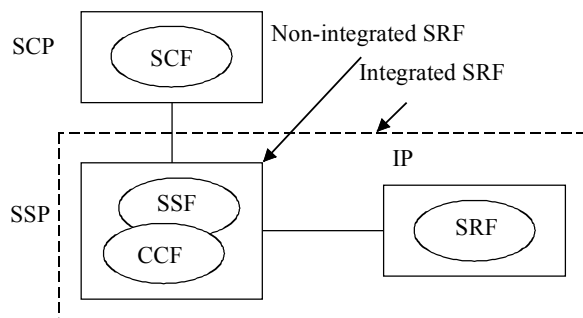
Note that, through this clause, bearer connection control signalling messages are used for explanatory purpose, and are not subject for standardization in this Recommendation. The terms used for bearer connection control signalling messages only represent the functional meaning.

7.3.1 SRF connect procedures

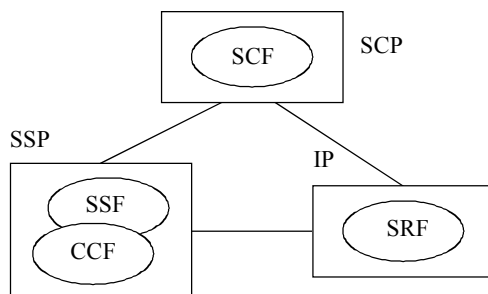
7.3.1.1 SRF connect physical procedures

Several procedures are required for different physical scenarios. The cases to be covered are described below and illustrated in Figure 4.

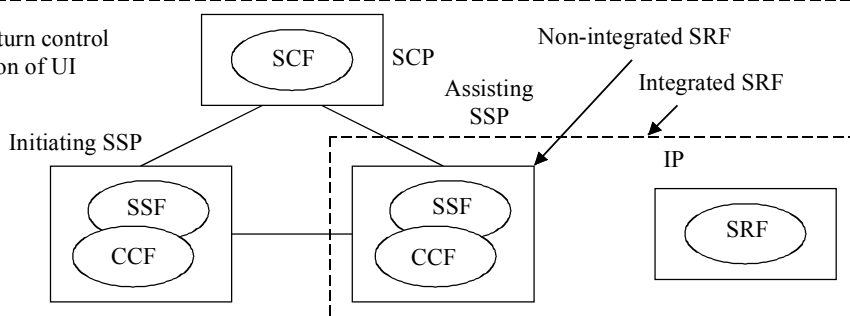
Case i) SSF relay



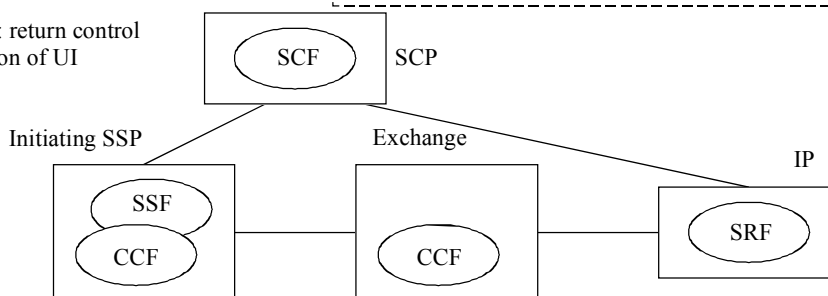
Case ii) Direct path SCP to IP



Case iii) Assist with relay: return control to initiating SSP on completion of UI



Case iv) Assist without relay: return control to initiating SSP on completion of UI



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Figure 4/Q.1248.3 – Physical scenarios

The SCF-SRF relationship could be done through a direct link as depicted in scenarios ii) and iv) or may be established through a relay SSF as depicted in scenarios i) and iii).

- i) the IP is integrated into the SSP, or attached to the SSP, possibly via a local exchange, that is interacting with the SCP but the SCP's operations to the IP are relayed via the SSP which performs any needed protocol conversion;

- ii) the IP is directly attached to the SSP that is interacting with the SCP but the SCP's operations to the IP are sent directly to the IP without SSP relaying involved;
 - iii) the IP is integrated into another SSP, or directly attached to another SSP, than the one that is interacting with the SCP but the SCP's operations to the IP are relayed via the second SSP (called the "Assist" method), and on completion of the user interaction, control is returned to the first SSP;
- and
- iv) the IP is directly attached to a node other than the SSP that is interacting with the SCP but the SCP's operations to the IP are sent directly to the IP without SSP relaying involved (called the "Assist" method, but with a variation on the physical connectivity of the entities involved), and on completion of the user interaction, control is returned to the first SSP.

As within a Call Segment Association several users may be present at the same time, it shall be possible to interact with one of the user independently from the others. For each independent User Interaction, any of one of the above scenario may be used.

Per Call Segment, only one User Interaction is allowed; the resource can be either connected to one leg or to the connection point of the Call Segment (that means to all the legs of the Call Segment). It is recommended that before performing the User Interaction towards a user, the SCF isolates the user (the leg) in a new CallSegment. PromptAndCollectInformation, PromptAndReceiveMessage, ScriptRun, ScriptInformation and ScriptClose operations are only accepted for Call Segment where only one "joined" leg exists.

Note that this control is not applicable in case of "direct" scenario; this is left to the SCF responsibility.

In case several legs are connected within a Call Segment, it is possible to perform a User Interaction towards one of the legs of the Call Segment. However, only a PlayAnnouncement is allowed in that configuration and will be applied to the dedicated leg (user) only. It has to be noted that this control could not be performed in case of "direct" scenario.

In order to be able to connect the resource to the targeted user(s), the LegId or CSid parameter is used in the ConnectToResource/EstablishTemporaryConnection. In order to be able to direct the operation to the right resource, the LegId or CSid parameter is also used in the subsequent PlayAnnouncement, PromptAndCollectUserInformation, PromptAndReceiveMessage, ScriptRun, ScriptInformation, ScriptClose operation and OCCRUI operations.

Note that, in case of direct scenario cases ii) and iv), established via EstablishTemporaryConnection, as there is one independent direct SCF-SRF relationship per established User Interaction, the LegId, CSid parameters in subsequent operation are ignored by the IP.

In case of relay scenario, subsequent operation shall address the Leg/CallSegment in the same way as it was done by the ConnectToResource operation.

If the PlayAnnouncement operation is received after a ConnectToResource operation only the following combinations are allowed, depending on the "resourceAddress" parameter of the related ConnectToResource operation:

ConnectToResource ("resourceAddress")	PlayAnnouncement ("connectedParty")
"none" or "iPRoutingAddress"	<not included>
"none" or "iPRoutingAddress"	"legID" (Note)
"none" or "iPRoutingAddress"	"callSegmentIdentifier"
"legID" or "iPAddressAndLegID"	"legID"
"callSegmentID" or "iPAddressAndCallSegment"	"callSegmentIdentifier"
"callSegmentID" or "iPAddressAndCallSegment"	"legID" (Note)
NOTE – Applicable if "informationToSend" parameter contains outband information (i.e. "displayInformation"). It is not possible for "inbandInfo" and "tone". This way, individual display information can be sent to each party of a call segment without each time connecting and disconnecting the SRF.	

If the PromptAndCollectUserInformation, PromptAndReceiveMessage, ScriptRun, ScriptInformation, ScriptClose operation is received after a ConnectToResource operation, only the following combinations are allowed, depending on the "resourceAddress" parameter of the related ConnectToResource operation:

ConnectToResource ("resourceAddress")	PromptAndCollectUserInformation, PromptAndReceiveMessage, ScriptRun, ScriptInformation, ScriptClose ("callSegmentIdentifier")
"none" or "iPRoutingAddress"	<not included>
"none" or "iPRoutingAddress"	"callSegmentIdentifier"
"callSegmentID" or "iPAddressAndCallSegment"	"callSegmentIdentifier"

If the RequestReportUTSI, SendSTUI, operation is received after a ConnectToResource operation only the following combinations are allowed, depending on the "resourceAddress" parameter of the related ConnectToResource operation:

ConnectToResource ("resourceAddress")	RequestReportUTSI, SendSTUI ("legID")
"iPRoutingAddress"	<not included>
"legID" or "iPAddressAndLegID"	"LegID"

If the use of the subsequent operation LegID/CSid parameter is not consistent with the "resourceAddress" of a related ConnectToResource operation (i.e. violates the allowed combinations) then the error "UnexpectedDataValue" is reported to the invoking entity.

Each of the scenarios will now be examined using arrow diagrams.

NOTE – In Figures 5 to 15, black lines indicate INAP operations and grey lines indicate DSS1 operations.

7.3.1.1.1 SSF relay

Case i) is illustrated in Figure 5. Note that for the integrated IP/SSP, the internal activities of the node can still be modelled in this way, but the details of how this is achieved are left to the implementor. This approach makes it unnecessary for the SCP to distinguish between integrated and external but directly connected IPs. See also a note on the possibility of concatenating the first user interaction operation with the ConnectToResource operation discussed in the clause on user interaction below. The establishment of the SCF-SRF relationship in this case is implicit.

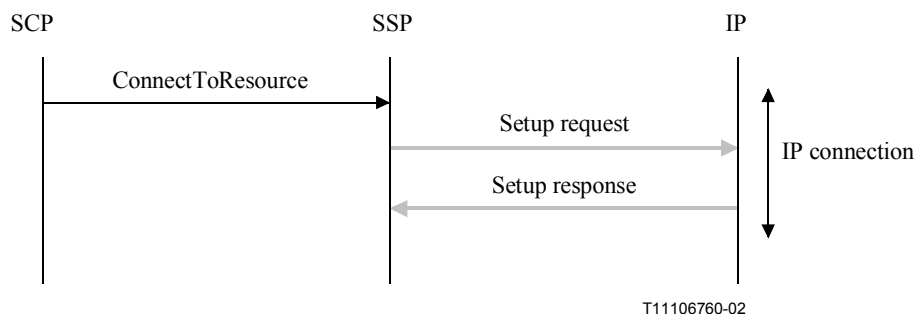


Figure 5/Q.1248.3 – Connection to integrated or external IP with SSP relay of IP operations

7.3.1.1.2 Direct path SCP to IP

Case ii) requires that the IP indicates to the SCP that it is ready to receive operations (see Figure 6). The establishment of the SCF-SRF relationship is explicit. Note that it is necessary to convey a correlation ID to ensure that the transaction established between the SCP and the IP can be correlated to the bearer connection setup as a result of the SCP's preceding operation to the SSP.

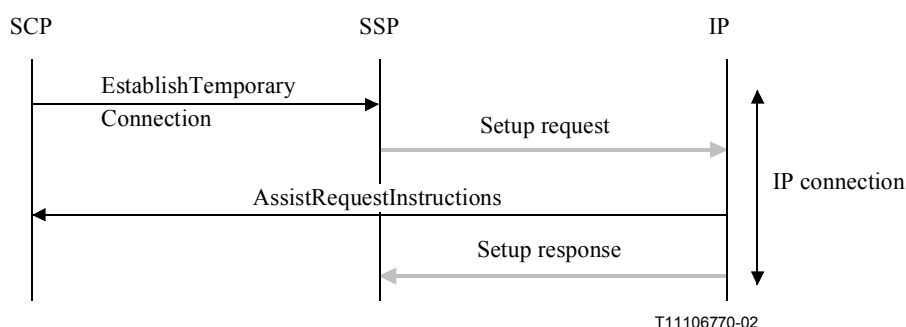


Figure 6/Q.1248.3 – Connection to IP with direct link to SCP, IP initiates interaction with SCP

7.3.1.1.3 Assist with relay

Case iii) requires that a transaction be opened with the assisting SSP so that it may relay operations from the SCP to the IP (integrated or external). Once the bearer control signalling has reached the assisting SSP, it triggers on the identity of the called facility, and initiates an interaction with the SCP that has requested the assistance. It would also be possible to trigger on other IEs such as the incoming address. The bearer control signalling must contain information to identify the SCP requesting the assistance, and a correlation ID. This information may be hidden in the address information in such a way that non-message-based signalling systems may also be used to establish the bearer connection to the assisting SSP. After the AssistRequestInstructions are received by the SCP, the procedures are the same as case i). Figure 7 illustrates the preamble involved.

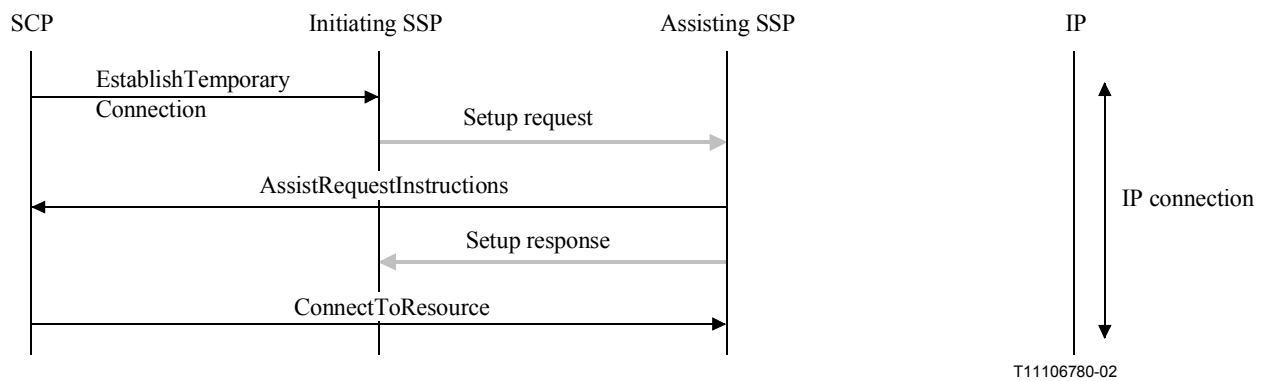


Figure 7/Q.1248.3 – Preamble for assist case with integrated IP or external IP and SSP relay of SCP-IP messages

7.3.1.1.4 Assist without relay

Case iv) does not require the establishment of a second transaction from the assisting exchange: hence, it does not need to be an SSP. This then becomes a preamble to the procedure shown in Figure 6 as shown in Figure 8.

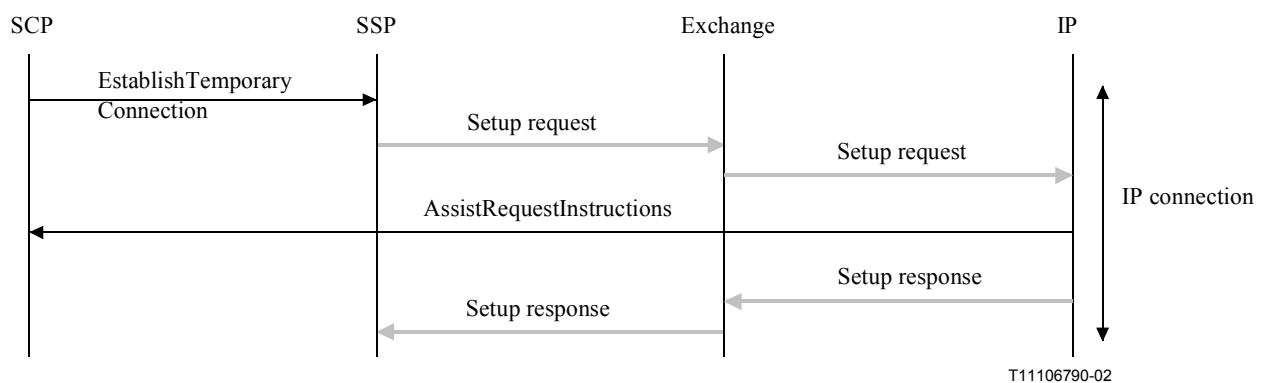


Figure 8/Q.1248.3 – Preamble for assist case with external IP and direct SCP-IP messaging

7.3.2 SRF end user interaction procedures

The end user interaction procedures allow:

- the sending of one or multiple messages to the end user by using the PlayAnnouncement operations;
- a dialogue with the end user by using one or a sequence of PromptAndCollectUserInformation operations;
- a dialogue with the end user by using one or a sequence of PromptAndReceiveMessage operations;
- cancellation of a PlayAnnouncement, PromptAndCollectUserInformation or PromptAndReceiveMessage operations by using a generic cancel operation;
- the execution of script in the SRF;
- a combination of the above.

There are only two physical scenarios for user interaction:

- the SSP relays the operations from the SCP to the IP and the responses from the IP to the SCP (SSF relay case); and
- the operations from the SCP to the IP and the responses from the IP are sent directly between the SCP and the IP without involving the SSP (direct SCF-SRF case).

In case of "direct" scenario, the messaging between the SCP and the IP may be SS7 TCAP-based; bearer control signalling may be any signalling system.

In case of "relay" scenarios, the operations between the SCP and the SSP may be SS7 TCAP-based; the messaging between the SSP and the IP may be any signalling system (e.g. DSS1, ISUP) and the way the operations are transported depends on the signalling system capabilities. The SSP would have to do protocol conversion from the transport protocol used at the SSP-SCP interface to the network one used for the SSP-IP for the operations and responses it relays between the SCP and the IP (e.g. SS7 TCAP to DSS1 facility IE).

In case SS7 TCAP is used, it is also necessary to consider the capability of SS7 TCAP to concatenate several Invoke PDUs in one message. This capability allows to concatenate any SCF-SRF subsequent UserInteraction operation PlayAnnouncement/PromptAndCollectUserInformation/PromptAndReceiveMessage/ScriptRun/ScriptInformation/ScriptClose to be carried in one message. This has some advantages in this physical scenario, such as reduced numbers of messages, and possibly better end user perceived performance.

In the Relay case, when the SCF uses the *ConnectToResource* operation to connect to an External SRF, as an alternative the SCF and the SRF may embed the "User Interaction" operations exchanged with each other using the "Out-Channel Call-Related User Interaction" operations: *SendSTUI*, *ReportUTSI* and *RequestReportUTSI*. The signalling system should support this transport mechanism.

A network-specific value of the *serviceIndicator* parameter is allocated for the "External SRF connection": *SRF_Connection*. Once receiving the *SendSTUI* (resp. *RequestReportUTSI*) operation from the SCF with a *serviceIndicator* parameter value set to *SRF_connection*, the SSF checks only this parameter to decide that this operation is related to the "SCF-External SRF communication". The SSF uses then the *legId* to address the right IP (e.g. in case within the CSA several User Interactions are running in parallel on legs). The same processing for *serviceIndicator* applies for the *reportUTSI* operation in the "SRF to SCF" direction.

The mapping of "User Interaction" operations on to USI mechanism is not subject to standardization, e.g. the value of the *USIInformation* could be the encoding of the ROSE component invoking the "User Interaction" operation.

The message sequence chart in Figure 9 illustrates the User Interaction in relay case using the OCCRUI operations.

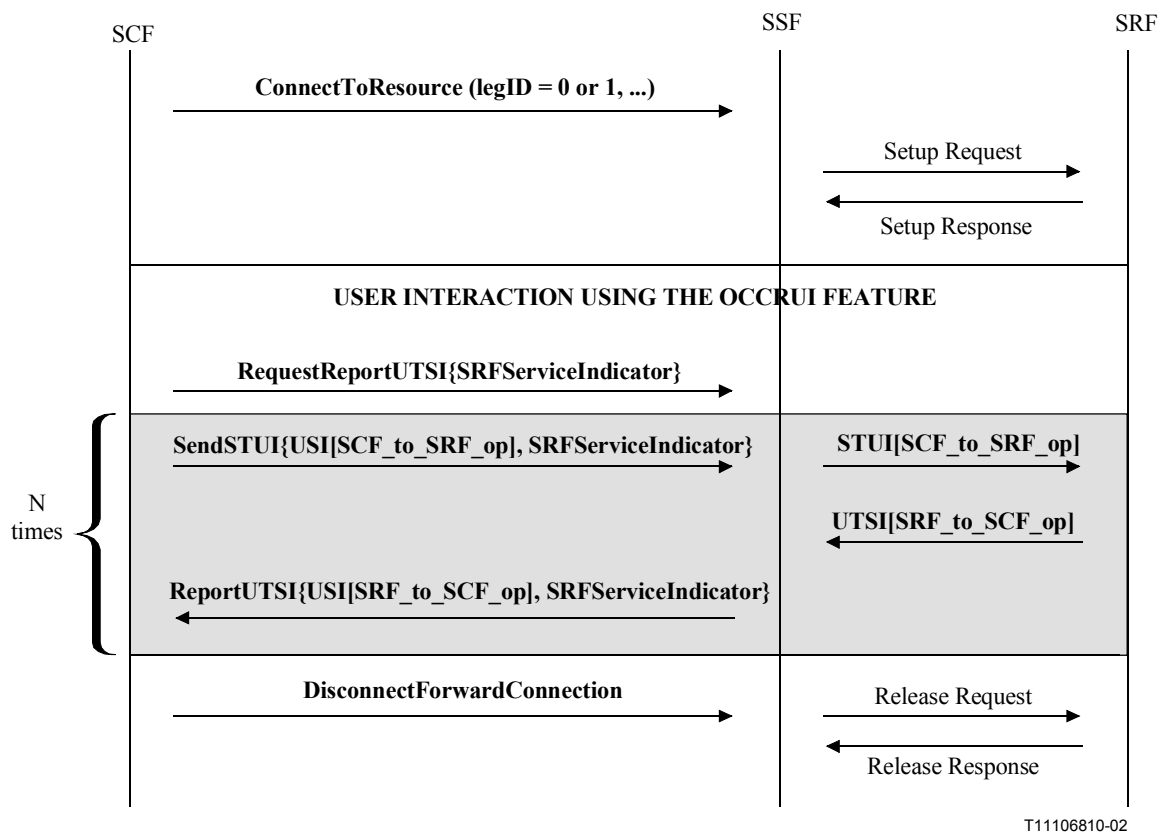


Figure 9/Q.1248.3 – User Interaction in the SRF relay case: OCCRUI mechanism

NOTE – For the SSF there is no correlation between a SendSTUI and a ReportUTSI.

7.3.2.1 (PA/P&C/P&R)

This clause illustrates User Interaction "relay" or "direct" scenario for PA/P&C/P&R.

Case i) is illustrated in Figure 10 below.

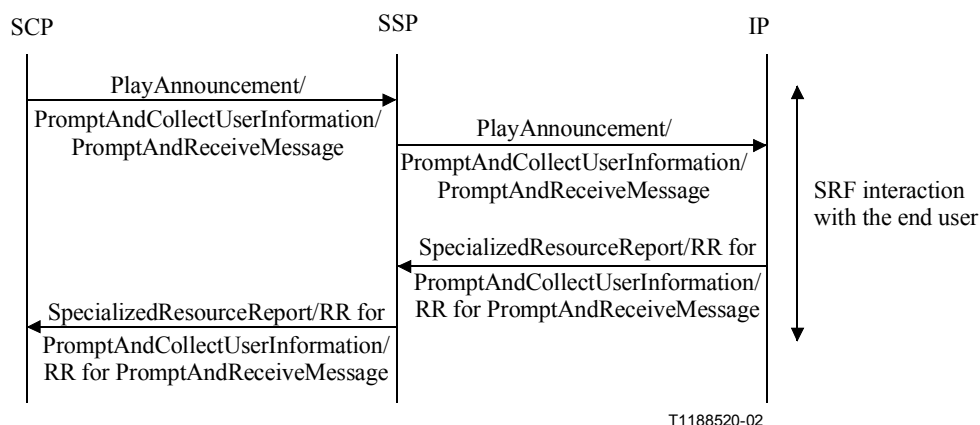


Figure 10/Q.1248.3 – SSP relay of User Interaction operations and responses

The corresponding connect procedure is described in Figure 5.

It is also necessary to consider the capability of SS7 TCAP to concatenate several Invoke PDUs in one message. This capability allows, for the scenario in Figure 5, the ConnectToResource and the