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Terrestrial Trunked Radio (TETRA);
Voice plus Data (V+D);
Part 12: Supplementary services stage 3;
Sub-part 23: Call Completion on No Reply (CCNR)

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Contents

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Foreword

This final draft European Standard (EN) has been produced by ETSI Technical Committee Terrestrial Trunked Radio (TETRA), and is now submitted for the ETSI standards One-step Approval Procedure.

The present document is part 12, sub-part 23 of a multi-part deliverable covering Voice plus Data (V+D), as identified below:

EN 300 392-1: "General network design";

EN 300 392-2: "Air Interface (AI)";

EN 300 392-3: "Interworking at the Inter-System Interface (ISI)";

ETS 300 392-4: "Gateways basic operation";

EN 300 392-5: "Peripheral Equipment Interface (PEI)";

EN 300 392-7: "Security";

EN 300 392-9: "General requirements for supplementary services";

EN 300 392-10: "Supplementary services stage 1";

EN 300 392-11: "Supplementary services stage 2";

EN 300 392-12: "Supplementary services stage 3";

- EN 300 392-12-1: "Call Identification (CI)";
- ETS 300 392-12-2: "Call Report (CR)";
- EN 300 392-12-3: "Talking Party Identification (TPI)";
- EN 300 392-12-4: "Call Forwarding (CF)";
- ETS 300 392-12-5: "List Search Call (LSC)";
- EN 300 392-12-6: "Call Authorized by Dispatcher (CAD)";
- ETS 300 392-12-7: "Short Number Addressing (SNA)";
- EN 300 392-12-8: "Area Selection (AS)";
- ETS 300 392-12-9: "Access Priority (AP)";
- EN 300 392-12-10: "Priority Call (PC)";
- ETS 300 392-12-11: "Call Waiting (CW)";
- EN 300 392-12-12: "Call Hold (HOLD)";

EN 300 392-12-13: "Call Completion to Busy Subscriber (CCBS)";

EN 300 392-12-14: "Late Entry (LE)";

EN 300 392-12-16: "Pre-emptive Priority Call (PPC)";

EN 300 392-12-17: "Include Call (IC)";

EN 300 392-12-18: "Barring of Outgoing Calls (BOC)";

EN 300 392-12-19: "Barring of Incoming Calls (BIC)";

EN 300 392-12-20: "Discreet Listening (DL)";

EN 300 392-12-21: "Ambience Listening (AL)";

EN 300 392-12-22: "Dynamic Group Number Assignment (DGNA)";

EN 300 392-12-23: "Call Completion on No Reply (CCNR)";

ETS 300 392-12-24: "Call Retention (CRT)";

ETS 300 392-13: "SDL model of the Air Interface (AI)";

ETS 300 392-14: "Protocol Implementation Conformance Statement (PICS) proforma specification";

TS 100 392-15: "TETRA frequency bands, duplex spacings and channel numbering";

TS 100 392-16: "Network Performance Metrics";

TR 100 392-17: "TETRA V+D and DMO specifications";

TS 100 392-18: "Air interface optimized applications".

NOTE: Part 3, sub-parts 6 and 7 (Speech format implementation), part 4, sub-part 3 (Data networks gateway), part 10, sub-part 15 (Transfer of control), part 13 (SDL) and part 14 (PICS) of this multi-part deliverable are in status "historical" and are not maintained.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

1 Scope

The present document specifies the stage 3 description of the Supplementary Service CCNR Call Completion on No Reply for the Terrestrial Trunked Radio (TETRA).

Call Completion on No Reply allows a calling user A, encountering a destination user B which does not answer the call, to have the call completed when user B becomes non busy after a period of activity, without having to make a new call attempt.

Man-Machine Interface and charging principles are outside the scope of the present document.

The supplementary service stage 3 description is preceded by the stage 1 and the stage 2 description of the service, according to the method described in ITU-T Recommendation I.130 [i.1]. The stage 1 description specifies the service from the user's point of view. The stage 2 description identifies the functional capabilities of each SS and the information flows needed to support the supplementary service as specified in its stage 1 description. The present stage 3 description specifies the protocols at the air interface and at the various Inter-System Interfaces (ISI) to support each Supplementary Service.

NOTE: According to ITU-T Recommendation I.130 [i.1], the stage 3 description of any telecommunication service addresses the network implementation aspects. Consequently it comprises two steps: the specifications of all protocols at the various reference points involved in any of the service procedures (notably the service operation) are the first step of the stage 3 description, and the specifications of the functions of the corresponding network entities are its second step. The latter have not been provided since they can be derived from the specification of the functional entity actions in the stage 2 description.

The present document is applicable to Voice plus Data individual call; the present document is neither applicable to Packet Mode of Operation nor to DMO; more specifically the present document is applicable to the following entities:

- the MS of either the calling user or the connected user during an individual call;
- the originating Switching and Management Infrastructure (SwMI) in an individual call;
- the terminating SwMI in an individual call;
- the inter-working SwMI for an individual call.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] ETSI EN 300 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

[2] ETSI EN 300 392-3-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 2: Additional Network Feature Individual Call (ANF-ISIIC)".

[3] ETSI EN 300 392-9: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 9: General requirements for supplementary services".

[4] ETSI ETS 300 392-10-23: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Sub-part 23: Call Completion on No Reply".

[5] ETSI EN 300 392-12-13: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-Part 13: Call Completion to Busy Subscriber (CCBS)".

[6] ETSI ETS 300 392-11-13: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 11: Supplementary services stage 2; Sub-part 13: Call Completion to Busy Subscriber (CCBS)".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ITU-T Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN (Blue Book)".

[i.2] ITU-T Recommendation I.221 (1993): "Common specific characteristics of services".

[i.3] ITU-T Recommendation Z.100: "Specification and description language (SDL)".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

activity: activity condition applies, if at least one CCNR request is in queue B and user B either:

- initiates an outgoing call with a D-SETUP message; or
- answers an incoming call with a U-CONNECT message; or
- clears an established call; or
- clears an outgoing call.

additional network feature: capability, over and above that of a basic service, provided by a SwMI, but not directly to a user

bearer service: type of telecommunication service that provides the capability for the transmission of signals between user-network interfaces

busy: property of a user for whom either a "network determined user busy" or "user determined user busy" condition exists

NOTE: See clause 3.1 of ITU-T Recommendation I.221 [i.2].

call, basic call: instance of the use of a basic service

call completion: successful presentation of a previously unsuccessful Call to a destination user (user B) which occurs when the call has entered an alerting phase or has been answered

call information retention: procedure at originating SwMI to store the call information of a specific call so that it can be used for that call

CCNR busy: any one of the following conditions cause CCNR busy condition:

- maximum number of calls reached at user A; or
- no resource available at user A; or
- CCNR or CCBS recall pending on user A.

CCNR call: call which is established under the control of the CCNR supplementary service

CCNR recall: procedure where user A is requested to complete the communication when user B ceases to be busy after having initiated an activity

CCNR retention: system attempt to establish CCNR call fails because:

- user B does not answer the CCNR call; or
- user B is busy;

NOTE: At CCNR retention the original CCNR request retains its position in the queue B, and monitoring user B continues.

compatible MS: MS presenting the same basic TETRA class of service as the TETRA class of service requested by the calling user MS

NOTE: By analogy to ISDN "compatible terminal".

free: property of a user who can accept any attempt by the SwMI to present a call to that user (i.e. allow the call to reach the alerting or answered state)

network determined user busy: network declines to allocate an additional call for the user

NOTE: If all of the appropriate user-network interface information channels are busy (channels busy) and either the network does not support the offering of additional calls beyond the number of appropriate channels, or the maximum number of such additional calls has been reached, the network will clear the call and indicate network determined user busy (ITU-T Recommendation I.221 [i.2], clause 3.1.4).

path reservation: reservation of resources prior to SS-CCNR Recall in order that a connection path through the SwMI is available when user A accepts the SS-CCNR Recall

NOTE 1: Path Reservation would not guarantee that user B will be free when user A accepts the SS-CCNR Recall.

NOTE 2: Path reservation is not the preferred solution in the TETRA environment.

recall timer: this timer specifies the length of time the network waits for a response from user A to a CCNR Recall

retention timer: this timer specifies the period of time the network retains the originating call information after a valid call attempt is released

SS-CCNR recall: indication informing user A that user B is no longer busy (in the case of SS-CCNR) or Acceptance of this indication by user A will cause the call to be completed by the SwMI

SS-CCNR service duration timer: this timer specifies the length of time that the service is active within the network

supplementary service: supplementary service modifies or supplements a bearer service or a tele-service

NOTE: A supplementary service cannot be offered to a customer as a stand alone service. It should be offered in combination with a bearer service or a tele-service.

Switching And Management Infrastructure (SwMI): all of the TETRA equipment for a Voice plus Data (V+D) network except for subscriber terminals

NOTE: The SwMI enables subscriber terminals to communicate with each other via the SwMI.

tele-service: type of telecommunications service that provides the complete capability, including terminal equipment functions, for communication between users according to agreed protocols

user A: specific user that originated the call and requested the supplementary service

user B: user that was initially addressed in the original call set up

3.2 Symbols

For the purposes of the present document, there are no additional symbols besides the symbols defined and used in ITU-T Recommendation Z.100 [i.3].

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACK	ACKnowlegdement
ANF	Additional Network Feature
CC	Call Control (functional entity)
CC	Call Completion
CCBS	Completion of Calls to Busy Subscribers
CCNR	Completion of Calls on No Reply
CPTI	Called Party Type Identifier
CR	Cancellation Reason
DMO	Direct Mode Operation
ISDN	Integrated Services Digital Network
ISI	Inter System Interface
ITSI	Individual TETRA Subscriber Identity
LS	Line Station
MS	Mobile Station
PDU	Protocol Data Unit
PISN	Private Integrated Services Network
SDL	Specification and Description Language
SS	Supplementary Service

NOTE 1: The abbreviation SS is only used when referring to a specific supplementary service.

SSI	Short Subscriber Identity
SwMI	Switching and Management Infrastructure
TE	Terminal Equipment
TETRA	Terrestrial Trunked Radio
V+D	Voice Plus Data

Supplementary service abbreviations

For the purposes of the present document, the following abbreviations also apply:

SS-AL	Ambience Listening
SS-AP	Access Priority
SS-AS	Area Selection
SS-BIC	Barring of Incoming Calls
SS-BOC	Barring of Outgoing Calls
SS-CAD	Call Authorized by Dispatcher
SS-CCBS	Call Completion on Busy Subscriber
SS-CCNR	Call Completion on No Reply
SS-CF	Call Forwarding
SS-CFB	Call Forwarding on Busy
SS-CFNR	Call Forwarding on No Reply (generic for both CFNRy and CFNRc)
SS-CFNRc	Call Forwarding on Mobile Subscriber Not Reachable
SS-CFNRy	Call Forwarding on No Reply
SS-CFU	Call Forwarding Unconditional
SS-CI	Call Identification
SS-CLIP	Calling Line Identification Presentation
SS-CLIR	Calling Line Identification Restriction

SS-COLP	COnnected Line identification Presentation
SS-COLR	COnnected Line identification Restriction
SS-CR	Call Report
SS-CRT	Call Retention
SS-CW	Call Waiting
SS-DGNA	Dynamic Group Number Assignment
SS-DL	Discreet Listening
SS-HOLD	call HOLD
SS-IC	Include Call
SS-LE	Late Entry
SS-LSC	List Search Call
SS-PC	Priority Call
SS-PPC	Pre-emptive Priority Call
SS-SNA	Short Number Addressing
SS-TPI	Talking Party Identification

NOTE 2: Supplementary service abbreviations are also used without "SS-" preamble e.g. "SS-AL" and "AL" are used as appropriate.

NOTE 3: The supplementary services list contains also abbreviations that are not used in the present document. Those expand "SS-CF" and "SS-CI" and are provided for information.

4 SS-CCNR Service Description

4.1 General

Completion of Calls on No Reply (SS-CCNR) is a supplementary service which allows a calling User A, when the called User B does not answer the call, to request that the SwMI monitors User B and indicates to User A when User B becomes not busy after a subsequent period of activity at User B's TE. On response by User A to that indication the SwMI will attempt to complete the call to User B. User A can request SS-CCNR when the call is in the alerting phase and after call clearing during the alerting phase before the retention timer expires.

The procedures for the SS-CCNR are similar to the procedures specified for the SS-CCBS (EN 300 392-12-13 [5]). Therefore, where possible, the same terms used for CCBS are re-used in the present document and references to the clauses of EN 300 392-12-13 [5] are made.

NOTE: Which activities at User B's TE would result in a 'B not busy' indication to User A is outside the scope of the present document.

These supplementary services are applicable to all TETRA Voice + Data basic individual circuit services defined in EN 300 392-2 [1].

4.2 SS-CCNR services offered over the TNSS-SAP

Same text as clause 4.2 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.1 CALL-INFORMATION-RELEASE indication

Same text as clauseclause 4.2.1 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.2 CALL-INFORMATION-RETENTION indication

Same text as clause 4.2.2 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.3 CANCEL request

Same text as clause 4.2.3 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.4 CANCEL confirmation

Same text as clause 4.2.4 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.5 CANCELLED indication

Same text as clause 4.2.5 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.6 FAILED indication

Same text as clause 4.2.6 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.7 LIST-CCNR request

Same text as clause 4.2.7 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.8 LIST-CCNR confirmation

Same text as clause 4.2.8 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.9 RECALL request

Same text as clause 4.2.9 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.10 RECALL-ACCEPTED request

Same text as clause 4.2.10 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.11 REQUEST request

Same text as clause 4.2.11 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.12 REQUEST confirmation

Same text as clause 4.2.12 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.2.13 USER-B-FREE indication

Same text as clause 4.2.13 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

4.3 Parameter description

Same text as clause 4.3 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

5 Signaling protocol for the support of SS-CCNR

5.1 SS-CCNR Operational requirements

5.1.1 Requirements on the served user MS/LS

Same text as clause 5.1.1 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

5.1.2 Requirements on the Originating SwMI

Same text as clause 5.1.2 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

5.1.3 Requirements on the Terminating SwMI

Same text as clause 5.1.3 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

5.1.4 Requirements on a Participating SwMI

Same text as clause 5.1.4 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

5.2 SS-CCNR Coding Requirements

All components (request PDU, return result, return error and reject) shall be included in a Facility information element.

5.2.1 SS-CCNR PDUs

Same text as clause 5.2.1 of EN 300 392-12-13 [5].

5.2.1.1 CALL-INFORMATION-RELEASE PDU

Same text as clause 5.2.1.1 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.2 CALL-INFORMATION-RETENTION PDU

Same text as clause 5.2.1.2 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.3 CANCEL PDU

Same text as clause 5.2.1.3 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.4 CANCEL ACK PDU

Same text as clause 5.2.1.4 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.5 CANCELLATION PDU

Same text as clause 5.2.1.5 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.6 CANCELLED PDU

Same text as clause 5.2.1.6 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.7 CCNRI PDU

Same text as clause 5.2.1.7 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.8 FAILED PDU

Same text as clause 5.2.1.8 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.9 FREE NOTIFICATION PDU

FREE NOTIFICATION PDU shall be sent from the terminating SwMI to the originating SwMI to indicate that user B has become non busy after a period of activity.

The rest of the text same as clause 5.2.1.9 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.10 LIST PDU

Same text as clause 5.2.1.10 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.11 LIST ACK PDU

Same text as clause 5.2.1.11 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.12 MONITOR PDU

Same text as clause 5.2.1.12 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.13 MONITOR ACK PDU

Same text as clause 5.2.1.13 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.14 RECALL PDU

Same text as clause 5.2.1.14 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing the SS-Type value.

5.2.1.15 RECALL PDU

Same text as clause 4.2.9 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing SS-Type value.

5.2.1.16 RECALL-ACCEPTED PDU

The RECALL-ACCEPTED PDU shall be sent by the served user to the originating SwMI to indicate that user A has accepted the RECALL and wishes to complete the original call to user B; the CCNRI element shall be carried as a facility element in a TETRA call set-up.

RECALL-ACCEPTED PDU shall contain the SS-CCNR information elements described in table 1; those elements are identical to a U-SETUP PDU at the air interface; the recall-accepted is in fact a CCNR call set-up at the air interface.

Message:	U-SETUP (alias RECALL-ACCEPTED)
Response to:	-
Response expected:	D-CALL PROCEEDING/D-ALERT/D-CONNECT
Short description:	This PDU shall be the request for a call set-up from a MS/LS and for a CCNR recall-accepted PDU.

Table 1: RECALL-ACCEPTED PDU contents

Information element	Length	Type	Owner	C/O/M	Remark
PDU Type	5	1	CC	M	
Area selection	4	1	CC	M	Note 3
Hook method selection	1	1	CC	M	Note 3
Simplex/duplex selection	1	1	CC	M	Note 3
Basic service information	8	1	CC	M	Note 3
Request to transmit/send data	1	1	CC	M	Note 3
Call priority	4	1	CC	M	Note 3
SS-CLIR	2	1		M	Note 1
Called party type identifier	2	1	CC	M	Short/SSI/TSI
Called party short number address	8	1	CC	C	Note 2
Called party SSI	24	1	CC	C	Note 2
Called party extension	24	1	CC	C	Note 2
External subscriber number		3	CC	O	
Facility		3	SS	C	CCNRI PDU is carried in this facility field
Proprietary		3	-	O	
NOTE 1: As used for SS-CLIR. NOTE 2: Shall be conditional on the value of Called Party Type Identifier (CPTI): - CPTI = 0; Called Party SNA; - CPTI = 1; Called Party SSI; - CPTI = 2; Called Party SSI + Called Party Extension. NOTE 3: All set up parameters are pickeD-up by the MS/LS from the call retention parameters.					

5.2.1.17 REQUEST PDU

Same text as clause 4.2.9 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing SS-Type value.

5.2.1.18 REQUEST ACK PDU

Same text as clause 4.2.9 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing SS-Type.

5.2.1.19 RESUME-COMPLETION PDU

Same text as clause 4.2.9 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing SS-Type.

5.2.1.20 SUSPEND-COMPLETION PDU

Same text as clause 4.2.9 of EN 300 392-12-13 [5] replacing CCBS by CCNR and changing SS-Type.

5.2.1.21 USER-B-FREE PDU

The USER-B-FREE PDU shall be sent by the originating SwMI to the served user to inform user A when user A is known to be busy that user B is now free after a period of activity. This PDU is used differently from the RECALL PDU which is presented when user A is free.

USER-B-FREE PDU shall contain the SS-CCNR information elements described in table 2.

NOTE: User B and called party are different names for identical entities.

Table 2: USER-B-FREE PDU contents

Information element	Length	Type	C/O/M		Remark
SS-Type	6	1	M		Defined in EN 300 392-9 [3]
CCNR-PDU type	5	1	M		USER-B-FREE
CCNRI	3	1	M		

5.2.2 TETRA PDU information element coding

5.2.2.1 Accept/Reject

Same coding as clause 5.2.2.1 of ETS 300 392-11-13 [6].

5.2.2.2 Basic Service Information

Same coding as clause 5.2.2.2 of ETS 300 392-11-13 [6].

5.2.2.3 Call Priority

Same coding as clause 5.2.2.3 of ETS 300 392-11-13 [6].

5.2.2.4 Called party extension

Same coding as clause 5.2.2.4 of ETS 300 392-11-13 [6].

5.2.2.5 Called party SSI

Same coding as clause 5.2.2.5 of ETS 300 392-11-13 [6].

5.2.2.6 Called party type identifier

Same coding as clause 5.2.2.6 of ETS 300 392-11-13 [6].

5.2.2.7 Calling party extension

Same coding as clause 5.2.2.7 of ETS 300 392-11-13 [6].

5.2.2.8 Calling party SSI

Same coding as clause 5.2.2.8 of ETS 300 392-11-13 [6].

5.2.2.9 Calling party type identifier

Same coding as clause 5.2.2.9 of ETS 300 392-11-13 [6].

5.2.2.10 Cancellation Cause

Same coding as clause 5.2.2.10 of ETS 300 392-11-13 [6].

5.2.2.11 Cancellation Result

Same coding as clause 5.2.2.11 of ETS 300 392-11-13 [6].

5.2.2.12 CCNR-PDU type

CCNR-PDU type indicates the type of the CCNR-PDU as defined in table 3.

Table 3: CCNR-PDU type information element contents

Information element	Length	Value	Remark
CCNR-PDU type	5	00000_2	See EN 300 392-9 [3]
		00001_2	See EN 300 392-9 [3]
		00010_2	See EN 300 392-9 [3]
		00011_2	See EN 300 392-9 [3]
		00100_2	See EN 300 392-9 [3]
		00101_2	CALL-INFORMATION-RETENTION
		00110_2	CANCEL
		00111_2	LIST
		01000_2	MONITOR
		01001_2	RECALL
		01010_2	RECALL-ACCEPTED
		01011_2	REQUEST
		01100_2	RESUME-COMPLETION
		01101_2	CANCEL ACK
		01110_2	LIST ACK
		01111_2	MONITOR ACK
		10000_2	REQUEST ACK
		10001_2	CALL-INFORMATION-RELEASE
		10010_2	CANCELLED
		10011_2	FAILED
		10100_2	FREE-NOTIFICATION
		10101_2	SUSPEND-COMPLETION
		10110_2	USER-B-FREE
		10111_2	CANCELLATION
		11000_2	CCNRI
		11001_2	Reserved
		etc.	etc.
		11111_2	Reserved

5.2.2.13 CCNRI

The purpose of the call completion on No Reply identifier CCNRI element shall be to identify a specific invocation of call completion on no reply supplementary service. The combination of CCNRI and user A full ITSI constitute a global reference for the identification of that SS-CCNR instance. It shall be encoded as defined in table 4. A maximum number of SS-CCNR invocation is set to 5.

Table 4: Call completion on no reply identifier information element contents

Information element	Length	Value	Remark
Call Completion on No Reply CCNRI	3	000_2	Dummy call identifier
		001_2 to 101_2	Identifies CCNR invocation uniquely
		110_2	Used in the CANCEL PDU to indicate the last CCNR request in chronological order
		111_2	Used in the CANCEL PDU to cancel all outstanding CCNR requests

5.2.2.14 Failure Cause

Same coding as clause 5.2.2.14 of ETS 300 392-11-13 [6].

5.2.2.15 Length of CCNR List

Same coding as clause 5.2.2.15 of ETS 300 392-11-13 [6].

5.2.2.16 Number of CCNR requests

Same coding as clause 5.2.2.16 of ETS 300 392-11-13 [6].

5.2.2.17 Reject Cause

Same coding as clause 5.2.2.17 of ETS 300 392-11-13 [6].

5.2.2.18 List Request

Same coding as clause 5.2.2.18 of ETS 300 392-11-13 [6].

5.2.2.19 Request Maintained

Same coding as clause 5.2.2.19 of ETS 300 392-11-13 [6].

5.2.2.20 Retain Capability

Same coding as clause 5.2.2.20 of ETS 300 392-11-13 [6].

5.2.2.21 SS-Type

SS-Type indicates the type of supplementary service to which the PDU belongs. The coding of the information element SS-type is defined in table 5 of EN 300 392-9 [3] and is recalled in table 5 where SS-CCNR is highlighted.

Table 5: SS-type information element contents

Information element	Length	Value	Remark
SS-type	6	0 to 22	Other SS-types
		23	**CCNR Call Completion on No Reply**
		24 to 63	Other SS-types or recerved

5.2.2.22 TETRA Call Identifier

Same coding as clause 5.2.2.22 of EN 300 392-12-13 [5].

5.2.3 Additional coding requirements over the ISI

Same text as clause 5.2.3 of EN 300 392-12-13 [5].

5.3 SS-CCNR State Definitions

5.3.1 States at User A MS/LS

5.3.1.1 CCNR-Idle

This state exists if SS-CCNR is not active.

5.3.1.2 CCNR-Requested

This state exists when user A has sent a request for CCNR to the network and is waiting for the response.

5.3.1.3 CCNR-Active

SS-CCNR has been activated as a result of the user A request.

5.3.1.4 CCNR-Recall

User A has received the indication that user B is now free and that he can proceed with recall.

5.3.1.5 CCNR-Call

The user has accepted the recall.

5.3.1.6 CCNR-List-Requested

User A has requested the list of outstanding CCNR request and is waiting for the response.

5.3.1.7 CCNR-Cancel

User A has requested CCNR cancellation and is waiting for a response.

5.3.1.8 CCNR-Retention-Idle

User A has not yet received the call retention parameters which will be needed for the CCNR REQUEST.

5.3.2 States at the Originating SwMI

5.3.2.1 CCNR-Idle

This state exists if SS-CCNR is not active.

5.3.2.2 CCNR-InvokeD-User-A

This state exists for an active CCNR Request while waiting for the indication that user B is not busy.

5.3.2.3 CCNR-Path-Setup

This state exists during CCNR path setup.

5.3.2.4 CCNR-Wait-ACK

This state exists during SS-CCNR invocation.

5.3.2.5 CCNR-Wait-User-A-Answer-N

This state exists while waiting for SS-CCNR Recall acceptance from user A if no path has been reserved.

5.3.2.6 CCNR-Wait-User-A-Answer-R

This state exists while waiting for SS-CCNR Recall acceptance from user A after a path has been reserved.

5.3.2.7 CCNR-Wait-User-A-Free

This state exists when Path Setup is delayed because user A is busy.

5.3.3 States at the Terminating SwMI

5.3.3.1 CCNR-Idle

This state exists if SS-CCNR is not active.

5.3.3.2 CCNR-Await-Call-Completion

This state exists while waiting for the incoming CCNR Call after having indicated that user B is not busy.

5.3.3.3 CCNR-InvokeD-User-B

This state exists while user B is monitored as a result of a CCNR Request received.

5.3.3.4 CCNR-Path-Complete

This state exists when a path has been successfully reserved and CCNR Call completion is pending.

5.3.3.5 CCNR-SuspendeD-User-B

This state exists when a CCNR Call has been postponed because user A is busy.

5.3.3.6 CCNR-Wait-User-B-Alert

This state exists after a CCNR Call has been extended to user B, while waiting for acceptance (alerting or connect).

5.3.4 States at User B

There are no additional states defined for user B.

5.4 SS-CCNR Signaling Procedures

5.4.1 Major Options

Same text as clause 5.4.1 of EN 300 392-12-13 [5].

5.4.2 Actions at the served user MS/LS

5.4.2.1 Normal procedures

The SDL process at User A is given in figure A.3 of EN 300 392-12-13 [5] replacing CCBS by CCNR. The served user actions are best described in conjunction with the originating SwMI actions as done in clause 5.4.3 of the present document.

5.4.3 Actions at the Originating SwMI

The SDL representation of procedures at the originating SwMI is shown in figure A.1 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

5.4.3.1 Normal Procedures

5.4.3.1.1 Invocation

In order that user A who has subscribed to SS-CCNR may invoke the service when a destination B, which does not answer a call, is encountered, it is necessary for the originating SwMI to use the call information retention procedure.

The originating SwMI shall provide the call information retention procedure as described below when the following conditions apply:

- CCNR subscribed;
- alerting indication has been received from user B;
- CCNR is available at the destination SwMI;
- user A CCNR queue limit has not been reached; and
- there are no other supplementary services that preclude CCNR.

NOTE 1: The condition that CCNR has not been invoked for an identical call is not required in the case of TETRA CCNR.

NOTE 2: These conditions do not prevent originating SwMI from providing the call retention procedures in other circumstances.

The call related information retained by the user A MS/LS shall contain all information needed to set-up the call at the time the recall is accepted; in relation to the initial call, it consists of:

- Basic service information; and
- TETRA Call identifier; and
- Call priority; and
- Calling party address information; and
- Called party address information.

This call related information is provided by the originating SwMI.

The call related information that shall be retained by the user A SwMI shall be, in relation to the initial call:

- list of invoked supplementary services.

Furthermore, the originating SwMI shall retain the following information provided by terminating SwMI in order to decide if CCNR is permitted or not:

- call failure reason; and
- CCNR available indication.

When interacting with other supplementary services, retention of further information may be mandatory.

5.4.3.1.1.1 Call information retention

The text of clause 5.4.3.1.1.1 of EN 300 392-12-13 [5] shall apply.

5.4.3.1.1.2 Invocation - Detailed procedure

To invoke SS-CCNR, user A shall send a CCNR REQUEST PDU including the TETRA Call Identifier described above to the originating SwMI, using the procedures of a call unrelated facility in EN 300 392-2 [1]. On receiving this CCNR REQUEST PDU and after checking its validity, the originating SwMI shall send SS-CCNR MONITOR PDU to the terminating SwMI, shall enter the state CCNR-Wait-Ack and shall start timer T1.

On receiving confirmation that SS-CCNR request has been accepted by the terminating SwMI, the originating SwMI shall select a new value for the CCNRI (CCNR Identifier), send a CCNR REQUEST ACK PDU to user A including the CCNRI parameter, place the CCNR request in queue A, stop timer T1 and start the CCNR service duration timer T2. The CCNRI parameter shall have significance on the whole access and its value shall not be reused until it is released. The originating SwMI shall then be in state CCNR-InvokeD-A.

NOTE: It is assumed that the signaling connection is retained during the whole duration of the TETRA SS-CCNR.

User A shall retain the CCNRI parameter for further reference.

The originating SwMI shall send a MONITOR PDU to the terminating SwMI which shall request monitoring of user B for non busy after a period of activity; in this MONITOR request PDU, the capability of the originating SwMI for service retention shall be described; the terminating SwMI shall reply with a MONITOR ACK PDU and the originating SwMI shall determine that service retention is to be used (in the case of TETRA).

5.4.3.1.2 Operation

If the originating SwMI is informed that the user B has become not busy after a period of activity, the originating SwMI shall determine whether user A is neither busy nor CCNR busy.

Two different cases may occur:

- user A is not busy; or
- user A is busy.

The general operations will be defined first in the two different cases. Details of the procedures shall be given second.

5.4.3.1.2.1 user A is not busy (non-path reservation)

If User A is not busy and the Originating SwMI uses the non-path reservation method for establishing the CCNR Call, the Originating SwMI shall indicate the SS-CCNR Recall to User A, start the recall timer T3 and enter state CCNR-Wait-User-A-Answer-N.

If the SS-CCNR Recall is accepted before timer T3 expires, the Originating SwMI shall send a SETUP message towards the Terminating SwMI, stop timer T3 and enter state CCNR-PATH-SETUP. The SETUP message shall contain in a Facility information element the identifier CCNRI.

If in state CCNR-PATH-SETUP, an ALERTING or a CONNECT message is received the Originating SwMI shall stop the service duration timer T2, cancel the CCNR Request and return to state CCNR-Idle. If a call independent signaling connection for SS-CCNR still exists it may be released. The CCNR Call shall continue.

5.4.3.1.2.2 user A is busy (non-path reservation)

- Suspend procedure:
  - if User A is busy and the Originating SwMI uses the non-path reservation method, the Originating SwMI shall send a CCNR SUSPEND PDU to the Terminating SwMI in a call independent FACILITY message, start monitoring User A and enter state CCNR-SuspendeD-User-A.
- Resume procedure:
  - if User A, for whom a CCNR Request in state CCNR-SuspendeD-User-A exists, becomes not busy the Originating SwMI shall send a call independent FACILITY message with a CCNR RESUME PDU and enter state CCNR-InvokeD-User-A-RET, waiting for another indication that User B is not busy after a period of activity.

5.4.3.1.2.3 User A monitoring procedure

Whenever the originating SwMI needs to know the status of user A, the originating SwMI shall have to decide if user A is CCNR busy or not.

5.4.3.1.2.4 Recall request

If user A is neither busy nor CCNR busy, then the originating SwMI shall start timer T3 and indicate that it is prepared for establishment of the requested call, by sending a RECALL PDU to user A. The RECALL PDU shall contain the CCNRI and the called user address.

If user A is busy or CCNR busy, then the network shall proceed as described in clause 5.4.3.1.2.9.

On receipt of the CCNR RECALL PDU, user A shall ignore the PDU unless the service provided by user A is compatible with the service indicated in the CCNR RECALL PDU.

User A upon accepting that CCNR RECALL PDU shall retain the CCNRI parameter and may proceed to establish a call as indicated in the clause "CCNR call request" below.

5.4.3.1.2.5 Basic call information and compatibility checking at user A

The originating SwMI shall send the CCNR call identifier to user A in order to allow user A to determine whether it is compatible with a particular CCNR request, and to allow user A to identify the basic call information retained by user A for a given CCNR request.

On receipt of a CCNR RECALL PDU containing this information, user A shall determine if it accepts the RECALL PDU.

User A may accept the CCNR RECALL PDU or may ignore it by letting the RECALL timer run out.

5.4.3.1.2.6 CCNR Call Request

To establish the CCNR call, user A shall send RECALL ACCEPTED PDU similar to a U-SETUP message to the originating SwMI in accordance with clause 14 of EN 300 392-2 [1]. The U-SETUP message shall contain the basic service information element from the original call and a facility information element which includes the CCNRI parameter received in the RECALL PDU. User A shall retain the CCNRI value after sending the U-SETUP.

NOTE: In relation with other supplementary services, it is assumed that further information elements have been retained in the user A SwMI and may be present in the SETUP message to invoke those supplementary services between SwMIs.

On receiving the U-SETUP, the originating SwMI shall stop timer T3, discard any received call information which is subject to call information retention as described above and proceed with basic call set-up as described in either EN 300 392-2 [1] or EN 300 392-3-2 [2] for individual call over ISI using the retained call information.

5.4.3.1.2.7 CCNR call establishment

On accepting a CCNR RECALL ACCEPTED PDU, the originating SwMI shall proceed to establish a call to user B.

On receiving an indication that user B alerting has been initiated at the called address, the originating SwMI shall proceed with basic call procedures; furthermore, SS-CCNR shall be canceled as described below in clause 5.4.3.1.2.8. The CCNR CANCELLED cause shall be "normal-unspecified".

5.4.3.1.2.8 Network initiated deactivation procedure

Whenever the originating SwMI cancel the instance of SS-CCNR, the originating SwMI shall:

- stop timer T2; and
- stop timer T3; and
- send a CANCELLED PDU to user A; this CANCELLED PDU shall include the CCNR CANCELLATION CAUSE, the called user address and the basic service parameters; the cancellation cause shall include the values "normal-unspecified", Time-out T2, Time-out T3 or basic call failed as appropriate; and
- release the CCNRI value and make it available for subsequent uses; and
- remove the request from queue A; and
- release all retained call information.

On receipt of the CANCELLED PDU, user A shall remove knowledge of the indicated CCNR request.

5.4.3.1.2.9 B free but A busy procedure

If the originating SwMI is informed that user B is not busy after a period of activity, and user A is either busy or CCNR busy, then the originating SwMI shall inform user A by sending a USER B FREE AFTER ACTIVITY PDU to user A, suspend CCNR processing and wait for user A becoming not busy.

The originating SwMI shall send to user A the USER B FREE AFTER ACTIVITY PDU which includes the CCNRI, the called user address and the basic service.

On receipt of USER B FREE AFTER ACTIVITY PDU, user A shall ignore the PDU parameters unless they are compatible with the initial request.

In case of CCNR requests being suspended, the originating SwMI shall apply the user A monitoring procedures for all suspended CCNR requests in the following situations:

- on user A becoming not CCNR busy; or
- if a busy or reserve resource becomes free while user A is not CCNR busy.

Each request for which user A indicates to be free shall be resumed. For each resumed CCNR request, the originating SwMI shall continue according to the procedures in clause 5.4.3.1.2.4. CCNR requests for which user A indicated to be busy shall remain suspended.

5.4.3.1.3 User initiated cancellation procedure

To cancel one invocation of SS-CCNR, user A shall send a CCNR CANCEL PDU including reference parameter CCNRI to the originating SwMI using the facility field of a call unrelated process.

On receipt of the CCNR CANCEL PDU, the originating SwMI shall send a CCNR CANCEL ACK PDU reply result and SS-CCNR shall be canceled with a cause "normal-unspecified".

If user A receives a correctly encoded CCNR CANCEL ACK PDU, then user A shall proceed with the cancellation and shall remove knowledge of the CCNR invocation identified by the CCNRI.

To cancel all CCNR requests at once, user A shall send the parameter binary 111 in place of actual individual CCNRI values (binary 111 is normally an illegal value).

5.4.3.1.4 List CCNR request

To perform a list request of all CCNR requests, user A shall send a CCNR LIST PDU without a CCNRI parameter to the originating SwMI using the procedure of call unrelated exchange of PDUs. At the time user A sends that LIST request, user A starts timer T5.

On receiving this LIST PDU, the originating SwMI shall send a LIST ACK PDU which shall include in chronological order the list of CCNR requests for that access, if any. The originating SwMI shall send a LIST ACK PDU in reply, the format of which will depend on the requested LIST format (number of requests, list of CCNRIs or details of each request with CCNRI and calling user identities). In the case of the detail list format, the originating SwMI shall provide user A with the CCNRI and the called user address for each outstanding service request; if there are no requests, the reply to the LIST PDU shall be the format number of requests null. Upon receiving that LIST ACK PDU, user A shall stop timer T5.

5.4.3.2 Exceptional Procedures

5.4.3.2.1 Invocation

If the originating SwMI cannot accept the CCNR REQUEST PDU because user A has not subscribed to SS-CCNR, the originating SwMI shall send a CCNR REQUEST ACK PDU with a reject cause "User not subscribed to service" to user A using the procedure in clause 14 of EN 300 392-2 [1].

If the originating SwMI cannot accept the CCNR REQUEST PDU because user A has provided an invalid TETRA Call Identifier, then the originating SwMI shall send a CCNR REQUEST ACK PDU with a reject cause "Wrong TETRA Call Identifier" using the procedure in clause 14 of EN 300 392-2 [1]. User A shall remove knowledge of this TETRA Call Identifier.

If the originating SwMI cannot accept the CCNR REQUEST PDU because the call failure reason of the call identified by the TETRA Call Identifier was not "no reply", then the originating SwMI shall send a CCNR REQUEST ACK PDU with a reject cause "Call failure reason not no reply" using the procedure in clause 14 of EN 300 392-2 [1].

If the originating SwMI cannot accept the CCNR REQUEST PDU because queue A is full (number of maximum CCNR requests reached), then the originating SwMI shall send a CCNR REQUEST ACK PDU with a reject cause "Maximum number of invocations exceeded locally" using the procedure in clause 14 of EN 300 392-2 [1].

If the originating SwMI receives a CCNR REQUEST PDU identical to an outstanding CCNR request in queue A, the originating SwMI shall not reject the request, shall reset timers relating to that identical original request, shall keep its chronological order and shall not increment the number of CCNR requests.

To determine whether the call indicated by the TETRA Call Identifier and a call in queue A are identical, the following basic call information shall be compared:

- Basic Service Information;
- Calling User Address;
- Called User Address.

NOTE 1: Identical calling user address implies identical user since the user may have migrated since the first CCNR invocation; the same apply to identical called user address. See interaction with ANF Mobility.

If the originating SwMI cannot accept the CCNR REQUEST PDU because there are invalid supplementary service(s) interactions between SS-CCNR and the call identified by the TETRA Call Identifier, then the originating SwMI shall send a CCNR REQUEST ACK PDU with a reject cause "Supplementary service interaction not allowed" using the procedure in clause 14 of EN 300 392-2 [1].

If the originating SwMI cannot accept the CCNR REQUEST PDU identified by the TETRA Call Identifier because CCNR is not available at the terminating SwMI, then the originating SwMI shall send a CCNR REQUEST ACK PDU with a reject cause "SS-CCNR not provided remotely" (a long term denial) using the procedure in clause 14 of EN 300 392-2 [1].

NOTE 2: This includes the case where the terminating SwMI did not indicate that CCNR was available when the call failed, and the case that the request for SS-CCNR was rejected by the terminating SwMI.

If the originating SwMI cannot accept the CCNR REQUEST PDU identified by the TETRA Call Identifier because CCNR is not available at the terminating SwMI at this time, then the originating SwMI shall send a CCNR REQUEST ACK PDU with a reject cause "Maximum number of invocations exceeded remotely" (a short term denial) using the procedure in clause 14 of EN 300 392-2 [1].

If timer T2 expires either locally or remotely, the originating SwMI shall cancel SS-CCNR invocation, shall send a CANCELLED PDU and shall indicate as a cancellation cause either "Expiration of local service duration timer" or "Expiration of remote service duration timer".

On expiration of timer T1 and user A has not received any response to the CCNR REQUEST PDU, then user A shall consider this request for SS-CCNR has failed.

If establishment of the call independent signaling connection fails, or if after sending a CCNR REQUEST PDU no answer is received from the Terminating SwMI before timer T1 expires, or if the answer is a return error PDU or a reject PDU, a failure indication shall be given to User A, and the Originating SwMI shall return to state CCNR-Idle. The call independent signaling connection shall be released, if it still exists. Timer T1 shall be stopped if still running.

A CCNR CANCEL PDU for which no matching CCNR REQUEST exists shall be ignored.

If the reject cause of CCNR invocation indicates "for any reason", then user A shall not take any action.

5.4.3.2.2 User initiated cancellation procedure

If the originating SwMI cannot accept the CANCEL PDU because user A has provided an invalid CCNRI, or user A has not subscribed to SS-CCNR, then the originating SwMI shall send a CANCEL ACK PDU with a reject cause indicating either "Invalid CCNRI reference" or "No invoked SS-CCNR requests exist" to user A using the procedure in clause 14 of EN 300 392-2 [1]. On receiving this rejection, user A shall remove knowledge of SS-CCNR request identified by this CCNRI.

On expiration of timer T1 and user A has not received any response to the CANCEL PDU, then user A shall consider that this attempt to cancel SS-CCNR has failed and that SS-CCNR may still be invoked.

5.4.3.2.3 List CCNR requests

If the originating SwMI cannot accept the LIST PDU because user A has not subscribed to SS-CCNR, then the originating SwMI shall send a LIST ACK PDU with a reject cause "User not subscribed to service" using the procedure in clause 14 of EN 300 392-2 [1]. User A shall remove knowledge of all CCNR requests, if any.

On expiration of timer T5 and user A has not received any response to the CCNR List PDU, then user A shall consider that this attempt to list the SS-CCNR requests has failed.

5.4.3.2.4 Operation

5.4.3.2.4.1 Recall request

If on receipt of RECALL PDU, user A does not want to accept the CCNR call, then user A shall either:

- ignore the RECALL PDU; or
- initiate the cancellation procedure by sending a CANCEL PDU.

If either timer T2 or timer T3 expires, SS-CCNR shall be canceled, the originating SwMI shall send a CANCELLED PDU with a cancellation cause either "Expiration of local service duration timer (T2L)" or "Expiration of recall timer (T3)" respectively.

If the service duration timer T2 expires while the originating SwMI is in state CCNR-InvokeD-User-A, CCNR-SuspendeD-User-A, or CCNR-Wait-User-A-Free, the Originating SwMI shall cancel the CCNR Request, using the procedure described below. In any other state, the Originating SwMI may defer action until reaching one of the states above or may cancel the SS-CCNR request immediately.

If a reject PDU is received and the CCNRI is not included, the originating SwMI shall take no action.

5.4.3.2.4.2 Basic call information and compatibility checking at user A

Not applicable.

5.4.3.2.4.3 CCNR Recall Accepted

If the originating SwMI cannot accept the CCNR RECALL ACCEPTED basic call set-up because user A provided an invalid CCNRI, the originating SwMI shall send a reject cause "Invalid CCNRI reference" to user A in a D-DISCONNECT PDU according to the clause 14 of EN 300 392-2 [1]. User A shall remove knowledge of the CCNRI parameter value.

If the originating SwMI cannot accept the CCNR RECALL ACCEPTED basic call set-up because recall timer T3 is not running for the given CCNRI (e.g. the originating SwMI is still monitoring user B or T3 has expired), the originating SwMI shall send a reject cause "Not ready for call" to user A in a D-DISCONNECT PDU according to the clause 14 of EN 300 392-2 [1].

If the originating SwMI cannot accept the CCNR RECALL ACCEPTED basic call set-up because there are no available resource at user A, the originating SwMI shall send a reject cause "Lack of resources at user A" to user A in a D-DISCONNECT PDU according to the clause 14 of EN 300 392-2 [1]. User A shall remove knowledge of the CCNRI parameter value. The originating SwMI shall suspend the CCNR request to the terminating SwMI and resume monitoring of user A.

If the originating SwMI cannot accept the CCNR RECALL ACCEPTED basic call set-up because the CCNR basic call set-up has already been accepted with the same CCNRI, the originating SwMI shall send a D-DISCONNECT with a reject cause "Already accepted" to user A according to the clause 14 of EN 300 392-2 [1]. User A shall remove knowledge of the CCNRI parameter value. The originating SwMI shall suspend the CCNR request to the terminating SwMI and resume monitoring of user A. User A may retain the CCNRI reference for the purpose of LIST and CANCEL.

5.4.3.2.4.4 CCNR call establishment

If the terminating SwMI cannot establish the call because user B is not replying again, the originating receives an ISI-DISCONNECT with CCNRI and a reject cause user B not replying (again) and the CCNR request has not been canceled, with the TETRA option "CCNR request retention", then as a result of the terminating SwMI proceeding with normal call clearing, the originating SwMI shall clear the call according to the procedures in clause 14 of EN 300 392-2 [1], go back to state CCNR-InvokeD-A and the terminating SwMI shall resume monitoring user B for being not busy after a period of activity.

If the terminating SwMI cannot establish the call for any reason other than user B not replying again, the originating SwMI receives an ISI-DISCONNECT, a CCNRI with a reject cause either "failure to match" or "unspecified", then as a result of the terminating SwMI proceeding with normal call clearing, the originating SwMI shall clear the call according to the procedures in clause 14 of EN 300 392-2 [1]. Furthermore, if the CCNR request has not been canceled the CCNR supplementary service shall be canceled by the originating SwMI which shall stop timer T2, indicate the failure to user A according to the normal procedure. The Cancellation Cause information element shall indicate "Basic call failed".

If timer T2 expires before sending the ALERTING or CONNECT message to user A, the CCNR supplementary service shall be canceled according to the normal procedure above. The Cancellation Cause information element shall indicate "Expiration of remote service duration timer (T2R)".

If clearing of the CCNR call is initiated by user A before the ALERTING or CONNECT message is sent to user A, the originating SwMI shall proceed with clearing according to the procedures in clause 14 of EN 300 392-2 [1]. Furthermore the CCNR supplementary service shall be canceled according to the normal procedure above. The Cancellation Cause information element shall indicate "basic call failed".

If user A requests cancellation of a CCNR request while the CCNR call associated with that request is in the process of being established, then the normal procedure above shall be followed and the establishment of the CCNR call set-up shall continue according to the procedures in clause 14 of EN 300 392-2 [1].

If the CCNR RECALL ACCEPTED basic call set-up fails without a cause being received, the originating SwMI shall cancel the CCNR Request.

5.4.3.2.4.5 Network initiated cancellation procedures

None.

5.4.3.2.4.6 B-free but A-busy procedure

None.

5.4.4 Actions at the Terminating SwMI

The SDL representation of procedures at the terminating SwMI is shown in figure A.2 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

5.4.4.1 Normal Procedures

5.4.4.1.1 Determination that CCNR is available

CCNR is available at the terminating SwMI, when the following set of conditions apply:

- a clearing message has been received from user B with cause value (no reply); and
- the maximum length of queue B is greater than zero.

5.4.4.1.2 Acceptance of a CCNR Request

A request to activate CCNR to a given destination shall be accepted by the terminating SwMI and queued if:

- user B has subscribed to the given basic service; and
- the limit on the number of CCNR requests to the given destination has not been exceeded (this limit is a network provider option with a maximum value of 5); and
- user B has not invoked a supplementary service which prohibits the activation of the CCNR supplementary service against that destination; and
- user B compatibility requirements are met (the service is an existing service, user B is determined to be "user B free" or "user B busy").

5.4.4.1.3 Queue B processing

The CCNR requests in queue B shall be processed in chronological order, although the actual mechanism for processing queue B is outside the scope of the present document. During the processing of queue B, the CCBS requests which are currently suspended shall be ignored.

Queue B processing shall start if a no reply user B becomes free after a period of activity.

If a new request is queued and queue processing is not active, then for this new request the determination of user B free shall take place according to the above procedure.

If on resumption of a CCNR request queue processing is not active, then for this request the determination of user B free after a period of activity shall take place according to the procedure below.

On selection of a CCNR request the determination of user B free after a period of activity shall take place according to the normal procedure below.

If, for any reason, no CCNR call results from the processing of a CCNR request, then the next CCNR request against user B shall be selected for processing.

If the whole queue B has been processed and no CCNR call results, processing is complete and shall only be restarted, if the conditions for starting (as specified above) are fulfilled again or became fulfilled again while the previous processing of queue B was ongoing.

5.4.4.1.4 Determination of user B free after a period of activity

User B shall be determined to be free after a period of activity if:

- user B has been active; and
- there is a free user B resource; and
- user B is determined to be "user B free"; and
- the service is an existing service corresponding to the basic service invoked in the CCNR Call.

If user B is determined to be free, then the originating SwMI shall start timer T6 and limit incoming calls during the time that T6 is running.

If the terminating SwMI receives only an indication "compatible and busy", the terminating SwMI shall select the next CCNR request in queue B and continue processing, and cancel any incoming call limitations.

Limitation of incoming call to user B in this case means that the last free B resource shall not be allocated to an incoming call during the time T6 is running and assuming incoming call priority is not lower to the CCNR CALL priority. The reserved user B resource may be used for outgoing calls. After expiration of timer T6, incoming calls shall be offered to user B only if they have service requirements and address information not identical to the CCNR request currently being processed. Identical calls shall be rejected with cause (no terminating SwMI resource available).

5.4.4.1.5 CCNR Call Set-Up

5.4.4.1.6 CCNR Call without Path Reservation

If a basic call ISI-SETUP message is received with a CCNRI PDU, the terminating SwMI shall attempt to associate the incoming CCNRI with a CCNR Request in state CCNR-Await-Call-Completion and, if successful and User B is still not busy, extend the CCNR Call to User B and enter state CCNR-Wait-User-B-Alert.

The association shall be achieved by comparing the CCNRI and the full user A ITSI locally stored with the information elements of the received ISI-SETUP message. A match shall be deemed to occur if all the elements stored locally match the corresponding information elements of the SETUP message; any information element in the SETUP message for which no corresponding element is stored shall be ignored during the comparison.

If in state CCNR-Wait-User-B-Alert an ALERTING or a CONNECT message is sent to the Originating SwMI, the Terminating SwMI shall cancel the respective CCNR Request and enter state CCNR-Idle. The associated signaling connection shall be released. The CCNR Call shall continue.

5.4.4.2 Exceptional Procedures

5.4.4.2.1 CCNR Invocation

A duplicate CCNR Request may be merged with an already stored CCNR Request excepted that the remote timer T2 shall be restarted.

NOTE: Duplicate requests can also be caused by the Terminating SwMI discarding part of the received basic call information.

If a request for SS-CCNR cannot be accepted, the Terminating SwMI shall return a RELEASE message with a CCNR REQUEST ACK PDU on the existing signaling connection. Cause "normal call clearing" shall be used.

If the failure condition is persistent (e.g. service not provided for User B), an error value corresponding to a long term denial shall be included.

If the failure condition is transient (e.g. allowed number of active CCNR Requests exceeded), an error value corresponding to a short term denial shall be included.

If the Terminating SwMI receives a CCNRI PDU for which no matching CCNR REQUEST in state CCNR-InvokeD-A exists the terminating SwMI shall include a CCNR CANCELLATION PDU in the RELEASE message.

5.4.4.2.1.1 Determination that CCNR is available

If a call independent CCNR CANCEL PDU is received which cannot be associated with a CCNR Request the PDU shall be ignored, but the signaling connection shall be released.

If a call related SETUP message is received with a CCNRI PDU that cannot be associated with a CCNR Request in state CCNR-Await-Call-Completion, the Terminating SwMI shall return a DISCONNECT message with CCNRI PDU with reject cause "failure to match".

5.4.4.2.2 Acceptance of a CCNR Request

The following situation shall be treated as "long Term Denial":

- the maximum length of queue B is zero;
- user B has not subscribed to the basic service.

If the terminating SwMI cannot accept the request to invoke CCNR for any other reason, then the terminating SwMI shall inform the originating SwMI that the CCNR request shall be rejected indicating an error corresponding to "short Term Denial".

5.4.4.2.3 Queue B processing

Not applicable.

5.4.4.2.4 Determination of user B free after a period of activity

If user B is not compatible for the basic service requested, the terminating SwMI shall release the user B resource reservation (limitation to incoming calls) and cancel the CCNR supplementary service. On expiration of timer T6 and if there is no user B resource available, the terminating SwMI shall cancel any user B resource reservation (limitation to incoming calls) and wait for a user B resource to become free.

5.4.4.2.5 CCNR Call set-up

If user A establishes the CCNR Call set-up, and user B is determined to be busy again, then the terminating SwMI shall inform the originating SwMI, and shall maintain the CCNR request.

If User B is busy when Terminating SwMI receives a CCNRI PDU, either in a FACILITY message while in state CCNR-Path-Complete or in a SETUP message while in state CCNR-Await-Call-Completion, the Terminating SwMI shall return a DISCONNECT message with a CCNRI PDU with error value user B busy. The service retention option being in use, the CCNR Request shall be retained and monitoring of User B shall be resumed, returning to state CCNR-InvokeD-User-B.

If user A does not request the CCNR call set-up and the originating SwMI cancels the CCNR request, then the terminating SwMI shall cancel the CCNR request and cancel the user B resource reservation (limitation of incoming calls).

If user A establishes the CCNR Call set-up and user B does not accept the Call set-up, or the Call set-up is rejected for any reason except no reply, then the terminating SwMI shall cancel the CCNR request and inform the originating SwMI.

If the originating SwMI indicates suspension of the CCNR request, then the terminating SwMI shall suspend the CCNR request and cancel the user B resource reservation (limitation of incoming Call set-ups).

If a DISCONNECT message without any SS-CCNR PDU is received for a CCNR Call set-up in progress the associated CCNR Request shall be canceled, and state CCNR-Idle shall be entered.

5.4.5 Actions at the Participating SwMI

There are no particular actions at the participating SwMI.

5.5 Inter-working

If the terminating SwMI cannot establish the call because user B is not replying again, and the CCNR request has not been canceled, and in the case or inter-working, the inter-working network option "CCNR request retention" is set to "no", then as a result of the terminating SwMI proceeding with normal call clearing, the originating SwMI shall clear the call according to the procedures in clause 14 of EN 300 392-2 [1], and allow user A to invoke SS-CCNR again using the normal invocation procedure above. Furthermore, the CCNR supplementary service shall be canceled according to the normal procedure above. The Cancellation Cause information element shall indicate "Basic call failed".

5.5.1 Incoming Gateway SwMI

If a call from the public ISDN encounters a user B, that does not answer a call, in the TETRA network and if the public ISDN requires to be informed if SS-CCNR is available, the Incoming Gateway SwMI shall indicate to the public ISDN that SS-CCNR is available, unless it is known that SS-CCNR is not available.

If a CCNR request is received from the public ISDN, the Incoming Gateway SwMI shall establish a call independent signaling connection towards the Terminating SwMI. The SETUP message shall include a CCNR REQUEST PDU, which shall contain in its argument the data received from the public ISDN, the element retain-sig-connection with value TRUE and optionally element can-retain-service, reflecting the corresponding indication from the public ISDN.

The Incoming Gateway SwMI shall translate the following PDUs received from the Terminating SwMI into corresponding information and send it to the public ISDN:

- a CCNR REQUEST ACK PDU;
- a RECALL PDU;
- a CCNR CANCEL PDU.

CCNR CANCEL, CCNR SUSPEND or CCNR RESUME PDUs shall be generated and sent to the Terminating SwMI when the Incoming Gateway SwMI receives corresponding indications from the public ISDN.

All call independent signaling for a particular CCNR Request shall use the same call independent signaling connection, which shall remain active until that CCNR Request terminates.

If a CCNR Call set-up is received from the public ISDN it shall be extended by the Incoming Gateway SwMI towards the Terminating SwMI, including a CCNR RINGOUT PDU in the SETUP message.

NOTE: The CCNR Call need not enter the TETRA network at the same Gateway SwMI as the corresponding call independent signaling connection.

When the call independent signaling connection to the Terminating SwMI is released the Incoming Gateway SwMI shall release the call independent signaling association at the T reference point.

5.5.2 Outgoing Gateway SwMI

NOTE 1: The Outgoing Gateway SwMI cannot pass on an indication that SS-CCNR is possible when received in a clearing message from the public ISDN.

If a CCNR request is destined for the public ISDN the Outgoing Gateway SwMI shall translate the CCNR REQUEST PDU and send it to the public ISDN according to the procedures for the T reference point. When receiving a response the Outgoing Gateway SwMI shall generate a CCNR REQUEST ACK PDU (if the CCNR request was accepted) or a reject cause PDU (if the CCNR request was rejected) and send it to the Originating SwMI in a CONNECT message (return result) or in a RELEASE message (return error). The return result PDU shall contain element no-path-reservation with value TRUE and optionally element retain-service, reflecting the corresponding indication from the public ISDN.

NOTE 2: The sending of the return result PDU in a CONNECT message is in accordance with the connection retention method. This overrides the value FALSE in element retain-sig-connection, if present in the CCNR REQUEST PDU.

RECALL or CCNR CANCEL PDUs shall be generated and sent to the Originating SwMI when the Outgoing Gateway SwMI receives corresponding indications from the public ISDN.

The Outgoing Gateway SwMI shall translate the following PDUs received from the Originating SwMI into corresponding information and send it to the public ISDN:

- a CCNR SUSPEND PDU;
- a CCNR RESUME PDU;
- a CCNR CANCEL PDU.

All call independent signaling for a particular CCNR Request shall use the same call independent signaling connection, which shall remain active until that CCNR Request terminates.

A CCNR Call without Path Reservation shall be extended by the Outgoing Gateway SwMI to the public ISDN.

NOTE 3: The CCNR Call need not leave the TETRA NETWORK at the same Gateway SwMI as the call independent signaling connection.

When the call independent signaling connection to the Originating SwMI is released the Outgoing Gateway SwMI shall release the call independent signaling association at the T reference point.

5.6 Protocol Interaction between SS-CCNR and Other Supplementary Services and ANFs

Interactions with other supplementary services and ANFs for which SwMI standards were available at the time of publication of the present document are specified below with the following exceptions; supplementary services with which either "no possible interaction" or "SS-CCNR shall not have any interaction with SS-XXX" were defined in ETS 300 392-10-23 [4] have not been repeated below.

5.6.1 Call Completion on No Reply (CCNR)

A user can be both a "user A", and a "destination B" simultaneously, i.e. that user can have activated the CCNR supplementary service and have CCNR requests outstanding while at the same time that user can be the destination of CCNR requests from other users.

If a user receives a CCNR recall while that user's destination B CCNR queue is being processed, then the CCNR recall shall take priority over the handling of the destination B CCNR queue. The handling of CCNR requests activated by this user shall have priority over the handling of CCNR requests activated by other users on this user.

If one of the user's CCNR requests can be processed as a result, then the user shall be given a CCNR recall or notification. The served user's destination B idle guard timer, if running, shall be canceled.

5.6.2 Call Completion to Busy Subscriber (CCBS)

A user can be both a "user A" and a "destination B" simultaneously, i.e. that user can have activated the CCNR or call completion to busy subscriber supplementary service and have CCNR or call completion to busy subscriber requests outstanding whilst at the same time that user can be the destination of CCNR or call completion to busy subscriber requests from other users.

If a user receives a CCNR or call completion to busy subscriber recall while that user's destination B CCNR or call completion to busy subscriber queue is being processed, then the CCNR or call completion to busy subscriber recall shall take priority over the handling of the destination B CCNR or call completion to busy subscriber queue. The handling of CCNR/call completion to busy subscriber requests activated by this user shall have priority over the handling of CCNR or call completion to busy subscriber requests activated by other users on this user.

If one of the user's CCNR or call completion to busy subscriber requests can be processed as a result, then the user shall be given a CCNR or call completion to busy subscriber recall or notification. The served user's destination B idle guard timer, if running, shall be canceled.

The call completion to busy subscriber requests shall be processed before the CCNR requests.

If user A has a call completion to busy subscriber recall pending on arrival of the CCNR recall, this should be treated in the same way as in the case where user A is CCNR busy.

5.6.3 Call Forwarding Busy (CFB)

CCNR recalls shall not be diverted. They are given to user A at user A's original location.

Assume user A calls user B and user B activates the call forwarding busy supplementary service or has activated the call forwarding busy supplementary service to user C. Using these assumptions the following situations may occur:

a) the call forwarding busy supplementary service was activated by user B before user A requests the CCNR supplementary service on user B.

   If user B has activated the call forwarding busy supplementary service and is busy, and the forwardeD-to user C does not answer the call (no reply) then a request by user A to activate the CCNR supplementary service shall be rejected. User A shall be informed that the CCNR request has been rejected with "short-term denial" as the reason;

b) the call forwarding busy supplementary service is activated by user B after user A has activated the CCNR supplementary service on user B.

If user B activates the call forwarding busy supplementary service after user A has activated the CCNR supplementary service on user B, the CCNR call shall be forwarded as a normal call to user C. The corresponding CCNR request shall be canceled.

5.6.4 Call Forwarding No Reply (CFNR)

CCNR recalls shall not be diverted. They are given to user A at user A's original location.

Assume user A calls user B and user B activates the call forwarding no reply supplementary service or has activated the call forwarding no reply supplementary service to user C. Using these assumptions the following situations may occur:

a) the call forwarding no reply supplementary service was activated by user B before user A requests the CCNR supplementary service on user B.

If user A calls user B and the call is forwarded on no reply to user C and user C does not answer the call (no reply), a request by user A to activate the CCNR supplementary service shall apply to the originally called user B;

b) arrival of the CCNR call after the call forwarding on no reply supplementary service has been activated.

If user B has activated the call forwarding on no reply supplementary service and does not answer the call (no reply) upon the arrival of the CCNR call, then according to a network option, the call shall be treated as follows:

- the procedures of the CCNR supplementary service shall apply; or
- the call shall be forwarded as a normal call. The corresponding CCNR request shall be canceled.

5.6.5 Call Forwarding Unconditional (CFU)

CCNR recalls shall not be diverted. They are given to user A at user A's original location.

Assume user A calls user B and user B activates the call forwarding unconditional supplementary service (or has activated the call forwarding unconditional supplementary service) to user C. Using these assumptions the following situations may occur:

a) the call forwarding unconditional supplementary service was activated by user B before user A requests the CCNR supplementary service on user B.

If the call to user B is forwarded to user C by the call forwarding unconditional supplementary service and user C does not answer the call (no reply), then a request by user A to activate the CCNR supplementary service shall be rejected. User A shall be informed that the CCNR request has been rejected with "short-term denial" as the reason;

b) the call forwarding unconditional supplementary service is activated by user B after user A has activated the CCNR supplementary service on user B.

If user B activates the call forwarding unconditional supplementary service after user A has activated the CCNR supplementary service, then outstanding queued CCNR requests shall remain in the user B CCNR request queue until the CCNR service duration timer expires. If user B deactivates the call forwarding unconditional supplementary service before the expiration of the CCNR service duration timer and subsequently becomes free after having terminated an activity, the outstanding CCNR requests shall be processed again.

If user B activates the call forwarding unconditional supplementary service between the expiration of the user B idle guard timer and the arrival of the CCNR call, the CCNR call shall be forwarded as a normal call. The corresponding CCNR request shall be canceled.

5.6.6 Barring of Outgoing Call (BOC)

When the outgoing call barring supplementary service is activated after the served user activates the CCNR supplementary service, the CCNR call shall be barred according to the barring program which is active at the served user's access, and the associated basic service for the call.

When the CCNR call is barred, the corresponding CCNR request shall be canceled.

5.6.7 List Search Call (SS-LSC)

User A shall not be able to invoke SS-CCNR if the original call has failed due to the attendants in the list search call being busy.

5.6.8 Call Authorized by Dispatcher (SS-CAD)

If the original call placed by user A was given authorization by a dispatcher for completion, then subsequent invocation of SS-CCNR by user A to the authorized destination, shall not require further authorization by a dispatcher. In the CCNR Call set-up, an indication that the call set-up belongs to a CCNR Call shall be needed; this will imply an additional bit in the ISI call set-up. This additional bit will insure that dispatcher is by-passed in the subsequent CCNR call.

5.6.9 Area Selection (SS-AS)

If user A invokes SS-CCNR to user B and subsequently user B moves outside of the selected area, then the request shall be canceled and user A shall receive a notification of the reason for cancellation.

If user A sets-up its CCNR call with a new area selected, SS-CCNR shall be canceled and user A will get a cause for the cancellation.

5.6.10 Priority Call (SS-PC)

Call completion to busy subscriber shall not have any interaction with priority call. If the priority call leads to invocation of SS-CCNR (finding user B busy), the CCNR CALL shall use the same priority as the original call.

5.6.11 Interactions with ISI Mobility Management (ANF-ISIMM)

Same text as clause 5.6.11 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

5.7 Parameter values (timers)

Same text as clause 5.7 of EN 300 392-12-13 [5] replacing CCBS by CCNR.

Annex A (informative): Bibliography

ITU-T Recommendation I.112 (1993): "Vocabulary of terms for ISDNs (Blue Book)".

ITU-T Recommendation I.210 (1988): "Principles of telecommunication services supported by an ISDN and the means to describe them (Blue Book)".

ECMA 185 (1997): "Private Integrated Services Network (PISN) - Specification, Functional Model and Information Flows - Call Completion Supplementary Services (CCSD), 2nd edition".

ETSI ETS 300 171: "Private Telecommunication Network (PTN); Specification, functional models and information flows; Control aspects of circuit mode basic services".

ETSI EN 300 392-3-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-Part 1: General Design".

ETSI EN 300 392-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".

ETSI ETS 300 392-11-23: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 11: Supplementary services stage 2; Sub-part 23: Call Completion on No Reply (CCNR)".

ETSI EN 300 392-3-5: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 5: Additional Network Feature for Mobility Management (ANF-ISIMM)".

Annex B (informative): Change requests

The present document contains Change requests as identified in table B.1.

Table B.1: Change requests

No	CR vers.	Standard Version	Clauses affected	Title	Remarks
001	10	Ed. 1	Many	Editorial modifications	For information

History

Document history		
V1.1.1	April 2000	Publication as ETS 300 392-12-23
V1.2.0	November 2011	One-step Approval Procedure OAP 20120321: 2011-11-22 to 2012-03-21