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Technical Specification

Railway Telecommunications (RT); GSM-R Core Network Redundancy

ETSI

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Railway Telecommunications (RT).

Introduction

GSM-R is a safety related and "Quality of Service" critical operation; therefore, redundancy in the Core Network is a solution to cope with MSC single outages.

In 3GPP/ETSI Technical Specifications a number of features have been defined which in combination are providing the means to fulfil the requirements for a redundant Core Network used for railway operation.

The present document collects the references required for the GSM-R Core Network Redundancy solution, in particular those needed for the redundancy of the network entities required for VGCS/VBS, the Group Call Serving MSC (GCSMSC) and its associated GCR.

1   Scope

The present document describes the GSM-R Core Network Redundancy which is based on several features described in ETSI/3GPP Technical Specifications. In particular these features are:

-       Intra-domain connection of RAN nodes to multiple CN nodes (RANflex).

-       Coexistence of VGCS/VBS and RANflex.

-       GCSMSC and GCR Redundancy for VGCS/VBS.

The present document is focussing on the relevant references needed for the GSM-R Core Network Redundancy. It does not describe the detailed requirements for the feature GSM-R Core Network Redundancy or the above listed sub-features respectively as these are available in TS 143 068 [i.4], TS 143 069 [i.5], TS 129 002 [i.3] and TS 123 236 [i.6].

The minimum requirements on ETSI/3GPP for the use of GSM for application on railway networks are based on the Release 99 version of the Technical Specifications as described in EN 301 515 [i.1] plus a set of Change Requests as described in TS 102 281 [i.2]. The features forming the basis for GSM-R Core Network redundancy are described in releases later than Release 99. So the present document is referring to specifications versions later than Release 99 but is not mandating any other functionality than covered by the applicable 3GPP Work Items and referenced in the applicable paragraphs as listed in clauses 5.1.2, 5.2.2 and 5.3.2.

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.

Not applicable.

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]   ETSI EN 301 515 (V2.3.0): "Global System for Mobile communication (GSM); Requirements for GSM operation on railways".

[i.2]   ETSI TS 102 281: "Railways Telecommunications (RT); Global System for Mobile communications (GSM); Detailed requirements for GSM operation on Railways".

[i.3]   ETSI TS 129 002: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile Application Part (MAP) specification (3GPP TS 29.002 version 11.6.0 Release 11)".

[i.4]   ETSI TS 143 068: "Digital cellular telecommunications system (Phase 2+); Voice Group Call Service (VGCS); Stage 2 (3GPP TS 43.068)".

[i.5]   ETSI TS 143 069: "Digital cellular telecommunications system (Phase 2+); Voice Broadcast service (VBS); Stage 2 (3GPP TS 43.069)".

[i.6]   ETSI TS 123 236: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Intra-domain connection of Radio Access Network (RAN) nodes to multiple Core Network (CN) nodes (3GPP TS 23.236)".

3   Definitions and abbreviations

3.1   Definitions

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

Mobile-service Switching Center (MSC): CN node which might be a single Mobile-switching Center entity or the couple MSC-Server + Media Gateway

RANflex: feature "Intra-domain connection of RAN nodes to multiple CN nodes" which has been added to the 3GPP standard in Rel-5 (see TS 123 236 [i.6]) and which allows providing a redundant MSC configuration ("MSC pool") for the support of point-to-point communication services and which does not group call redundancy

3.2   Abbreviations

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

BSC	Base Station Controller
CN	Core Network
CS	Circuit Switched
EIRENE	European Integrated Radio Enhanced Network
GCR	Group Call Register
GCSMSC	Group Call Serving MSC
GSM-R	Global System for Mobile communication for Railways applications
IMSI	International Mobile Station Identifier
LAC	Location Area Code
MAP	Mobile Application Part
MSC	Mobile-service Switching Center
NRI	Network Resource Identifier
PLMN	Public Land Mobile Network
PS	Packet Switched
QoS	Quality of Service
RANflex	Radio Network flexibility
RNC	Radio Network Controller
SGSN	Serving GPRS Support Node
TMSI	Temporary Mobile Station Identity
UMTS	Universal Mobile Telecommunications System
UTRAN	UMTS Terrestrial Radio Access Network
VBS	Voice Broadcast Service
VGCS	Voice Group Call Service
VLR	Visitor Location Register
VMSC	Visited MSC

4 General description

4.1 Basic concept

Railway traffic management is a safety and quality of service critical related operation; therefore, redundancy in the core network is required in order to cope with MSC single outages. This redundancy functionality is required in case of unplanned external events (as e.g. earthquakes, fire, terrorist attacks) as well as in case of planned events (as e.g. maintenance activities) which may cause downtimes of MSC or core network.

GSM-R Core Network Redundancy is based on several features described in 3GPP/ETSI Technical Specifications. In particular these features are:

- Intra-domain connection of RAN nodes to multiple CN nodes (RANflex)
  This feature has been added to the 3GPP standard in Rel-5 (see TS 123 236 [i.6]) and allows providing a redundant MSC configuration ("MSC pool") for the support of point-to-point communication services by enabling connection of a BSC to multiple MSC servers.

- Coexistence of VGCS/VBS and RANflex
  In railway operation the point-to-multipoint communication services Voice Group Call Service and Voice Broadcast Service (TS 143 068 [i.4] and TS 143 069 [i.5]) are frequently used. For the coexistence of VGCS/VBS and RANflex within the same network special enhancements for voice group calls and voice broadcast calls are required. These enhancements have been added to 3GPP Rel-7 (TS 143 068 [i.4], TS 143 069 [i.5], TS 129 002 [i.3] and TS 123 236 [i.6]) and guarantee e.g. that also in a network using RANflex a setup request for a voice group call or voice broadcast call is routed to the appropriate serving Anchor MSC.

- GCSMSC and GCR Redundancy for VGCS/VBS
  As the coexistence of VGCS/VBS and RANflex does not support redundancy of the network entities required for VGCS/VBS, the Group Call Serving MSC (GCSMSC) and its associated GCR, further enhancements are necessary to offer the possibility of routing the signaling to a backup GCSMSC when the original target is out of service. These enhancements have been added to 3GPP Rel-11 (TS 143 068 [i.4], TS 143 069 [i.5] and TS 129 002 [i.3]).

4.2 Technical Requirements

This list provides a (non-exhaustive) set of technical requirements:

- The basic requirement of the GSM-R Core Network Redundancy is the ability to reach more than one MSC from the same geographical location.

- GSM-R Core Network Redundancy is required for point to point calls and for voice group calls and voice broadcast calls. The point to point calls may be voice communication or circuit switched data communication.

- For the voice group calls and voice broadcast calls the backup MSC shall have the same information as the failed one when the original target fails. Therefore a redundancy of the group call register is required. This is including both operational and maintenance aspects. The backup functionality is required on a per group call reference level.

- The redundancy concept shall ensure that all requests for one specific group call reference are handled by the same MSC in a MSC pool for the entire duration of this specific group call or broadcast call.

- Inter PLMN voice group calls (international common group call areas) shall be supported.

- The GSM-R Core Network Redundancy shall provide redundancy without the need of physical intervention in case of disaster recovery, i.e. automatic switchover, no manual switchover.

- At installation of the redundancy functionality in the network a manual impact (configuration) on neighbour networks is valid.

- It is not required to maintain ongoing calls in case of MSC outages.

4.3   System Architecture

In principle the GSM-R Core Network Redundancy as described in the present document is architecture neutral, i.e. it is applicable to either Rel-99 CN architecture or Rel-4 CN architecture. However in order to reach the high QoS requirements of GSM-R networks the GSM-R Core Network Redundancy is assumed to be implemented in a Rel-4 CN architecture.

3GPP TS does not restrict the number of MSCs within the core networks or RANflex pools. As the majority of the railway networks using Rel-4 CN architecture will consist of only 2 MSCs at a maximum, the GSM-R Core Network Redundancy is mainly focused on 'basic' 1+1 configuration. Nevertheless the present document also covers the 1+N configuration.

5   Components of GSM-R Core Network Redundancy

As explained in clause 4.1, the GSM-R Core Network Redundancy is a combination of several features described in 3GPP/ETSI Technical Specifications. This clause contains one clause for each of these features containing a high level description for the sake of reminder and a list of the references describing the feature in detail.

5.1   Intra-domain connection of RAN nodes to multiple CN nodes (RANflex)

5.1.1   Main concept

RANflex is answering the need for a flexible network structure as the former requirements to have a BSC controlled by a single MSC server or SGSN lead to certain limitations. Allowing the BSCs to connect to a number of MSC servers increases the networks performance in terms of scalability, distributing the network load amongst the serving entities, and reducing the required signalling as the user roams.

The Intra Domain Connection of RAN Nodes to Multiple CN Nodes overcomes the strict hierarchy, which restricts the connection of a RAN node to just one CN node. This restriction results from routing mechanisms in the RAN nodes which differentiate only between information to be sent to the PS or to the CS domain CN nodes and which do not differentiate between multiple CN nodes in each domain. The Intra Domain Connection of RAN Nodes to Multiple CN Nodes introduces a routing mechanism (and other related functionality), which enables the RAN nodes to route information to different CN nodes within the CS or PS domain, respectively.

> NOTE 1:   PS domain communications are outside the scope of the present document.

The Intra Domain Connection of RAN Nodes to Multiple CN Nodes introduces further the concept of "pool-areas" which is enabled by the routing mechanism in the RAN nodes. A pool-area is comparable to an MSC or SGSN service area as a collection of one or more RAN node service areas. In difference to an MSC or SGSN service area a pool-area is served by multiple CN nodes (MSCs or SGSNs) in parallel which share the traffic of this area between each other. Furthermore, pool-areas may overlap which is not possible for MSC or SGSN service areas.

RANflex is applicable for RAN nodes in general, i.e. for BSC and RNC. However, as UTRAN is not applicable for railway operation the GSM-R Core Network Redundancy is relying on BSC as RAN node only.

> NOTE 2:   The usage of RANflex in the core network requires the support of the functionality in the radio network as well.

Primarily RANflex is providing the ability for loadsharing but due to the MSC pool concept it allows providing a redundant MSC configuration for the support of point-to-point communication services as well.

GSM-R Core Network Redundancy is based on this functionality which is fulfilling the requirements for point to point communication.

5.1.2 References specifying RANflex

Intra-domain connection of RAN nodes to multiple CN nodes (RANflex) has been added to the 3GPP standard in Rel-5.

3GPP Work Item:

3GPP Work Item = 2243 (IUFLEX) "Intra Domain Connection of RAN Nodes to Multiple CN Nodes"

Applicable Technical Specifications:

TS 123 236 [i.6]

5.2 Coexistence of VGCS/VBS and RANflex

5.2.1 Main concept

In railway operation the point-to-multipoint communication services Voice Group Call Service and Voice Broadcast Service (TS 143 068 [i.4] and TS 143 069 [i.5]) are frequently used.

RANflex introduces redundancy of CN nodes while VGCS/VBS require a specific hierarchy for service and traffic plane control. So without further enhancements RANflex and VGCS/VBS do not interoperate. In order to get rid of this limitation and to achieve full interworking between RANflex and VGCS/VBS the feature "Coexistence of VGCS/VBS and RANflex" has been introduced.

The concept of a group call serving MSC is introduced. In a RANflex configuration the group call serving MSC of a location area is a group call anchor MSC or a group call relay MSC that controls the group call signalling for this location area. A location area within the pool area is served (with group call services) by a single predefined group call serving MSC. For a service subscriber located in this location area the visited MSC may be different from the location area's group call serving MSC.

Two cases need to be considered:

- The VMSC of a subscriber is identical to its group call serving MSC.

- The VMSC is different from the group call serving MSC. In this case the procedures for voice group call setup and talker change are needed to be implemented as follows.

Voice group call or voice broadcast call setup

In a RANflex configuration the VMSC in which a voice group call is initiated may be different from the group call serving MSC of the voice group call initiating subscriber's location area. This case is applicable in the 1+N case only.

In this case the interrogation of the GCR on the VMSC would return a negative result, as the group call register is always associated to the group call serving MSC. So in this case the VMSC derives the identity of the group call serving MSC from the initiating subscriber's LAC and requests the group call anchor MSC address from the group call serving MSC's GCR by means of the SEND_GROUP_CALL_INFO MAP service. The call is then "forwarded" from the VMSC to the anchor MSC and further "call-establishment" is done by the anchor MSC.

Uplink management

In a RANflex configuration, if the VMSC is not equal to the group call serving MSC a talker change request or sending of application specific data could not be supported since the group call serving MSC has no access to the VLR of the VMSC to check the group call subscription of the subscriber.

In this case, if the group call serving MSC receives an uplink request message it shall check by analysing the NRI of the requesting subscriber's TMSI whether it is the requesting subscriber's VMSC. If it is not, the group call serving MSC shall retrieve the IMSI and information about subscribed talker priorities from the VLR of the VMSC by means of the MAP service SEND_GROUP_CALL_INFO or Update_Location_Area procedure to retrieve the subscriber data from the HLR.

5.2.2   References specifying "Coexistence of VGCS/VBS and RANflex"

The enhancement for support of coexistence of VGCS/VBS and RANflex have been added to 3GPP Rel-7.

3GPP Work Item:

3GPP Work Item 7043 (VGCSFlex) "Interoperability between VGCS/VBS and A/Gb flexibility"

Applicable Technical Specifications:

TS 143 068 [i.4], TS 143 069 [i.5], TS 129 002 [i.3]

Applicable clauses:

The feature "Coexistence of VGCS/VBS and RANflex" has firstly been added to these Technical Specifications with the main Change Requests covering the major part of the feature as listed in Table 1. However, there have been corrections after the first introduction, partly also in Rel-11 only. So a reference to the Change Requests in Table 1 only would be incomplete. Therefore the full reference is given by Table 2 which is listing all applicable clauses in the applicable specifications describing the functionality "Coexistence of VGCS/VBS and RANflex".

Table 1: Change Requests introducing the major part of "Coexistence of VGCS/VBS and RANflex"

TSG#	TSG doc	WG doc	Spec	CR	rev.	Ph.	Cat	Title
CP-32	CP-060273	C1-061101	43.068	0075	2	Rel-7	B	Addition of interoperability with RANflex
CP-33	CP-060470	C1-061817	43.069	0084	1	Rel-7	B	Addition of interoperability with RANflex
CP-33	CP-060407	C4-061047	29.002	0805	1	Rel-7	B	Interoperability between VBS/VGCS and RANflex

Table 2: Applicable clauses for "Coexistence of VGCS/VBS and RANflex"

TS number	Clause number	Clause title	Comment
143 068 [i.4]	2	References	
	3.1	Definitions	
	4.2.1.1	Normal operation with successful outcome	
	4.2.2.1	Normal operation with successful outcome	
	4.2.8.4.1	Distribution via the MSC	
	5.1	Group Call Register (GCR)	
	5.2	Voice group call responsibility	
	7.1	Transmission architecture	
	8.1.1	Information used for routing of service subscriber originated voice group calls	
	8.1.2	Static Group call attributes	In Rel-7 the clause title has been 'Group call attributes'
	8.1.2.1	Group call area	
	8.1.3	Transient Group call attributes	Clause added for "Coexistence of VGCS/VBS and RANflex"; in Rel-7 the clause title has been 'Transient GCR Data'
	9.2	Use of identities in the network	
	11.3.1.1.1	Initial stage	
	11.3.5.2	Talking subscriber	
	11.3.8	Overview of signalling	
	11.4	Functional requirement of Anchor MSC	
	11.5	Functional requirement of Relay MSC	
	11.5A	Functional requirement of group call serving MSC (within a RANflex pool)	Clause added for "Coexistence of VGCS/VBS and RANflex"
	11.5B	Functional requirement of VMSC (within a RANflex pool)	Clause added for "Coexistence of VGCS/VBS and RANflex"
	11.6	Functional requirement of GCR	
	12	Functional requirement of GCR	
	12.1.5	Send Group Call Info	Clause added for "Coexistence of VGCS/VBS and RANflex"

TS number	Clause number	Clause title	Comment
	12.1.6	Send Group Call Info ack	Clause added for "Coexistence of VGCS/VBS and RANflex"
	12.1.7	Send Group Call Info negative response	Clause added for "Coexistence of VGCS/VBS and RANflex"
	12.3.1	GCR Interrogation	
	12.3.2	GCR Interrogation ack	
	13.1.7	T3	Clause added for "Coexistence of VGCS/VBS and RANflex"
	12.2.9	Send Group Call Info	Clause added for "Coexistence of VGCS/VBS and RANflex"
	12.2.10	Send Group Call Info ack	Clause added for "Coexistence of VGCS/VBS and RANflex"
	12.2.11	Send Group Call Info negative response	Clause added for "Coexistence of VGCS/VBS and RANflex"
143 069 [i.5]	2	References	
	3.1	Definitions	
	4.2.1.1	Normal operation with successful outcome	
	5.1	Group Call Register (GCR)	
	5.2	Voice broadcast call responsibility	
	7.1	Transmission architecture	
	8.1.1	Information used for routing of service subscriber originated voice broadcast calls	
	8.1.2	Static Broadcast call attributes	In Rel-7 the clause title has been 'Broadcast call attributes';
	8.1.2.1	Group call area	
	8.1.3	Transient Group Call attributes	Clause added for "Coexistence of VGCS/VBS and RANflex"; in Rel-7 the clause title has been 'Transient GCR Data';
	9.2	Use of identities in the network	
	11.3.1.1.1	Initial stage	
	11.3.8	Overview of signalling	
	11.4	Functional requirement of Anchor-MSC	
	11.5A	Functional requirement of group call serving MSC (within a RANflex pool)	Clause added for "Coexistence of VGCS/VBS and RANflex"
	11.5B	Functional requirement of VMSC (within a RANflex pool)	Clause added for "Coexistence of VGCS/VBS and RANflex"
	11.6	Functional requirement of GCR	
	12	Content of messages	
	12.2.5	Send Group Call Info	Clause added for "Coexistence of VGCS/VBS and RANflex"
	12.2.10	Send Group Call Info ack	Clause added for "Coexistence of VGCS/VBS and RANflex"
	12.2.11	Send Group Call Info negative response	Clause added for "Coexistence of VGCS/VBS and RANflex"
	12.3.1	GCR Interrogation	
	12.3.2	GCR Interrogation ack	
	13.1.3	T3	Clause added for "Coexistence of VGCS/VBS and RANflex"
129 002 [i.3]	2	References	
	5.1.2	Overload control for MAP entities	
	10.7A	MAP_SEND_GROUP_CALL_INFO service	Clause added for "Coexistence of VGCS/VBS and RANflex"
	16.2.2.4	Operation	
	17.1.6	Application Contexts	
	17.2.2.32A	Group Call Info Retrieval	Clause added for "Coexistence of VGCS/VBS and RANflex"
	17.3.2.30A	Group Call Info Retrieval	Clause added for "Coexistence of VGCS/VBS and RANflex"
	17.3.3	ASN.1 Module for application-context-names	
	17.5	MAP operation and error codes	
	17.6.6	Errors	
	17.6.7	Group Call operations	

TS number	Clause number	Clause title	Comment
	17.7.1	Mobile Service data types	
	17.7.7	Error data types	
	17.7.12	Group Call data types	
	21.4A	Inter MSC Group Call Info Retrieval	Clause added for "Coexistence of VGCS/VBS and RANflex"

5.3 GCSMSC and GCR Redundancy for VGCS/VBS

5.3.1 Main concept

Coexistence of VGCS/VBS and RANflex provides the functionality of VGCS/VBS in a network supporting RANflex, however it does not support redundancy of the network entities required for VGCS/VBS, the Group Call Serving MSC (GCSMSC) and its associated GCR. In order to ensure that the group call attributes are available even in case of an outage of the group call serving MSC, access to a backup GCSMSC when the original target is out of service shall be possible. The backup GCSMSC shall have the same information about the given voice group call / voice broadcast call as the failed one, therefore the transient data about the given voice group call / voice broadcast call is synchronized among the GCRs within the pool.

Redundancy pools and roles

The backup concept is achieved with a RANflex pool, i.e. with a pool of group call serving MSCs each of which can take the same role for a given group call (anchor /relay) and serve the same location areas within a RANflex pool area with group call services. For a given voice group call / voice broadcast call a location area's group call serving MSC redundancy pool is either the group call anchor MSC redundancy pool or one of the group call relay MSC redundancy pools.

For a given instance of a voice group call one group call anchor MSC is selected from the group call anchor MSC redundancy pool. For a given instance of a voice group call / voice broadcast call one group call relay MSC is selected from every relevant group call relay MSC redundancy pool.

NOTE: In the basic 1+1 configuration, the Group Call Serving MSC can only be either one or the other MSC Server in the pool.

In a RANflex configuration with group call redundancy some messages sent to an MSC do not address an individual MSC but an MSC redundancy pool. Network routing ensures that these messages are routed to one of the available (i.e. not out of service) MSCs within the redundancy pool. Once the message is received by one of the available MSCs, the receiving MSC shall check whether there is the need to forward the message to another specific MSC within the redundancy pool. If the message forwarding MSC detects that the specific target MSC is out of service, it shall handle the request locally.

Group Call Register

The GCR shall hold redundancy pool relevant static information as e.g. the addresses identifying GCRs associated to MSCs within the redundancy pool, the identity of the group call anchor MSC redundancy pool (in case the GCR is associated to a relay MSC) or a list of group call relay MSC redundancy pools, into which the call is to be sent (in case the GCR is associated to an anchor MSC).

Additionally the GCR shall hold redundancy relevant transient group call attributes, i.e. the address of the MSC within the redundancy pool, where the group call is ongoing (if so). The transient group call attributes shall be synchronized among the GCRs of the pool.

Group call setup

At every VGCS/VBS call setup in the group call anchor MSC redundancy the MSC that receives the set-up request checks from its local GCR whether the group call is already ongoing in the local or in another MSC within the redundancy pool.

In case of a dispatcher originated voice group call request, if the group call is ongoing at another MSC within the redundancy pool, the requesting MSC shall forward the original request to the MSC within the redundancy pool where the group call is ongoing. If the group call is idle or busy in the local MSC then it is handled by the local MSC as in the non redundant case.

In case of a service subscriber originated group call request, if the group call is already ongoing, the MSC shall either reject the call request with a cause user busy (if the group all is ongoing at the requesting MSC) or forward the original request to the MSC within the redundancy pool where the group call is ongoing (if the group call is ongoing at another MSC within the redundancy pool).

This mechanism prevents the establishment of two simultaneous group calls with the same group call reference controlled by two different anchor MSCs. This mechanism also allows a dispatcher to join to an ongoing group call.

5.3.2   References specifying "GCSMSC and GCR Redundancy for VGCS/VBS"

The enhancement for support of "GCSMSC and GCR Redundancy for VGCS/VBS" have been added to 3GPP Rel-11.

3GPP Work Item:

3GPP Work Item 530020 (RT_VGCS_Red) "GCSMSC and GCR Redundancy for VGCS/VBS"

Applicable Technical Specifications:

TS 143 068 [i.4], TS 143 069 [i.5]

Applicable clauses:

The feature "GCSMSC and GCR Redundancy for VGCS/VBS" has firstly been added to these Technical Specifications with the main Change Requests covering the major part of the feature as listed in Table 3. However, there have been corrections after the first introduction. So a reference to the Change Requests in Table 3 only would be incomplete. Therefore the full reference is given by Table 4 which is listing all applicable clauses in the applicable specifications describing the functionality "GCSMSC and GCR Redundancy for VGCS/VBS".

Table 3: Change Requests introducing the major part of "GCSMSC and GCR Redundancy for VGCS/VBS"

TSG#	TSG doc	WG doc	Spec	CR	rev.	Ph.	Cat	Title
CP-55	CP-120121	C1-120521	43.068	0156	1	Rel-11	B	TC-RT: Group Call Redundancy
CP-55	CP-120121	C1-120522	43.069	0111	1	Rel-11	B	TC-RT: Broadcast Call Redundancy

Table 4: Applicable clauses for "GCSMSC and GCR Redundancy for VGCS/VBS"

TS number	Clause number	Clause title	Comment
143 068 [4]	3.1	Definitions	
	4.2.1.1	Normal operation with successful outcome	
	4.2.2.1	Normal operation with successful outcome	
	5.1	Group Call Register (GCR)	
	5.2	Voice group call responsibility	
	5.3	RANflex configuration with group call redundancy	Clause added for "GCSMSC and GCR Redundancy for VGCS/VBS"
	5.3.1	MSC selection in a RANflex configuration with group call redundancy	Clause added for "GCSMSC and GCR Redundancy for VGCS/VBS"
	5.3.2	GCR synchronization in a RANflex configuration with group call redundancy	Clause added for "GCSMSC and GCR Redundancy for VGCS/VBS"
	5.3.3	GCR Restoration in a RANflex configuration with group call redundancy	Clause added for "GCSMSC and GCR Redundancy for VGCS/VBS"
	7.1	Transmission architecture	
	8.1.1	Information used for routing of service subscriber originated voice group calls	
	8.1.2	Static Group call attributes	
	8.1.2.1	Group call area	

TS number	Clause number	Clause title	Comment
	8.1.3.0	General	Clause title added for "GCSMSC and GCR Redundancy for VGCS/VBS"
	8.1.3.1	Group Call Status Information	
	8.1.3.2	Initial Talker Information	
	9.2	Use of identities in the network	
	11.3.1.1.1	Initial stage	
	11.3.1.2	Dispatcher call establishment	
	11.3.5.2	Talking subscriber	
	11.3.8	Overview of signalling	
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	12.4.2	Sync GCR ack	Clause added for "GCSMSC and GCR Redundancy for VGCS/VBS"
	12.4.3	Sync GCR negative response	Clause added for "GCSMSC and GCR Redundancy for VGCS/VBS"
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	7.1	Transmission architecture	
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	8.1.3.1	Group Call Status Information	
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TS number	Clause number	Clause title	Comment
	11.5B	Functional requirement of VMSC (within a RANflex pool)	
	11.6	Functional requirement of GCR	
	12	Content of messages	
	12.3.1	GCR Interrogation	
	12.3.2	GCR Interrogation ack	
	12.3.3	GCR interrogation negative response	
	12.4	Messages on the GCR - GCR interface	
	12.4.1	Sync GCR	Clause added for "GCSMSC and GCR Redundancy for VGCS/VBS"
	12.4.2	Sync GCR ack	Clause added for "GCSMSC and GCR Redundancy for VGCS/VBS"
	12.4.3	Sync GCR negative response	Clause added for "GCSMSC and GCR Redundancy for VGCS/VBS"
	13.1.7	T3	

Annex A (informative):
Bibliography

- ETSI TR 101 748 (V8.0.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Abbreviations and acronyms (GSM 01.04 version 8.0.0 Release 1999)".

History

Document history		
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