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Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	5
1 Scope	6
2 References	6
3 Definitions, symbols and abbreviations	6
3.1 Definitions	6
4 Description	7
4.1 Description of multicall.....	7
4.2 Applicability to telecommunication services.....	7
5 Functional requirements	7
5.1 Provision	7
5.2 Withdrawal	7
5.3 Registration	8
5.4 Erasure.....	8
5.5 Activation	8
5.6 Deactivation	8
5.7 Invocation.....	8
5.8 Interrogation.....	8
5.9 Call related procedures	8
5.9.1 Terminating CS call.....	8
5.9.2 Originating CS call	9
5.10 Charging requirements	9
6 Exceptional procedures or unsuccessful outcome.....	9
6.1 Exceptional operation or unsuccessful outcome.....	9
6.2 Registration	9
6.3 Erasure.....	9
6.4 Activation	10
6.5 Deactivation	10
6.6 Invocation.....	10
6.7 Interrogation.....	10
6.8 Roaming in non-supporting networks	10
7 Interaction with other services	10
7.1 Line Identification	10
7.1.1 Calling Line Identification Presentation (CLIP).....	10
7.1.2 Calling Line Identification Restriction (CLIR).....	10
7.1.3 Connected Line Identification Presentation (COLP)	10
7.1.4 Connected Line Identification Restriction (COLR).....	10
7.2 Call Forwarding.....	11
7.2.1 Call Forwarding Unconditional (CFU).....	11
7.2.2 Call Forwarding on Busy (CFB).....	11
7.2.3 Call Forwarding on No Reply (CFNRy).....	11
7.2.4 Call Forwarding on Not Reachable (CFNRc).....	11
7.3 Call Completion	11
7.3.1 Call Hold (CH)	11
7.3.2 Call Waiting (CW).....	11
7.4 Multi Party (MPTY).....	12
7.5 Closed User Group (CUG)	12
7.6 Advice of Charge (AoC)	12
7.7 Call Barring	12
7.7.1 Barring of all outgoing calls	12

7.7.2	Barring of outgoing international calls	12
7.7.3	Barring of outgoing international calls except those directed to the HPLMN country	12
7.7.4	Barring of all incoming calls.....	12
7.7.5	Barring of incoming calls when roaming.....	12
7.8	Explicit Call Transfer (ECT).....	12
7.9	Completion of Call to Busy Subscriber (CCBS).....	13
7.10	Multiple Subscriber Profile (MSP).....	13
7.11	Calling Name Presentation (CNAP).....	13
7.12	User-to-User Signalling (UUS).....	13
7.13	enhanced Multi-Level Precedence and Pre-emption service (eMLPP)	13
7.14	Call Deflection (CD)	13
8	Interaction with other network features and services	13
8.1	CAMEL.....	13
8.2	IST.....	13
8.3	ODB	13
8.4	Emergency Calls	13
Annex A (normative): Busy definition.....		15
Annex B (informative): Cross Phase Compatibility		16
B.1	Compatibility With Existing Standards.....	16
B.2	Compatibility With Future Releases	16
B.2.1	Multicall configuration.....	16
B.2.2	Several simultaneous speech calls / bearers	16
B.2.3	CCBS.....	17
Annex C (informative): Change history		18
History		20

Foreword

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- x the first digit:
 - 1 presented to TSG for information;
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1 Scope

The present document presents describes Multicall supplementary service.

The general aspects, including definitions and recommended provision, of the description of the 3GPP Supplementary Services are given in 3GPP TS 22.004.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TS 22.001: "Principles of circuit telecommunication services supported by a Public Land Mobile Network (PLMN)".
- [2] 3GPP TS 22.004: "General on Supplementary Services".
- [3] 3GPP TS 22.024: "Description of Charge Advice Information (CAI)".
- [4] 3GPP TS 22.030: "Man-Machine Interface (MMI) of the Mobile Station (MS)".
- [5] 3GPP TS 22.100: "UMTS Phase 1 Release 99".
- [6] 3GPP TS 22.129: "Handover Requirement between UTRAN and GERAN or other Radio Systems".
- [7] 3GPP TS 22.097: "Multiple Subscriber Profile (MSP)".

3 Definitions, symbols and abbreviations

3.1 Definitions

CS Call: Circuit switched call. A call routed through CS domain. CS call can be for example a speech call, fax call or data call. One call shall only use one bearer at the time

Multiparty: Supplementary Service for speech conference service

N_{cs_MO}: maximum number of simultaneous mobile originating CS calls. The value of The Value of N_{cs_MO} is 7. If N_{cs_MO} has been reached, no more MO calls can be set-up

N_{cs_MT}: Maximum number of simultaneous mobile terminating CS calls. The value of N_{cs_MT} is 7. If N_{cs_MT} has been reached, additional MT call attempts shall fail without any indication to the called subscriber

N_{br}: Maximum number of simultaneous CS bearers. The value of N_{br} is the smallest value within the N_{br_User}, N_{br_UE}, and N_{br_SN}

N_{br_User}: Maximum number of simultaneous CS bearers allowed, as defined by the user within the limits given by N_{br_SB}

N_{br_SB} : Maximum number of simultaneous CS bearers allowed, defined by the service provider in the Multicall subscription

N_{br_UE} : Maximum number of simultaneous CS bearers supported by the UE

N_{br_SN} : Maximum number of simultaneous CS bearers supported by the serving network

4 Description

4.1 Description of multicall

The Multicall supplementary service enables a mobile subscriber to have several simultaneous CS calls, each call using its own dedicated bearer.

Only one CS bearer can be used for speech at any one time.

A speech call is one of TS11 (Telephony), TS12 (Emergency Calls), and TS61 (Alternate speech/fax). If the bearer capability information is not available, e.g. the call is originated/transited by a PSTN, the basic service cannot be deduced and the network shall, for multicall purposes, handle the call as telephony.

A held call shall be regarded as using the bearer used while the call was active.

NOTE: The 3GPP protocol architecture allows several parallel CS calls, the limitation being that there is only one traffic channel in GERAN, which the different CS calls share. This is facilitated by e.g. the Call Waiting, Call Hold, Call Transfer and Multiparty Supplementary Services. Call configurations related to supplementary services are not considered as Multicall. See clause 7 for interaction.

It shall be possible for each CS call to use a dedicated bearer of independent traffic and performance characteristics. It shall be possible to release each active CS call independently of any other CS call.

4.2 Applicability to telecommunication services

The applicability of this Supplementary Service is defined in 3GPP TS 22.004.

5 Functional requirements

5.1 Provision

Multicall is provided by prior arrangement with the service provider.

Multicall shall be provisioned for all Basic Services (BS) subscribed to and to which it is applicable, i.e. not to any subset of these BS.

When the Multicall supplementary service is provisioned the maximum number of simultaneous CS bearers available to the subscriber (N_{br_SB}) shall be defined as part of the subscription. The value for N_{br_SB} shall be in the range from 2 up to 7.

5.2 Withdrawal

It shall be possible to withdraw the Multicall supplementary service subscription on request of the subscriber or for administrative reasons.

5.3 Registration

The user shall be able to modify the maximum number of CS bearers available (N_{br_User}) within the limitations set by the service provider. (N_{br_SB}).

If the subscriber attempts to register a value for N_{br_User} that is higher than the value of N_{br_SB} , the request shall be rejected and the subscriber shall be informed on the unsuccessful outcome on the request.

5.4 Erasure

Data related to the Multicall supplementary service shall be erased by the service provider as a result of withdrawal.

5.5 Activation

The Multicall supplementary service shall be activated by the service provider as a result of provision.

5.6 Deactivation

The Multicall supplementary service shall be deactivated by the service provider as a result of withdrawal.

5.7 Invocation

The Multicall supplementary service shall be invoked by the system when at least one call is in progress and another call with a dedicated bearer is to be set up. The Multicall service applies to mobile originating and mobile terminating calls.

5.8 Interrogation

The user shall be able to interrogate the network for the values of N_{br_User} , N_{br_SB} and N_{br_SN} .

5.9 Call related procedures

5.9.1 Terminating CS call

The indication of a terminating CS call to the mobile terminal will be done by the Multicall supplementary service until either the maximum number of bearer (N_{br}) or the maximum number of CS mobile terminating calls (N_{cs_MT}) has been reached.

If the maximum number of terminating calls (N_{cs_MT}) has been reached, and additional terminating call shall be reject without any indication to the subscriber.

If the maximum number of bearers (N_{br}) has been reached an additional terminating call will be only indicated to the user if the user has the Call Waiting supplementary service active, see chapter 7.4.2 for interactions with Call Waiting.

If N_{br} and N_{cs_MT} havenot been reached, a terminating call is indicated to the user and she may react in the following way:

- a) Accept the terminating call:
 - The user/user applications shall have the possibility to allocate a new bearer for the terminating call.
 - If the user has the Call Hold SS active, the user shall have the possibility to reuse/share an already established bearer (e.g. release existing calls or put an speech on hold and accept the terminating call).
- b) Rejecting the terminating call:
 - If the user rejects the terminating call the call shall be released in a normal way.

c) Ignore the incoming call:

- If the user ignores the indication of the terminating call (i.e. neither accepts nor rejects it), the normal call handling shall apply, e.g. after the Alerting Timer expires the call will be released.

If there is a terminating speech call attempt and an ongoing speech call (active or held), the terminating call shall not be indicated to user by the Multicall service. The Call waiting call SS shall be invoked if applicable, see chapter 7.4.2 for interactions with Call Waiting SS.

The user can have possibility to reuse/share a bearer only when she is provisioned for Call Hold SS. See subclause 7.4.1 for interaction with Call Hold SS.

5.9.2 Originating CS call

If neither N_{br} nor N_{cs_MO} have not been reached and the user wants to establish a new originating CS call she may act in the following way:

- allocate a new bearer for the originating call;
- reuse/share an already established bearer (e.g. to put an speech on hold and set-up a new call).

The user can have possibility to reuse/share a bearer only when she is provisioned for Call Hold SS. See subclause 7.4.1 for interaction with Call Hold SS. The mobile terminal shall not originate a speech call requesting a new bearer when there is already an active speech call.

5.10 Charging requirements

Each of the calls using a dedicated bearer shall be charged individually.

Allocation of a dedicated bearer shall be visible in the charging data.

6 Exceptional procedures or unsuccessful outcome

6.1 Exceptional operation or unsuccessful outcome

The number of simultaneous CS bearers supported by the system may vary in different regions. For instance, after handover the number of simultaneous bearers available to the served subscriber may be lower than the number of already established bearers. Such events shall trigger changes to individual calls in any multicall scenario.

The handover requirements for multicall are specified in 3GPP TS 22.129 [6].

6.2 Registration

If the system cannot accept a registration request, the served mobile subscriber shall receive a notification that Multicall registration was not successful. Possible causes are:

- service not subscribed to;
- $N_{br_User} > N_{br_SB}$;
- insufficient information.

6.3 Erasure

No exceptional operation identified.

6.4 Activation

No exceptional operation identified.

6.5 Deactivation

No exceptional operation identified.

6.6 Invocation

If the served subscriber attempts to set up a new call with a dedicated bearer while the maximum number of bearers available to the subscriber (N_{br}) has been reached, the call attempt shall be rejected by normal procedures, indicating that no more bearers are available.

6.7 Interrogation

When a mobile subscriber who is not provided with the Multicall supplementary service interrogates the service data of the Multicall supplementary service, she shall be notified that she is not subscribed to the service.

6.8 Roaming in non-supporting networks

Roaming into networks not supporting the Multicall supplementary service shall be possible. The served subscriber will not have any access to the Multicall supplementary service and the system should behave accordingly.

When the served subscriber performs any procedure related to Multicall service as described in the clauses above while roaming in a non-supporting network, she shall be notified that the service is not available.

7 Interaction with other services

7.1 Line Identification

7.1.1 Calling Line Identification Presentation (CLIP)

No impact, i.e. CLIP shall be provided with all calls.

7.1.2 Calling Line Identification Restriction (CLIR)

No impact, i.e. CLIR shall be provided with all calls.

7.1.3 Connected Line Identification Presentation (COLP)

No impact, i.e. COLP shall be provided with all calls.

7.1.4 Connected Line Identification Restriction (COLR)

No impact, i.e. COLR shall be provided with all calls.

7.2 Call Forwarding

7.2.1 Call Forwarding Unconditional (CFU)

No impact.

7.2.2 Call Forwarding on Busy (CFB)

No impact.

NOTE: CFB shall be invoked when the network detects a NDUB condition. The maximum number of bearers available to the subscriber (N_{br}) affects the NDUB condition. For the NDUB definition specific for Multicall, see annex A.

This means that for the case of $N_{br} = 1$, the system behaviour shall be the same as for a subscriber who is not provided with the Multicall service.

7.2.3 Call Forwarding on No Reply (CFNRy)

No impact.

7.2.4 Call Forwarding on Not Reachable (CFNRc)

No impact.

7.3 Call Completion

7.3.1 Call Hold (CH)

No impact, i.e. it shall be possible to put an established speech call on hold.

Irrespective of whether the maximum number of CS bearers (N_{br}) is reached or not, and a terminating call is indicated to the user, she shall be able to accept the terminating call by applying the Call Hold service to an active speech call. By that she makes the bearer of the held call available to the new call.

NOTE 1: This means that for the case of $N_{br} = 1$, the system behaviour shall be the same as for a subscriber who is not provided with the Multicall service.

NOTE 2: There is no change to the maximum number of held calls allowed for the Multicall supplementary service. The maximum number of held calls is still 1 per a subscriber.

7.3.2 Call Waiting (CW)

When the subscriber has at least one ongoing call and a new terminating call is speech; then Call Waiting shall be invoked if:

- 1) there is an active speech call and Call Waiting is active and operative for speech or;
- 2) there is a held speech call, with no active call on the same bearer, and Call Waiting is active and operative for speech or;
- 3) there is a held speech call, with an active non-speech call on the same bearer, and Call Waiting is active and operative for that non-speech basic service or;
- 4) there are no speech calls (including a call on hold), the maximum number of bearers (N_{br}) has been reached and Call Waiting is active and operative for at least one of the basic services currently in use.

When the subscriber has at least one ongoing call and a new terminating call is not speech; then Call Waiting shall be invoked if the maximum number of bearers (N_{br}) has been reached and Call Waiting is active and operative for at least one of the basic services currently in use.

NOTE: There is no change to the maximum number of waiting calls allowed for the Multicall service. The maximum number of waiting calls is still 1 per a subscriber.

7.4 Multi Party (MPTY)

No Impact.

The number of MPTY member may be limited by N_{cs_MO} , N_{cs_MT} and N_{cs} .

7.5 Closed User Group (CUG)

No impact.

7.6 Advice of Charge (AoC)

The subscriber shall receive the AoC indication individually for each CS call.

For the AoCC service, the ACM (Accumulated Call Meter as defined in TS 22.024) shall reckon the sum of the charge generated by all simultaneous CS calls.

7.7 Call Barring

No impact.

7.7.1 Barring of all outgoing calls

No impact.

7.7.2 Barring of outgoing international calls

No impact.

7.7.3 Barring of outgoing international calls except those directed to the HPLMN country

No impact.

7.7.4 Barring of all incoming calls

No impact.

7.7.5 Barring of incoming calls when roaming

No impact.

7.8 Explicit Call Transfer (ECT)

No impact.

7.9 Completion of Call to Busy Subscriber (CCBS)

The definition of the IDLE state of subscriber A and destination B is not modified, i.e. a subscriber is considered to be IDLE when all the bearers (calls) for her have been released.

A subscriber to whom CCBS can be invoked shall be regarded as NDUB under the specific NDUB condition for Multicall (See Annex A).

7.10 Multiple Subscriber Profile (MSP)

No impact. The Multicall supplementary service shall be provisioned on a per subscriber basis. Nbr_SN, Nbr_SB, and Nbr_user shall apply over all profiles.

7.11 Calling Name Presentation (CNAP)

No impact.

7.12 User-to-User Signalling (UUS)

No Impact

7.13 enhanced Multi-Level Precedence and Pre-emption service (eMLPP)

No impact.

7.14 Call Deflection (CD)

No impact.

8 Interaction with other network features and services

8.1 CAMEL

No impact.

8.2 IST

No impact.

8.3 ODB

No impact.

8.4 Emergency Calls

The network shall handle emergency call at first priority. When a user originates an emergency call, the network shall behave as follows:

- The network, which supports Multicall, shall accept the emergency call within the serving network capability regardless of Multicall subscription limitation to the user.

- The MS shall ensure that an emergency call setup request is acceptable to a serving network which does not support multicall, if necessary by releasing one or more existing call.

Annex A (normative): Busy definition

NDUB (Network Determined User Busy) occurs when:

1. The maximum number of mobile terminating calls (N_{cs_MT}) has been reached (NOTE 1).
2. The maximum number of bearers (N_{br}) has been reached and the maximum number of waiting calls has been reached (NOTE 2, NOTE3).

NOTE 1: This can occur even if bearers are still available, e.g. when the MS is engaged in MPTY SS. If the maximum number of mobile terminating calls (N_{cs_MT}) has been reached, the Call Waiting SS cannot be invoked.

NOTE 2: If Call Waiting is provisioned and activated, and when the maximum number of bearers has been reached the Call Waiting SS can be invoked. This case is not regarded as NDUB. See subclause 7.3.2 for interaction with Call Waiting SS.

NOTE 3: According to the speech bearer number limitation, the incoming speech call shall be regarded as encountering NDUB when the MS is engaged in a speech call (including a held call) and Call Waiting SS is not provisioned and activated for the user, irrespective of the further availability of bearers for the user. For the condition under which Call Waiting SS shall be invoked in this case, see subclause 7.3.2.

For User Determined User Busy (UDUB) condition see TS 22.001 Annex C.

Annex B (informative): Cross Phase Compatibility

This section details the cross phase compatibility requirements relating to the service requirements in this document.

NOTE: When a change is introduced which affects the 3GPP specifications, it is said to be 'backward compatible' if existing equipment can continue to operate and perform correctly with equipment that conforms to the new implementation.

B.1 Compatibility With Existing Standards

Where the service and operational requirements in this document relate to core network functionality, compatibility is required.

Multicall mechanisms are not applicable for GERAN.

B.2 Compatibility With Future Releases

It is envisaged that 3GPP standards will evolve in future releases, for example with the addition of new service requirements. The standards which define the technical implementation should be developed in such a way that it is practical to add the requirements in this section in a backward compatible manner.

Following chapters include requirements that are foreseen for future release.

B.2.1 Multicall configuration

When having one active CS call and one held call on the same bearer. It shall be possible to create a new CS bearer and to move one of the calls to the new bearer, resulting both calls being active within the limits set by the operator/user and within the capability of the terminal. See figure 2: Split of bearer.

When having two calls (multicall) on the separate bearers. It shall be possible to join both calls to one of the two bearers, put the one of the calls to hold and to release unused CS bearer. It shall be possible to select which call to put on hold. See figure 2: Combination of bearers. (*Note: there is no clear end-user service requirement for this feature at time being*).

NOTE: Due to that only speech calls can be put on hold, so one of the two active Cs calls has to be a speech call.

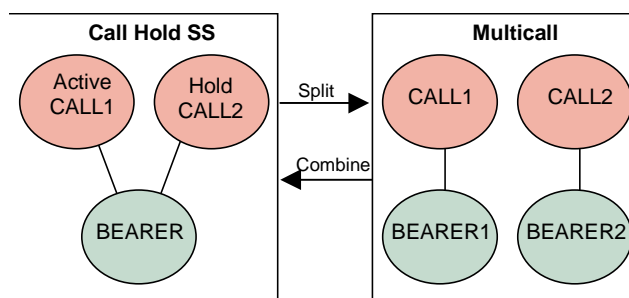


Figure 2: Illustration for split of bearer and combination of bearers

B.2.2 Several simultaneous speech calls / bearers

A Key requirements for multicall is to allow several simultaneous CS calls with dedicated bearers. The most important usage scenario is to allow several CS data bearers to be bind at application level resulting to higher than 64kbits/s data rates. Another important feature is to allow simultaneous speech and data calls.

It's been proposed that the multicall feature could be introduced in a phased manner; meaning that in the first phase, i.e. 3GPP release 99 does only support one active speech call at a time. However, Call control should not prohibit a complete set of multiple speech bearer services in future releases and UTRAN shall be designed in a flexible way to support multiple speech bearers. The specific NDUB definition for speech call shall be removed when multiple speech call is supported. At this release , Supplementary Services Call Waiting, Multiparty and Call Hold are used to offer simultaneous speech calls to user.

N_{cs} may be extended in further releases.

If multiple simultaneous speech calls are supported in the future then the Call Hold service may be used to reconfigure the number of bearers supporting speech calls if required during handover. e.g. in the case of handover to GERAN where only one speech call can be active at a time. This requirement is dependent on the user subscribing to Call Hold.

B.2.3 CCBS

At this release CCBS no enhancements for CCBS is required.

In the future releases the definition of IDLE state of subscriber A and destination B should be modified in away that the IDLE state is reach even if there are active CS calls but the maximum limit of CS calls is not reached.

Annex C (informative): Change history

Date	Version	Comment
19 Mar. 1999	0.0.1	First draft by the editor (Tommi Kokkola / Nokia)
30 Mar. 1999	0.1.0	Output from S1 Multicall ad hoc
6 Apr. 1999	0.1.0	Minor modifications by the editor. Proposed version 1.0.0
19 Apr. 1999	1.0.0	For information to 3GPP TSG SA#3
10. Jun. 1999	1.1.0	Draft from editor for the email meeting.
18. Jun. 1999	1.1.1	Draft during the email meeting.
24. Jun. 1999	1.2.0	Result of email discussions. For some issues status still unstable.
1. Jul. 1999	1.2.1	Comments from TSGN & TSGS Multimedia and Multicall joint meeting included. (Revisions included from version 1.1.0)
8. Jul. 1999	1.3.0	Results from S1 Plenary. Drafting continues at S1_Multicall mailing lists. Contributions expected on: -Busy, Idle, Active states -Busy definition -Supplementary service interactions incl. related CR to appropriate SS when needed. (Specifically 02.83 need to be studied.) - all topics marked with FFS...
28. Sep. 1999	1.4.0	Output from S1 Multicall ad hoc, Germany.
1.Oct. 1999	1.6.0	Proposed version 2.0.0
10. Oct 1999	2.0.0	Version 2.0.0

Change history											
TSG SA#	SA Doc.	SA1 Doc	Spec	CR	Rev	Rel	Cat	Subject/Comment	Old	New	Work Item
SP-05	SP99-433		22.135					Version 3.0.0 approved		3.0.0	
SP-06	SP-99523	S1-991020	22.135	001		R99	D	Transfer of Handover chapter to 22.129	3.0.0	3.1.0	
SP-06	SP-99523	S1-991065	22.135	002		R99	D	Clarification on handling of multiple bearers	3.0.0	3.1.0	
SP-06	SP-99554	S1-99963	22.135	003		R99	C	Registration, Interrogation and Restriction of Packet Domain	3.0.0	3.1.0	
SP-07	SP-000068	S1-000168	22.135	004		R99	F	Clarification of requirement for Multicall	3.1.0	3.2.0	
SP-08	SP-000205	S1-000349	22.129	012		R99	F	Alignment of handover requirements for Multicall	3.2.0	3.3.0	
SP-09	SP-000375	S1-000585	22.135	006		R99	F	Interaction with MSP	3.3.0	3.4.0	
SP-09	SP-000406	S1-000656	22.135	007		R99	F	Removal of the Requirement on Network to Tear Down Calls to Accept EC in Multicall	3.3.0	3.4.0	
SP-09	SP-000406	S1-000657	22.135	008		R99	F	Addition of Ncs_MT limitation to number of MPTY members	3.3.0	3.4.0	

SP-11	SP-010065	S1-010258	22.135			Rel-4		Transferred to 3GPP Release 4	3.4.0	4.0.0	
SP-15	SP-020045	S1-020457	22.135	009	-	Rel-4	F	Editorial CR to correct terms and references	4.0.0	4.1.0	CORRECT
SP-16	SP-020267	S1-021043	22.135			Rel-5		Updated from Rel-4 to Rel5	4.1.0	5.0.0	
SP-26	SP-040744	S1-040997	22.135			Rel-6		Updated from Rel-5 to Rel-6	5.0.0	6.0.0	
SP-36			22.135			Rel-7		Updated from Rel-6 to Rel-7	6.0.0	7.0.0	
SP-42						Rel-8		Updated from Rel-7 to Rel-8	7.0.0	8.0.0	
SP-46	-	-	-	-	-	-	-	Updated to Rel-9 by MCC	8.0.0	9.0.0	
2011-03	-	-	-	-	-	-	-	Update to Rel-10 version (MCC)	9.0.0	10.0.0	
2012-09	-	-	-	-	-	-	-	Updated to Rel-11 by MCC	10.0.0	11.0.0	
2014-10	-	-	-	-	-	-	-	Update to Rel-12 version (MCC)	11.0.0	12.0.0	
2015-12	-	-	-	-	-	-	-	Updated to Rel-13 by MCC	12.0.0	13.0.0	
2017-03	-	-	-	-	-	-	-	Updated to Rel-14 by MCC	13.0.0	14.0.0	
2018-06	-	-	-	-	-	-	-	Updated to Rel-15 by MCC	14.0.0	15.0.0	
SA#88e	-	-	-	-	-	-	-	Updated to Rel-16 by MCC	15.0.0	16.0.0	

History

Document history		
V16.0.0	August 2020	Publication