3GPP TSG-CN Meeting #26 **NP-040501**
8th – 10th December 2004. Athens, Greece.

Source: **TSG CN WG1**

Title: **CR to Rel-4 WI TEI4 (with mirror CRs) for TS 24.007**

Agenda item: **7.11**

Document for: **APPROVAL**

This document contains **3 CRs on Rel-4 Work Item "TEI4"**, that have been agreed by TSG CN WG1 CN#36 meeting and forwarded to TSG CN Plenary meeting #26 for approval.

TDoc #	Tdoc Title	Spec	CR #	Rev	CAT	C_Version	WI	Rel
N1-041842	Sequence numbering for SS via PS	24.007	68		F	4.3.0	TEI4	Rel-4
N1-041843	Sequence numbering for SS via PS	24.007	69		A	5.2.0	TEI4	Rel-5
N1-041844	Sequence numbering for SS via PS	24.007	70		A	6.2.0	TEI4	Rel-6

3GPP TSG-CN1 Meeting #36
Seoul, Korea, 15-19 November 2004

Tdoc N1-041842

CR-Form-v7.1

CHANGE REQUEST

⌘ **24.007** **CR** **068** ⌘ **rev** **-** ⌘ Current version: **4.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [ ] Core Network [X]

Title:	⌘	Infineon, Siemens AG
Source:	⌘	Sequence numbering for SS via PS
Work item code:	⌘	TEI4
Date:	⌘	05/11/2004
Category:	⌘	**F**
Release:	⌘	Rel-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	From Rel-4 onwards the SS protocol can be used also in the PS domain. In the CS domain the "Sequenced message transfer operation" is used for SS. If SS is used in the PS domain, it is not clear how the "Sequenced message transfer operation" should be used. One possible interpretation is that the same send sequence instance used for MM, CC and SS in the CS domain is also used for SS in the PS domain. But with this definition, there is the risk that the send sequence numbering during a CS call is affected by a parallel SS transaction via the PS domain and that as result the MSC will ignore the next CC uplink message erroneously.
Summary of change:	⌘	It is clarified, that a SS transaction via the PS domain does not use the layer 3 sequence numbering and thus does not impact the sequence numbering of the MM, CC and SS protocol in the CS domain.
Consequences if not approved:	⌘	Risk that in case of a CC transaction in parallel to an SS transaction via PS domain a CC or MM message will be ignored by the MSC although the message is not a duplication due to handover.

Clauses affected:	⌘	11.2.3.2.1, 11.2.3.2.2; 11.2.3.2.3; 11.2.3.2.3.1.1; 11.2.3.2.3.2.2

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications	⌘	TS 24.080 – CR#040
			X	Test specifications		
			X	O&M Specifications		

Other comments: ⌘

11.2.3.2 Message type octet

11.2.3.2.1 Message type octet (when accessing Release 98 and older networks only)

The message type octet is the second octet in a standard L3 message.

When a standard L3 message is expected, and a message is received that is less than 16 bit long, that message shall be ignored.

When the radio connection started with a core network node of a Release 98 or older network, the message type IE is coded as shown in figure 11.10a and 11.10x.

Bit 8 is encoded as "0"; value "1" is reserved for possible future use as an extension bit. A protocol entity expecting a standard L3 message, and receiving a message containing bit 8 of octet 2 encoded as "1" shall diagnose a " message not defined for the PD" error and treat the message accordingly.

In messages of MM, CC, SS (via CS domain), GCC, and BCC protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the mobile station or the LMU to the network, bit 7 of octet 2 is used for send sequence number, see subclause 11.2.3.2.3.

In messages of the LCS protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the type A LMU to the network, bit 7 of octet 2 is used for send sequence number, see subclause 11.2.3.2.3.

In all other standard layer 3 messages, except for RR messages, bit 7 is set to a default value. A protocol entity expecting a standard L3 message, and not using the transmission functionality provided by the RR layer, and receiving a message containing bit 7 of octet 2 encoded different to the default value shall diagnose a "message not defined for the PD" error and treat the message accordingly.

The default value for bit 7 is 0 except for the SM protocol where the default value is 1. No default value for bit 7 is specified for RR protocol. For RR message types see 3GPP TS 44.018.

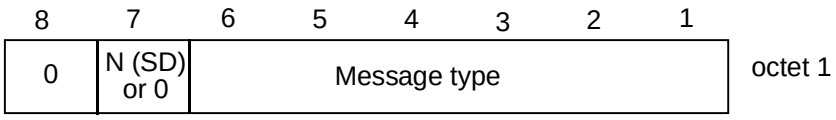

Figure 11.10a: Message type IE (MM, CC, SS, GCC, BCC and LCS)

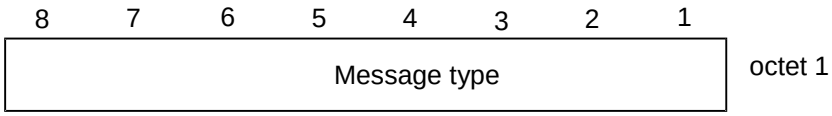

Figure 11.10x: Message type IE (protocol other than MM, CC, SS, GCC, BCC and LCS)

For MM, CC, SS, GCC, BCC and LCS protocols bits 1 to 6 of octet 2 of standard L3 messages contain the message type. For all other L3 protocols bits 1 to 8 of octet 2 of standard L3 message contain the message type.

The message type determines the function of a message within a protocol in a given direction and for a given lower layer SAP. The meaning of the message type is therefore dependent on the protocol (the same value may have different meanings in different protocols), the direction (the same value may have different meanings in the same protocol, when sent from the Mobile Station to the network and when sent from the network to the Mobile Station) and the lower layer SAP (the same value may have different meanings, e.g., whether the message was sent on the SACCH or on the main DCCH).

Each protocol defines a list of allowed message types for each relevant SAP. A message received analysed as a standard L3 message, and with a message type not in the corresponding list leads to the diagnosis "message not defined for the PD". Some message types may correspond to a function not implemented by the receiver. They are then said to be non implemented by the receiver.

The reaction of a protocol entity expecting a standard L3 message and receiving a message with message type not defined for the PD or not implemented by the receiver and the reception conditions is defined in the relevant protocol specification. As a general rule, a protocol specification should not force the receiver to analyse the message further.

11.2.3.2.2 Message type octet (when accessing Release 99 and newer networks)

The message type octet is the second octet in a standard L3 message.

When a standard L3 message is expected, and a message is received that is less than 16 bit long, that message shall be ignored.

When the radio connection started with a core network node of a Release 99 or later network, the message type IE is coded dependent on the PD as shown in figures 11.10b, c and d.

In messages of MM, CC and SS (via CS domain) protocol sent using the transmission functionality provided by the RR and/or access stratum layer to upper layers, and sent from the mobile station or the LMU to the network, bits 7 and 8 of octet 2 are used for send sequence number, see clause 11.2.3.2.3.

In messages of GCC and BCC protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the mobile station or the LMU to the network, only bit 7 of octet 2 is used for send sequence number. Bit 8 is set to the default value.

In messages of the LCS protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the type A LMU to the network, only bit 7 of octet 2 is used for send sequence number. Bit 8 is set to the default value.

In all other standard layer 3 messages, except for RR messages, bits 7 and 8 are set to the default value. A protocol entity expecting a standard L3 message, and not using the transmission functionality provided by the RR and/or access stratum layer, and receiving a message containing bit 7 or bit 8 of octet 2 encoded different to the default value shall diagnose a "message not defined for the PD" error and treat the message accordingly.

In messages of the RR protocol entity, bit 8 of octet 2 is set to the default value. The other value is reserved for possible future use as an extension bit .If an RR protocol entity expecting a standard L3 message receives message containing bit 8 of octet 2 encoded different from the default value it shall diagnose a "message not defined for the PD" error and treat the message accordingly.

The default value for bit 8 is 0. The default value for bit 7 is 0 except for the SM protocol which has a default value of 1. No default value for bit 7 is specified for RR protocol. For RR message types see 3GPP TS 44.018.

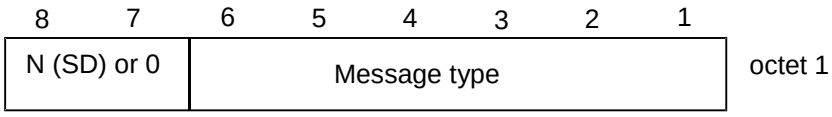

Figure 11.10b: Message type IE (MM, CC and SS)

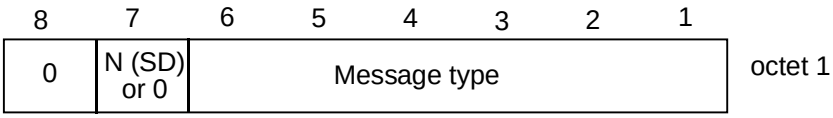

Figure 11.10c: Message type IE (GCC, BCC and LCS)

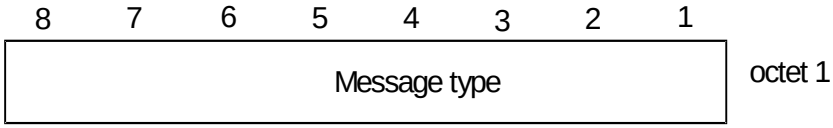

Figure 11.10d: Message type IE (protocol other than MM, CC, SS, GCC, BCC and LCS)

For MM, CC, SS, GCC, BCC and LCS protocols bits 1 to 6 of octet 2 of standard L3 messages contain the message type. For all other L3 protocols bits 1 to 8 of octet 2 of standard L3 message contain the message type.

The message type determines the function of a message within a protocol in a given direction and for a given lower layer SAP. The meaning of the message type is therefore dependent on the protocol (the same value may have different meanings in different protocols), the direction (the same value may have different meanings in the same protocol, when

sent from the Mobile Station to the network and when sent from the network to the Mobile Station) and the lower layer SAP (the same value may have different meanings, e.g., whether the message was sent on the SACCH or on the main DCCH).

Each protocol defines a list of allowed message types for each relevant SAP. A message received analysed as a standard L3 message, and with a message type not in the corresponding list leads to the diagnosis "message not defined for the PD". Some message types may correspond to a function not implemented by the receiver. They are then said to be non implemented by the receiver.

The reaction of a protocol entity expecting a standard L3 message and receiving a message with message type not defined for the PD or not implemented by the receiver and the reception conditions is defined in the relevant protocol specification. As a general rule, a protocol specification should not force the receiver to analyse the message further.

11.2.3.2.3 Sequenced message transfer operation

Upper layer messages sent using the RR sub-layer transport service from the mobile station to the network can be duplicated by the data link layer in at least the following cases:

- in A/Gb mode, when a channel change of dedicated channels is required (assignment or handover procedure) and the last layer 2 frame has not been acknowledged by the peer data link layer before the mobile station leaves the old channel;
- in Iu mode, when an RLC re-establishment occurs (e.g. due to relocation) and the RLC layer has not acknowledged the last one or more RLC PDUs before RLC re-establishment;
- an inter-system change from Iu mode to A/Gb mode is performed and the RLC layer has not acknowledged the last one or more RLC PDUs;
- an inter-system change from A/Gb mode to Iu mode is performed and the the last layer 2 frame in A/Gb mode has not been acknowledged by the peer data link layer before the mobile station leaves the old channel.

In these cases, the mobile station does not know whether the network has received the messages correctly. Therefore, the mobile station has to send the messages again when the channel change is completed.

The network must be able to detect the duplicated received messages. Therefore, each concerned upper layer messages must be marked with a send sequence number.

To allow for different termination points in the infrastructure of the messages of different PDs, the sequence numbering is specific to each PD. For historical reasons, an exception is that messages sent with the CC, SS (via CS domain) and MM PDs share the same sequence numbering. In the following, the phrase **upper layer message flow** refers to a flow of messages sharing the same sequence numbering. The different upper layer flows are MM+CC+SS (via CS domain), GCC, BCC and LCS. The GMM, SM, SMS, SS (via PS domain) and TC (Test Control, see 3GPP TS 44.014 [5a] and 3GPP TS 34.109 [17a]) protocols do not use layer 3 sequence numbering.

11.2.3.2.3.1 Variables and sequence numbers

11.2.3.2.3.1.1 Send state variable V(SD)

The mobile station shall have one associated send state variable V(SD) ("Send Duplicated") for each upper layer message flow. The send state variable denotes the sequence number of the next in sequence numbered message in the flow to be transmitted. The value of the corresponding send state variable shall be incremented by one with each numbered message transmission.

For the MM+CC+SS upper layer message flow, when the RR connection starts with a core network of release 98 or earlier, arithmetic operations on V(SD) are performed modulo 2. When the RR connection starts with a core network of Release 99 or later, arithmetic operations on V(SD) are performed modulo 4. The mobile station shall keep using the same modulo (2 or 4) for the duration of the RR connection.

For the GCC, BCC, and LCS upper layer message flows, arithmetic operations on V(SD) are performed modulo 2.

NOTE: In GSM, the release supported by the core network is broadcast as system information.

11.2.3.2.3.1.2 Send sequence number N(SD)

At the time when such a message to be numbered is designated for transmission, the value of N(SD) for the message to be transferred is set equal to the value of the send state variable V(SD).

11.2.3.2.3.2 Procedures for the initiation, transfer execution and termination of the sequenced message transfer operation

11.2.3.2.3.2.1 Initiation

The sequenced message transfer operation is initiated by establishing a RR connection. The send state variables V(SD) are set to 0.

11.2.3.2.3.2.2 Transfer Execution

The core network must compare the send sequence numbers of pairs of subsequent messages in the same upper layer messages flow.

For the GCC, BCC, and LCS upper layer message flows, in case the send sequence numbers of two subsequent messages in a flow are not identical, no duplication has occurred. In case the send sequence numbers are identical, the network must ignore the second one of the received messages.

For the MM+CC+SS (via CS domain) upper layer message flow:

- when accessed by a release 98 or earlier mobile station, in case the send sequence numbers of two subsequent messages in the flow are identical, the core network shall discard the second one of the received messages;

- when accessed by a release 99 or later mobile station, the core network shall discard any message whose N(SD) is not the increment by one (modulo 4) than the N(SD) of the last accepted message.

NOTE: The release supported by the mobile station is indicated by the revision level in *the Mobile Station Classmark 1* or *Mobile Station Classmark 2* information element, or by the revision level indicator in the *MS network capability* information element (see 3GPP TS 24.008, subclause 10.5).

11.2.3.2.3.2.3 Termination

The sequenced message transfer operation is terminated by the RR connection release procedure.

Inter system change from A/Gb mode to Iu mode or from Iu mode to A/Gb mode shall not terminate the sequenced message transfer. UMTS SRNC relocation shall not terminate the sequenced message transfer.

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Seoul, Korea, 15-19 November 2004

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CHANGE REQUEST

⌘ **24.007** **CR** **069** ⌘ **rev** **-** ⌘ Current version: **5.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [ ] Core Network [X]

Title:	⌘	Infineon, Siemens AG
Source:	⌘	Sequence numbering for SS via PS
Work item code:	⌘	TEI4
Date:	⌘	05/11/2004
Category:	⌘	**A**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	From Rel-4 onwards the SS protocol can be used also in the PS domain. In the CS domain the "Sequenced message transfer operation" is used for SS. If SS is used in the PS domain, it is not clear how the "Sequenced message transfer operation" should be used. One possible interpretation is that the same send sequence instance used for MM, CC and SS in the CS domain is also used for SS in the PS domain. But with this definition, there is the risk that the send sequence numbering during a CS call is affected by a parallel SS transaction via the PS domain and that as result the MSC will ignore the next CC uplink message erroneously.
Summary of change:	⌘	It is clarified, that a SS transaction via the PS domain does not use the layer 3 sequence numbering and thus does not impact the sequence numbering of the MM, CC and SS protocol in the CS domain.
Consequences if not approved:	⌘	Risk that in case of a CC transaction in parallel to an SS transaction via PS domain a CC or MM message will be ignored by the MSC although the message is not a duplication due to handover.

Clauses affected:	⌘	11.2.3.2.1, 11.2.3.2.2; 11.2.3.2.3; 11.2.3.2.3.1.1; 11.2.3.2.3.2.2

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications	⌘	TS 24.080 – CR#041
			X	Test specifications		
			X	O&M Specifications		

Other comments: ⌘

11.2.3.2 Message type octet

11.2.3.2.1 Message type octet (when accessing Release 98 and older networks only)

The message type octet is the second octet in a standard L3 message.

When a standard L3 message is expected, and a message is received that is less than 16 bit long, that message shall be ignored.

When the radio connection started with a core network node of a Release 98 or older network, the message type IE is coded as shown in figure 11.10a and 11.10x.

Bit 8 is encoded as "0"; value "1" is reserved for possible future use as an extension bit. A protocol entity expecting a standard L3 message, and receiving a message containing bit 8 of octet 2 encoded as "1" shall diagnose a " message not defined for the PD" error and treat the message accordingly.

In messages of MM, CC, SS (via CS domain), GCC, and BCC protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the mobile station or the LMU to the network, bit 7 of octet 2 is used for send sequence number, see subclause 11.2.3.2.3.

In messages of the LCS protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the type A LMU to the network, bit 7 of octet 2 is used for send sequence number, see subclause 11.2.3.2.3.

In all other standard layer 3 messages, except for RR messages, bit 7 is set to a default value. A protocol entity expecting a standard L3 message, and not using the transmission functionality provided by the RR layer, and receiving a message containing bit 7 of octet 2 encoded different to the default value shall diagnose a "message not defined for the PD" error and treat the message accordingly.

The default value for bit 7 is 0 except for the SM protocol where the default value is 1. No default value for bit 7 is specified for RR protocol. For RR message types see 3GPP TS 44.018.

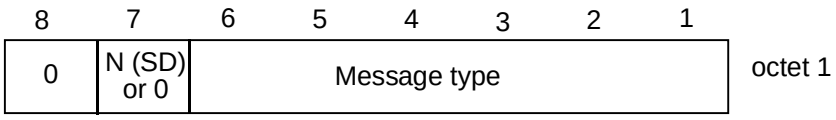

Figure 11.10a: Message type IE (MM, CC, SS, GCC, BCC and LCS)

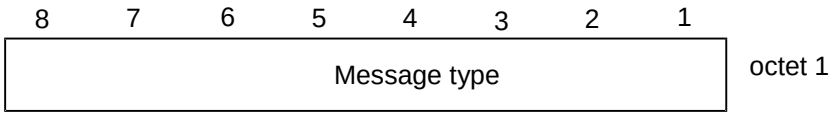

Figure 11.10x: Message type IE (protocol other than MM, CC, SS, GCC, BCC and LCS)

For MM, CC, SS, GCC, BCC and LCS protocols bits 1 to 6 of octet 2 of standard L3 messages contain the message type. For all other L3 protocols bits 1 to 8 of octet 2 of standard L3 message contain the message type.

The message type determines the function of a message within a protocol in a given direction and for a given lower layer SAP. The meaning of the message type is therefore dependent on the protocol (the same value may have different meanings in different protocols), the direction (the same value may have different meanings in the same protocol, when sent from the Mobile Station to the network and when sent from the network to the Mobile Station) and the lower layer SAP (the same value may have different meanings, e.g., whether the message was sent on the SACCH or on the main DCCH).

Each protocol defines a list of allowed message types for each relevant SAP. A message received analysed as a standard L3 message, and with a message type not in the corresponding list leads to the diagnosis "message not defined for the PD". Some message types may correspond to a function not implemented by the receiver. They are then said to be non implemented by the receiver.

The reaction of a protocol entity expecting a standard L3 message and receiving a message with message type not defined for the PD or not implemented by the receiver and the reception conditions is defined in the relevant protocol specification. As a general rule, a protocol specification should not force the receiver to analyse the message further.

11.2.3.2.2 Message type octet (when accessing Release 99 and newer networks)

The message type octet is the second octet in a standard L3 message.

When a standard L3 message is expected, and a message is received that is less than 16 bit long, that message shall be ignored.

When the radio connection started with a core network node of a Release 99 or later network, the message type IE is coded dependent on the PD as shown in figures 11.10b, c and d.

In messages of MM, CC and SS (via CS domain) protocol sent using the transmission functionality provided by the RR and/or access stratum layer to upper layers, and sent from the mobile station or the LMU to the network, bits 7 and 8 of octet 2 are used for send sequence number, see clause 11.2.3.2.3.

In messages of GCC and BCC protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the mobile station or the LMU to the network, only bit 7 of octet 2 is used for send sequence number. Bit 8 is set to the default value.

In messages of the LCS protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the type A LMU to the network, only bit 7 of octet 2 is used for send sequence number. Bit 8 is set to the default value.

In all other standard layer 3 messages, except for RR messages, bits 7 and 8 are set to the default value. A protocol entity expecting a standard L3 message, and not using the transmission functionality provided by the RR and/or access stratum layer, and receiving a message containing bit 7 or bit 8 of octet 2 encoded different to the default value shall diagnose a "message not defined for the PD" error and treat the message accordingly.

In messages of the RR protocol entity, bit 8 of octet 2 is set to the default value. The other value is reserved for possible future use as an extension bit .If an RR protocol entity expecting a standard L3 message receives message containing bit 8 of octet 2 encoded different from the default value it shall diagnose a "message not defined for the PD" error and treat the message accordingly.

The default value for bit 8 is 0. The default value for bit 7 is 0 except for the SM protocol which has a default value of 1. No default value for bit 7 is specified for RR protocol. For RR message types see 3GPP TS 44.018.

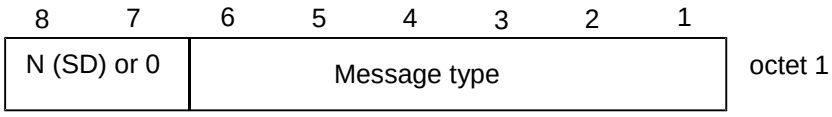

Figure 11.10b: Message type IE (MM, CC and SS)

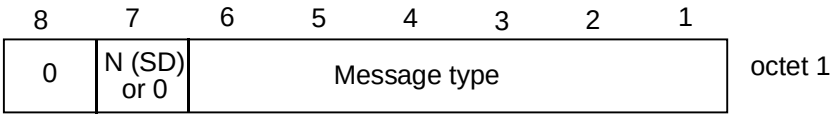

Figure 11.10c: Message type IE (GCC, BCC and LCS)

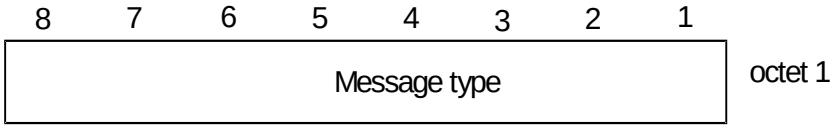

Figure 11.10d: Message type IE (protocol other than MM, CC, SS, GCC, BCC and LCS)

For MM, CC, SS, GCC, BCC and LCS protocols bits 1 to 6 of octet 2 of standard L3 messages contain the message type. For all other L3 protocols bits 1 to 8 of octet 2 of standard L3 message contain the message type.

The message type determines the function of a message within a protocol in a given direction and for a given lower layer SAP. The meaning of the message type is therefore dependent on the protocol (the same value may have different meanings in different protocols), the direction (the same value may have different meanings in the same protocol, when

sent from the Mobile Station to the network and when sent from the network to the Mobile Station) and the lower layer SAP (the same value may have different meanings, e.g., whether the message was sent on the SACCH or on the main DCCH).

Each protocol defines a list of allowed message types for each relevant SAP. A message received analysed as a standard L3 message, and with a message type not in the corresponding list leads to the diagnosis "message not defined for the PD". Some message types may correspond to a function not implemented by the receiver. They are then said to be non implemented by the receiver.

The reaction of a protocol entity expecting a standard L3 message and receiving a message with message type not defined for the PD or not implemented by the receiver and the reception conditions is defined in the relevant protocol specification. As a general rule, a protocol specification should not force the receiver to analyse the message further.

11.2.3.2.3 Sequenced message transfer operation

Upper layer messages sent using the RR sub-layer transport service from the mobile station to the network can be duplicated by the data link layer in at least the following cases:

- in A/Gb mode, when a channel change of dedicated channels is required (assignment or handover procedure) and the last layer 2 frame has not been acknowledged by the peer data link layer before the mobile station leaves the old channel;
- in Iu mode, when an RLC re-establishment occurs (e.g. due to relocation) and the RLC layer has not acknowledged the last one or more RLC PDUs before RLC re-establishment;
- an inter-system change from Iu mode to A/Gb mode is performed and the RLC layer has not acknowledged the last one or more RLC PDUs;
- an inter-system change from A/Gb mode to Iu mode is performed and the the last layer 2 frame in A/Gb mode has not been acknowledged by the peer data link layer before the mobile station leaves the old channel.

In these cases, the mobile station does not know whether the network has received the messages correctly. Therefore, the mobile station has to send the messages again when the channel change is completed.

The network must be able to detect the duplicated received messages. Therefore, each concerned upper layer messages must be marked with a send sequence number.

To allow for different termination points in the infrastructure of the messages of different PDs, the sequence numbering is specific to each PD. For historical reasons, an exception is that messages sent with the CC, SS (via CS domain) and MM PDs share the same sequence numbering. In the following, the phrase **upper layer message flow** refers to a flow of messages sharing the same sequence numbering. The different upper layer flows are MM+CC+SS (via CS domain), GCC, BCC and LCS. The GMM, SM, SMS, SS (via PS domain) and TC (Test Control, see 3GPP TS 44.014 [5a] and 3GPP TS 34.109 [17a]) protocols do not use layer 3 sequence numbering.

11.2.3.2.3.1 Variables and sequence numbers

11.2.3.2.3.1.1 Send state variable V(SD)

The mobile station shall have one associated send state variable V(SD) ("Send Duplicated") for each upper layer message flow. The send state variable denotes the sequence number of the next in sequence numbered message in the flow to be transmitted. The value of the corresponding send state variable shall be incremented by one with each numbered message transmission.

For the MM+CC+SS (via CS domain) upper layer message flow, when the RR connection starts with a core network of release 98 or earlier, arithmetic operations on V(SD) are performed modulo 2. When the RR connection starts with a core network of Release 99 or later, arithmetic operations on V(SD) are performed modulo 4. The mobile station shall keep using the same modulo (2 or 4) for the duration of the RR connection.

For the GCC, BCC, and LCS upper layer message flows, arithmetic operations on V(SD) are performed modulo 2.

NOTE: In GSM, the release supported by the core network is indicated in the MSCR bit and in the SGSNR bit in the system information broadcast (see 3GPP TS 44.018 [6b] and 3GPP TS 44.060 [10a]).

11.2.3.2.3.1.2 Send sequence number N(SD)

At the time when such a message to be numbered is designated for transmission, the value of N(SD) for the message to be transferred is set equal to the value of the send state variable V(SD).

11.2.3.2.3.2 Procedures for the initiation, transfer execution and termination of the sequenced message transfer operation

11.2.3.2.3.2.1 Initiation

The sequenced message transfer operation is initiated by establishing a RR connection. The send state variables V(SD) are set to 0.

11.2.3.2.3.2.2 Transfer Execution

The core network must compare the send sequence numbers of pairs of subsequent messages in the same upper layer messages flow.

For the GCC, BCC, and LCS upper layer message flows, in case the send sequence numbers of two subsequent messages in a flow are not identical, no duplication has occurred. In case the send sequence numbers are identical, the network must ignore the second one of the received messages.

For the MM+CC+SS (via CS domain) upper layer message flow:

- when accessed by a release 98 or earlier mobile station, in case the send sequence numbers of two subsequent messages in the flow are identical, the core network shall discard the second one of the received messages;

- when accessed by a release 99 or later mobile station, the core network shall discard any message whose N(SD) is not the increment by one (modulo 4) than the N(SD) of the last accepted message.

NOTE: The release supported by the mobile station is indicated by the revision level in *the Mobile Station Classmark 1* or *Mobile Station Classmark 2* information element, or by the revision level indicator in the *MS network capability* information element (see 3GPP TS 24.008, subclause 10.5).

11.2.3.2.3.2.3 Termination

The sequenced message transfer operation is terminated by the RR connection release procedure.

Inter system change from A/Gb mode to Iu mode or from Iu mode to A/Gb mode shall not terminate the sequenced message transfer. UMTS SRNC relocation shall not terminate the sequenced message transfer.

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Seoul, Korea, 15-19 November 2004

Tdoc N1-041844

CR-Form-v7.1

CHANGE REQUEST

⌘ **24.007** **CR** **070** ⌘ **rev** **-** ⌘ Current version: **6.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [ ] Core Network [X]

Title:	⌘	Infineon, Siemens AG
Source:	⌘	Sequence numbering for SS via PS
Work item code:	⌘	TEI4
Date:	⌘	05/11/2004
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	From Rel-4 onwards the SS protocol can be used also in the PS domain. In the CS domain the "Sequenced message transfer operation" is used for SS. If SS is used in the PS domain, it is not clear how the "Sequenced message transfer operation" should be used. One possible interpretation is that the same send sequence instance used for MM, CC and SS in the CS domain is also used for SS in the PS domain. But with this definition, there is the risk that the send sequence numbering during a CS call is affected by a parallel SS transaction via the PS domain and that as result the MSC will ignore the next CC uplink message erroneously.
Summary of change:	⌘	It is clarified, that a SS transaction via the PS domain does not use the layer 3 sequence numbering and thus does not impact the sequence numbering of the MM, CC and SS protocol in the CS domain.
Consequences if not approved:	⌘	Risk that in case of a CC transaction in parallel to an SS transaction via PS domain a CC or MM message will be ignored by the MSC although the message is not a duplication due to handover.

Clauses affected:	⌘	11.2.3.2.1, 11.2.3.2.2; 11.2.3.2.3; 11.2.3.2.3.1.1; 11.2.3.2.3.2.2

	Y	N			
Other specs affected: ⌘	X		Other core specifications	⌘	TS 24.080 – CR#042
		X	Test specifications		

	X	O&M Specifications
Other comments:	⌘	

11.2.3.2 Message type octet

11.2.3.2.1 Message type octet (when accessing Release 98 and older networks only)

The message type octet is the second octet in a standard L3 message.

When a standard L3 message is expected, and a message is received that is less than 16 bit long, that message shall be ignored.

When the radio connection started with a core network node of a Release 98 or older network, the message type IE is coded as shown in figure 11.10a and 11.10x.

Bit 8 is encoded as "0"; value "1" is reserved for possible future use as an extension bit. A protocol entity expecting a standard L3 message, and receiving a message containing bit 8 of octet 2 encoded as "1" shall diagnose a " message not defined for the PD" error and treat the message accordingly.

In messages of MM, CC, SS (via CS domain), GCC and BCC protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the mobile station or the LMU to the network, bit 7 of octet 2 is used for send sequence number, see subclause 11.2.3.2.3.

In messages of the LCS protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the type A LMU to the network, bit 7 of octet 2 is used for send sequence number, see subclause 11.2.3.2.3.

In all other standard layer 3 messages, except for RR messages, bit 7 is set to a default value. A protocol entity expecting a standard L3 message, and not using the transmission functionality provided by the RR layer, and receiving a message containing bit 7 of octet 2 encoded different to the default value shall diagnose a "message not defined for the PD" error and treat the message accordingly.

The default value for bit 7 is 0 except for the SM protocol where the default value is 1. No default value for bit 7 is specified for RR protocol. For RR message types see 3GPP TS 44.018.

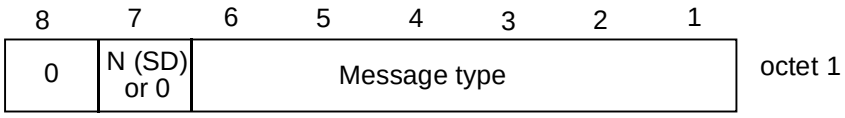

Figure 11.10a: Message type IE (MM, CC, SS, GCC, BCC and LCS)

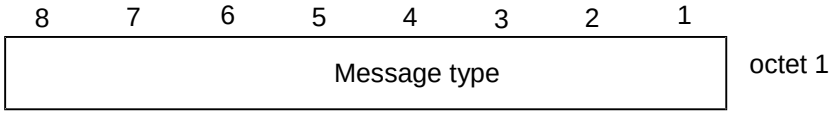

Figure 11.10x: Message type IE (protocol other than MM, CC, SS, GCC, BCC and LCS)

For MM, CC, SS, GCC, BCC and LCS protocols bits 1 to 6 of octet 2 of standard L3 messages contain the message type. For all other L3 protocols bits 1 to 8 of octet 2 of standard L3 message contain the message type.

The message type determines the function of a message within a protocol in a given direction. The meaning of the message type is therefore dependent on the protocol (the same value may have different meanings in different protocols), and the direction (the same value may have different meanings in the same protocol, when sent from the Mobile Station to the network and when sent from the network to the Mobile Station).

Each protocol defines a list of allowed message types for each relevant SAP. A message received analysed as a standard L3 message, and with a message type not in the corresponding list leads to the diagnosis "message not defined for the PD". Some message types may correspond to a function not implemented by the receiver. They are then said to be non implemented by the receiver.

The reaction of a protocol entity expecting a standard L3 message and receiving a message with message type not defined for the PD or not implemented by the receiver and the reception conditions is defined in the relevant protocol specification. As a general rule, a protocol specification should not force the receiver to analyse the message further.

11.2.3.2.2 Message type octet (when accessing Release 99 and newer networks)

The message type octet is the second octet in a standard L3 message.

When a standard L3 message is expected, and a message is received that is less than 16 bit long, that message shall be ignored.

When the radio connection started with a core network node of a Release 99 or later network, the message type IE is coded dependent on the PD as shown in figures 11.10b, c and d.

In messages of MM, CC and SS (via CS domain) protocol sent using the transmission functionality provided by the RR and/or access stratum layer to upper layers, and sent from the mobile station or the LMU to the network, bits 7 and 8 of octet 2 are used for send sequence number, see clause 11.2.3.2.3.

In messages of GCC and BCC protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the mobile station or the LMU to the network, only bit 7 of octet 2 is used for send sequence number. Bit 8 is set to the default value.

In messages of the LCS protocol sent using the transmission functionality provided by the RR layer to upper layers, and sent from the type A LMU to the network, only bit 7 of octet 2 is used for send sequence number. Bit 8 is set to the default value.

In all other standard layer 3 messages, except for RR messages, bits 7 and 8 are set to the default value. A protocol entity expecting a standard L3 message, and not using the transmission functionality provided by the RR and/or access stratum layer, and receiving a message containing bit 7 or bit 8 of octet 2 encoded different to the default value shall diagnose a "message not defined for the PD" error and treat the message accordingly.

In messages of the RR protocol entity, bit 8 of octet 2 is set to the default value. The other value is reserved for possible future use as an extension bit .If an RR protocol entity expecting a standard L3 message receives message containing bit 8 of octet 2 encoded different from the default value it shall diagnose a "message not defined for the PD" error and treat the message accordingly.

The default value for bit 8 is 0. The default value for bit 7 is 0 except for the SM protocol which has a default value of 1. No default value for bit 7 is specified for RR protocol. For RR message types see 3GPP TS 44.018.

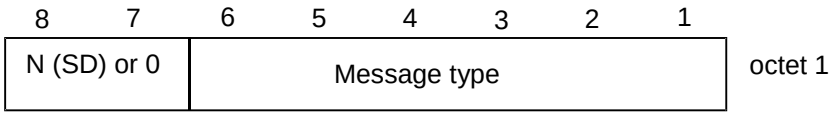

Figure 11.10b: Message type IE (MM, CC and SS)

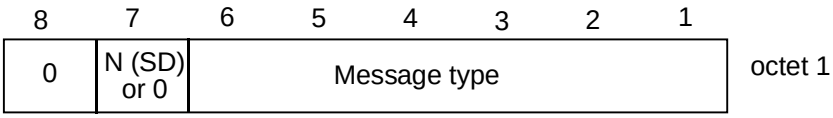

Figure 11.10c: Message type IE (GCC, BCC and LCS)

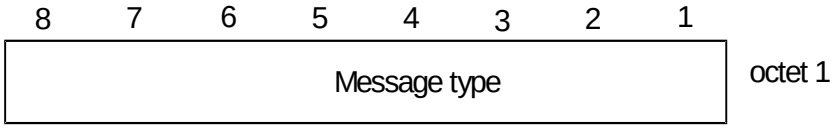

Figure 11.10d: Message type IE (protocol other than MM, CC, SS, GCC, BCC and LCS)

For MM, CC, SS, GCC, BCC and LCS protocols bits 1 to 6 of octet 2 of standard L3 messages contain the message type. For all other L3 protocols bits 1 to 8 of octet 2 of standard L3 message contain the message type.

The message type determines the function of a message within a protocol in a given direction. The meaning of the message type is therefore dependent on the protocol (the same value may have different meanings in different

protocols), and the direction (the same value may have different meanings in the same protocol, when sent from the Mobile Station to the network and when sent from the network to the Mobile Station).

Each protocol defines a list of allowed message types for each relevant SAP. A message received analysed as a standard L3 message, and with a message type not in the corresponding list leads to the diagnosis "message not defined for the PD". Some message types may correspond to a function not implemented by the receiver. They are then said to be non implemented by the receiver.

The reaction of a protocol entity expecting a standard L3 message and receiving a message with message type not defined for the PD or not implemented by the receiver and the reception conditions is defined in the relevant protocol specification. As a general rule, a protocol specification should not force the receiver to analyse the message further.

11.2.3.2.3 Sequenced message transfer operation

Upper layer messages sent using the RR sub-layer transport service from the mobile station to the network can be duplicated by the data link layer in at least the following cases:

- in A/Gb mode, when a channel change of dedicated channels is required (assignment or handover procedure) and the last layer 2 frame has not been acknowledged by the peer data link layer before the mobile station leaves the old channel;
- in Iu mode, when an RLC re-establishment occurs (e.g. due to relocation) and the RLC layer has not acknowledged the last one or more RLC PDUs before RLC re-establishment;
- an inter-system change from Iu mode to A/Gb mode is performed and the RLC layer has not acknowledged the last one or more RLC PDUs;
- an inter-system change from A/Gb mode to Iu mode is performed and the the last layer 2 frame in A/Gb mode has not been acknowledged by the peer data link layer before the mobile station leaves the old channel.

In these cases, the mobile station does not know whether the network has received the messages correctly. Therefore, the mobile station has to send the messages again when the channel change is completed.

The network must be able to detect the duplicated received messages. Therefore, each concerned upper layer messages must be marked with a send sequence number.

To allow for different termination points in the infrastructure of the messages of different PDs, the sequence numbering is specific to each PD. For historical reasons, an exception is that messages sent with the CC, SS (via CS domain) and MM PDs share the same sequence numbering. In the following, the phrase **upper layer message flow** refers to a flow of messages sharing the same sequence numbering. The different upper layer flows are MM+CC+SS (via CS domain), GCC, BCC and LCS. The GMM, SM, SMS, SS (via PS domain) and TC (Test Control, see 3GPP TS 44.014 [5a] and 3GPP TS 34.109 [17a]) protocols do not use layer 3 sequence numbering.

In a shared network with a MOCN configuration, Network Sharing non-supporting UEs can be redirected between CN operators (see 3GPP TS 23.251 [22]). When the redirection takes place, the CN node of the redirecting CN operator shall forward via the RAN the value of N(SD) of the last message received on the MM+CC+SS (via CS domain) message flow to the CN node of the next CN operator (3GPP TS 25.413 [23]).

11.2.3.2.3.1 Variables and sequence numbers

11.2.3.2.3.1.1 Send state variable V(SD)

The mobile station shall have one associated send state variable V(SD) ("Send Duplicated") for each upper layer message flow. The send state variable denotes the sequence number of the next in sequence numbered message in the flow to be transmitted. The value of the corresponding send state variable shall be incremented by one with each numbered message transmission.

For the MM+CC+SS (via CS domain) upper layer message flow, when the RR connection starts with a core network of release 98 or earlier, arithmetic operations on V(SD) are performed modulo 2. When the RR connection starts with a core network of Release 99 or later, arithmetic operations on V(SD) are performed modulo 4. The mobile station shall keep using the same modulo (2 or 4) for the duration of the RR connection.

For the GCC, BCC, and LCS upper layer message flows, arithmetic operations on V(SD) are performed modulo 2.

NOTE: In GSM, the release supported by the core network is indicated in the MSCR bit and in the SGSNR bit in the system information broadcast (see 3GPP TS 44.018 [6b] and 3GPP TS 44.060 [10a]).

11.2.3.2.3.1.2 Send sequence number N(SD)

At the time when such a message to be numbered is designated for transmission, the value of N(SD) for the message to be transferred is set equal to the value of the send state variable V(SD).

11.2.3.2.3.2 Procedures for the initiation, transfer execution and termination of the sequenced message transfer operation

11.2.3.2.3.2.1 Initiation

The sequenced message transfer operation is initiated by establishing a RR connection. The send state variables V(SD) are set to 0.

11.2.3.2.3.2.2 Transfer Execution

The core network shall compare the send sequence numbers of pairs of subsequent messages in the same upper layer messages flow.

For the GCC, BCC, and LCS upper layer message flows, in case the send sequence numbers of two subsequent messages in a flow are not identical, no duplication has occurred. In case the send sequence numbers are identical, the network must ignore the second one of the received messages.

For the MM+CC+SS (via CS domain) upper layer message flow:

- when accessed by a release 98 or earlier mobile station, in case the send sequence numbers of two subsequent messages in the flow are identical, the core network shall discard the second one of the received messages;

- when accessed by a release 99 or later mobile station, the core network shall discard any message whose N(SD) is not the increment by one (modulo 4) of the N(SD) of the last accepted message.

NOTE: The release supported by the mobile station is indicated by the revision level in *the Mobile Station Classmark 1* or *Mobile Station Classmark 2* information element, or by the revision level indicator in the *MS network capability* information element (see 3GPP TS 24.008, subclause 10.5).

In a shared network with a MOCN configuration, the core network node to which the mobile station was redirected shall compare the send sequence number of the first message received after the redirection in the MM+CC+SS (via CS domain) message flow with the value of N(SD) received during the redirection procedure (see 3GPP TS 23.251 [22]):

- when accessed by a release 98 or earlier mobile station, if the two send sequence numbers are identical, the core network shall discard the received message from the mobile station;

- when accessed by a release 99 or later mobile station, the core network shall discard any message whose N(SD) is not the increment by one (modulo 4) of the N(SD) received during the redirection procedure.

11.2.3.2.3.2.3 Termination

The sequenced message transfer operation is terminated by the RR connection release procedure.

Inter system change from A/Gb mode to Iu mode or from Iu mode to A/Gb mode shall not terminate the sequenced message transfer. UMTS SRNC relocation shall not terminate the sequenced message transfer.