

**TSG-RAN Meeting #16**  
**Marco Island, FL, USA, 4 - 7 June 2002**

**RP-020328**

**Title:** Agreed CRs (Release '99 and Rel-4/Rel-5 category A) to TS 25.323

**Source:** TSG-RAN WG2

**Agenda item:** 7.2.3

Doc-1st-	Status-	Spec	CR	Rev	Phase	Subject	Cat	Version	Versio
R2-021241	agreed	25.323	047		R99	Clarification on PDCP sequence number synchronization procedure	F	3.8.0	3.9.0
R2-021242	agreed	25.323	048		Rel-4	Clarification on PDCP sequence number synchronization procedure	A	4.4.0	4.5.0
R2-021243	agreed	25.323	049		Rel-5	Clarification on PDCP sequence number synchronization procedure	A	5.0.0	5.1.0

## CHANGE REQUEST

⌘ **25.323 CR 047** ⌘ rev **-** ⌘ Current version: **3.8.0** ⌘

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**Proposed change affects:** ⌘ (U)SIM  ME/UE  Radio Access Network  Core Network

<b>Title:</b>	⌘ Clarification on PDCP sequence number synchronisation procedure		
<b>Source:</b>	⌘ TSG-RAN WG2		
<b>Work item code:</b>	⌘ TEI	<b>Date:</b>	⌘ 2002-05-16
<b>Category:</b>	⌘ <b>F</b>	<b>Release:</b>	⌘ R99
	<i>Use <u>one</u> of the following categories:</i> <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .		<i>Use <u>one</u> of the following releases:</i> <b>2</b> (GSM Phase 2) <b>R96</b> (Release 1996) <b>R97</b> (Release 1997) <b>R98</b> (Release 1998) <b>R99</b> (Release 1999) <b>REL-4</b> (Release 4) <b>REL-5</b> (Release 5)

<b>Reason for change:</b>	⌘ 1. PDCP PDUs may be lost after RRC procedures which trigger a RLC re-establishment. 2. Some typos in subclause 7.1 are corrected.
<b>Summary of change:</b>	⌘ 1. If a PDCP entity has to synchronise the PDCP SN following a RLC reset or RLC re-establishment not caused by a SRNS Relocation, the PDCP entity shall trigger the PDCP SN synchronisation procedure by submitting one PDCP SeqNum PDU to the lower layer. 2. "Receive_SN" and "Send_SN" are replaced with "Next_Receive_SN" and "Next_Send_SN" respectively in subclause 7.1.  <b>Impact analysis:</b> Impacted functionality: PDCP sequence number synchronisation procedure Correction to a function where the specification was not sufficiently explicit. Would not impact an implementation behaving as indicated in the CR, would impact an implementation otherwise.
<b>Consequences if not approved:</b>	⌘ 1. Unnecessary PDCP sequence number synchronisation procedure may be triggered. 2. PDCP PDUs may be lost due to other RRC procedures besides Radio Bearer reconfiguration procedure. 3. The exchange of "next expected PDCP sequence number" is meaningless.

<b>Clauses affected:</b>	⌘ 5.4.1.2, 7.1		
<b>Other specs affected:</b>	⌘ <input type="checkbox"/> Other core specifications	⌘ 25.323 v4.4.0, CR 048	
	<input type="checkbox"/> Test specifications	25.323 v5.0.0, CR 049	
	<input type="checkbox"/> O&M Specifications		
<b>Other comments:</b>	⌘		

### **How to create CRs using this form:**

Comprehensive information and tips about how to create CRs can be found at <http://www.3gpp.org/specs/CR.htm>.

Below is a brief summary:

- 1) Fill out the above form. The symbols above marked ☒ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under <ftp://ftp.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

## 5.4 SRNS Relocation

In case of SRNS Relocation upper layer indicates to PDCP to perform the re-initialisation of all compression entities of a RB. This entails the following:

- Configured compression parameters remain valid during re-initialisation.
- All compression state information is initialised, e.g. header compression contexts. Therefore, the first 'compressed' packet type after SRNS Relocation is a full header.
- The PDCP sequence numbers are not changed due to the PDCP header compression protocol re-initialisation.

### 5.4.1 Lossless SRNS Relocation

Lossless SRNS Relocation is only applicable when RLC is configured for in-sequence delivery and acknowledged mode. The support of lossless SRNS Relocation is configured by upper layer.

For the support of lossless SRNS Relocation PDCP maintains sequence numbers for PDCP SDUs, as described in subclause 5.4.1.1. These sequence numbers are synchronised between PDCP Sender and Receiver, as described in subclause 5.4.1.2. When a lossless SRNS Relocation is performed sequence numbers are exchanged between UE and UTRAN. They are used to confirm PDCP SDUs transmitted but not yet acknowledged by the Receiver, as described in subclause 5.4.1.3. After relocation the data transfer begins with the first unconfirmed PDCP SDU.

#### 5.4.1.1 PDCP Sequence Numbering

PDCP sequence numbering shall be applied when lossless SRNS Relocation is supported. PDCP Sequence Numbers serve to acknowledge previously transmitted PDCP SDUs prior to relocation. The value of the PDCP sequence number ranges from 0 to 65535. The PDCP SN window size indicates the maximum number of PDCP SDUs, not confirmed to have been successfully transmitted to the peer entity by lower layer, that can be numbered at any given time. The PDCP SN window size is configured by upper layers. PDCP sequence numbers are set to "0" when the PDCP entity is set-up for the first time.

In the following the "submission/reception of a PDCP SDU to/from lower layer" is used as a synonym for the submission/reception of a PDCP Data PDU or a PDCP SeqNum PDU to/from lower layer that carries in its Data field a compressed or uncompressed PDCP SDU. In case PDCP sequence numbers are applied, for each radio bearer:

- in the UE:
  - the UL\_Send PDCP SN shall be set to "0" for the first PDCP SDU submitted to lower layer;
  - the UL\_Send PDCP SN shall be incremented by "1" for the next PDCP SDU submitted to lower layer;
  - the DL\_Receive PDCP SN shall be set to "0" for the first PDCP SDU received from lower layer;
  - the DL\_Receive PDCP SN shall be incremented by "1" for the next PDCP SDU received from lower layer.
- in the UTRAN:
  - the DL\_Send PDCP SN should be set to "0" for the first PDCP SDU submitted to lower layer;
  - the DL\_Send PDCP SN should be incremented by "1" for the next PDCP SDU submitted to lower layer;
  - the UL\_Receive PDCP SN should be set to "0" for the first PDCP SDU received from lower layer;
  - the UL\_Receive PDCP SN should be incremented by "1" for the next PDCP SDU received from lower layer.

PDCP sequence numbers shall not be decremented in a PDCP entity.

#### 5.4.1.2 PDCP Sequence Number synchronization

For radio bearers that are configured to support lossless SRNS Relocation, the PDCP entity shall:

- if a PDCP entity has to synchronise the PDCP SN following a RLC reset or RLC re-establishment not caused by a SRNS Relocation; or
- if the UE/UTRAN PDCP entity receives an invalid "next expected UL/DL\_Receive PDCP SN" from upper layer after Relocation:
  - trigger the PDCP SN synchronisation procedure by submitting one PDCP SeqNum PDU to lower layer;
  - consider that the synchronisation procedure is complete on confirmation by lower layer of the successful transmission of the PDCP SeqNum PDU.

In the UE/UTRAN, the "next expected UL/DL\_Receive PDCP SN" is considered invalid if its value is less than the UL/DL\_Send PDCP SN of the first transmitted but not yet acknowledged PDCP SDU or greater than that of the first unsent PDCP SDU.

On receiving a PDCP SeqNum PDU:

- the UE PDCP entity shall:
  - set the value of the DL\_Receive PDCP SN to the value indicated in the PDCP SeqNum PDU;
- the UTRAN PDCP entity should:
  - set the value of the UL\_Receive PDCP SN to the value indicated in the PDCP SeqNum PDU.

### 5.4.1.3 Sequence Number and Data Forwarding

In case of a lossless SRNS Relocation procedure, as described in [1]:

- the UTRAN should send to the UE the next expected UL\_Receive PDCP SN; and
- the UE shall send to the UTRAN the next expected DL\_Receive PDCP SN.

This information exchange synchronises the Sequence Numbers at the UE and UTRAN PDCP entities.

When requested by the upper layer, for each radio bearer configured to support lossless SRNS Relocation, the PDCP sublayer in the source RNC should forward the following to the target RNC:

- the UL\_Receive PDCP SN of the next PDCP SDU expected to be received from the UE;
- the DL\_Send PDCP SN of the first transmitted but not yet acknowledged PDCP SDU;
- the transmitted but not yet acknowledged PDCP SDUs together with their related DL\_Send PDCP SNs;
- the not yet transmitted PDCP SDUs.

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## 7 Elements for layer-to-layer communication

The interaction between the PDCP layer and other layers are described in terms of primitives where the primitives represent the logical exchange of information and control between the PDCP layer and other layers. The primitives shall not specify or constrain implementations.

### 7.1 Primitives between PDCP and upper layers

The primitives between PDCP and upper layers are shown in Table 3.

**Table 3: Primitives between PDCP and upper layers**

Generic Name	Parameter			
	Req. Data	Ind. Data	Resp. Not Defined	Conf. Not Defined
PDCP-DATA			Not Defined	Not Defined
CPDCP-CONFIG	PDCP-Info, RLC-SAP SN_Sync, R/I	Not Defined	Not Defined	Not Defined
CPDCP-RELEASE	RLC-SAP	Not Defined	Not Defined	Not Defined
CPDCP-SN	PDCP SN	Not Defined	Not Defined	Not Defined
CPDCP-RELOC	Next_Receive_SN	Not Defined	Not Defined	Next_Receive_SN, Next_Send_SN

Each Primitive is defined as follows:

a) PDCP-DATA-Req./Ind.

- PDCP-DATA-Req is used by upper user-plane protocol layers to request a transmission of upper layer PDU. PDCP-DATA-Ind is used to deliver PDCP SDU that has been received to upper user plane protocol layers.

b) CPDCP-CONFIG-Req.

- CPDCP-CONFIG-Req is used to configure and – in case of already existing PDCP entity – to reconfigure a PDCP entity and to assign it to the radio bearer associated with that entity.

c) CPDCP-RELEASE-Req.

- CPDCP-RELEASE-Req is used by upper layers to release a PDCP entity.

d) CPDCP-SN-Req.

- This primitive is used at the UTRAN. CPDCP-SN-Req is used to transfer the PDCP SN to PDCP.

e) CPDCP-RELOC-Req/Conf.

- CPDCP-RELOC-Req initiates the SRNS Relocation procedure in PDCP for those radio bearers that are configured to support lossless SRNS Relocation. The Next\_Receive\_SN is only included at the UE side.
- CPDCP-RELOC-Conf is used to transfer the Next\_Receive\_SN and/or Next\_Send\_SN to upper layers for lossless SRNS Relocation. The Next\_Send\_SN is only included at the source RNC.

The following parameters are used in the primitives:

1) PDCP-Info:

- Contains the parameters for each of the header compression protocols configured to be used by one PDCP entity.

2) RLC-SAP:

- The RLC-SAP (TM/UM/AM) used by PDCP entity when communicating with RLC sublayer.

3) SN\_Sync:

- Indicates that PDCP should start PDCP SN synchronisation procedure.

4) Next\_Send\_SN:

- The Send PDCP SN of the next PDCP SDU to be sent. There is one in the uplink (UL\_Send PDCP SN) and one in the downlink (DL\_Send PDCP SN). Refer to subclause 5.4.1.

5) Next\_Receive\_SN:

- The Receive PDCP SN of the next PDCP SDU expected to be received. There is one in the uplink (UL\_Receive PDCP SN) and one in the downlink (DL\_Receive PDCP SN). Refer to subclause 5.4.1.

6) PDCP SN:

- This includes a PDCP sequence number.

7) R/I:

- Indicates that PDCP should Re-initialise/Initialise the header compression protocols.

## CHANGE REQUEST

⌘ **25.323 CR 048** ⌘ rev **-** ⌘ Current version: **4.4.0** ⌘

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**Proposed change affects:** ⌘ (U)SIM  ME/UE  Radio Access Network  Core Network

<b>Title:</b>	⌘ Clarification on PDCP sequence number synchronisation procedure		
<b>Source:</b>	⌘ TSG-RAN WG2		
<b>Work item code:</b>	⌘ TEI	<b>Date:</b>	⌘ 2002-05-16
<b>Category:</b>	⌘ <b>A</b>	<b>Release:</b>	⌘ REL4
	<i>Use <u>one</u> of the following categories:</i> <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .		<i>Use <u>one</u> of the following releases:</i> <b>2</b> (GSM Phase 2) <b>R96</b> (Release 1996) <b>R97</b> (Release 1997) <b>R98</b> (Release 1998) <b>R99</b> (Release 1999) <b>REL-4</b> (Release 4) <b>REL-5</b> (Release 5)

<b>Reason for change:</b>	⌘ 1. PDCP PDUs may be lost after RRC procedures which trigger a RLC re-establishment. 2. Some typos in subclause 7.1 are corrected.
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<b>Consequences if not approved:</b>	⌘ 1. Unnecessary PDCP sequence number synchronisation procedure may be triggered. 2. PDCP PDUs may be lost due to other RRC procedures besides Radio Bearer reconfiguration procedure. 3. The exchange of "next expected PDCP sequence number" is meaningless.

<b>Clauses affected:</b>	⌘ 5.4.1.2, 7.1		
<b>Other specs affected:</b>	⌘ <input type="checkbox"/> Other core specifications	⌘ 25.323 v3.8.0, CR 047	
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## 5.4 SRNS Relocation

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#### 5.4.1.1 PDCP Sequence Numbering

PDCP sequence numbering shall be applied when lossless SRNS Relocation is supported. PDCP Sequence Numbers serve to acknowledge previously transmitted PDCP SDUs prior to relocation. The value of the PDCP sequence number ranges from 0 to 65535. The PDCP SN window size indicates the maximum number of PDCP SDUs, not confirmed to have been successfully transmitted to the peer entity by lower layer, that can be numbered at any given time. The PDCP SN window size is configured by upper layers. PDCP sequence numbers are set to "0" when the PDCP entity is set-up for the first time.

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- in the UE:
  - the UL\_Send PDCP SN shall be set to "0" for the first PDCP SDU submitted to lower layer;
  - the UL\_Send PDCP SN shall be incremented by "1" for the next PDCP SDU submitted to lower layer;
  - the DL\_Receive PDCP SN shall be set to "0" for the first PDCP SDU received from lower layer;
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- in the UTRAN:
  - the DL\_Send PDCP SN should be set to "0" for the first PDCP SDU submitted to lower layer;
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PDCP sequence numbers shall not be decremented in a PDCP entity.

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For radio bearers that are configured to support lossless SRNS Relocation, the PDCP entity shall:

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- if the UE/UTRAN PDCP entity receives an invalid "next expected UL/DL\_Receive PDCP SN" from upper layer after Relocation:
  - trigger the PDCP SN synchronisation procedure by submitting one PDCP SeqNum PDU to lower layer;
  - consider that the synchronisation procedure is complete on confirmation by lower layer of the successful transmission of the PDCP SeqNum PDU.

In the UE/UTRAN, the "next expected UL/DL\_Receive PDCP SN" is considered invalid if its value is less than the UL/DL\_Send PDCP SN of the first transmitted but not yet acknowledged PDCP SDU or greater than that of the first unsent PDCP SDU.

On receiving a PDCP SeqNum PDU:

- the UE PDCP entity shall:
  - set the value of the DL\_Receive PDCP SN to the value indicated in the PDCP SeqNum PDU;
- the UTRAN PDCP entity should:
  - set the value of the UL\_Receive PDCP SN to the value indicated in the PDCP SeqNum PDU.

### 5.4.1.3 Sequence Number and Data Forwarding

In case of a lossless SRNS Relocation procedure, as described in [1]:

- the UTRAN should send to the UE the next expected UL\_Receive PDCP SN; and
- the UE shall send to the UTRAN the next expected DL\_Receive PDCP SN.

This information exchange synchronises the Sequence Numbers at the UE and UTRAN PDCP entities.

When requested by the upper layer, for each radio bearer configured to support lossless SRNS Relocation, the PDCP sublayer in the source RNC should forward the following to the target RNC:

- the UL\_Receive PDCP SN of the next PDCP SDU expected to be received from the UE;
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## 7 Elements for layer-to-layer communication

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CPDCP-SN	PDCP SN	Not Defined	Not Defined	Not Defined
CPDCP-RELOC	Next_Receive_SN	Not Defined	Not Defined	Next_Receive_SN, Next_Send_SN

Each Primitive is defined as follows:

a) PDCP-DATA-Req./Ind.

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- CPDCP-RELEASE-Req is used by upper layers to release a PDCP entity.

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- This primitive is used at the UTRAN. CPDCP-SN-Req is used to transfer the PDCP SN to PDCP.

e) CPDCP-RELOC-Req/Conf.

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The following parameters are used in the primitives:

1) PDCP-Info:

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2) RLC-SAP:

- The RLC-SAP (TM/UM/AM) used by PDCP entity when communicating with RLC sublayer.

3) SN\_Sync:

- Indicates that PDCP should start PDCP SN synchronisation procedure.

4) Next\_Send\_SN:

- The Send PDCP SN of the next PDCP SDU to be sent. There is one in the uplink (UL\_Send PDCP SN) and one in the downlink (DL\_Send PDCP SN). Refer to subclause 5.4.1.

5) Next\_Receive\_SN:

- The Receive PDCP SN of the next PDCP SDU expected to be received. There is one in the uplink (UL\_Receive PDCP SN) and one in the downlink (DL\_Receive PDCP SN). Refer to subclause 5.4.1.

6) PDCP SN:

- This includes a PDCP sequence number.

7) R/I:

- Indicates that PDCP should Re-initialise/Initialise the header compression protocols.

## CHANGE REQUEST

⌘ **25.323 CR 049** ⌘ rev **-** ⌘ Current version: **5.0.0** ⌘

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

**Proposed change affects:** ⌘ (U)SIM  ME/UE  Radio Access Network  Core Network

<b>Title:</b>	⌘ Clarification on PDCP sequence number synchronisation procedure		
<b>Source:</b>	⌘ TSG-RAN WG2		
<b>Work item code:</b>	⌘ TEI	<b>Date:</b>	⌘ 2002-05-16
<b>Category:</b>	⌘ <b>A</b>	<b>Release:</b>	⌘ REL-5
	<i>Use <u>one</u> of the following categories:</i> <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .		<i>Use <u>one</u> of the following releases:</i> <b>2</b> (GSM Phase 2) <b>R96</b> (Release 1996) <b>R97</b> (Release 1997) <b>R98</b> (Release 1998) <b>R99</b> (Release 1999) <b>REL-4</b> (Release 4) <b>REL-5</b> (Release 5)

<b>Reason for change:</b>	⌘ 1. PDCP PDUs may be lost after RRC procedures which trigger a RLC re-establishment. 2. Some typos in subclause 7.1 are corrected.
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<b>Clauses affected:</b>	⌘ 5.4.1.2, 7.1		
<b>Other specs affected:</b>	⌘ <input type="checkbox"/> Other core specifications	⌘ 25.323 v3.8.0, CR 047	
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<b>Other comments:</b>	⌘		

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- Configured compression parameters remain valid during re-initialisation.
- All compression state information is initialised, e.g. header compression contexts. Therefore, the first 'compressed' packet type after SRNS Relocation is a full header.
- The PDCP sequence numbers are not changed due to the PDCP header compression protocol re-initialisation.

### 5.4.1 Lossless SRNS Relocation

Lossless SRNS Relocation is only applicable when RLC is configured for in-sequence delivery and acknowledged mode. The support of lossless SRNS Relocation is configured by upper layer.

For the support of lossless SRNS Relocation PDCP maintains sequence numbers for PDCP SDUs, as described in subclause 5.4.1.1. These sequence numbers are synchronised between PDCP Sender and Receiver, as described in subclause 5.4.1.2. When a lossless SRNS Relocation is performed sequence numbers are exchanged between UE and UTRAN. They are used to confirm PDCP SDUs transmitted but not yet acknowledged by the Receiver, as described in subclause 5.4.1.3. After relocation the data transfer begins with the first unconfirmed PDCP SDU.

#### 5.4.1.1 PDCP Sequence Numbering

PDCP sequence numbering shall be applied when lossless SRNS Relocation is supported. PDCP Sequence Numbers serve to acknowledge previously transmitted PDCP SDUs prior to relocation. The value of the PDCP sequence number ranges from 0 to 65535. The PDCP SN window size indicates the maximum number of PDCP SDUs, not confirmed to have been successfully transmitted to the peer entity by lower layer, that can be numbered at any given time. The PDCP SN window size is configured by upper layers. PDCP sequence numbers are set to "0" when the PDCP entity is set-up for the first time.

In the following the "submission/reception of a PDCP SDU to/from lower layer" is used as a synonym for the submission/reception of a PDCP Data PDU or a PDCP SeqNum PDU to/from lower layer that carries in its Data field a compressed or uncompressed PDCP SDU. In case PDCP sequence numbers are applied, for each radio bearer:

- in the UE:
  - the UL\_Send PDCP SN shall be set to "0" for the first PDCP SDU submitted to lower layer;
  - the UL\_Send PDCP SN shall be incremented by "1" for the next PDCP SDU submitted to lower layer;
  - the DL\_Receive PDCP SN shall be set to "0" for the first PDCP SDU received from lower layer;
  - the DL\_Receive PDCP SN shall be incremented by "1" for the next PDCP SDU received from lower layer.
- in the UTRAN:
  - the DL\_Send PDCP SN should be set to "0" for the first PDCP SDU submitted to lower layer;
  - the DL\_Send PDCP SN should be incremented by "1" for the next PDCP SDU submitted to lower layer;
  - the UL\_Receive PDCP SN should be set to "0" for the first PDCP SDU received from lower layer;
  - the UL\_Receive PDCP SN should be incremented by "1" for the next PDCP SDU received from lower layer.

PDCP sequence numbers shall not be decremented in a PDCP entity.

#### 5.4.1.2 PDCP Sequence Number synchronization

For radio bearers that are configured to support lossless SRNS Relocation, the PDCP entity shall:



- if a PDCP entity has to synchronise the PDCP SN following a RLC reset or RLC re-establishment not caused by a SRNS Relocation; or
- if the UE/UTRAN PDCP entity receives an invalid "next expected UL/DL\_Receive PDCP SN" from upper layer after Relocation:
  - trigger the PDCP SN synchronisation procedure by submitting one PDCP SeqNum PDU to lower layer;
  - consider that the synchronisation procedure is complete on confirmation by lower layer of the successful transmission of the PDCP SeqNum PDU.

In the UE/UTRAN, the "next expected UL/DL\_Receive PDCP SN" is considered invalid if its value is less than the UL/DL\_Send PDCP SN of the first transmitted but not yet acknowledged PDCP SDU or greater than that of the first unsent PDCP SDU.

On receiving a PDCP SeqNum PDU:

- the UE PDCP entity shall:
  - set the value of the DL\_Receive PDCP SN to the value indicated in the PDCP SeqNum PDU;
- the UTRAN PDCP entity should:
  - set the value of the UL\_Receive PDCP SN to the value indicated in the PDCP SeqNum PDU.

### 5.4.1.3 Sequence Number and Data Forwarding

In case of a lossless SRNS Relocation procedure, as described in [1]:

- the UTRAN should send to the UE the next expected UL\_Receive PDCP SN; and
- the UE shall send to the UTRAN the next expected DL\_Receive PDCP SN.

This information exchange synchronises the Sequence Numbers at the UE and UTRAN PDCP entities.

When requested by the upper layer, for each radio bearer configured to support lossless SRNS Relocation, the PDCP sublayer in the source RNC should forward the following to the target RNC:

- the UL\_Receive PDCP SN of the next PDCP SDU expected to be received from the UE;
- the DL\_Send PDCP SN of the first transmitted but not yet acknowledged PDCP SDU;
- the transmitted but not yet acknowledged PDCP SDUs together with their related DL\_Send PDCP SNs;
- the not yet transmitted PDCP SDUs.

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## 7 Elements for layer-to-layer communication

The interaction between the PDCP layer and other layers are described in terms of primitives where the primitives represent the logical exchange of information and control between the PDCP layer and other layers. The primitives shall not specify or constrain implementations.

### 7.1 Primitives between PDCP and upper layers

The primitives between PDCP and upper layers are shown in Table 3.

**Table 3: Primitives between PDCP and upper layers**

Generic Name	Parameter			
	Req. Data	Ind. Data	Resp. Not Defined	Conf. Not Defined
PDCP-DATA			Not Defined	Not Defined
CPDCP-CONFIG	PDCP-Info, RLC-SAP SN_Sync, R/I	Not Defined	Not Defined	Not Defined
CPDCP-RELEASE	RLC-SAP	Not Defined	Not Defined	Not Defined
CPDCP-SN	PDCP SN	Not Defined	Not Defined	Not Defined
CPDCP-RELOC	Next_Receive_SN	Not Defined	Not Defined	Next_Receive_SN, Next_Send_SN

Each Primitive is defined as follows:

a) PDCP-DATA-Req./Ind.

- PDCP-DATA-Req is used by upper user-plane protocol layers to request a transmission of upper layer PDU. PDCP-DATA-Ind is used to deliver PDCP SDU that has been received to upper user plane protocol layers.

b) CPDCP-CONFIG-Req.

- CPDCP-CONFIG-Req is used to configure and – in case of already existing PDCP entity – to reconfigure a PDCP entity and to assign it to the radio bearer associated with that entity.

c) CPDCP-RELEASE-Req.

- CPDCP-RELEASE-Req is used by upper layers to release a PDCP entity.

d) CPDCP-SN-Req.

- This primitive is used at the UTRAN. CPDCP-SN-Req is used to transfer the PDCP SN to PDCP.

e) CPDCP-RELOC-Req/Conf.

- CPDCP-RELOC-Req initiates the SRNS Relocation procedure in PDCP for those radio bearers that are configured to support lossless SRNS Relocation. The Next\_Receive\_SN is only included at the UE side.
- CPDCP-RELOC-Conf is used to transfer the Next\_Receive\_SN and/or Next\_Send\_SN to upper layers for lossless SRNS Relocation. The Next\_Send\_SN is only included at the source RNC.

The following parameters are used in the primitives:

1) PDCP-Info:

- Contains the parameters for each of the header compression protocols configured to be used by one PDCP entity.

2) RLC-SAP:

- The RLC-SAP (TM/UM/AM) used by PDCP entity when communicating with RLC sublayer.

3) SN\_Sync:

- Indicates that PDCP should start PDCP SN synchronisation procedure.

4) Next\_Send\_SN:

- The Send PDCP SN of the next PDCP SDU to be sent. There is one in the uplink (UL\_Send PDCP SN) and one in the downlink (DL\_Send PDCP SN). Refer to subclause 5.4.1.

5) Next\_Receive\_SN:

- The Receive PDCP SN of the next PDCP SDU expected to be received. There is one in the uplink (UL\_Receive PDCP SN) and one in the downlink (DL\_Receive PDCP SN). Refer to subclause 5.4.1.

6) PDCP SN:

- This includes a PDCP sequence number.

7) R/I:

- Indicates that PDCP should Re-initialise/Initialise the header compression protocols.