**3GPP TSG-RAN WG2 Meeting #109-e *DRAFT\_R2-200xxxx***

**Online, 24 February – 6 March 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  |  | **CR** | **TBD** | **rev** |  | **Current version:** | **0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **x** | Core Network |  |

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|  |
| ***Title:***  | Introduction of NR Industrial IoT features |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** | 2020-03 |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** | 16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | This CR introduces Ethernet header compression feature specified as part of the Work Item on support of Industrial Internet of Things. |
|  |  |
| ***Summary of change:*** | 1. Ethernet header compression support is added in sections 4.1 and 6.3.1.
 |
|  |  |
| ***Consequences if not approved:*** | Ethernet header compression agreed as part of WI on support of Industrial IoT is not specified in stage-2 LTE specifications. |
|  |  |
| ***Clauses affected:*** | 3.2, 4.1, 6.3.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **x** |  |  Other core specifications  | TS 36.323 CR 0278 TS 36.331 CR 4228 |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*First Modified Subclause*

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

1xCSFB Circuit Switched Fallback to 1xRTT

5GC 5G Core Network

ABS Almost Blank Subframe

AC Access Category

ACK Acknowledgement

ACLR Adjacent Channel Leakage Ratio

AM Acknowledged Mode

AMBR Aggregate Maximum Bit Rate

ANDSF Access Network Discovery and Selection Function

ANR Automatic Neighbour Relation

ARP Allocation and Retention Priority

ARQ Automatic Repeat Request

AS Access Stratum

AUL Autonomous Uplink

BCCH Broadcast Control Channel

BCH Broadcast Channel

BL Bandwidth reduced Low complexity

BR-BCCH Bandwidth Reduced Broadcast Control Channel

BSR Buffer Status Report

C/I Carrier-to-Interference Power Ratio

CA Carrier Aggregation

CAZAC Constant Amplitude Zero Auto-Correlation

CBC Cell Broadcast Center

CC Component Carrier

CG Cell Group

CIF Carrier Indicator Field

CIoT Cellular Internet of Things

CMAS Commercial Mobile Alert Service

CMC Connection Mobility Control

C-plane Control Plane

C-RNTI Cell RNTI

CoMP Coordinated Multi Point

CP Cyclic Prefix

CQI Channel Quality Indicator

CRC Cyclic Redundancy Check

CRE Cell Range Extension

CRS Cell-specific Reference Signal

CSA Common Subframe Allocation

CSG Closed Subscriber Group

CSI Channel State Information

CSI-IM CSI interference measurement

CSI-RS CSI reference signal

DC Dual Connectivity

DCCH Dedicated Control Channel

DCN Dedicated Core Network

DeNB Donor eNB

DFTS DFT Spread OFDM

DL Downlink

DMTC Discovery Signal Measurement Timing Configuration

DRB Data Radio Bearer

DRS Discovery Reference Signal

DRX Discontinuous Reception

DTCH Dedicated Traffic Channel

DTX Discontinuous Transmission

DwPTS Downlink Pilot Time Slot

E-CID Enhanced Cell-ID (positioning method)

E-RAB E-UTRAN Radio Access Bearer

E-UTRA Evolved UTRA

E-UTRAN Evolved UTRAN

EAB Extended Access Barring

ECGI E-UTRAN Cell Global Identifier

ECM EPS Connection Management

EDT Early Data Transmission

eHRPD enhanced High Rate Packet Data

eIMTA Enhanced Interference Management and Traffic Adaptation

EMM EPS Mobility Management

eNB E-UTRAN NodeB

EHC Ethernet Header Compression

EPC Evolved Packet Core

EPDCCH Enhanced Physical Downlink Control Channel

EPS Evolved Packet System

ETWS Earthquake and Tsunami Warning System

FDD Frequency Division Duplex

FDM Frequency Division Multiplexing

G-RNTI Group RNTI

GBR Guaranteed Bit Rate

GERAN GSM EDGE Radio Access Network

GNSS Global Navigation Satellite System

GP Guard Period

GRE Generic Routing Encapsulation

GSM Global System for Mobile communication

GUMMEI Globally Unique MME Identifier

GUTI Globally Unique Temporary Identifier

GWCN GateWay Core Network

H-SFN Hyper System Frame Number

HARQ Hybrid ARQ

(H)eNB eNB or HeNB

HO Handover

HPLMN Home Public Land Mobile Network

HRPD High Rate Packet Data

HSDPA High Speed Downlink Packet Access

ICIC Inter-Cell Interference Coordination

IDC In-Device Coexistence

IP Internet Protocol

ISM Industrial, Scientific and Medical

KPAS Korean Public Alert System

L-GW Local Gateway

LAA Licensed-Assisted Access

LB Load Balancing

LBT Listen Before Talk

LCG Logical Channel Group

LCR Low Chip Rate

LCS LoCation Service

LHN Local Home Network

LHN ID Local Home Network ID

LIPA Local IP Access

LMU Location Measurement Unit

LPPa LTE Positioning Protocol Annex

LTE Long Term Evolution

LWA LTE-WLAN Aggregation

LWAAP LTE-WLAN Aggregation Adaptation Protocol

LWIP LTE WLAN Radio Level Integration with IPsec Tunnel

LWIP-SeGW LWIP Security Gateway

MAC Medium Access Control

MBMS Multimedia Broadcast Multicast Service

MBR Maximum Bit Rate

MBSFN Multimedia Broadcast multicast service Single Frequency Network

MCCH Multicast Control Channel

MCE Multi-cell/multicast Coordination Entity

MCG Master Cell Group

MCH Multicast Channel

MCS Modulation and Coding Scheme

MDT Minimization of Drive Tests

MeNB Master eNB

MGW Media Gateway

MIB Master Information Block

MIMO Multiple Input Multiple Output

MME Mobility Management Entity

MMTEL Multimedia telephony

MPDCCH MTC Physical Downlink Control Channel

MSA MCH Subframe Allocation

MSI MCH Scheduling Information

MSP MCH Scheduling Period

MTC Machine-Type Communications

MTCH Multicast Traffic Channel

MTSI Multimedia Telephony Service for IMS

N2 Reference point between the NG-RAN and the AMF

NACK Negative Acknowledgement

NAS Non-Access Stratum

NB-IoT Narrow Band Internet of Things

NCC Next Hop Chaining Counter

NCGI NR Cell Global Identifier

NCR Neighbour Cell Relation

NG-RAN NG Radio Access Network

NH Next Hop key

NNSF NAS Node Selection Function

NPBCH Narrowband Physical Broadcast channel

NPDCCH Narrowband Physical Downlink Control channel

NPDSCH Narrowband Physical Downlink Shared channel

NPRACH Narrowband Physical Random Access channel

NPUSCH Narrowband Physical Uplink Shared channel

NPRS Narrowband Positioning Reference Signal

NPSS Narrowband Primary Synchronization Signal

NR NR Radio Access

NRT Neighbour Relation Table

NSSS Narrowband Secondary Synchronization Signal

OFDM Orthogonal Frequency Division Multiplexing

OFDMA Orthogonal Frequency Division Multiple Access

OPI Offload Preference Indicator

OTDOA Observed Time Difference Of Arrival (positioning method)

P-GW PDN Gateway

P-RNTI Paging RNTI

PA Power Amplifier

PAPR Peak-to-Average Power Ratio

PBCH Physical Broadcast CHannel

PBR Prioritised Bit Rate

PCC Primary Component Carrier

PCCH Paging Control Channel

PCell Primary Cell

PCFICH Physical Control Format Indicator CHannel

PCH Paging Channel

PCI Physical Cell Identifier

PDCCH Physical Downlink Control CHannel

PDCP Packet Data Convergence Protocol

PDN Packet Data Network

PDSCH Physical Downlink Shared CHannel

PDU Protocol Data Unit

PHICH Physical Hybrid ARQ Indicator CHannel

PHY Physical layer

PLMN Public Land Mobile Network

PMCH Physical Multicast CHannel

PMK Pairwise Master Key

PPPP ProSe Per-Packet Priority

PPPR ProSe Per-Packet Reliability

PRACH Physical Random Access CHannel

PRB Physical Resource Block

ProSe Proximity based Services

PSBCH Physical Sidelink Broadcast CHannel

PSC Packet Scheduling

PSCCH Physical Sidelink Control CHannel

PSCell Primary SCell

PSDCH Physical Sidelink Discovery CHannel

PSK Pre-Shared Key

PSM Power Saving Mode

PSSCH Physical Sidelink Shared CHannel

pTAG Primary Timing Advance Group

PTW Paging Time Window

PUCCH Physical Uplink Control CHannel

PUSCH Physical Uplink Shared CHannel

PWS Public Warning System

QAM Quadrature Amplitude Modulation

QCI QoS Class Identifier

QoE Quality of Experience

QoS Quality of Service

R-PDCCH Relay Physical Downlink Control CHannel

RA-RNTI Random Access RNTI

RAC Radio Admission Control

RACH Random Access Channel

RANAC RAN-based Notification Area code

RAT Radio Access Technology

RB Radio Bearer

RBC Radio Bearer Control

RCLWI RAN Controlled LTE-WLAN Interworking

RF Radio Frequency

RIBS Radio-interface based synchronization

RIM RAN Information Management

RLC Radio Link Control

RMTC RSSI Measurement Timing Configuration

RN Relay Node

RNA RAN-based Notification Area

RNAU RAN-based Notification Area Update

RNC Radio Network Controller

RNL Radio Network Layer

RNTI Radio Network Temporary Identifier

ROHC Robust Header Compression

ROM Receive Only Mode

RRC Radio Resource Control

RRM Radio Resource Management

RU Resource Unit

S-GW Serving Gateway

S-RSRP Sidelink Reference Signal Received Power

S1-MME S1 for the control plane

SAE System Architecture Evolution

SAP Service Access Point

SBCCH Sidelink Broadcast Control Channel

SC-FDMA Single Carrier – Frequency Division Multiple Access

SC-MCCH Single Cell Multicast Control Channel

SC-MTCH Single Cell Multicast Transport Channel

SC-N-RNTI Single Cell Notification RNTI

SC-PTM Single Cell Point To Multiploint

SC-RNTI Single Cell RNTI

SCC Secondary Component Carrier

SCell Secondary Cell

SCG Secondary Cell Group

SCH Synchronization Channel

SCTP Stream Control Transmission Protocol

SD-RSRP Sidelink Discovery Reference Signal Received Power

SDAP Service Data Adaptation Protocol

SDF Service Data Flow

SDMA Spatial Division Multiple Access

SDU Service Data Unit

SeGW Security Gateway

SeNB Secondary eNB

SFN System Frame Number

SI System Information

SI-RNTI System Information RNTI

S1-U S1 for the user plane

SIB System Information Block

SIPTO Selected IP Traffic Offload

SIPTO@LN Selected IP Traffic Offload at the Local Network

SL-BCH Sidelink Broadcast Channel

SL-DCH Sidelink Discovery Channel

SL-RNTI Sidelink RNTI

SL-SCH Sidelink Shared Channel

SPDCCH Short PDCCH

SPID Subscriber Profile ID for RAT/Frequency Priority

SPT Short Processing Time

SPUCCH Short PUCCH

SR Scheduling Request

SRB Signalling Radio Bearer

sTAG Secondary Timing Advance Group

STCH Sidelink Traffic Channel

SU Scheduling Unit

TA Tracking Area

TAG Timing Advance Group

TB Transport Block

TCP Transmission Control Protocol

TDD Time Division Duplex

TDM Time Division Multiplexing

TEID Tunnel Endpoint Identifier

TFT Traffic Flow Template

TM Transparent Mode

TMGI Temporary Mobile Group Identity

TNL Transport Network Layer

TTI Transmission Time Interval

U-plane User plane

UAC Unified Access Control

UDC Uplink Data Compression

UE User Equipment

UL Uplink

UM Unacknowledged Mode

UMTS Universal Mobile Telecommunication System

UpPTS Uplink Pilot Time Slot

UTRA Universal Terrestrial Radio Access

UTRAN Universal Terrestrial Radio Access Network

V2I Vehicle-to-Infrastructure

V2N Vehicle-to-Network

V2P Vehicle-to-Pedestrian

V2V Vehicle-to-Vehicle

V2X Vehicle-to-Everything

VRB Virtual Resource Block

WLAN Wireless Local Area Network

WT WLAN Termination

WUS Wake Up Signal

X2-C X2-Control plane

X2 GW X2 GateWay

X2-U X2-User plane

Xw-C Xw-Control plane

Xw-U Xw-User plane

*Next Modified Subclause*

## 4.1 Functional Split

The eNB hosts the following functions:

- Functions for Radio Resource Management: Radio Bearer Control, Radio Admission Control, Connection Mobility Control, Dynamic allocation of resources to UEs in uplink, downlink and sidelink (scheduling);

- IP and Ethernet header compression, uplink data decompression and encryption of user data stream;

- Selection of an MME at UE attachment when no routing to an MME can be determined from the information provided by the UE;

- Routing of User Plane data towards Serving Gateway;

- Scheduling and transmission of paging messages (originated from the MME);

- Scheduling and transmission of broadcast information (originated from the MME or O&M);

- Measurement and measurement reporting configuration for mobility and scheduling;

- Scheduling and transmission of PWS (which includes ETWS and CMAS) messages (originated from the MME);

- CSG handling;

- Transport level packet marking in the uplink;

- S-GW relocation without UE mobility, as defined in TS 23.401 [17];

- SIPTO@LN handling;

- Maintaining security and radio configuration for User Plane CIoT EPS optimizations, as defined in TS 24.301 [20];

- Optionally registering with the X2 GW (if used).

The DeNB hosts the following functions in addition to the eNB functions:

- S1/X2 proxy functionality for supporting RNs;

- S11 termination and S-GW/P-GW functionality for supporting RNs.

The MME hosts the following functions (see TS 23.401 [17]):

- NAS signalling;

- NAS signalling security;

- AS Security control;

- Selection of CIoT EPS optimizations (e.g., Control Plane CIoT EPS optimization, as defined in TS 24.301 [20]);

- Inter CN node signalling for mobility between 3GPP access networks;

- Idle mode UE Reachability (including control and execution of paging retransmission);

- Tracking Area list management (for UE in idle and active mode);

- PDN GW and Serving GW selection;

- MME selection for handovers with MME change;

- SGSN selection for handovers to 2G or 3G 3GPP access networks;

- Roaming;

- Authentication;

- Bearer management functions including dedicated bearer establishment. The MME may include two transport layer addresses of different versions in the Transport Layer Address IE to enable that an en-gNB can select either IPv4 or IPv6 for a bearer;

- Support for PWS (which includes ETWS and CMAS) message transmission;

- Optionally performing paging optimisation;

- S-GW relocation without UE mobility, as defined in TS 23.401 [17].

NOTE 1: The MME should not filter the PAGING message based on the CSG IDs towards macro eNBs.

The Serving Gateway (S-GW) hosts the following functions (see TS 23.401 [17]):

- The local Mobility Anchor point for inter-eNB handover;

- Mobility anchoring for inter-3GPP mobility;

- E-UTRAN idle mode downlink packet buffering and initiation of network triggered service request procedure;

- Lawful Interception;

- Packet routeing and forwarding;

- Transport level packet marking in the uplink and the downlink;

- Accounting on user and QCI granularity for inter-operator charging;

- UL and DL charging per UE, PDN, and QCI.

The PDN Gateway (P-GW) hosts the following functions (see TS 23.401 [17]):

- Per-user based packet filtering (by e.g. deep packet inspection);

- Lawful Interception;

- UE IP address allocation;

- Transport level packet marking in the uplink and the downlink;

- UL and DL service level charging, gating and rate enforcement;

- DL rate enforcement based on APN-AMBR;

This is summarized on the figure below where yellow boxes depict the logical nodes, white boxes depict the functional entities of the control plane and blue boxes depict the radio protocol layers.

NOTE 2: There is no logical E-UTRAN node other than the eNB needed for RRM purposes.

NOTE 3: MBMS related functions in E-UTRAN are described separately in clause 15.



Figure 4.1-1: Functional Split between E-UTRAN and EPC

*Next Modified Subclause*

## 6.3 PDCP Sublayer

### 6.3.0 General

This clause provides an overview on services, functions and PDU structure provided by the PDCP sublayer.

### 6.3.1 Services and Functions

Except for NB-IoT, the main services and functions of the PDCP sublayer for the user plane include:

- Header compression and decompression using ROHC and/or EHC;

- Compression and decompression of uplink PDCP SDUs: DEFLATE based UDC only;

- Transfer of user data;

- In-sequence delivery of upper layer PDUs at PDCP re-establishment procedure for RLC AM;

- For split bearers in DC (only support for RLC AM) and LWA bearers (only support for RLC AM and RLC UM): PDCP PDU routing for transmission and PDCP PDU reordering for reception;

- Duplicate detection of lower layer SDUs at PDCP re-establishment procedure for RLC AM;

- Retransmission of PDCP SDUs at handover and, for split bearers in DC and LWA, of PDCP PDUs at PDCP data-recovery procedure, for RLC AM;

- Ciphering and deciphering;

- Timer-based SDU discard in uplink;

- Duplication of PDCP PDUs;

- For PDCP duplication, reordering and duplicate detection at the receiver.

For NB-IoT UE when AS security is activated, the main services and functions of the PDCP sublayer for the user plane include:

- Header compression and decompression: ROHC only;

- Transfer of user data;

- In-sequence delivery of upper layer PDUs at PDCP re-establishment procedure for RLC AM;

- Duplicate detection of lower layer SDUs at PDCP re-establishment procedure for RLC AM;

- Ciphering and deciphering;

- Timer-based SDU discard in uplink.

NOTE 1: When compared to UTRAN, the *lossless DL RLC PDU size change* is not required.

The main services and functions of the PDCP for the control plane include:

- Ciphering and Integrity Protection;

- Transfer of control plane data.

Except for NB-IoT, the main services and functions of the PDCP sublayer for the control plane also include:

- Duplication of PDCP PDUs;

- For PDCP duplication, reordering and duplicate detection at the receiver.

NOTE 2: For a NB-IoT UE that only supports Control Plane CIoT EPS optimization, as defined in TS 24.301 [20], PDCP is bypassed. For a NB-IoT UE that supports Control Plane CIoT EPS optimization and S1-U data transfer or User Plane CIoT EPS optimization, as defined in TS 24.301 [20], PDCP is not used until AS security is activated.

*End of changes*