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TECHNICAL SPECIFICATION

**5G;
Management and orchestration;
5G Network Resource Model (NRM);
Stage 1
(3GPP TS 28.540 version 15.1.0 Release 15)**

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Contents

Foreword

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Version x.y.z

where:

x   the first digit:

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3   or greater indicates TSG approved document under change control.

y   the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z   the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

The present document is part of a TS-family covering the 3rd Generation Partnership Project Technical Specification Group Services and System Aspects Management and orchestration of networks, as identified below:

TS 28.540:   Management and orchestration of 5G networks; Network Resource Model (NRM); Stage 1.

TS 28.541:   Management and orchestration of 5G networks; Network Resource Model (NRM); Stage 2 and stage 3.

1 Scope

The present document specifies the requirements for the Network Resource Model (NRM) definition of NR, NG-RAN, 5G Core Network (5GC) and network slice, to support the management for:

- variety of 5G radio access network functions and features, covering management for NR connectivity options defined in 3GPP TS 37.340 [5] and NG-RAN architectural options defined in 3GPP TS 38.401 [4].

- variety of 5GC network functions and features defined in 3GPP TS 23.501 [2].

- network slice and network slice subnet.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1]   3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2]   3GPP TS 23.501: "System Architecture for the 5G System".

[3]   3GPP TS 38.300: "NR; Overall description; Stage-2".

[4]   3GPP TS 38.401: "NG-RAN; Architecture description".

[5]   3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage 2".

[6]   3GPP TS 28.531: "Management and orchestration of 5G networks; Provisioning".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

5G Core Network: Defined in 3GPP TS 23.501 [2].

AMF Region: Defined in 3GPP TS 23.501 [2].

AMF Set: Defined in 3GPP TS 23.501 [2].

en-gNB: Defined in 3GPP TS 37.340 [5].

gNB: Defined in 3GPP TS 38.300 [3].

gNB Central Unit (gNB-CU): Defined in 3GPP TS 38.401 [4].

gNB-CU-Control Plane (gNB-CU-CP): Defined in 3GPP TS 38.401 [4].

gNB-CU-User Plane (gNB-CU-UP): Defined in 3GPP TS 38.401 [4].

gNB Distributed Unit (gNB-DU): Defined in 3GPP TS 38.401 [4].

ng-eNB: Defined in 3GPP TS 38.300 [3].

NG-RAN: Defined in 3GPP TS 23.501 [2].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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 3GPP TR 21.905 [1].

5GC	5G Core network
5GS	5G System
AMF	Access and Mobility Management Function
EN-DC	E-UTRA-NR Dual Connectivity
EPS	Evolved Packet System
MR-DC	Multi-RAT Dual Connectivity
NG-RAN	NG Radio Access Network
NR	New Radio
PCF	Policy Controle Function
UDM	Unified Data Management
UDR	Unified Data Repository
UDSF	Unstructured Data Storage Function

4 Concepts and background

4.1 NR and NG-RAN deployment scenarios

According to NG-RAN architecture defined in 3GPP TS 38.300 [3], An NG-RAN node is either a gNB or an ng-eNB connected to 5GC.

A gNB may consist of a gNB-CU and one or more gNB-DU(s), and a gNB-CU may consist of a gNB-CU-CP and one or more gNB-CU-UP. From functional split point of view, there have following gNB deployment scenarios which are specified in 3GPP TS 38.401 [4]:

1) gNB which does not consist split function.

2) gNB which consists of gNB-CU and gNB-DU(s).

3) gNB which consists of gNB-CU-CP, gNB-CU-UP(s) and gNB-DU(s).

Abovementioned deployment scenarios apply to en-gNB also.

Part of gNB (e.g. gNB-CU) can be deployed as virtualized network function.

4.2 MR-DC

Besides single connectivity operation, E-UTRAN, NR and NG-RAN support Multi-RAT Dual Connectivity (MR-DC) operation defined in 3GPP TS 37.340 [5], which can be further divided into following two categories based on connected core network types.

1) MR-DC with the EPC via EN-DC, the NR node in EN-DC is called en-gNB.

2) MR-DC with the 5GC via either NG-RAN E-UTRA-NR Dual Connectivity (NGEN-DC) or NR-E-UTRA Dual Connectivity (NE-DC).

There are different user plane connectivity options of the master node and secondary node involved in MR-DC (see detail in 3GPP TS 37.340 [5]).

4.3 5GC architecture

The 5G architecture is defined as service-based and the interaction between network functions is represented in the following two ways:

- Service-based representation

- Reference point representation

The network functions composed 5GC is specified in 3GPP TS 23.501 [2], network functions within the 5GC control plane shall only use service-based interfaces for their interactions.

4.4 Data storage architecture

5G system architecture allows UDM, PCF and NEF to store their data in the Unified Data Repository (UDR), and allows any NF to store and retrieve its unstructured data (e.g. UE context) into/from a UDSF.

4.5 AMF load balancing insides AMF Region/AMF Set

When deploying AMF Region or AMF Set, AMF load balancing insides AMF Region/AMF Set is achieved by setting a weight factor for each AMF according to its relative capacity compared to other AMFs, see detail in clause 5.19.3 of 3GPP TS 23.501 [2].

4.6 5GC NFs supporting edge computing

Edge computing enables operator and 3rd party services to be hosted close to the UE's access point of attachment, so as to achieve an efficient service delivery through the reduced end-to-end latency and load on the transport network, see details in clause 5.13 of 3GPP TS 23.501 [2].

4.7 General information for network slice instance and network slice subnet instance

The general information used to describe network slice instance and network slice subnet instance are specified in TS 28.531 [6].

5 Requirements

5.1 Requirements for management of NG-RAN

The following specific requirements apply to NG-RAN:

REQ-NGRAN_NRM-CON-001: The NRM definitions shall support management of NG-RAN, containing gNB or/and ng-eNB.

REQ-NGRAN_NRM-CON-002: The NRM definitions shall support management of either gNB without split function or gNB with split functions defined in 3GPP TS 38.401 [4].

REQ-NGRAN_NRM-CON-003: The NRM definitions shall support management of virtualized network functions that are part of gNB, e.g. virtualized gNB-CU.

REQ-NGRAN_NRM-CON-004: The NRM definitions shall support management of intra-NG-RAN handover between any combinations of gNB and ng-eNB.

REQ-NGRAN_NRM-CON-005: The NRM definitions shall support management of inter-system handover between 5GS and EPS.

REQ-NGRAN_NRM-CON-006: The NRM definitions shall support management of network slicing feature in NG-RAN.

REQ-NGRAN_NRM-CON-007: The NRM definitions shall have a read-only representation of NR beam properties in NG-RAN.

5.2 Requirements for management of MR-DC

The following specific requirements apply to MR-DC management, including management of NR in EN-DC and other MR-DC operations.

REQ-MRDC_NRM-CON-001: The NRM definitions shall support management of NR node in EN-DC operation (en-gNB).

REQ-MRDC_NRM-CON-002: The NRM definitions shall support management of en-gNB with different user plane connectivity options defined in 3GPP TS 37.340 [5].

REQ-MRDC_NRM-CON-003: The NRM definitions shall support management of NG-RAN nodes in NGEN-DC operation.

REQ-MRDC_NRM-CON-004: The NRM definitions shall support management different user plane connectivity options in NGEN-DC operation defined in 3GPP TS 37.340 [5].

REQ-MRDC_NRM-CON-005: The NRM definitions shall support management of NG-RAN nodes in EN-DC operation.

REQ-MRDC_NRM-CON-006: The NRM definitions shall support management different user plane connectivity options in NE-DC operation defined in 3GPP TS 37.340 [5].

5.3 Requirements for management of 5GC NFs

The following specific requirements apply to management of 5GC NFs:

REQ-5GC_NRM-CON-001: The NRM definitions shall support management of 5GC containing variety of network functions defined in 3GPP TS 23.501 [2].

REQ-5GC_NRM-CON-002: The NRM definitions should support management of all the relationships between network functions and corresponding data storage functions where the network functions store/retrieve their data.

REQ-5GC_NRM-CON-003: The NRM definitions shall support management of interworking between 5GC and EPC.

REQ-5GC_NRM-CON-004: The NRM definitions shall support management of network slicing feature in 5GC.

5.4 Requirements for management of AMF Set

REQ-AMFSET_NRM-CON-001: The NRM definitions shall support management of AMF Region and AMF Set, including AMF load balancing management.

5.5 Requirements for management of edge computing

REQ-ECM_NRM-CON-001 The NRM definitions shall support management of 5GC NFs supporting edge computing.

5.6 Requirements for management of network slice and network slice subnet

The following requirements apply to network slice and network slice subnet:

REQ-NS_NRM-CON-001: The NRM definitions shall support management of network slice.

REQ-NS_NRM-CON-002: The NRM definitions shall support management of network slice subnet.

Annex A (informative):
Change history

<table>
<tr><th colspan="8">Change history</th></tr>
<tr><th>Date</th><th>Meeting</th><th>TDoc</th><th>CR</th><th>Rev</th><th>Cat</th><th>Subject/Comment</th><th>New version</th></tr>
<tr><td>2018-09</td><td>SA#81</td><td>SP-180808</td><td></td><td></td><td></td><td>Presented for approval</td><td>2.0.0</td></tr>
<tr><td>2018-09</td><td>SA#81</td><td></td><td></td><td></td><td></td><td>Upgrade to change control version</td><td>15.0.0</td></tr>
<tr><td>2018-12</td><td>SA#82</td><td>SP-181046</td><td>0001</td><td>2</td><td>C</td><td>Support read-only representation of NR beam properties in NG-RAN NRM definitions</td><td>15.1.0</td></tr>
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History

Document history		
V15.0.0	October 2018	Publication
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