**3GPP TSG CT WG3 Meeting #138 *C3-246291***

**Orlando, US, 18 - 22 November, 2024 *(Revision of C3-246xyz)***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **29.565** | **CR** | **0161** | **rev** | **1** | **Current version:** | **19.0.1** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Updating the IETF HTTP RFC for DetNet | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | HuaweI, Ericsson | | | | | | | | | |
| ***Source to TSG:*** | CT3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | DetNet | | | | |  | ***Date:*** | | | 2024-11-05 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **A** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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 can be 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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The IETF published the new offical RFC for Deterministic Networking (DetNet) YANG Model as RFC 9633.  Hence, it is porposed to updated the new IETF HTTP RFC for DetNet in this specification and remove the EN as follows:  Editor's note: The above document cannot be formally referenced until it is published as an RFC. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Updating the RFC for DetNet and remove the EN. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Alignment with the IETF. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, B.1.1, B.1.2.1, B.1.2.2, B.1.2.3, B.2.2.1, B.2.2.2.1, C.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | This CR does not impact on the OpenAPI file. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**Additional discussion(if needed):**

**Proposed changes:**

\*\*\* 1st Change \*\*\*

# 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; Stage 2".

[3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[5] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[6] OpenAPI: "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.

[7] 3GPP TR 21.900: "Technical Specification Group working methods".

[8] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[9] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[10] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[11] IETF RFC 9113: "HTTP/2".

[12] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[13] IETF RFC 9457: "Problem Details for HTTP APIs".

[14] 3GPP TS 29.534: "5G System; Access and Mobility Policy Authorization Service; Stage 3".

[15] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".

[16] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

[17] 3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".

[18] IEEE Std 802.1Q-2018: "IEEE Standard for Local and metropolitan area networks--Bridges and Bridged Networks".

[19] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

[20] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[21] 3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".

[22] IETF RFC 7396: "JSON Merge Patch".

[23] 3GPP TS 29.521: "5G System; Binding Support Management Service; Stage 3".

[24] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[25] IEEE Std 1588-2019: "IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control".

[26] IEEE Std 802.1AS-2020: "IEEE Standard for Local and metropolitan area networks--Timing and Synchronization for Time-Sensitive Applications".

[27] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[28] IETF RFC 9633: "Deterministic Networking (DetNet) YANG Data Model".

[29] IETF RFC 6241: "Network Configuration Protocol (NETCONF)".

[30] IETF RFC 8040: "RESTCONF Protocol".

[31] 3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

[32] IETF RFC 8939: "Deterministic Networking (DetNet) Data Plane: IP".

[33] IETF RFC 7950: "The YANG 1.1 Data Modeling Language".

[34] IETF RFC 8407: "Guidelines for Authors and Reviewers of Documents Containing YANG Data Models".

[35] IETF RFC 6020: "YANG – A Data Modeling Language for the Network Configuration Protocol (NETCONF)".

\*\*\* Next Change \*\*\*

## B.1.1 Introduction

The 5G System is integrated with the Deterministic Networking as defined in IETF RFC 8655[63] as a logical DetNet transit node as specified in 3GPP TS 23.501 [2], clause 4.4.8.4.

The support of deterministic networking is achieved by reusing the TSC framework for deterministic QoS and time synchronization services. To enable deterministic networking in 5GS, the DetNet controller collects interface information from the 5GS DetNet node via the TSCTSF using the 5GS DetNet node information reporting procedure described in clause 5.5.12.2 of 3GPP TS 23.513 [31] and provides DetNet Yang configurations for DetNet flow(s) as described in clause 5.5.12.3 of 3GPP TS 23.513 [31].

The TSCTSF offers to the DetNet controller RESTCONF (IETF RFC 8040 [30]) and/or NETCONF (IETF RFC 6241 [29]) interfaces and the data schema defined by the 3GPP Extended Deterministic Networking (DetNet) YANG model. The 3GPP Extended DetNet YANG model is based on the DetNet YANG model specified in IETF RFC 9633 [28] and extended by 3GPP Extensions described in table B.1.1-1.

The 3GPP Extended DetNet YANG Model offered by the TSCTSF is accessed by the DetNet controller as shown in figure B.1.1-1



Figure B.1.1-1: Representation of the access to 3GPP Extended DetNet YANG Model.

Table B.1.1-1 summarizes the 3GPP extensions to the DetNet YANG model defined in this specification.

Table B.1.1-1: 3GPP Extensions Descriptions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 3GPP Extension | Clause | Description | YANG File | Module Name | Annex |
| \_3gpp-5gs-detnet-node | B.1.2 | Enables the report of 5GS DetNet node interface information and the provisioning and configuration of data for the DetNet flows. | \_3gpp-5gs-detnet-node.yang | \_3gpp-5gs-detnet-node | C.2 |

\*\*\* Next Change \*\*\*

### B.1.2.1 Description

Deterministic Networking parameter provisioning allows a DetNet controller to configure deterministic networking parameters in 5GS and provide time-sensitive features that guarantee almost zero packet loss rates and bounded latency.

The DetNet controller communicates with the 5GS system through the TSCTSF as specified in 3GPP TS 29.513 [31] to collect 5GS DetNet node interface information and to provide DetNet flow-related parameters to configure the DetNet traffic in 5GS.

The TSCTSF may receive DetNet YANG configuration for DetNet flows as described in IETF RFC 9633 [28], that describes the traffic characteristics and QoS requirements for the DetNet flows. Additionally, when both, the TSCTSF and the DetNet controller support the 3GPP Extension \_3gpp-5gs-detnet-node, the configuration of the DetNet traffic in 5GS also enable that:

- The DetNet controller may provide the maximum latency and/or maximum loss requirements the 5GS system needs to apply, as specified in clause B.1.2.2.

- The TSCTSF may provide to the DetNet controller 5GS specific status code information on the status of the configuration requested by the DetNet controller for the DetNet flow(s), as specified in clause B.1.2.3.

To enable the DetNet controller builds up network topology information, the 5GS DetNet node exposes interface information to the DetNet controller through the TSCTSF. When both, the TSCTSF and the DetNet controller support the 3GPP Extension \_3gpp-5gs-detnet-node, the TSCTSF may provide to the DetNet controller 5GS DetNet node identification as specified in clause B.1.2.4.

\*\*\* Next Change \*\*\*

### B.1.2.2 Provisioning of 5GS specific traffic characteristics and requirements

When both, the DetNet controller and the TSCTSF support the 3GPP Extension \_3gpp-5gs-detnet-node, the DetNet controller may provide the following 5GS specific traffic characteristics and requirements within the "\_3gpp-5gs-node-requirements" YANG container:

- the maximum latency from 5GS node ingress to 5GS node egress(es) of a DetNet flow by providing the "\_3gpp-5gs-node-max-latency" attribute; and/or

- the maximum packet loss ratio parameter for the DetNet service between the 5G node ingress and the 5GS node egress(es) by providing the "\_3gpp-5gs-node-max-loss" attribute; and

- a reference to the DetNet flow identification within the "forwarding-sub-layer" attribute.

When the DetNet controller does not provide the "\_3gpp-5gs-node-max-latency" attribute and/or the "\_3gpp-5gs-node-max-loss" attribute but instead provides the IETF RFC 9633 [28] "max-latency" and/or "max-loss" attributes for the end-to-end flow, the TSCTSF may determine the corresponding maximum latency and/or maximum packet loss values based on a preconfigured mapping and applicable to the 5GS specific deployment.

NOTE: If the DetNet controller does not include the 5GS specific "\_3gpp-5gs-node-max-latency" nor the end-to-end "max-latency", the TSCTSF can derive the Requested 5GS Delay or, alternatively, the PCF can derive the PDB. Similarly, if the DetNet YANG configuration does not include the 5GS specific "\_3gpp-5gs-node-max-loss" nor the end-to-end "max-loss", the TSCTSF can derive the Requested Packet Error Rate or, alternatively, the PCF can derive the PER.

\*\*\* Next Change \*\*\*

### B.1.2.3 Report of 5GS DetNet flow(s) status

The DetNet controller may be informed about the following 5GS specific events about status change of the configured DetNet flows:

- Notification about DetNet flow(s) deactivation in 5GS node. To notify the DetNet controller about DetNet flow deactivation in 5GS, the TSCTSF shall subscribe with the PCF to service data flow deactivation as specified in 3GPP TS 29.514 [20].

- Notification about resource allocation outcome in 5GS node. The TSCTSF shall subscribe with the PCF to notifications about the unsuccessful and/or successful resource allocation outcome as specified in 3GPP TS 29.514 [20].

- Notification about PDU session release.

When the TSCTSF receives from the PCF the notification about service data flow deactivation, or the notification about unsuccessful or successful resource allocation, or the notification about PDU session release and both, the DetNet controller and the TSCTSF support the 3GPP Extension \_3gpp-5gs-detnet-node, the TSCTSF may notify the DetNet controller by including the following 3GPP 5GS specific failure reason:

- "\_3gpp-5gs-node-resource-allocation-failure", to notify about the failed resource allocation in the 5G System;

- "\_3gpp-5gs-node-resource-allocation-success", to notify about the successful resource allocation in the 5G System; or

- "\_3gpp-5gs-node-pdu-session-release", to notify about PDU session release.

When the TSCTSF or the DetNet controller do not support the 3GPP Extension \_3gpp-5gs-detnet-node, the TSCTSF provides an IETF RFC 9633 [28] defined failure-reason, e.g. "resource-unavailable".

\*\*\* Next Change \*\*\*

### B.2.2.1 Introduction

The 3GPP extension to the IETF RFC 9633 [28] is defined in 3GPP as a YANG module which imports IETF RFC 9633 [28] and adds the 3GPP specific parameters.

The module name shall be set to "\_3gpp-5gs-detnet-node".

The YANG version shall be set to "1.1".

The namespace for the \_3gpp-5gs-detnet-node YANG module shall be set to "urn:3gpp:node:detnet:\_3gpp-5gs-detnet-node".

The prefix statement for the \_3gpp-5gs-detnet-node YANG module shall be set to "\_5gs3gppdnet".

\*\*\* Next Change \*\*\*

#### B.2.2.2.1 General

Table B.2.2.2.1-1 specifies the data types defined for the \_3gpp-5gs-detnet-node Module.

Table B.2.2.2.1-1: \_3gpp-5gs-detnet-node Module specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| \_3gpp-5gs-node-configuration-outcome | B.2.2.2.2.3 | It is a container that represents the additional outcome the 5GS may provide to a configuration request. |  |
| \_3gpp-5gs-node-configuration-status | B.2.2.2.3.3 | It is an enumeration that represents the 3GPP specific configuration status that may be reported by the 5GS node. |  |
| \_3gpp-5gs-node-identity | B.2.2.2.2.4 | It is a container that represents the user-plane node Id handling the traffic of the reported DetNet flows/PDU session. |  |
| \_3gpp-5gs-node-requirements | B.2.2.2.2.2 | It is a container that represents the maximum delay and/or the maximum loss the 5GS needs to satisfy for the traffic of the DetNet flows indicated by the forwarding sublayer. |  |

Table B.2.2.2.1-2 specifies data types re-used by the \_3gpp-5gs-detnet-node Module from other YANG modules, including a reference to their respective specifications and when needed, a short description of their use.

Table BA.2.2.2.1-2: \_3gpp-5gs-detnet-node Module re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| forwarding-sub-layer-ref | IETF RFC 9633 [28] | Contains a reference to the forwarding sublayer as specified in draft-ietf-detnet-yang-17 YANG module. |  |

\*\*\* Next Change \*\*\*

# C.2 YANG module \_3gpp-5gs-detnet-node

<CODE BEGINS> file "\_3gpp-5gs-detnet-node.yang"

module \_3gpp-5gs-detnet-node {

yang-version 1.1;

namespace "urn:3gpp:node:detnet:\_3gpp-5gs-detnet-node";

prefix \_5gs3gppdnet;

import ietf-detnet {

prefix dnet;

reference

"IETF-RFC-9633";

}

organization "3GPP CT3 Working Group";

contact

"CT3 WG Web: <https://www.3gpp.org/3gpp-groups/core-network-terminals-ct/ct-wg3>";

description

"\_3gpp-5gs-detnet-node module contains an extension of IETF RFC 9633 DetNet YANG module with

additional parameters defined for interworking with 3GPP 5GS.

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This version of this YANG module is specified in:

3GPP TS 29.565 V18.5.0; 5G System;

Time Sensitive Communication and Time Synchronization Function Services.

url: https://www.3gpp.org/ftp/Specs/archive/29\_series/29.565/";

reference

"Additional information to this YANG module is specified in:

3GPP TS 23.501, System architecture for the 5G System (5GS);

url: https://www.3gpp.org/ftp/Specs/archive/23\_series/23.501/

3GPP TS 23.503, Policy and charging control framework (5GS)

url: <https://www.3gpp.org/ftp/Specs/archive/23_series/23.503/>

3GPP TS 29.513, Policy and Charging Control signalling flows and QoS parameter mapping

url: <https://www.3gpp.org/ftp/Specs/archive/29_series/29.513/>";

revision 2024-12-10 {

description "version: v1.0.0";

}

typedef \_3gpp-5gs-node-configuration-status {

type enumeration {

enum \_3gpp-5gs-node-resource-allocation-success {

description

"Successful configuration request.

Successful resource allocation within 5GS for the requested configuration";

}

enum \_3gpp-5gs-node-resource-allocation-failure {

description

"Unsuccessful configuration request.

Failed resource allocation within 5GS for the requested configuration";

}

enum \_3gpp-5gs-node-port-release {

description

"Port release due to the termination of PDU session with the requested

5GS configuration";

}

description

"\_3gpp-5gs-node-configuration-status type identifies the 3GPP specific configuration

status that may be reported by the 3GPP 5GS node.";

}

container \_3gpp-5gs-node-requirements {

description

"This container defines the maximum delay and/or the maximum loss the 5GS needs to satisfy";

leaf forwarding-sub-layer {

type dnet:forwarding-sub-layer-ref;

description

"Reference to the forwarding sub-layer that the maximum delay and/or the maximum loss

applies to";

}

leaf \_3gpp-5gs-node-max-latency {

type uint32;

units "nanoseconds";

description

"Maximum latency from 5GS node ingress to 5GS node egress(es) for a single packet of the

DetNet flow. It is specified as an integer number of nanoseconds";

}

leaf \_3gpp-5gs-node-max-loss {

type uint32;

description

"Maximum Packet Loss Ration (PLR) parameter for the DetNet service between the 5GS node

ingress and 5GS node egress(es)";

}

}

container \_3gpp-5gs-node-configuration-outcome {

description

"This container defines the additional outcome the 5GS may provide to a configuration

request";

leaf forwarding-sub-layer {

type dnet:forwarding-sub-layer-ref;

description

"Reference to the forwarding sub-layer the outcome to a configuration request applies to";

}

leaf \_3gpp-5gs-node-configuration-status {

type \_3gpp-5gs-node-configuration-status;

description "Changes on configuration status reported by the 3GPP 5GS node";

}

}

container \_3gpp-5gs-node-identity {

description

"This container defines the 5GS Node identity the 5GS provides to the DetNet controller";

leaf forwarding-sub-layer {

type dnet:forwarding-sub-layer-ref;

description

"Reference to the forwarding sub-layer that the 5GS node Id applies to";

}

leaf \_3gpp-5gs-node-id {

type string;

description

"5GS node identity. It is the user-plane node Id handling the traffic of the indicated

DetNet flows";

}

}

}

<CODE ENDS>

\*\*\* End of Changes \*\*\*