**3GPP TSG-CT WG3 Meeting #142C3-253555**

**25-29 August 2025, Goteborg, Sweden *(was\_C3-25xxxx)***

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** | **0164** | **rev** | **1** | **Current version:** |  |  |
|  | | | | | | | | |
| *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 |  | Radio Access Network |  | Core Network | **x** |

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|  | | | | | | | | | | |
| ***Title:*** | Support of VFL preparation procedures | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | AIML\_CN | | | | |  | ***Date:*** | | | 2025-08-15 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | SA2 introduces VFL preparation procedures in clause 6.2H.2.2 of TS 23.288 before the VFL training between VFL server and VFL clients. Current clause 5.10.3.2 is placeholder for VFL preparation procedures. Stage 3 needs to capture above procedures in the current specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add VFL preparation procedures in TS 29.552 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Stage 2 requirements cannot be fulfilled. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 5.10.3.2, 5.10.3.2.1 (new), 5.10.3.2.2(new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 the OpenAPI file. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* First 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 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

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

[4] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[5] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".

[6] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

[7] Void.

[8] 3GPP TS 29.554: "5G System; Background Data Transfer Policy Control Service; Stage 3".

[9] Void.

[10] 3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".

[11] 3GPP TS 29.591: "5G System; Network Exposure Function Southbound Services; Stage 3".

[12] 3GPP TS 29.517: "5G System; Application Function Event Exposure Service; Stage 3".

[13] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[14] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[15] 3GPP TS 29.574: "5G System; Data Collection Coordination Services; Stage 3".

[16] 3GPP TS 29.575: "5G System; Analytics Data Repository Services; Stage 3".

[17] 3GPP TS 29.576: "5G System; Messaging Framework Adaptor Services; Stage 3".

[18] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[19] 3GPP TS 28.532: "Management and orchestration; Generic management services".

[20] 3GPP TS 29.536: "5G System: Network Slice Admission Control Services; Stage 3".

[21] 3GPP TS 29.531: "5G System: Network Slice Selection Services; Stage 3".

[22] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[23] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[24] 3GPP TS 29.507: "5G System; Access and Mobility Policy Control Service; Stage 3".

[25] 3GPP TS 29.512: "5G System; Session Management Policy Control Service; Stage 3".

[26] “”Void

[27] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[28] 3GPP TS 28.533: "Management and orchestration; Architecture framework".

[29] 3GPP TS 37.320: " Radio measurement collection for Minimization of Drive Tests (MDT); Overall description".

[30] 3GPP TS 28.554: " Management and orchestration; 5G end to end Key Performance Indicators (KPI)".

[31] 3GPP TS 28.550: "Management and orchestration; Performance assurance".

[32] Void.

[33] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[34] 3GPP TS 36.331: "Radio Resource Control (RRC); Protocol specification".

[35] 3GPP TS 38.215: "NR; Physical layer measurements".

[36] 3GPP TS 28.310: "Management and orchestration; Energy efficiency of 5G".

[37] 3GPP TS 28.545: "Management and orchestration; Fault Supervision (FS)".

[38] 3GPP TS 28.104: "Management and orchestration; Management Data Analytics (MDA)".

[39] 3GPP TS 29.551: "5G System; Packet Flow Description Management Service; Stage 3".

[40] 3GPP TS 29.564: "5G System; User Plane Function Services; Stage 3".

[41] 3GPP TS 29.515: "5G System; Gateway Mobile Location Services; Stage 3".

[42] 3GPP TS 28.622: "Generic Network Resource Model (NRM)Integration Reference Point (IRP); Information Service (IS)".

[43] 3GPP TS 32.422: "Subscriber and equipment trace; Trace control and configuration management".

[44] 3GPP TS 28.537: "Management and orchestration; Management capabilities".

[45] 3GPP TS 29.244: "Interface between the Control Plane and the User Plane Nodes".

[46] 3GPP TS 28.558: "User Equipment (UE) level measurements for 5G system".

[47] 3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

[48] 3GPP TS 28.404: "Quality of Experience (QoE) measurement collection; Concepts, use cases and requirements".

[49] 3GPP TS 28.405: "Quality of Experience (QoE) measurement collection; Control and configuration".

[50] 3GPP TS 28.406: "Quality of Experience (QoE) measurement collection; Information definition and transport".

[51] 3GPP TS 29.523: "5G System; Policy Control Event Exposure Service; Stage 3".

[52] 3GPP TS 29.570: "5G System; Service Communication Proxy Services; Stage 3".

[X] 3GPP TS 29.530: "5G System; Application Function Artificial Intelligence/Machine Learning (AI/ML) Services; Stage 3".

[Y] 3GPP TS 29.591: "5G System; Network Exposure Function Southbound Services; Stage 3".

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

#### 5.10.3.2 Preparation procedures

##### 5.10.3.2.1 General

The preparation procedures are triggered by VFL server and it is used to check whether the VFL Client(s) can meet the ML Model training requirement. The procedure includes the negotiation, between server and client(s) to enable interoperability, sample alignment and may include feature negotiation if the VFL Server did not learn the supported Feature IDs from each VFL Client using the discovery phase, alternatively the VFL Server may know the supported Feature IDs by a VFL Client based on configuration.

NOTE: The VFL preparation procedure may be skipped if the VFL Server can decide which VFL Client(s) support the VFL procedure to be performed, e.g. based on local configuration or offline procedures.

The preparation procedures in this clause include the following cases:

* subclause 5.10.3.2.2 specifies the preparation procedure when NWDAF or trusted AF is acting as VFL server while VFL client(s) can be NWDAF, AF, and/or untrusted AF;

- subclause 5.10.3.2.3 specifies the preparation procedure when untrusted AF is acting VFL server while VFL client(s) can be NWDAF.

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

##### 5.10.3.2.2 Preparation Procedure for Vertical Federated Learning when NWDAF/trusted AF is acting as VFL server

This procedure describes the preparation process of VFL when NWDAF or trusted AF is the VFL server, while VFL client(s) can be NWDAF, AF, and/or untrusted AF.



Figure 5.10.3.2.2-1: Preparation procedure for Vertical Federated Learning when NWDAF/trusted AF is the VFL Server

1. The NWDAF or trusted AF acting as VFL server sends a VFL preparation request to each VFL client.

1a. If the VFL client is another instance of NWDAF, the NWDAF or trusted AF acting as VFL server invokes Nnwdaf\_VFLTraining\_Subscribe service operation by sending an HTTP POST request targeting the resource "VFL Training Subscriptions".

1b. If VFL client is a trusted AF, the NWDAF or trusted AF acting as VFL server invokes Naf\_VFLTraining\_Subscribe service operation by sending an HTTP POST request targeting the resource "VFL Training Subscriptions".

1c-1-1c-2. If VFL client is an untrusted AF, the NWDAF or trusted AF acting as VFL server invokes Nnef\_VFLTraining\_Subscribe service operation by sending an HTTP POST request targeting the resource "VFL Training Subscriptions". The NEF then invokes Naf\_VFLTraining\_Subscribe service operation by sending an HTTP POST request targeting the resource "VFL Training Subscriptions".

2a-2c. Each VFL client checks whether it can meet the ML model training requirements and decide whether to participate in the training process as defined in clause 6.2H.2.2.1 of 3GPP TS 23.288 [2].

3. Each VFL client responses to the VFL server.

3a. If the VFL client is another instance of NWDAF, then it responses to the Nnwdaf\_VFLTraining\_Subscribe service operation with "201 Created", and the URI of the created subscription is included in the Location header field. Details are described in clause 4.10.2.2 of 3GPP TS 29.520 [5].

3b. If the VFL client is a trusted AF, then it responses to the Naf\_VFLTraining\_Subscribe service operation with "201 Created", and the URI of the created subscription is included in the Location header field. Details are described in clause 4.x.2.2 of 3GPP TS 29.530 [X].

3c-1-3c-2. If the VFL client is an untrusted AF, then it will send the response to the VFL server through NEF by invoking Naf\_VFLTraining\_Subscribe reponse with "201 Created", and the URI of the created subscription is included in the Location header field, and the NEF then invoking Nnef\_VFLTraining\_Subscribe response sending an HTTP POST request with resource "VFL Training Subscriptions" with "201 Created", and the URI of the created subscription is included in the Location header field. Details are described in clause 4.x.2.2 of 3GPP TS 29.591 [Y].

Editor’s Note: (CR0164, WI:AIML\_CN) The Nnef\_VFLTraining\_Subscribe service operations is to be defined in 3GPP TS 29.591.

If the immediate reporting indication in the "immRep" attribute within the "eventReq" attribute sets to "true" during the event subscription, the VFL client shall include the intermediate VFL training results of the subscribed analytics event, if available, within the "vflTrainSub" attribute in the HTTP POST response.

4. The VFL server decides what VFL clients shall participate in the VFL training procedure according to the subscription accepted.

NOTE 1: For details of Nnwdaf\_VFLTraining\_Subscribe service operations refer to 3GPP TS 29.520 [5].

NOTE 2: For details of Nnef\_VFLTraining\_Subscribe service operations refer to 3GPP TS 29.591 [Y].

NOTE 3: For details of Naf\_VFLTraining\_Subscribe service operations refer to 3GPP TS 29.530 [X].

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

##### 5.10.3.2.3 Preparation Procedure for Vertical Federated Learning when untrusted AF is acting as VFL server

This procedure describes the preparation process of VFL when an untrusted AF is the VFL server and all VFL clients are NWDAF.



Figure 5.10.3.2.2-1: Preparation procedure for Vertical Federated Learning when untrusted AF is the VFL Server

1. To send a VFL preparation request to VFL clients, the untrusted AF acting as VFL server invoks Nnef\_VFLTraining\_Subscribe service operation to all associated VFL clients i.e., NWDAF, by sending an HTTP POST request targeting the resource "VFL Training Subscriptions".

2. The NEF invokes training requests received from the untrusted AF acting as VFL server to VFL clients i.e., NWDAF instances. The NEF shall map the external NWDAF and GPSI(s) to the internal NWDAF and SUPI(s). To send the training request, the NEF invoks Nnwdaf\_VFLTraining\_Subscribe service operation by snding HTPP POST request targting the resource "VFL Training Subscriptions".

3. Each VFL client checks whether it can meet the ML model training requirements and decide whether to join in the training process as defined in clause 6.2H.2.2.1 of 3GPP TS 23.288 [2].

4. Each VFL client responds to the Nnwdaf\_VFLTraining\_Subscribe service operation. Upon receipt of the HTTP POST request, if the subscription is accepted to be created, the VFL client responds to the NEF with "201 Created", and the URI of the created subscription is included in the Location header field.

If the immediate reporting indication in the "immRep" attribute within the "eventReq" attribute sets to "true" during the event subscription, the VFL client shall include the intermediate VFL training results of the subscribed analytics event, if available, within the "vflTrainSub" attribute in the HTTP POST response.

5. The NEF maps the internal NWDAF and SUPI(s) to external NWDAF and GPSI(s) by invoking Nnef\_VFLTraining \_Subscribe response and sending an HTTP POST request to the untrusted AF acting as VFL server with "201 Created".

6. The VFL server decides which VFL client(s) shall participate in the VFL training procedure according to the subscription accepted.

NOTE 1: For details of Nnwdaf\_VFLTraining\_Subscribe service operations refer to 3GPP TS 29.520 [5].

NOTE 2: For details of Nnef\_VFLTraining\_Subscribe service operations refer to 3GPP TS 29.522 [10].

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