**3GPP TSG-WG SA2 Meeting #156-e *S2-230xxxx***

**Elbonia, April 17 – 21, 2023 (revision of S2-230xxxx)**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **23.288** | **CR** | **xxxx** | **rev** | **-** | **Current version:** | **18.x.x** |  |
|  | | | | | | | | |
| *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:*** | Update the End-to-end data volume transfer time analytics | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | AIMLsys | | | | |  | ***Date:*** | | | 2023-04-07 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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:*** | | As listed in Table 6.10.2-4 of TS 23.288, the location of applications can be collected from AF/NEF, and it can be represented by a list of DNAI(s). Therefore, the following EN can be removed.  Editor's note: Which AF event can be used to collect Server location is FFS.  The outputs for E2E data volume transfer time analytics contain not only the E2E data volume transfer time, it also contain the other outputs such as UE location, Validity period and Spatial validity, etc. Therefore, the name of “E2E data volume transfer time” in the output analytics should be changed to “E2E data volume transfer time performance”.  The validity period in output analytics is the subset of corresponding time slot, and the spatial validity should indicate the area within the AOI.  The E2E data volume transfer time UL/DL should indicate the time over the corresponding time slot, not Analytics target period. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Remove the following EN:  Editor's note: Which AF event can be used to collect Server location is FFS.  Change “E2E data volume transfer time” to “E2E data volume transfer time performance”.  Clarify that the validity period is the subset of corresponding time slot, and the spatial validity indicates the area within the AOI.  Clarify that the E2E data volume transfer time UL/DL indicates the time over the corresponding time slot. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The EN for collecting Server location still exists.  Unclear descriptions for End-to-end data volume transfer time analytics. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.x | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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's revision history:*** | |  | | | | | | | | |

\* \* \* \* First change \* \* \* \*

### 6.x End-to-end data volume transfer time analytics

#### 6.x.1 General

The clause 6.x describes how NWDAF can provide E2E data volume transfer time analytics, in the form of statistics or predictions or both, to a service consumer. NWDAF collects E2E data volume transfer time related input data from 5GC NFs, OAM and AF. The consumer can either subscribe to analytics notifications (i.e., a Subscribe-Notify model) or request a single notification (i.e., a Request-Response model).

The E2E data volume transfer time refers to a time delay for completing the transmission of a specific data volume from UE to AF, or from AF to UE. If a target number of repeating data transmissions or a target time interval between data transmissions is given, the E2E data volume transfer time can be provided as an average value of every data volume transfer time within the Analytics target period. The E2E data volume transfer time analytics may be used to assist an AF hosting AI/ML-based services, e.g., for member selection of federated learning.

The E2E data volume transfer time analytics may be provided as defined in clause 6. x.3 for a UE individually or a list of UEs.

More than one E2E data volume transfer time classes might be assigned by operator or AF for a group of UEs. The UEs might be classified to high-, medium-, and low-transfer time classes with respect to the threshold(s) of the corresponding class.

The service consumer may be an NF (e.g. AF, or NEF).

The consumer of these analytics may indicate in the request:

- Analytics ID = "E2E data volume transfer time ".

- Target of Analytics Reporting: a single UE (SUPI/GPSI) or a group of UEs (a list of SUPIs/GPSIs).

- Analytics Filter Information optionally including:

- DNN;

- S-NSSAI;

- Application ID;

- Area of Interest (AOI(s)): restricts the scope of the E2E data volume transfer time analytics to the provided area;

- An optional list of analytics subsets that are requested (see clause 6.x.3);

- Data Volume UL/DL: indicates a specific data volume transmitted once from UE to AF and/or from AF to UE;

- QoS requirements (e.g., 5QI, QoS Characteristics);

- Optionally, either a target number of repeating data transmissions or a target time interval between data transmissions within the Analytics target period;

- Optionally, a request for geographical distribution (i.e., the AoIs) of the UEs.

- An Analytics target period indicates the time period over which the statistics or predictions are requested.

- In a subscription, the Notification Correlation Id and the Notification Target Address are included.

- Optionally, preferred level of accuracy of the analytics.

- Optional preferred order of results for the list of E2E data volume transfer time:

- ordering criterion: "E2E data volume transfer time",

- order: ascending or descending.

- Optionally, Reporting Thresholds, which indicate conditions on the level to be reached for respective analytics subsets (see clause 6.X.3)

- Optionally, maximum number of UEs.

#### 6.x.2 Input Data

The NWDAF supporting analytics on E2E data volume transfer time shall be able to collect E2E data volume transfer time information from AF, OAM and 5GC NFs.

More detailed information collected by the NWDAF from the OAM is defined in the Table 6.x.2-1, from relevant 5GC NFs (i.e. UPF, SMF, AMF) is defined in Table 6.x.2-2, and from AF is defined in Table 6.x.2-3.

Table 6.x.2-1: Input data from OAM related to E2E data volume transfer time

|  |  |  |
| --- | --- | --- |
| Information | Source | Description |
| RAN part delay | OAM TS 28.554 [10] | Average packet transmission delay through the RAN part to the UE, per timeslot, per 5QI and per S-NSSAI. |
| Timestamp | OAM | A time stamp associated with the collected information. |
| RAN Throughput for DL and UL | OAM  (see NOTE 1) | The per UE measurement of the throughput for DL and UL as specified in clauses 5.2.1.1 and 5.4.1.1 of TS 37.320 [20] |
| RAN Packet delay for DL and UL | OAM  (see NOTE 1) | The per UE measurement of the packet delay for DL and UL, including per QCI per UE packet delay as specified in clauses 5.2.1.1 of TS 37.320 [20] and per DRB per UE packet delay as specified in clauses 5.4.1.1 of TS 37.320 [20] |
| RAN Packet loss rate for DL and UL | OAM  (see NOTE 1) | The per UE measurement of the packet loss rate for DL and UL, including the per QCI per UE packet loss rate as specified in clauses 5.2.1.1 of TS 37.320 [20] and the per DRB per UE packet loss rate as specified in clauses 5.4.1.1 of TS 37.320 [20] |
| Distribution of UL/DL/round trip packed delay between PSA UPF and UE | OAM | The distribution of UL/DL/round trip packet delay between PSA UPF and UE as captured in TS 28.552 [8]. |
| NOTE 1: Per UE measurement for a specific UE from OAM (via MDT), is as captured in clause 6.2.3.1. | | |

NWDAF subscribes the network data from OAM in the Table 6.X.2-1 by using the services provided by OAM as described in clause 6.2.3.

NOTE 1: Whether the UE(s) is supporting a Slice or not can be checked by retrieving the registered AMF details from UDM or by asking AMF about what Slice is used by the UE(s) at the current registration (Alternatively, if NSACF is deployed, NSACF can provide a report on what slices are used by the UE(s))

NOTE 2: User consent checking from UDM can apply for these analytics.

**Table 6.x.2-2: Service Data from 5GC NFs for E2E data volume transfer time analytics**

|  |  |  |
| --- | --- | --- |
| **Information** | **Source** | **Description** |
| Timestamp | 5GC NF | A time stamp associated with the collected information. |
| UE location | AMF, GMLC | Location of the UE(s) needs to be selected via AMF if the application needs to be started at the same time. If the AoI indicated by the AF is a finer granularity area than the Cell level, the current location of the UE(s) needs to be selected via GMLC instead. |
| UE ID | AMF | (list of) SUPI(s). |
| 5QI | SMF | A reference to 5G QoS characteristics. |
| QoS flow Packet Delay | SMF, UPF | The observed Packet delay for UL/DL/round trip directions; |

**Table 6.x.2-3: Service Data from AF for E2E data volume transfer time analytics**

|  |  |  |
| --- | --- | --- |
| **Information** | **Source** | **Description** |
| Timestamp | AF | Timestamp of the collected information. |
| Application ID | AF | Identifier of the application at the AF. |
| UE ID(s) | AF | Internal or External UE IDs (i.e. SUPI or GPSI, respectively). |
| Transmitted data volume | AF | The volume of the transmitted data |
| Transmission time duration | AF | The time duration (start and end time) needed for sending a volume of data |
| Location of Application | AF/NEF | Location of application represented by a list of DNAI(s). The NEF may map the AF-Service identifier information to a list of DNAI(s) when the DNAI(s) being used by the application are statically defined. |

#### 6.x.3 Output Analytics

The NWDAF supporting E2E data volume transfer time analytics provides the analytics results to consumer NFs, e.g., AF, or NEF. The analytics results provided by the NWDAF could be E2E data volume transfer time performance statistics as defined in Table 6.X.3-1 or predictions as defined in table 6.x.3-2.

Table 6.x.3-1: E2E data volume transfer time performance statistics

|  |  |
| --- | --- |
| Information | Description |
| UE ID or list of UE IDs (1..SUPImax) | Identifies a UE or a group of UEs, e.g. a list of UEs for which the statistic applies. |
| Time slot entry (1..max) | List of time slots during the Analytics target period. | |
| > Time slot start | Time slot start within the Analytics target period. | |
| > Duration | Duration of the time slot. | |
| > E2E data volume transfer time performance (1…max) | List of E2E data volume transfer time performance per UE  Max. is the number of UEs, if applicable. | |
| >> Application ID | Identifies the application in use during the time slot | |
| >> DNAI | Identifier of a user plane access to one or more DN(s) where applications are deployed as defined in TS 23.501 [2]. | |
| >> UE location | Indicating the UE location information when the UE service is delivered. | |
| >> DNN | DNN for the PDU Session which contains the QoS flow. | |
| >> S-NSSAI | Identifies the Network Slice used to access the Application. | |
| >> Validity period | The validity period within the time slot for the E2E data volume transfer time performance statistics as defined in clause 6.1.3. | |
| >> Spatial validity | Area where the E2E data volume transfer time performance statistics applies within the AOI. | |
| >> E2E data volume transfer time UL | E2E data volume transfer time UL indicators  Statistics of E2E data volume transfer time for uplink over the time slot(e.g. average, variance). | |
| >>> Data volume UL | Indicates uplink data volume used to derive E2E data volume transfer time UL | |
| >> E2E data volume transfer time DL | E2E data volume transfer time DL indicators  Statistics of E2E data volume transfer time for downlink over the time slot (e.g. average, variance). | |
| >>> Data volume DL | Indicates downlink data volume used to derive E2E data volume transfer time DL | |
| > Classified E2E data volume transfer time performance for a list of UEs (NOTE 1) | Classified E2E data volume transfer time performance statistics for multiple UEs with respect to one or more reporting thresholds (e.g., NWDAF may provide the ratio of UEs that have reached certain Reporting Threshold(s)).  The list of UEs is indicated in the request of service consumer. | |
| >> E2E data volume transfer time classes (1…max) (NOTE 2) | List with group of UEs classified by ranges of E2E data volume transfer time | |
| >>> UE ID(s) | Identifies the UE(s) in the transfer time class with respect to the threshold of the corresponding transfer time class. |
| >>> Ratio of UEs per E2E data volume transfer time class | Ratio of UEs | |
| >> Validity period | The validity period within the time slot for the E2E data volume transfer time performance statistics as defined in clause 6.1.3. | |
| >> Spatial Validity Condition | Area where the E2E data volume transfer time performance statistics applies within the AOI. | |
| > Geographical distribution of the UE(s) | If requested, a list of UEs per location information | |
| NOTE 1: Analytics subset that can be used in "list of analytics subsets that are requested", "Preferred level of accuracy per analytics subset" and "Reporting Thresholds".  NOTE 2: The number of transfer time classes may be pre-configured by the operator or provided by the service consumer via reporting thresholds. | | |

Table 6.x.3-2: E2E data volume transfer time performance predictions

|  |  |
| --- | --- |
| **Information** | **Description** |
| UE ID or list of UE IDs (1..SUPImax) | Identifies a UE or a group of UEs, e.g. a list of UEs for which the statistic applies. |
| Time slot entry (1..max) | List of time slots during the Analytics target period. |
| > Time slot start | Time slot start within the Analytics target period. |
| > Duration | Duration of the time slot. |
| > E2E data volume transfer time performance (1…max) | List of E2E data volume transfer time performance per UE.  Max. is the number of UEs, if applicable. |
| >> Application ID | Identifies the application in use during the time slot |
| >> DNAI | Identifier of a user plane access to one or more DN(s) where applications are deployed as defined in TS 23.501 [2]. |
| >> UE location | Indicating the UE location information when the UE service is delivered. |
| >> DNN | DNN for the PDU Session which contains the QoS flow. |
| >> S-NSSAI | Identifies the Network Slice used to access the Application. |
| >> Validity period | The validity period within the time slot for the E2E data volume transfer time performance prediction as defined in clause 6.1.3. |
| >> Spatial validity | Area where the E2E data volume transfer time performance prediction applies within the AOI. |
| >> E2E data volume transfer time UL | E2E data volume transfer time indicators  Predictions of E2E data volume transfer time for uplink over the time slot (e.g. average, variance). |
| >>> Data volume UL | Indicates uplink data volume used to derive E2E data volume transfer time UL |
| >> E2E data volume transfer time DL | E2E data volume transfer time DL indicators  Predictions of E2E data volume transfer time for downlink over the time slot (e.g. average, variance). |
| >>> Data volume DL | Indicates downlink data volume used to derive E2E data volume transfer time DL |
| > Classified E2E data volume transfer time performance for a list of UEs (NOTE 1) | Classified E2E data volume transfer time performance prediction for multiple UEs with respect to one or more reporting thresholds (e.g., NWDAF may provide the ratio of UEs that have reached certain Reporting Threshold(s)).  The list of UEs is indicated in the request of service consumer. |
| >> E2E data volume transfer time classes (1…max) (NOTE 2) | List with group of UEs classified by ranges of E2E data volume transfer time |
| >>> UE ID(s) | Identifies the UE(s) in the transfer time class with respect to the threshold of the corresponding transfer time class. |
| >>> Ratio of UEs per E2E data volume transfer time class | Ratio of UEs |
| >> Validity period | The validity period within the time slot for the E2E data volume transfer time performance prediction as defined in clause 6.1.3. |
| >> Spatial Validity Condition | Area where the E2E data volume transfer time performance prediction applies within the AOI. |
| > Geographical distribution of the UE(s) | If requested, a list of UEs per location information |
| Confidence | Confidence of this prediction. |
| NOTE 1: Analytics subset that can be used in "list of analytics subsets that are requested", "Preferred level of accuracy per analytics subset" and "Reporting Thresholds".  NOTE 2: The number of transfer time classes may be pre-configured by the operator or provided by the service consumer via reporting thresholds. | |

NOTE: When Target of Analytics Reporting is an individual UE, one UE ID (i.e. SUPI) will be included, the NWDAF will provide the analytics transfer time result (i.e. list of (predicted) time slots) to NF service consumer(s) for the UE.

#### 6.x.4 Procedures

The NWDAF can provide E2E data volume transfer time analytics to a 5GC NF (e.g., AF, or NEF).



Figure 6.x.4-1: Procedure for E2E data volume transfer time analytics

1. The Consumer NF, e.g., AF, or NEF, requests or subscribes to analytics for E2E data volume transfer time analytics from NWDAF (possibly via NEF in case the consumer NF is AF) and provides the input information as specified in 6.x.1 to 5GC.

2a-b. The NWDAF subscribes the service data from AMF in Table 6.x.2-2 using Namf\_EventExposure\_Subscribe service for collecting UE location(s) for a UE or a group of UEs.

NOTE: If NWDAF requires UE location information with finer granularity than TA/cell, then NWDAF collects the location data from GMLC instead of AMF.

2c. NWDAF subscribes to service data from SMF in Table 6.x.2-2 by invoking Nsmf\_EventExposure\_Subscribe (Event ID, SUPI(s) or Application ID).

In order to provide the requested analytics, the NWDAF subscribes to information of the UE and may subscribe to N4 Session related input data from SMFs as defined in Table 6.x.2-2.

2d-e. N4 related input data is provided by UPF to SMF.

2f. SMF provides the requested input data to NWDAF.

2g-h. The NWDAF may subscribe to input data in Table 6.x.2-1 from the OAM according to the data collection principles from the OAM described in clause 6.2.3.

2i-j The NWDAF may subscribe the service data from AF in the Table 6.x-3 by invoking Nnef\_EventExposure\_Subscribe or Naf\_EventExposure\_Subscribe service as defined in TS 23.502 [3].

3. The NWDAF derives requested analytics, in the form of E2E data volume transfer time performance statistics or predictions or both.

4. The NWDAF provides requested E2E data volume transfer time analytics to the NF, using either Nnwdaf\_AnalyticsInfo\_Request response or Nnwdaf\_AnalyticsSubscription\_Notify, depending on the service used in step 1.

5-7. If the NF subscribed to E2E data volume transfer time analytics at step 1, when the NWDAF generates new analytics, it notifies the new generated analytics to the consumer.

\* \* \* \* End of changes \* \* \* \*