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# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

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.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# 1 Scope

The present document defines a generic architecture for collecting and reporting data in the 5G System as defined in TS 23.501 [2], TS 23.502 [3] , TS 23.288 [4] and TS 29.517 [5].

# 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 (5GS)".

[3] 3GPP TS 23.502: "Procedures for the 5G System (5GS)".

[4] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

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

[6] 3GPP TS 29.510: "Network function repository services; Stage 3".

[7] 3GPP TS 29.532: "Data Collection and Reporting; Protocols and Formats".

[8] 3GPP TS 23.222: "Common API Framework for 3GPP Northbound APIs".

[9] 3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1], TS 23.501 [2], TS 23.502 [3], TS 23.288 [4], TS 29.517 [5] 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].

**direct reporting:** method of sending a data report from the Direct Data Collection Client to the Data Collection AF

**indirect reporting:** method of sending a data report from a UE Application to the Data Collection AF via an Indirect Data Reporting Client function of an Application Service Provider

## 3.2 Symbols

Void.

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] , TS 23.501 [2], TS 23.502 [3], TS 23.288 [4], TS 29.517 [5] 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].

AF Application Function

AS Application Server

CAPIF Common API Framework for 3GPP Northbound APIs

DCAF Data Collection AF

DN Data Network

NEF Network Exposure Function

NF Network Function

NWDAF Network Data Analytics Function

UE User Equipment

# 4 Reference architecture for data collection and reporting

## 4.1 General

Clause 6.2.8 of TS 23.288 [4] envisages a set of high-level procedures by which data is collected by a Network Data Analytics Function (NWDAF) from UE Application(s) via an intermediary Application Function. This clause defines a generic reference architecture for data collection and reporting that satisfies those procedures, including the logical functions involved and the logical reference points between them. The intermediary Application Function envisaged in [4] is here named the *Data Collection AF*. It is intended that this reference architecture be instantiated in domain-specific ways to suit the needs of different features of the 5G System. The reference architecture may be instantiated separately in different slices of a network.

The Data Collection AF may support CAPIF [8] to provide APIs to other applications (i.e. API invokers). When CAPIF is supported, then:

- the Data Collection AF shall support the CAPIF API provider domain functions as part of a distributed CAPIF deployment, i.e. Ndcaf and Naf via CAPIF‑2/2e; and CAPIF‑3, CAPIF‑4 and CAPIF‑5, as specified in clause 7.3 of TS 23.222 [8];

- the Data Collection AF shall support the CAPIF Core Function and API provider domain functions as part of a centralised CAPIF deployment, i.e. Ndcaf and Naf via CAPIF‑2/2e, as specified in clause 7.2 of TS 23.222 [8].

The CAPIF and associated API provider domain functions are specified in TS 23.222 [8].

## 4.2 Functional entities for data collection and reporting

Editor’s Note: Different realisations of the reference are currently under consideration by SA4, including SEAL-based and CAPIF-based models.

Figure 4.2‑1 below shows the reference architecture for data collection and reporting using reference point notation.



NOTE: The Application Service Provider and/or the AS and/or the Data Collection AF may be deployed outside the trusted domain, in which case the services they expose to API invokers are mediated by the NEF. The logical relationships denoted by the reference points are unaffected by such deployment choices.

Figure 4.2‑1: Reference architecture for data collection and reporting in reference point notation

The functional entities illustrated in the figure are described as follows:

1. Data collection and reporting functionality is provisioned at reference point R1 by a *Provisioning AF* inside the *Application Service Provider* that may be deployed either inside or outside the trusted domain.

2. The *Data Collection AF* may be deployed inside or outside the trusted domain. It is responsible for managing the provisioning state for data collection and reporting. When its provisioning state changes, the Data Collection AF updates the set of available NF profile(s) in the NRF by invoking the Nnrf\_NFManagement service defined in clause 5.2.7.2 of TS 23.502 [3] according to the usage defined in clause 6.2.8.2.2 of TS 23.288 [4] and specified in clause 6.1 of TS 29.510 [6].

NOTE 1: If the Data Collection AF is deployed outside the trusted domain, this registration occurs via the NEF, as described in clause 6.2.2.3 of TS 23.288 [4].

The Data Collection AF provides a data collection and reporting configuration to the *Direct Data Collection Client* at reference point R2, to the *Indirect Data Collection Client* at reference point R3 and Application Server (*AS*) instances at reference point R4, and receives data reports from them respectively at those same reference points.

The Data Collection AF processes received data reports according to processing instructions in its provisioning state. The processing activities include, but are not limited to, reporting format conversion, data normalisation, domain-specific anonymisation of data and (dis)aggregation of data into reports to be exposed as events.

Editor’s Note: Currently-defined 3GPP event types are specified in TS 23.502 and TS 23.288. Additional types of UE application level information available at the AF – for example content hosting logs, QoS and charging policy modification, network assistance and consumption reports as defined in TS 26.501 and TS 26.512 for 5G Media Streaming may also be deemed suitable as event exposure services for subscription by the NWDAF in performing related data analytics, based on further discussion with SA2.

Finally, the Data Collection AF is responsible for exposing processed UE data to event notification subscribers both inside the trusted domain (such as the NWDAF) and outside it (such as the *Event Consumer AF* in the Application Service Provider). In this role, the Data Collection AF realises the Event Exposure Service as defined in clause 6.2.2.1 of TS 23.288 [4] and as specified in TS 29.517 [5]. Subscribers fulfil the role of NF consumers of this service in the service-based architecture [2, 3].

The set of UE data to be collected and exposed by the Data Collection AF is determined by the intersection between its provisioning state provided at R1 and the current set of subscriptions. This is reflected in the data collection and reporting configuration exposed at reference points R2, R3 and R4. and in the subscription-driven event notifications sent to consumer entities over reference points R5 and R6. The permissible information to be exposed by the Data Collection AF shall be set by the rule with more restrictive semantics in the event of similar rules between provisioning and subscription data. The Data Collection AF is responsible for ensuring that access to UE data is controlled according to the rules indicated in its provisioning state.

NOTE 2: When the Data Collection AF is deployed outside the trusted domain, the NWDAF uses the procedure defined in clause 5.2.6.2 of TS 23.502 [3] and further elaborated by clause 6.2.2.3 of TS 23.288 [4] to collect data from the externally deployed Data Collection AF via the NEF.

NOTE 3: The Data Collection AF is intended to be instantiated inside another Application Function in order to satisfy the domain-specific data collection and reporting requirements corresponding to particular features in the 5G System. As such, there may be several domain-specific Data Collection AF instances operating simultaneously in a particular 5G System, each one performing a different role. The definitions of these instantiations are beyond the scope of the present document.

3. The *Direct Data Collection Client* is responsible for collecting relevant data in the UE and for sending data reports to the Data Collection AF via reference point R2 using the Ndcaf\_DataReporting service according to a data collection and reporting configuration that it has previously obtained from the Data Collection AF.

NOTE 1: This method of reporting corresponds to the direct data collection procedure defined in clause 6.2.8 of TS 23.288 [4].

NOTE 2: This method of reporting occurs over a user plane PDU session, regardless of whether the Data Collection AF resides within or outside the trusted domain.

NOTE 3: The Direct Data Collection Client function is intended to be instantiated inside other UE functions in order to satisfy the domain-specific data collection and reporting requirements corresponding to particular features of the 5G System. As such, there may be several domain-specific Data Collection Client instances operating simultaneously on a given UE, each one performing a different role. One valid deployment option is to combine these instances in a common middleware component. Another option is to provide the Direct Data Collection Client as an integral part of each relevant UE Application. The definitions of these instantiations are beyond the scope of the present document. The realisation of these logical functions is implementation-dependent.

4. The *UE Application* is responsible for sharing relevant data with the Direct Data Collection Client via reference point R7. This may be achieved as a combination of application design, application configuration via R8 and/or application configuration via R7.

5. An Application Service Provider may also collect data from UE Applications via reference point R8 and employ an *Indirect Data Collection Client* subfunction to then send data reports to the Data Collection AF via reference point R3 by invoking the Ndcaf\_DataReporting service according to a data collection and reporting configuration that it has previously obtained from the Data Collection AF via reference point R3.

NOTE 1: This method of reporting corresponds to the indirect data collection procedure defined in clause 6.2.8 of TS 23.288 [4].

NOTE 2: In the case where the Application Service Provider server is deployed in a different trust domain than the Data Collection AF, the Indirect Data Collection Client instead invokes the equivalent Nnef\_DataReporting API via the NEF at reference point R3.

Editor’s Note: Need to check with SA2 about stage 2 definition of the Nnef\_DataReporting service (and possibly as follow-up with CT3 on corresponding stage 3 specification) which is currently absent in TS 23.502 [3] and TS 23.288 [4].

6. Application Server instances (labelled *AS*) inside or outside the trusted domain may also collect data and report it to the Data Collection AF via reference point R4 by invoking the Ndcaf\_DataReporting service, according to a data collection and reporting configuration previously obtained from the Data Collection AF via reference point R4.

NOTE 1: In the case where the Application Server is deployed in a different trust domain than the Data Collection AF, the AS instead invokes the equivalent Nnef\_DataReporting service via the NEF.

Editor’s Note: Need to check with SA2 about stage 2 definition of the Nnef\_DataReporting service (and possibly as follow-up with CT3 on corresponding stage 3 specification) which is currently absent in TS 23.502 [3] and TS 23.288 [4].

NOTE 2: The data collection and reporting requirements for such Application Servers are domain-specific and therefore beyond the scope of the present document.

7. The NWDAF is the primary consumer of processed UE data. This is exposed to the NWDAF by the Data Collection AF in the form of data reporting event notifications via reference point R5 using the Naf\_EventExposure service (as specified in TS 29.517 [5]) after any processing by the Data Collection AF has been performed according to its provisioned recipes.

NOTE: If the Data Collection AF is deployed outside the trusted domain, this interaction occurs instead by invoking the Nnef\_EventExposure service via the NEF, as defined in clause 5.2.6.2 of TS 23.502 [3] and as further elaborated by clause 6.2.2.3 of TS 23.288 [4].

8. By means of appropriate data collection and reporting provisioning, certain UE data may also be exposed in the form of data reporting events by the Data Collection AF to an *Event Consumer AF* residing in the Application Service Provider via reference point R6 using the Naf\_EventExposure service defined in clause 5.2.19 of TS 23.502 [4] and specified in TS 29.517 [5].

NOTE: In the case where the Application Service Provider server is deployed outside the trusted domain, the Nnef\_EventExposure service, as defined in clause 5.2.6.2 of TS 23.502 [3], is invoked instead.

## 4.3 Reference points for data collection and reporting

The purposes of the reference points in the functional architecture defined in clause 4.2 above are as follows:

- **R1** supports the following interactions between a Provisioning AF in the Application Service Provider and the Data Collection AF:

- Used by the Application Service Provider to provision data collection and reporting in a Data Collection AF instance by means of the Ndcaf\_DataReportingProvisioning service defined in clause 4.4 of the present document (or else the equivalent service exposed by the NEF if the two functions are deployed in different trust domains). The provisioning information specifies what data is to be collected by Data Collection Clients, how it is to be processed by the Data Collection AF and how it is to be exposed to event notification subscribers. A generic provisioning envelope for data collection and reporting is defined in clause 4.6 of the present document, but this is expected to be extended by individual reporting domains.

- **R2** supports the following interactions between the Direct Data Collection Client in the UE and the Data Collection AF:

- Used by a Direct Data Collection Client instance to obtain its data collection and reporting configuration from the corresponding Data Collection AF instance by means of the Ndcaf\_DataReporting service defined in clause 4.4 of the present document. A generic data collection and reporting configuration envelope is defined in clause 4.7 of the present document, but details of the configuration are specific to individual reporting domains and are specified elsewhere.

- Subsequently used by the Direct Data Collection Client to send reports to its Data Collection AF instance by means of the Ndcaf\_DataReporting service defined in clause 4.4 of the present document. A generic data reporting envelope is defined in clause 4.8 of the present document, but details of the reporting format are specific to individual reporting domains and are specified elsewhere.

NOTE 1: This method of reporting corresponds to the direct data collection procedure defined in clause 6.2.8 of TS 23.288 [4].

- **R3** supports the following interactions between the Indirect Data Collection Client in the Application Service Provider Server and the Data Collection AF.

- Used by an Indirect Data Collection Client instance to obtain its data collection and reporting configuration from the corresponding Data Collection AF instance by means of the Ndcaf\_DataReporting service defined in clause 4.4 of the present document (or else the equivalent service exposed by the NEF if the two functions are deployed in different trust domains). A generic data collection and reporting configuration envelope is defined in clause 4.7 of the present document, but details of the configuration are specific to individual reporting domains and are specified elsewhere.

- Subsequently used by the Indirect Data Collection Client in the Application Service Provider server to send data reports to its Data Collection AF instance by means of the Ndcaf\_DataReporting service defined in clause 4.4 of the present document (or else the equivalent service exposed by the NEF if the two functions are deployed in different trust domains). A generic data reporting envelope is defined in clause 4.8 of the present document, but details of the reporting format are specific to individual reporting domains and are specified elsewhere.

NOTE 2: This method of reporting corresponds to the indirect data collection procedure defined in clause 6.2.8 of TS 23.288 [4].

- **R4** supports the following interactions between the Application Server (AS) and the Data Collection AF:

- Used by an AS instance to obtain its data collection and reporting configuration from the corresponding Data Collection AF instance by means of the Ndcaf\_DataReporting service defined in clause 4.4 of the present document (or else the equivalent service exposed by the NEF if the two functions are deployed in different trust domains). A generic data collection and reporting configuration envelope is defined in clause 4.7 of the present document, but details of the configuration are specific to individual reporting domains and are specified elsewhere.

- Subsequently used by the AS instance to send data reports to its Data Collection AF instance by means of the Ndcaf\_DataReporting service defined in clause 4.4 of the present document (or else the equivalent service exposed by the NEF if the two functions are deployed in different trust domains).

NOTE 3: The AS plays the role of a Network Function when it invokes the Ndcaf\_DataReporting service at reference point R4.

- **R5** supports the following interactions between the NWDAF and the Data Collection AF:

Used by an NWDAF instance to subscribe to data reporting events exposed by a Data Collection AF instance, according to the Naf\_EventExposure\_Subscribe procedure defined in clause 5.2.19.2.2 of TS 23.502 [3], as further elaborated in step 3a of clause 6.2.8.2.3 in TS 23.288 [4], and as specified in TS 29.517 [5] (or else the equivalent Nnef\_EventExposure\_Subscribe service exposed by the NEF if the two functions are deployed in different trust domains).

Subsequently used by the Data Collection AF to expose data reporting events to the NWDAF, according to the Naf\_EventExposure\_Notify procedure defined in clause 5.2.19.2.2 of TS 23.502 [3], as further elaborated in step 5a of clause 6.2.8.2.3 in TS 23.288 [4], and as specified in TS 29.517 [5] (or else the equivalent Nnef\_EventExposure\_Notify service exposed by the NEF if the two functions are deployed in different trust domains).

- **R6** supports the following interactions between the Event Consumer AF in the Application Service Provider and the Data Collection AF:

- Used by an Event Consumer AF instance to subscribe to data reporting events exposed by the Data Collection AF, according to the Naf\_EventExposure\_Subscribe procedure defined in clause 5.2.19.1 of TS 23.502 [3] and specified in TS 29.517 [5] (or else the equivalent Nnef\_EventExposure\_Subscribe service exposed by the NEF if the two functions are deployed in different trust domains).

- Subsequently used by the Data Collection AF to expose data reporting events to the Event Consumer AF according to the Naf\_EventExposure\_Notify procedure defined in clause 5.2.19.1 of TS 23.502 [3] and specified in TS 29.517 [5] (or else the equivalent Nnef\_EventExposure\_Notify service exposed by the NEF if the two functions are deployed in different trust domains).

Editor’s Note: Need to check with SA2/CT3 about the security aspects of event exposure to External AFs via the NEF. Exposure of events to external parties via NEF is not explicitly described in TS 23.288, although it is envisaged as a possibility in TS 23.502.

- **R7** is a client API offered by the Direct Data Collection Client to the UE Application.

NOTE 4: When the Direct Data Collection Client is embedded in the UE Application, reference point R7 is not used.

NOTE 5: Interactions at reference point R7 are not fully specified in this release.

- **R8** supports data collection and reporting interactions between the UE Application and the Application Service Provider server.

NOTE 6: Interactions at reference point R8 are beyond the scope of 3GPP standardisation.

## 4.4 Service-based architecture for data collection and reporting

Editor’s Note: Different realisations of the reference architecture are currently under consideration by SA4, including SEAL-based and CAPIF-based models.

Figure 4.4‑1 below shows the reference architecture for data collection and reporting in service-based architecture notation. It depicts the case where the Data Collection AF is deployed inside the trusted domain, while the Application Service Provider and the AS may be deployed independently either inside or outside the trusted domain.



NOTE 1: In its role as an event exposure service provider Application Function, the Data Collection AF provides the (un)subscription operations of the Naf\_EventExposure (or Nnef\_EventExposure) service for use by Network Function service consumers. As Network Function service consumers, the NWDAF and the Event Consumer AF provide the event notification operation of the Naf\_EventExposure (or Nnef\_EventExposure) service for use by the Data Collection AF.

NOTE 2: The UE-based Direct Data Collection Client interacts with the Data Collection AF in the user plane, and so the interaction at reference point R2 does not traverse the service bus.

Figure 4.4‑1: Reference architecture for data collection and reporting in service‑based architecture notation when the Data Collection AF is deployed in the trusted domain

The following service-based APIs are used in connection with data collection and reporting:

1. The Ndcaf\_DataReportingProvisioning service is provided by the Data Collection AF. It is defined by the present document and is specified in TS 26.532 [7].

a. Used by Provisioning AF instances in the Application Service Provider server to provision data collection and reporting in the Data Collection AF.

2. The Nnrf\_NFManagement service is provided by the NRF. It is defined in clause 5.2.7.2 of TS 23.502 [3] and specified in clause 6.1 of TS 29.510 [6].

a. Used by the Data Collection AF to register an available NF profile with the NRF for each set of data collection and reporting provisioning information held by the former.

NOTE: As described in clause 6.2.8.2.2 of TS 23.288 [4] the NF profile in this case includes the External Application Identifier (used by clients when reporting data to the Data Collection AF), the Internal Application Identifier (used for event exposure to the NWDAF) and the Event ID. These NF profile parameters are in addition to those specified in clause 5.2.7.2 of TS 23.502 [3].

3. The Ndcaf\_DataReporting service is provided by the Data Collection AF. It is defined by the present document and is specified in TS 26.532 [7].

a. Used by the Direct Data Collection Client, by the Indirect Data Collection Client in the Application Service Provider server and by AS instances to obtain their data collection and reporting configuration from the Data Collection AF.

b. Subsequently used by the Direct Data Collection Client, by the Indirect Data Collection Client and by AS instances to send data reports to the Data Collection AF.

NOTE: Trusted AS instances play the role of a Network Function when invoking the Ndcaf\_DataReporting service (or equivalent) and are therefore depicted in figure 4.4‑1 as being directly attached to the service bus.

4. The Naf\_EventExposure service is provided by the Data Collection AF. It is defined in clause 5.2.19.2 of TS 23.502 [3] and TS 23.288 [4], and is specified in TS 29.517 [5].

a. Used by the NWDAF to subscribe to data reporting events exposed by the Data Collection AF and subsequently used by the Data Collection AF to notify these events to the NWDAF, as described in clause 6.2.2.2 or 6.2.2.3 (as appropriate) of TS 23.288 [4].

b. Used by an Event Consumer AF in the Application Service Provider server to subscribe to data reporting events exposed by the Data Collection AF and subsequently used by the Data Collection AF to notify these events to the Application Service Provider server, as described in clause 6.2.2.2 or clause 6.2.2.3 (as appropriate) of TS 23.288 [4].

Figure 4.4‑2 depicts the case where the Data Collection AF is instead deployed outside the trusted domain, along with the Application Service Provider and the (external) AS. In this case, the subfunctions of the Application Service Provider and the (external) AS do not interact with the Data Collection AF via the 5G System service bus. The Ndcaf service is therefore not required in such deployments. The interactions at the relevant reference points are outside the scope of 3GPP and are depicted as R1′, R3′, R4′ and R6′ to reflect this.



Figure 4.4‑2: Reference architecture for data collection and reporting in service‑based architecture notation when the Data Collection AF is deployed outside the trusted domain

## 4.5 Domain model

Editor’s Note: UML static entity model explaining the relationship between the data entities and their cardinalities.

## 4.6 Provisioning information for data collection and reporting

A separate set of provisioning information shall be provided to the Data Collection AF at reference point R1 for each Event ID it is to expose. This provisioning information embodies the Service Level Agreement between the network operator and the Application Service Provider envisaged in clause 6.2.8.1 of TS 23.288 [4]. The provisioning information shall include at least the parameters defined in table 4.5‑1 below:

Table 4.6‑1: Baseline provisioning information for data collection and reporting

|  |  |  |
| --- | --- | --- |
| Parameter | Cardinality | Description |
| External Application Identifier | 1..1 | The identifier used in reports sent to the Data Collection AF. (This needs to be mapped to the Internal Application Identifier when exposing events to the NWDAF.) |
| Internal Application Identifier | 1..1 | The identifier used by the NWDAF when subscribing to events in the Data Collection AF. |
| Event ID | 1..1 | The identifier of an AF event that will be exposed to event consumers as a result of the provisioning. |
| Valid targets | 1..1 | A parameter to control whether event consumers are permitted to filter events by External UE identifier or External Group Identifier when subscribing, instead of receiving events relating to all UEs. |
| Parameters to be collected | 1..\* | The subset of domain-specific parameters associated with the specified Event ID to be collected by the Data Collection AF (subject to user consent). |
| Exposed data restrictions | 1..\* | A collection of objects that restrict event exposure of the collected data. Each object provides a description of a different level of access to the collected data. The collected data may be subject to data processing prior to exposure at the specific access level.  The ASP, as provider of the media streaming service and when subscribing to the Data Collection AF for event notifications, should be granted complete and fine-grain access to UE data reports. On the other hand, depending on the service level agreement between the mobile operator and the ASP, the NWDAF may be granted partial and coarse-grain access to that data, possibly in aggregated and anonymized form under ASP control. The ASP may authorize event exposure for each of the specified access levels. |
| Data processing instructions | 1..1 | A set of data metrics and their corresponding aggregation operations that will be performed on the collected data for those metrics by the Data Collection AF, prior to event exposure at the specified access level.  The defined aggregation functions shall include: COUNT, MEAN, MEDIAN, MINIMUM, MAXIMUM, SUM. |

## 4.7 Configuration information for data collection and reporting clients

All clients of the Data Collection AF wishing to report data shall first obtain a data collection and reporting configuration from the Data Collection AF at reference point R2, R3 or R4 (as appropriate). The data collection and reporting configuration shall include at least the parameters defined in table 4.6‑1 below:

Table 4.7‑1: Baseline information for data collection and reporting configuration

|  |  |  |
| --- | --- | --- |
| Parameter | Cardinality | Description |
| External Application Identifier | 1..1 | Identifies the UE Application to which this data collection and reporting configuration pertains.  Quoted in reports sent to the Data Collection AF. |
| Parameters to be collected | 1..\* | The subset of domain-specific parameters associated with the specified Event ID to be collected by the Data Collection AF (subject to user consent). |

Editor’s Note: When *requesting configuration*, additional information needs to be passed across the R7 client API (then R2) to realise the "authentication information that enables the [Data Collection] AF to verify the authenticity of the UE's Application that provides data" as envisaged in clause 6.2.8.1 of TS 23.288 [4].

## 4.8 Information included in data reports to the Data Collection AF

Table 4.8‑1: Baseline information for data reporting

|  |  |  |
| --- | --- | --- |
| Parameter | Cardinality | Description |
| External Application Identifier | 1..1 | Identifies the UE Application to which this data report pertains. |
| Collected parameters | 1..\* | The subset of domain-specific parameters associated with the specified Event ID to be collected by the Data Collection AF (subject to user consent). |

Editor’s Note: When *reporting data*, additional information needs to be passed across the R7 client API (then R2) to realise the "authentication information that enables the [Data Collection] AF to verify the authenticity of the UE's Application that provides data" as envisaged in clause 6.2.8.1 of TS 23.288 [4].

# 5 Procedures for data collection and reporting

## 5.1 General

This clause defines the high-level procedures for data collection and reporting.

## 5.2 Procedures for data collection and reporting provisioning

Editor’s Note: High-level definition of how data collection and reporting is provisioned, including, but not limited to:

1. Access controls relating to user privacy protection and/or differential exposure of collected data in reports to different parties.

2. Manipulation of collected data for subsequent reporting (e.g. summarisation, anonymisation, etc.).

## 5.3 Procedures for Data Collection AF subscription management

Editor’s Note: High-level definition of how the Data Collection AF manages subscriptions for data exposure at Naf.

Editor’s Note: It appears that the specification of the *Naf\_EventExposure* service to NF consumers residing outside the trusted domain is outside the current scope of SA2. Therefore it is unclear whether SA2 will wish to take the lead on the design of the Naf\_EventExposure API, in support of subscription by and event notification to an ASP (i.e. its Event Consumer AF) located in an external DN. To be confirmed by LS exchange with SA2, SA4 may be responsible for defining *Naf\_EventExposure*, and whereby close coordination with SA2 and perhaps CT3 will be necessary to ensure appropriate handling and ownership of the stage 2 and stage 3 specifications of the associated *Naf\_EventExposure* and *Nnef\_EventExposure* service APIs.

## 5.4 Procedures for reporting to the Data Collection AF

Editor’s Note: High-level definition of how data is reported by the Data Collection Client and the Application Service Provider to the Data Collection AF via a new service-based API.

## 5.5 Procedures for Data Collection AF data exposure

Editor’s Note: Exposure to NWDAF and external parties (such as the Application Service Provider) via Naf.

Annex A (informative):  
Collaboration scenarios for data collection and reporting

# A.1 General

This annex documents a set of collaboration scenarios that illustrate potential deployments of the data collection and reporting architecture as defined in the present document.

In deployment, it is possible that some UE data is provided to the Data Collection AF using the direct data reporting method at reference point R2, while other (application-private) UE data is collected via reference R8 and provided to the Data Collection AF via the indirect data reporting method at reference point R3 (R3′ in Collaboration D). In certain domains, UE data is collected in the first instance by an AS and therefore needs to be provided to the Data Collection AF at reference point R4 (R4′ in Collaboration D). Hence, all three data reporting reference points are potentially in scope for all of the documented collaboration scenarios.

NOTE 1: In all of the documented collaboration scenarios, reference point R2 traverses the data plane between the Direct Data Collection Client and the Data Collection AF regardless of whether the latter is deployed inside or outside the trusted domain.

NOTE 2: In all of the documented collaboration scenarios, reference point R8 traverses the data plane between the UE Application the Application Service Provider. The traffic carried at this reference point is tunnelled transparently through the trusted domain without interacting with any control plane entities.

# A.2 Collaboration A

In this collaboration scenario all of the functions are deployed inside the trusted domain. This corresponds to the case where the functional entities of the Application Service Provider as well as the Application Server (AS) are internal to the 5G System.

NOTE: Although deployed within the trusted domain, and granted privileged access to certain Network Functions in the 5G System, the Application Service Provider and/or the AS may or may not be under direct control of the MNO in this collaboration scenario. For example, management of one or more of the functional entities may be delegated to a trusted third-party service provider.



Figure A.2‑1: Collaboration A with all functions deployed inside the trusted domain

# A.3 Collaboration B

In this collaboration scenario the functional entities of the Application Service Provider are deployed outside the trusted domain. Interactions between these functions and the Data Collection AF must therefore be mediated by the NEF.

Editor's Note: Need to check with SA2 that the proposed new Ndcaf service can be exposed via NEF.



Figure A.3‑1: Collaboration B with all functions of Application Service Provider  
deployed outside the trusted domain

# A.4 Collaboration C

This collaboration scenario illustrates the case where the Application Server (AS) is also deployed outside the trusted domain (in addition to the functional entities of the Application Service Provider per Collaboration B). In this case, the AS must therefore additionally interact with the Data Collection AF via the NEF.

Editor's Note: Need to check with SA2 that the proposed new Ndcaf service can be exposed via NEF.



Figure A.4‑1: Collaboration C with all functions of Application Service Provider  
and Application Server deployed outside the trusted domain

# A.5 Collaboration D

In this collaboration scenario, the Data Collection AF itself is deployed outside the trusted domain and interactions with functions inside the trusted domain occur via the NEF. This scenario corresponds to the "Procedure for Data Collection from AF via NEF" defined in clause 6.2.2.3 of TS 23.288 [4]. Specifically:

- The externally deployed Data Collection AF registers with the NRF inside the trusted domain using the Nnef\_NFManagement service via the NEF.

NOTE: In practice, the Data Collection AF is instantiated as a subfunction of a domain-specific Application Function. The enclosing Application Function should include data collection and reporting capabilities in its own registration with the NRF on behalf of the enclosed Data Collection AF rather than making a separate registration for the subfunction.

- The NWDAF inside the trusted domain uses the Nnef\_EventExposure service (as specified in clause 5.2.6.2 of TS 23.502 [3]) to subscribe to and receive events exposed by the externally deployed Data Collection AF.



Figure A.5‑1: Collaboration D with Data Collection AF deployed outside the trusted domain

The functional entities of the Application Service Provider, as well as the Application Server (AS), interact with the externally deployed Data Collection AF using interfaces that are outside the scope of 3GPP specification. However, the interactions at reference points R1′, R3′, R4′ and R6′ are expected to be functionally equivalent to those at R1, R3, R4 and R6 respectively.

# A.6 Collaboration E

In this collaboration scenario, the Data Collection Client is deployed as a subfunction of the UE Application. As a consequence of this arrangement, reference point R7 is subsumed into the UE Application.

This collaboration may be combined with any of the preceding collaboration scenarios. Hence, only reference points R2 and R8 are depicted in the figure in the interests of brevity.



Figure A.6‑1: Collaboration E with Data Collection Client deployed as part of the UE Application

The Direct Data Collection Client could, for example, be realised as a software library that implements the appropriate protocol at reference point R2. In such a realisation, the procedures defined in the present document at reference point R7 would likely form the API of the Data Collection Client library.

Annex B (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2021-06 | Post-SA4#115-e ad hoc |  |  |  |  | Initial skeleton document. | 0.0.1 |
| 2021-08 | SA4#115-e | S4-211037  S4-211218  S4-211232 |  |  |  | Addition of reference architecture and collaboration scenarios.  References to CAPIF as an implementation option. | 0.1.0 |
| 2021-10 | Post SA4#115-e ad hoc | S4aI211226  S4aI211227  S4aI211233 |  |  |  | Additional collaboration scenario.  Additional service-based reference architecture figure.  Informative note declaring R7 for future study. | 0.1.1 |