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**Universal Mobile Telecommunications System (UMTS);
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functionality over Ns reference point
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Foreword

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1 Scope

This document defines the protocol for Ns reference point between the Service Capability Exposure Function (SCEF) and RAN Congestion Awareness Function (RCAF).

The Ns reference point and related stage 2 procedures are defined in 3GPP TS 23.682 [2].

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 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".
- [3] IETF RFC 3588: "Diameter Base Protocol".
- [4] 3GPP TS 29.217: "Congestion reporting over Np reference point".
- [5] IETF RFC 7683: "Diameter Overload Indication Conveyance".
- [6] 3GPP TS 29.229: "Cx and Dx interfaces based on Diameter protocol; Protocol details".
- [7] 3GPP TS 29.336: "Home Subscriber Server (HSS) diameter interfaces for interworking with packet data networks and applications Diameter Base Protocol".
- [8] 3GPP TS 29.154: "Service Capability Exposure Functionality over Nt reference point".
- [9] 3GPP TS 29.274: "3GPP Evolved Packet System. Evolved GPRS Tunnelling Protocol for EPS (GTPv2)".
- [10] IETF RFC 5719: "Updated IANA Considerations for Diameter Command Code Allocations".
- [11] IETF RFC 2234: "Augmented BNF for syntax specifications".
- [12] 3GPP TS 29.213: "Policy and charging control signalling flows and Quality of Service (QoS) parameter mapping".
- [13] IETF RFC 7944: "Diameter Routing Message Priority".
- [14] IETF RFC 8583: "Diameter Load Information Conveyance".
- [15] IETF RFC 6733: "Diameter Base Protocol".

3 Definitions and abbreviations

3.1 Definitions

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

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

AS	Application Server
DRMP	Diameter Routing Message Priority
NCA	Network Status Continuous Report Answer
NCR	Network Status Continuous Report Request
NSA	Network Status Answer
NSR	Network Status Request
RCAF	RAN Congestion Awareness Function
SCEF	Service Capability Exposure Function
SCS	Service Capability Server

4 Architectural Overview

4.0 Overview

The Ns reference point is located between the RCAF and SCEF. The Ns reference point is used for network status reporting.

The stage 2 level requirements for the Ns reference point are defined in 3GPP TS 23.682 [2].

Refer to Annex G of 3GPP TS 29.213 [12] for Diameter overload control procedures over the Ns reference point.

Refer to Annex J of 3GPP TS 29.213 [12] for Diameter message priority mechanism procedures over the Ns interface.

Refer to Annex K of 3GPP TS 29.213 [12] for Diameter load control procedures over the Ns reference point.

4.1 Reference Model

The Ns reference point is defined between the RCAF and the SCEF to transfer the network status. The relationship between the two functional entities is depicted in figure 4.1.1. The complete 3GPP architecture for service capability exposure is defined in 3GPP TS 23.682 [2].

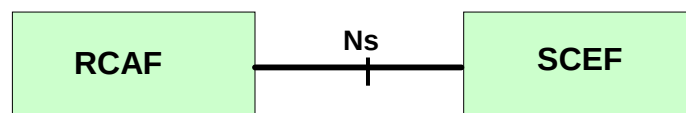


Figure 4.1.1: Ns reference model

4.2 Functional elements

4.2.1 RCAF

The RCAF is a functional element which reports network status to the SCEF to enable the SCEF to take the RAN user plane congestion status into account. The network status includes the following information;

- Congestion level or an indication of the "no congestion" state;
- ECGI, or eNB-ID, or SAI for which the congestion level is being provided.

4.2.2 SCEF

The SCEF is a functional element which provides a means to securely expose the services and capabilities provided by 3GPP network interfaces.

Based on the geographical area provided by the SCS/AS and the configuration data, the SCEF determines from which RCAF(s) to request congestion reporting.

NOTE: The procedures in 3GPP TS 23.682 [2], subclause 5.8, describe the interaction between the SCEF and SCS/AS and the information elements exchanged in the relevant steps of each procedure. When the SCEF receives the network status information from one or more RCAF(s) in both the one-time or continuous reporting cases, it determines the Network Status Indication (NSI) of the geographical area based on the Congestion-Level-Value AVP in the Network-Congestion-Area-Report AVP it receives from the RCAF(s). The NSI value (e.g. High, Medium, Low, No-Congestion) is determined per Service Provider policies.

4.3 Procedures over the Ns reference point

4.3.1 Network status reporting procedures

4.3.1.1 General

This clause contains the detailed procedures for:

- Requesting one-time or continuous network status report ;
- Continuous reporting of network status;
- Cancellation of continuous reporting of network status.

4.3.1.2 Request of one-time or continuous reporting of network status

This procedure shall be used by the SCEF to request one-time or continuous network status report.

This procedure is mapped to Network-Status-Request /Answer commands specified in subclause 5.6.

After the SCEF authorized a SCS/AS request for notification about the network status, the SCEF shall assign an SCEF Reference ID and identify the RCAF(s) responsible for requesting of the network status report. The identity of the RCAF is found by the SCEF based on the RCAF selection procedure defined in subclause 4.3.2. If multiple RCAFs have been found, the procedure shall be invoked multiple times, for each RCAF responsible for the network status report.

The SCEF shall send a Network-Status-Request (NSR) command to the targeted RCAF. The NSR shall include the Ns-Request-Type AVP with the value 0 (initial request), the SCEF reference ID within SCEF-Reference-ID AVP and the location area in the Network-Area-Info-List AVP, the location area is either a 3GPP location area (e.g. list of TA/RAs, list of cell(s), list of eNBs etc) according to operator configuration or a 3GPP location area (e.g. list of TA/RAs, list of cell(s), list of eNBs etc) as provided by the SCS/AS.

The SCEF may also include duration in the Monitoring-Duration AVP and the threshold value(s) in Congestion-Level-Range AVP if the SCS/AS requested reporting for specific threshold(s). The duration indicates the time for which a

continuous reporting is requested.

The SCEF, based on operator policies, may choose a different threshold value than the one received from the SCS/AS. The SCEF shall not include the Congestion-Level-Range AVP in the request to the RCAF if no threshold was requested by the SCS/AS.

NOTE: The SCS/AS can be notified when the SCEF changes the threshold provided by the SCS/AS.

If the continuous reporting is requested, the SCEF shall include the SCEF Id in the SCEF-ID AVP in the NSR command.

Upon reception of a Network-Status-Request (NSR) command including the Ns-Request-Type AVP with the value 0 (initial request), the RCAF shall send the Network-Status-Answer (NSA) command to the SCEF including the SCEF-Reference-ID AVP and one or more congestion status(es) within Network-Congestion-Area-Report AVP(s). If the Monitoring-Duration AVP is present in the NSR, the RCAF shall store the SCEF Id and the SCEF instruction, and then start to monitor the location area for a change in the congestion status.

When receiving NSA from the RCAF, the SCEF shall store the report if the SCS/AS request identified via the SCEF reference ID is valid and active.

4.3.1.3 Continuous reporting of network status

This procedure shall be used by the RCAF to continuously notify the SCEF of the congestion status list for the location area requested by the SCEF when at least one of the following conditions applies:

- a threshold is not provided by the SCEF and the congestion level(s) is changed;
- one or more thresholds are provided by the SCEF and the congestion level(s) is changed which corresponds to the threshold(s) provided.

This procedure is mapped to Network-Status-Continuous-Report-Request/Answer commands specified in subclause 5.6.

If one or more thresholds was provided to the RCAF by the SCEF, and when the RCAF detects a change in the congestion level(s) and this congestion level(s) corresponds to congestion threshold(s) for the location area (e.g. set of cells or eNodeBs) requested by the SCEF, the RCAF shall send Network-Status-Continuous-Report-Request (NCR) command to report this to the SCEF.

The NCR command shall include SCEF reference ID within the SCEF-Reference-ID AVP and congestion status within one or more Network-Congestion-Area-Report AVP(s).

If no threshold was provided to the RCAF by the SCEF, see subclause 4.3.1.2, and when the RCAF detects a change in the congestion level(s) for the location area (e.g. set of cells or eNodeBs) requested by the SCEF, the RCAF shall report the change of congestion level value(s) to the SCEF by sending a NCR command including SCEF reference ID within SCEF-Reference-ID AVP and one or more congestion level value(s) within Network-Congestion-Area-Report AVP(s).

The RCAF shall include one Network-Congestion-Area-Report AVP per congestion level value reported. Within the Network-Congestion-Area-Report AVP the congestion level value shall be included in the Congestion-Level-Value AVP and the affected location area in the Network-Area-Info-List AVP.

The RCAF shall send an NCR command to the destination SCEF by including the SCEF id within the Destination-Host AVP.

The SCEF shall acknowledge the NCR command by sending Network-Status-Continuous-Report-Answer (NCA) command.

4.3.1.4 Cancellation of continuous reporting of network status

This procedure shall be used by the SCEF to request the cancellation of the continuous network status report.

This procedure is mapped to Network-Status-Request (NSR)/Network-Status-Answer (NSA) commands specified in subclause 5.6.

When the SCEF detects that the duration for ongoing continuous reporting of network status is over or is requested to terminate ongoing continuous reporting of network status by the SCS/AS, the SCEF shall identify the RCAF(s)