

ETSI TS 129 153 V18.0.0 (2024-04)



**Universal Mobile Telecommunications System (UMTS);  
LTE;  
Service capability exposure functionality  
over Ns reference point  
(3GPP TS 29.153 version 18.0.0 Release 18)**



---

**Reference**

RTS/TSGC-0329153vi00

---

**Keywords**

LTE,UMTS

**ETSI**

---

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° w061004871

---

**Important notice**

The present document can be downloaded from:

<https://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [www.etsi.org/deliver](http://www.etsi.org/deliver).

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

If you find a security vulnerability in the present document, please report it through our  
Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

---

**Notice of disclaimer & limitation of liability**

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

---

**Copyright Notification**

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2024.  
All rights reserved.

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

# Legal Notice

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

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <https://webapp.etsi.org/key/queryform.asp>.

---

# Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

# Contents

Intellectual Property Rights .....	2
Legal Notice .....	2
Modal verbs terminology.....	2
Foreword.....	4
1 Scope .....	5
2 References .....	5
3 Definitions and abbreviations.....	6
3.1 Definitions .....	6
3.2 Abbreviations .....	6
4 Architectural Overview .....	6
4.0 Overview .....	6
4.1 Reference Model .....	6
4.2 Functional elements.....	7
4.2.1 RCAF.....	7
4.2.2 SCEF.....	7
4.3 Procedures over the Ns reference point.....	7
4.3.1 Network status reporting procedures .....	7
4.3.1.1 General .....	7
4.3.1.2 Request of one-time or continuous reporting of network status.....	7
4.3.1.3 Continuous reporting of network status .....	8
4.3.1.4 Cancellation of continuous reporting of network status.....	8
4.3.2 RCAF selection.....	9
5 Ns protocol .....	9
5.1 Protocol support .....	9
5.2 Initialization, maintenance and termination of connection and session.....	9
5.3 Ns specific AVPs .....	10
5.3.1 General.....	10
5.3.2 Network-Congestion-Area-Report AVP.....	10
5.3.3 Ns-Request-Type AVP .....	10
5.4 Ns re-used AVPs .....	10
5.4.1 General.....	10
5.4.2 Use of the Supported-Features AVP on the Ns reference point.....	11
5.5 Ns specific Experimental-Result-Code AVP values .....	12
5.5.1 General.....	12
5.5.2 Success.....	12
5.5.3 Permanent Failures .....	12
5.5.4 Transient Failures .....	12
5.6 Ns messages .....	12
5.6.1 Command-Code Values .....	12
5.6.2 Network-Status-Request (NSR) command .....	13
5.6.3 Network-Status-Answer (NSA) command .....	13
5.6.4 Network-Status-Continuous-Report-Request (NCR) command.....	14
5.6.5 Network-Status-Continuous-Report-Answer (NCA) command .....	14
<b>Annex A (informative): Call Flows over Ns .....</b>	<b>15</b>
A.1 Request of one time or continuous reporting of network status .....	15
A.2 Continuous reporting of network status .....	15
A.3 Cancellation of continuous reporting of network status.....	16
<b>Annex B (informative): Change history .....</b>	<b>17</b>
History .....	18

---

# Foreword

This Technical Specification has been produced by the 3<sup>rd</sup> 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.

---

# 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].

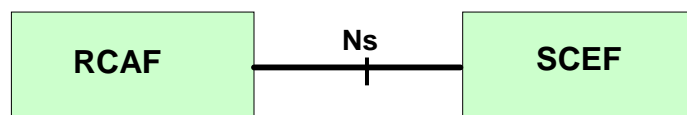


Figure 4.1.1: Ns reference model

## 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)

involved in the continuous reporting represented by the SCEF reference ID and send a Network-Status-Request (NSR) command to the identified RCAF(s) including the SCEF reference ID in SCEF-Reference-ID AVP and the Ns-Request-Type AVP with the value 1 (cancellation request).

Upon reception of a NSR command including the Ns-Request-Type AVP with the value 1 (cancellation request), the RCAF shall remove the related SCEF instructions associated with the SCEF reference ID such that the RCAF will no longer notify the SCEF of the change of the network status and send a Network-Status-Answer (NSA) command including the corresponding SCEF reference ID in the SCEF-Reference-ID AVP to acknowledge the cancellation.

### 4.3.2 RCAF selection

To discover the RCAF(s) responsible for reporting of network status, the SCEF may use the following information:

- Geographical area provided by SCS/AS;
- Pre-configured RCAF address for the geographical area the RCAF is responsible for;

---

## 5 Ns protocol

### 5.1 Protocol support

The Ns application is defined as a vendor specific Diameter application, where the vendor is 3GPP and the Application-ID for the Ns Application in the present release is 16777347. The vendor identifier assigned by IANA to 3GPP (<http://www.iana.org/assignments/enterprise-numbers>) is 10415.

**NOTE:** A route entry can have a different destination based on the application identification AVP of the message. Therefore, Diameter agents (relay, proxy, redirection, translation agents) must be configured appropriately to identify the 3GPP Ns application within the Auth-Application-Id AVP in order to create suitable routing tables.

With regard to the Diameter protocol defined over the Ns interface, the RCAF acts as a Diameter server, in the sense that it is the network element that handles network status reporting requests for a particular location. The SCEF acts as the Diameter client, in the sense that is the network element requesting reporting of network status.

### 5.2 Initialization, maintenance and termination of connection and session

The initialization and maintenance of the connection between each SCEF and RCAF pair is defined by the underlying protocol. Establishment and maintenance of connections between Diameter nodes is described in IETF RFC 6733 [15].

After establishing the transport connection, the SCEF and the RCAF shall advertise the support of the Ns specific Application by including the value of the application identifier in the Auth-Application-Id AVP and the value of the 3GPP (10415) in the Vendor-Id AVP of the Vendor-Specific-Application-Id AVP contained in the Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands. The Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands are specified in the Diameter Base Protocol (IETF RFC 6733 [15]).

The Ns Diameter session shall consist of a single request and answer pair. The Ns Diameter session is terminated after each request and answer pair interaction. In order to indicate that the session state is not to be maintained, the Diameter client and server shall include the Auth-Session-State AVP with the value set to NO\_STATE\_MAINTAINED (1), in the request and in the answer messages (see IETF RFC 6733 [15]).

## 5.3 Ns specific AVPs

### 5.3.1 General

Table 5.3.1.1 describes the Diameter AVPs defined for the Ns reference point, their AVP Code values, types, possible flag values, whether or not the AVP may be encrypted and which supported features the AVP is applicable to. The Vendor-Id header of all AVPs defined in the present document shall be set to 3GPP (10415).

**Table 5.3.1.1: Ns specific Diameter AVPs**

Attribute Name	AVP Code	Clause defined	Value Type (NOTE 2)	AVP Flag rules (NOTE 1)				May Encr.	Applicability (NOTE 3)
				Must	May	Should not	Must not		
Network-Congestion-Area-Report	4101	5.3.2	Grouped	M,V	P			Y	
Ns-Request-Type	4102	5.3.3	Unsigned32	M,V	P			Y	

NOTE 1: The AVP header bit denoted as 'M', indicates whether support of the AVP is required. The AVP header bit denoted as 'V', indicates whether the optional Vendor-ID field is present in the AVP header. For further details, see IETF RFC 6733 [15].

NOTE 2: The value types are defined in IETF RFC 6733 [15].

NOTE 3: AVPs marked with a supported feature are applicable as described in subclause 5.4.1.

### 5.3.2 Network-Congestion-Area-Report AVP

The Network-Congestion-Area-Report AVP (AVP code 4101) is of type Grouped, and includes the Network-Area-Info-List AVP and the Congestion-Level-Value-AVP.

AVP Format:

```
Network-Congestion-Area-Report ::= < AVP Header: 4101 >
    { Network-Area-Info-List }
    [ Congestion-Level-Value ]
    *[ AVP ]
```

### 5.3.3 Ns-Request-Type AVP

The Ns-Request-Type AVP (AVP code 4102) is of type Unsigned32, and contains the reason for sending a request message.

The following values are defined:

0 (initial request)

An initial request is used to initiate a one time or continuous reporting and contains information that is relevant to initiation.

1 (cancellation request)

A cancellation request is used to cancel an ongoing continuous reporting.

## 5.4 Ns re-used AVPs

### 5.4.1 General

Table 5.4.1.1 lists the Diameter AVPs re-used by the Ns reference point from other existing Diameter Applications, reference to their respective specifications, short description of their usage within the Ns reference point and which supported features the AVP is applicable to. AVPs from existing Diameter Applications, except for the AVPs from Diameter base protocol, do not need to be supported. Unless otherwise stated, re-used AVPs shall maintain their 'M', 'P' and 'V' flag settings.

Table 5.4.1.1: Ns re-used Diameter AVPs

Attribute Name	Reference	Description	Applicability (NOTE)
Congestion-Level-Range	3GPP TS 29.217 [4]	It indicates the list of congestion level(s).	
Congestion-Level-Value	3GPP TS 29.217 [4]	Indicates the congestion level of a location.	
DRMP	IETF RFC 7944 [13]	Allows Diameter endpoints to indicate the relative priority of Diameter transactions.	
Load	IETF RFC 8583 [14]	The AVP used to convey load information between Diameter nodes. This AVP and all AVPs within this grouped AVP shall have the 'M' bit cleared.	
Monitoring-Duration	3GPP TS 29.336 [7]	It shall contain the number of seconds for which network status reporting shall be performed.	
Network-Area-Info-List	3GPP TS 29.154 [8]	It contains the network area information which is coded as specified in 3GPP TS 29.274 [9] in Presence Reporting Area Action IE, starting from octet 9.	
OC-OLR	IETF RFC 7683 [5]	Contains the necessary information to convey an overload report.	
OC-Supported-Features	IETF RFC 7683 [5]	Defines the support for the Diameter overload indication conveyence by the sending node.	
SCEF-ID	3GPP TS 29.336 [7]	It shall contain the identity of the SCEF which has requested the network status reporting.	
SCEF-Reference-ID	3GPP TS 29.336 [7]	It contains the identifier provided by the SCEF.	
Supported-Features	3GPP TS 29.229 [6]	If present, this AVP informs the destination host about the features that the origin host requires to successfully complete this command exchange.	
NOTE: AVPs marked with a supported feature are applicable as described in subclause 5.4.2.			

## 5.4.2 Use of the Supported-Features AVP on the Ns reference point

When new functionality is introduced on the Ns reference point, it should be defined as optional. If backwards incompatible changes cannot be avoided, the new functionality shall be introduced as a new feature and support advertised with the Supported-Features AVP. Unless otherwise stated, the use of the Supported-Features AVP on the Ns reference point shall be compliant to the usage of the Supported-Features AVP on the Cx reference point and consistent with the procedures for the dynamic discovery of supported features as defined in subclause 7.2 of 3GPP TS 29.229 [6].

When extending the application by adding new AVPs for a feature, the new AVPs shall have the M bit cleared and the AVP shall not be defined mandatory in the command ABNF.

As defined in 3GPP TS 29.229 [6], the Supported-Features AVP is of type grouped and contains the Vendor-Id, Feature-List-ID and Feature-List AVPs. On the all reference points as specified in this specification, the Supported-Features AVP is used to identify features that have been defined by 3GPP and hence, for features defined in this document, the Vendor-Id AVP shall contain the vendor ID of 3GPP (10415). If there are multiple feature lists defined for the reference point, the Feature-List-ID AVP shall differentiate those lists from one another.

The Supported-Features AVP shall be included in every NSR and NSA command if supported by the RCAF and SCEF respectively.

The Table 5.4.2.1 defines the features applicable to the Ns reference point for the feature list with a Feature-List-ID of 1.

Table 5.4.2.1: Features of Feature-List-ID 1 used in Ns

Feature bit	Feature	M/O	Description
<b>Feature bit:</b> The order number of the bit within the Feature-List AVP where the least significant bit is assigned number "0". <b>Feature:</b> A short name that can be used to refer to the bit and to the feature, e.g. "EPS". <b>M/O:</b> Defines if the implementation of the feature is mandatory ("M") or optional ("O") in this 3GPP Release. <b>Description:</b> A clear textual description of the feature.			

NOTE: This table is a placeholder for when any supported features are added to Ns. There are no supported features in this release.

## 5.5 Ns specific Experimental-Result-Code AVP values

### 5.5.1 General

This clause defines result code values that shall be supported by Diameter implementations that conform to this specification.

### 5.5.2 Success

Result Codes that fall into the Success category are used to inform a peer that a request has been successfully completed. The Result-Code AVP values defined in Diameter BASE Protocol IETF RFC 6733 [15] are applied.

### 5.5.3 Permanent Failures

Errors that fall into the Permanent Failures category shall be used to inform the peer that the request has failed. The Result-Code AVP values defined in Diameter Base Protocol IETF RFC 6733 [15] are applied.

### 5.5.4 Transient Failures

Errors that fall within the Transient failures category are used to inform a peer that the request could not be satisfied at the time it was received, but may be able to satisfy the request in the future.

The Result-Code AVP values defined in Diameter Base Protocol IETF RFC 6733 [15] are applicable.

## 5.6 Ns messages

### 5.6.1 Command-Code Values

This clause defines the Command-Code values for the Ns interface application as allocated by IANA from the vendor-specific namespace defined in IETF RFC 5719 [10]. Every command is defined by means of the ABNF syntax in IETF RFC 2234 [11], and according to the rules in IETF RFC 6733 [15].

NOTE: As the commands in the present specification have originally been defined based on the former specification of the Diameter Base Protocol (IETF RFC 3588 [3]), the Vendor-Specific-Application-Id AVP is still assumed as a required AVP (an AVP indicated as {AVP}) in the command code format to avoid backward compatibility issues, even if the use of this AVP has been deprecated in the new specification of the Diameter Base Protocol (IETF RFC 6733 [15]).

The following Command Codes are defined in this specification:

Table 5.6.1: Command-Code values for Ns

Command-Name	Abbreviation	Code	Section
Network-Status-Request	NSR	8388724	5.6.2
Network-Status-Answer	NSA	8388724	5.6.3
Network-Status-Continuous-Report-Request	NCR	8388725	5.6.4
Network-Status-Continuous-Report-Answer	NCA	8388725	5.6.5

## 5.6.2 Network-Status-Request (NSR) command

The NSR command, indicated by the Command-Code field set to 8388724 and the 'R' bit set in the Command Flags field, is sent by the SCEF to the RCAF as part of the one time or continuous network status reporting procedure and as part of the cancellation of continuous reporting of network status procedure.

Message Format:

```
<NS-Request> ::= <Diameter Header: 8388724, REQ, PXY >
  < Session-Id >
  [ DRMP ]
  { Vendor-Specific-Application-Id }
  { Auth-Session-State }
  { Origin-Host }
  { Origin-Realm }
  { Destination-Realm }
  [ Destination-Host ]
  [ Origin-State-Id ]
  [ OC-Supported-Features ]
  { Ns-Request-Type }
  [ SCEF-ID ]
  [ SCEF-Reference-ID ]
  [ Network-Area-Info-List ]
  [ Congestion-Level-Range ]
  [ Monitoring-Duration ]
  *[ Proxy-Info ]
  *[ Route-Record ]
  *[ Supported-Features ]
  *[ AVP ]
```

## 5.6.3 Network-Status-Answer (NSA) command

The NSA command, indicated by the Command-Code field set to 8388724 and the 'R' bit cleared in the Command Flags field, is sent by the RCAF to the SCEF as part of the one time or continuous network status reporting request procedure and as part of the cancellation of continuous reporting of network status procedure.

Message Format:

```
<NS-Answer> ::= < Diameter Header: 8388724, PXY >
  < Session-Id >
  [ DRMP ]
  { Vendor-Specific-Application-Id }
  { Auth-Session-State }
  { Origin-Host }
  { Origin-Realm }
  [ Result-Code ]
  [ Experimental-Result ]
  [ Error-Message ]
  [ Error-Reporting-Host ]
  [ Failed-AVP ]
  [ OC-Supported-Features ]
  [ OC-OLR ]
  [ SCEF-Reference-ID ]
  [ Origin-State-Id ]
  *[ Network-Congestion-Area-Report ]
  *[ Redirect-Host ]
  [ Redirect-Host-Usage ]
  [ Redirect-Max-Cache-Time ]
  *[ Proxy-Info ]
  *[ Supported-Features ]
  *[ Load ]
  *[ AVP ]
```

## 5.6.4 Network-Status-Continuous-Report-Request (NCR) command

The NCR command, indicated by the Command-Code field set to 8388725 and the 'R' bit set in the Command Flags field, is sent by the RCAF to the SCEF as part of the continuous network status reporting procedure.

Message Format:

```
<NC-Request> ::= <Diameter Header: 8388725, REQ, PXY >
  < Session-Id >
  [ DRMP ]
  { Vendor-Specific-Application-Id }
  { Auth-Session-State }
  { Origin-Host }
  { Origin-Realm }
  { Destination-Realm }
  [ Destination-Host ]
  [ Origin-State-Id ]
  [ OC-Supported-Features ]
  [ SCEF-Reference-ID ]
  *[ Network-Congestion-Area-Report ]
  *[ Proxy-Info ]
  *[ Route-Record ]
  *[ Supported-Features ]
  *[ AVP ]
```

## 5.6.5 Network-Status-Continuous-Report-Answer (NCA) command

The NCA command, indicated by the Command-Code field set to 8388725 and the 'R' bit cleared in the Command Flags field, is sent by the SCEF to the RCAF as part of the continuous network status reporting procedure.

Message Format:

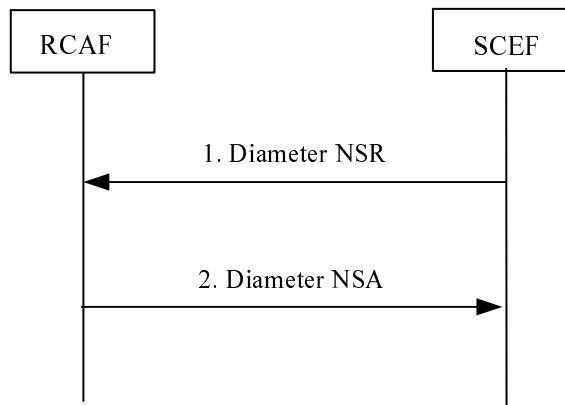
```
<NC-Answer> ::= < Diameter Header: 8388725, PXY >
  < Session-Id >
  [ DRMP ]
  { Vendor-Specific-Application-Id }
  { Auth-Session-State }
  { Origin-Host }
  { Origin-Realm }
  [ Result-Code ]
  [ Experimental-Result ]
  [ Error-Message ]
  [ Error-Reporting-Host ]
  [ Failed-AVP ]
  [ OC-Supported-Features ]
  [ OC-OLR ]
  *[ Redirect-Host ]
  [ Redirect-Host-Usage ]
  [ Redirect-Max-Cache-Time ]
  *[ Proxy-Info ]
  *[ Supported-Features ]
  *[ AVP ]
```

---

## Annex A (informative): Call Flows over Ns

### A.1 Request of one time or continuous reporting of network status

This signalling flow is used by SCEF to request one time or continuous reporting of network status.



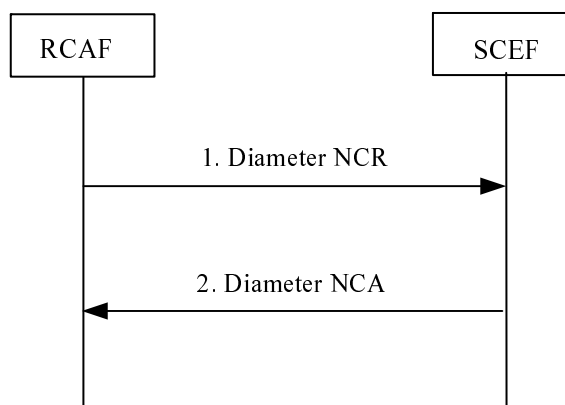
**Figure A.1.1: Request of one time or continuous reporting of network status**

1. After the SCEF authorized a SCS/AS request for notification about the network status, the SCEF sends a Diameter NSR command to the selected RCAF(s) including the parameters as defined in subclause 4.3.1.2.
2. The RCAF sends a NSA command to the SCEF including the parameters as defined in subclause 4.3.1.2.

---

### A.2 Continuous reporting of network status

This signalling flow is used by RCAF to continuously notify the SCEF of the network status.



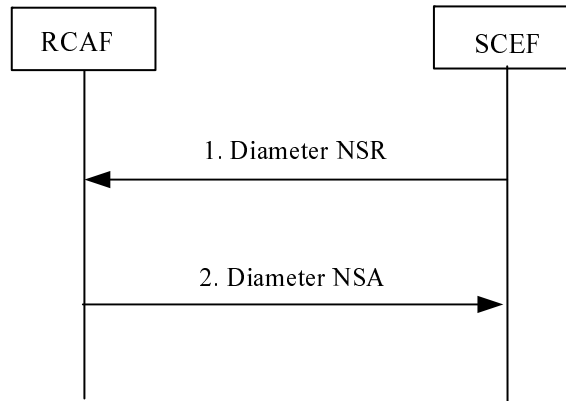
**Figure A.2.1: Continuous reporting of network status**

1. When the congestion level(s) is changed or the congestion level(s) is changed which corresponds to a threshold(s) provided, the RCAF sends a Diameter NCR command including the parameters as defined in subclause 4.3.1.3.
2. The SCEF acknowledges the NCR command by sending a NCA command to the RCAF.



## A.3 Cancellation of continuous reporting of network status

This signalling flow is used by SCEF to request the cancellation of continuous reporting of network status.



**Figure A.3.1: Cancellation of continuous reporting of network status**

1. 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 sends a Diameter NSR command to the identified RCAF(s) including the parameters as defined in subclause 4.3.1.4.
2. The RCAF removes the continuous reporting of network status related instructions meaning that the RCAF will no longer notify the SCEF of the change of the network status, and sends a NSA command to the SCEF.

## Annex B (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2015-08					Editor's Initial Draft		0.0.0
2015-08-25	CT3#82	C3-153466			Initial version includes agreed documents: C3-153407, C3-153431, C3-153433	0.0.0	0.1.0
2015-10-21	CT3#82bis				Initial version includes agreed documents:C3-154183, C3-154298, C3-154332, C3-154333, C3-154318, C3-154334, C-154347	0.1.0	0.2.0
2015-11-24	CT3#83	C3-155416			Initial version includes agreed documents:C3-155240, C3-155241, C3-155331, C3-155347, C3-155364	0.2.0	1.0.0
2015-11-30	CT#70	CP-150822			TS 29.153 sent to plenary CT#70 for information and approval	1.0.0	1.0.1
2015-12	CT#70	CP-150822			TS 29.153 upgraded to 13.0.0 after approval	1.0.1	13.0.0
Change history							
Date	TSG #	TSG Doc.	CR	Rev	Cat	Subject/Comment	New
2016-03	CT#71	CP-160095	0001	1	F	Add the missing abbreviations	13.1.0
2016-03	CT#71	CP-160095	0002	-	F	Removal of the Editor's Note	13.1.0
2016-03	CT#71	CP-160095	0003	-	F	Add command codes and AVP numbers for Ns protocol	13.1.0
2016-03	CT#71	CP-160095	0004	2	F	Signalling flows over Ns reference point	13.1.0
2016-03	CT#71	CP-160093	0005	-	B	Diameter Message Priority over Ns interface	13.1.0
2016-06	CT#72	CP-160251	0006	-	F	Multiple instances of Network-Congestion-Area-Report AVP	13.2.0
2016-06	CT#72	CP-160251	0007	3	F	Correction of network status reporting procedures	13.2.0
2016-09	CT#73	CP-160444	0008	-	F	Correction of the NCR command	13.3.0
2016-09	CT#73	CP-160444	0009	1	F	Correction to the continuous congestion reporting	13.3.0
2016-12	CT#74	CP-160614	0011	-	F	Change IETF drmp draft version to official RFC 7944	13.4.0
2016-12	CT#74	CP-160615	0010	1	B	Diameter Load Control Mechanism	14.0.0
2016-12	CT#74	CP-160616	0012	1	F	Diameter base protocol specification update	14.0.0
2017-03	CT#75	CP-170076	0013	-	F	Update instance number for the Failed-AVP in answer commands	14.1.0
2017-06	CT#76	CP-171119	0014	1	F	Reference update for draft-ietf-dime-load	14.2.0
2017-06	CT#76	CP-171136	0019	1	F	Vendor-Specific-Application-Id AVP handling	14.2.0
2018-06	SA#80	-	-	-		Update to Rel-15 version (MCC)	15.0.0
2019-09	CT#85	CP-192154	0021	1	A	draft-ietf-dime-load published as RFC 8583	15.1.0
2020-07	SA#88e	-	-	-		Update to Rel-16 version (MCC)	16.0.0
2022-03	SA#95e	-	-	-		Update to Rel-17 version (MCC)	17.0.0
2024-03	SA#103	-	-	-		Update to Rel-18 version (MCC)	18.0.0

---

# History

<b>Document history</b>		
V18.0.0	April 2024	Publication