N-Squared Software N2IWF
Diameter Protocol Conformance Statement

Version 2023-10

1 Document Information

1.1 Scope and Purpose

This document describes the implementation of the Diameter protocol in the N-Squared Network/Charging Interworking Function for outbound communication with a Diameter OCS for real-time charging of network functions.

This document describes the details of N2IWF support for both session/call-based charging and event-based charging over Diameter. This includes charging for the following network-side protocols:

- Voice calls from INAP/CAMEL InitialDP (CAP1, CAP2, CAP3, CAP4).
- Voice calls from SIP INVITE.
- SMS charging from CAMEL InitialDPSMS (CAP3, CAP4).
- SMS charging from south-side Ericsson SCAP (inbound RFC 3588 Diameter).

When charging for INAP/CAMEL calls, the product is denoted as N2IWF-SCP. When charging for SIP-based call control, the product is denoted as N2IWF-SIP.

This document should be read in conjunction with the applicable technical documents including the N2SVCD Technical Guide [R-1], N2SCP Technical Guide [R-2], the N2SIP Technical Guide [R-5], and the N2IWF Technical Guide [R-6].

See and the relevant network-side Protocol Conformance Statements including the N-Squared N2SCP CAMEL-INAP PCS [R-7] and the N-Squared N2SIP SIP-SDP-RTP PCS [R-8].

This document assumes a working knowledge of the relevant Diameter protocol documents and its network implementation.

1.2 Definitions, Acronyms, and Abbreviations

Term	Meaning
3GPP	Third-Generation Partnership Project
ASA	Abort Session Answer
ASR	Abort-Session-Request
AVP	Attribute-Value Pair
BFT	Billing Failure Treatment
BAU	Business As Usual
BSS	Business Support Systems
CAMEL	Customized Applications for Mobile networks Enhanced Logic
CCA	Credit Control Answer
CCR	Credit-Control-Request
CEA	Capabilities Exchange-Answer
CER	Capabilities-Exchange-Request
CGI	Cell Global ID
DP	Detection Point
DPA	Disconnect-Peer-Answer
DPR	Disconnect-Peer-Request

Term	Meaning
DTLS	Datagram Transport Layer Security
DWA	Device Watchdog Answer
DWR	Device-Watchdog-Request
ECUR	Event Charging with Unit Reservation
EDR	Event Data Record
ETSI	European Telecommunications Standards Institute
IEC	Immediate Event Debit
IN	Intelligent Network
INAP	Intelligent Network Application Part
IP	Internet Protocol
IPSec	IP Security
ISDN	Integrated Services Digital Network
IWF	Interworking Function
LAC	Location Area Code
MCC	Mobile Country Code
MF	Mobile Forwarded
MNC	Mobile Network Code
MO	Mobile Originated
MSCC	Multiple Services Credit-Control
MT	Mobile Terminated
N2	N-Squared
NGIN	Next Generation Intelligent Network
OCS	Online Charging Server
OSS	Operational Support Systems
RAA	Re-Auth-Answer
RAR	Re-Auth-Request
RFC	Request For Comments
SCP	Service Control Point
SCTP	Stream Control Transmission Protocol
SCUR	Session Charging with Unit Reservation
TCP	Transmission Control Protocol
TLS	Transport Layer Security
TS	Technical Specification
Tx	Diameter client response pending timer

1.3 References

The following documents are referenced within this document:

Reference	Document
[R-1]	N2SVCD Technical Guide (including base components)
[R-2]	N2SCP Technical Guide (including base components for N2IWF-SCP)

[R-5]	N2SIP Technical Guide (including base components for N2IWF-SIP)
[R-6]	N2IWF Technical Guide
[R-7]	N-Squared N2SCP CAMEL-INAP PCS 2022-03 (or later version)
[R-8]	N-Squared N2SIP SIP-SDP-RTP PCS 2023-08 (or later version)
[P-1]	IETF RFC 6733 (Diameter Base Protocol, October 2012)
[P-2]	IETF RFC 8506 (Diameter Credit Control Application, March 2019)
[P-3]	3GPP TS 32.299 Diameter charging applications (Release 16.0.0)

1.4 Ownership and Usage

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2 Contents

3 Introduction

3.1 N2IWF Overview

The N-Squared Interworking Function is a protocol conversion appliance that integrates a Diameter-capable OCS with IN and NGIN networks for charging and control of voice calls and SMS events. It provides both session and event control for prepaid, postpaid, and hybrid networks.

N2IWF is deployed on the N-Squared Service Control Daemon (N2SVCD) framework, which provides high availability and linear horizontal scalability and is deployed on low-cost commodity x86-64 hardware with minimal third-party licensing charges. The result is a cost-effective deployment which can be easily upscaled in response to future business growth.

3.2 Diameter Overview

The Diameter protocol is widely used for authorization and control of traffic. The base protocol is defined in RFC 6733 [P-1], with credit control extensions from RFC 8506 [P-2]. Credit control is further extended by the 3GPP charging applications [P-3].

One notable feature of the Diameter protocol is its ability to allow custom Attribute-Value Pairs (AVPs) to be used when both the client and server are configured to understand them.

3.3 General Restrictions

Specific compliance to the RFCs and TS documentation is described in section *6: RFC Compliance*, but there are some high-level Diameter interactions and features that are not supported by N2IWF:

- In-band security over TLS/DTLS is not supported. If desired, an external IPSec gateway can provide transport layer security.
- N2IWF does not supply Diameter MSCC credit pooling or tariff change. The standard validity time and quota grant mechanisms are used for credit control.
- Validity time of session grants cannot be enforced
- Although N2IWF supports MSCC messaging, it does not support MSCC sub-sessions within a single parent session. MSCC sessions and their parent are tightly coupled.
- Diameter peer election, request proxying, and request forwarding are not supported. N2IWF is intended to be a terminal client endpoint for credit control servers in a single ecosystem.

4 Diameter Messaging

4.1 Message Encoding

All Diameter messaging sent by N2IWF will follow the basic encoding of RFC 6733. Received Diameter messages must also follow this encoding.

4.1.1 Diameter Headers

All Diameter headers sent by N2IWF comply with RFC 6733 section 3.

Field	Type / Length	Notes
Version	1 octet	Always set to 1.
Message Length	3 octets	Total message length, including header.
Command Flags	1 octet	Set as per RFC 6733, i.e. *R P E T r r r r*.
Command Code	3 octets	Only the following command codes are supported: • Code 257: Capabilities-Exchange-Request (CER) and Capabilities-Exchange-Answer (CEA) • Code 280: Device-Watchdog-Request (DWR) and Device-Watchdog-Answer (DWA) • Code 282: Disconnect-Peer-Request (DPR) and Disconnect-Peer-Answer (DPA) • Code 272: Credit-Control-Request (CCR) and Credit-Control-Answer (CCA) • Code 274: Abort-Session-Request (ASR) and Abort-Session-Answer (ASA)
Application-ID	4 octets	Set to 4 for CCR/CCA and ASR/ASA, otherwise 0.
Hop-by-Hop Identifier	Unsigned32, 4 octets	Set as per RFC 6733.
End-to-End Identifier	Unsigned32, 4 octets	Set as per RFC 6733.

Table 1: Diameter headers

4.1.2 Diameter AVPs

All Diameter AVPs sent by N2IWF comply with RFC 6733 section 3.

Field	Type / Length	Notes
AVP Code	4 octets	-
AVP Flags	1 octet	Set as per RFC 6733, i.e. *V M P r r r r r.* Flag values will be set according to the individual AVP definition.
AVP Length	3 octets	Total AVP length, including header.
Vendor-ID	4 octets	Included only if required for the vendor-specific AVP definition.
Data	Variable	As specified by the AVP Code and AVP Length.

Table 2: Diameter AVPs

In addition to the stated compliance to standard AVPs given in *Table 10: N2IWF compliance to RFC 6733*, *Table 11: N2IWF compliance to RFC 8506*, *Table 12: N2IWF compliance to TS 32.299*, and the

N-Squared vendor-specific AVPs specified in *Table 15: N-Squared vendor-specific AVPs*, N2IWF may be configured to receive and send additional arbitrary standard or vendor-specific AVPs for use in rating. Refer to the N2IWF Technical Guide [R-2] for further details.

4.1.3 AVP Data Types

N2IWF supports most basic and derived data types specified in RFC 6733 sections 4.2 and 4.3. Specifically, the following AVP data types are supported:

- OctetString
- Integer32 / Integer64
- Unsigned32 / Unsigned64
- DiameterIdentity
- Grouped
- Address
- Time
- UTF8String
- Enumerated

The following AVP data types are not supported:

- DiameterURI
- Float32 / Float64
- IPFilterRule

4.2 Connection Management

N2IWF may be configured to accept inbound connections from, or to invoke outbound connections to, charging servers following the capability exchange transaction specified in RFC 6733 section 5.3. Connection management command codes supported by N2IWF are:

- Capability-Exchange-Request (CER) and Capability-Exchange-Answer (CEA)
- Disconnect-Peer-Request (DPR) and Disconnect-Peer-Answer (DPA)
- Device-Watchdog-Request (DWR) and Device-Watchdog-Answer (DWA)

The message parameters for these command codes are shown in the following sections.

N2IWF must be configured with a whitelist of charging server information for servers that initiate connections to N2IWF.

Connections may be made to and from N2IWF over either TCP or SCTP.

Refer to the N2IWF Technical Guide for details of the configuration allowed for connection management.

4.2.1 Capability Exchange Messages

Depending on whether N2IWF is configured to listen or initiate connections, both CER and CEA messages may be sent and/or received.

Field	AVP Code	Data Type	Presence		Inbound Notes	Notes
			CER	CEA		
Result-Code	268	Unsigned32	0	1	-	Set as per RFC 6733.
Origin-Host	264	DiameterIdentity	1	1	Must match whitelist.	Set from configuration.
Origin-Realm	296	DiameterIdentity	1	1	-	Set from configuration.
Host-IP-Address	257	Address	1+	1+	Must match whitelist.	Set from configuration.
Vendor-Id	266	Unsigned32	1	1	-	Set from configuration.
Product-Name	269	UTF8String	1	1	-	Set from configuration.
Origin-State-Id	278	Unsigned32	0-1	0-1	-	Not used for session maintenance.
Error-Message	281	UTF8String	0	0-1	Ignored by default.	Only sent in error cases. Set as per RFC 6733.
Failed-AVP	279	Grouped	0	0-1	Ignored by default.	Only sent in error cases. Set as per RFC 6733.
Supported-Vendor-Id	265	Unsigned32	0+	0+	-	Set from configuration.
Auth-Application-Id	258	Unsigned32	0+	0+	Must be set to 4.	Set to 4.
Inband-Security-Id	299	Unsigned32	0+	0+	Ignored by default.	Not sent by default.
Acct-Application-Id	259	Unsigned32	0+	0+	Ignored by default.	Not sent by default.
Vendor-Specific-Application-Id	260	Grouped	0+	0+	Ignored by default.	Not sent by default.
Firmware-Revision	267	Unsigned32	0-1	0-1	Ignored by default.	Not sent by default.
(other AVPs)	*	*	*	*	Ignored by default.	Not sent by default.

Table 3: Capability exchange message parameters

4.2.2 Disconnect Peer Messages

When the N2IWF platform is taken out of service, a DPR message is sent to all connected charging servers. These servers may attempt to reconnect as required, if configured to initiate connections.

In cases where a DPR is received from a charging server and N2IWF is configured to initiate connections, the Disconnect-Cause AVP is not considered and reconnections will be made on the configured schedule.

Field	AVP Code	Data Type	Presence		Inbound Notes	Notes
			DPR	DPA		
Result-Code	268	Unsigned32	0	1	-	Set as per RFC 6733.
Origin-Host	264	DiameterIdentity	1	1	Must match CER/CEA.	As per CER/CEA.
Origin-Realm	296	DiameterIdentity	1	1	Must match CER/CEA.	As per CER/CEA.
Disconnect-Cause	273	Enumerated	1	0	Ignored by default. Reconnection will occur on the configured SCP schedule unless configured otherwise.	Set to 0 (REBOOTING).
Error-Message	281	UTF8String	0	0-1	Ignored by default.	Only sent in error cases. Set as per RFC 6733.
Failed-AVP	279	Grouped	0	0-1	Ignored by default.	Only sent in error cases. Set as per RFC 6733.
(other AVPs)	*	*	*	*	Ignored by default.	Not sent by default.

Table 4: Disconnect peer message parameters

4.2.3 Device Watchdog Messages

The SCP will send DWRs to currently-connected charging servers after no traffic is sent or received from them for a configurable period.

Under normal circumstances, N2IWF will always respond to a DWR from a connected charging server positively to indicate that the system is functioning satisfactorily.

Field	AVP Code	Data Type	Presence		Inbound Notes	Notes
			DWR	DWA		
Result-Code	268	Unsigned32	0	1	-	Set as per RFC 6733.
Origin-Host	264	DiameterIdentity	1	1	Must match CER/CEA.	As per CER/CEA.
Origin-Realm	296	DiameterIdentity	1	1	Must match CER/CEA.	As per CER/CEA.

Field	AVP Code	Data Type	Presence		Inbound Notes	Notes
			DWR	DWA		
Error-Message	281	UTF8String	0	0-1	Ignored by default.	Only sent in error cases. Set as per RFC 6733.
Failed-AVP	279	Grouped	0	0-1	Ignored by default.	Only sent in error cases. Set as per RFC 6733.
Origin-State-Id	278	Unsigned32	1	1	-	Not used for session maintenance.
(other AVPs)	*	*	*	*	Ignored by default.	Not sent by default.

Table 5: Device watchdog message parameters

4.3 Duplicate Messages

4.3.1 Received Messages

N2IWF supports message retransmission by servers by using the retransmit command flag. For more information on this flag, refer to RFC 6733 section 3. Additionally, N2IWF supports transport layer retransmission for Diameter messaging.

No duplicate detection is performed by N2IWF.

4.3.2 Sent Messages

The retransmit flag may be set on request messages sent from N2IWF. The number of retransmissions for request messages is configurable.

N2IWF does not set the retransmit command flag on answer messages, as per RFC 6733. However, the amount of transport layer retransmissions is configurable.

Note that N2IWF does not persist Diameter sessions in non-volatile storage, so no duplication after reboot can occur for answer messages.

4.4 Credit Control Messaging

Credit control messaging is the primary function of the N2IWF platform. Command codes supported by N2IWF for credit control are:

- Credit-Control-Request (CCR) and Credit-Control-Answer (CCA)
- Abort-Session-Request (ASR) and Abort-Session-Answer (ASA)

The message parameters for these command codes are shown in the following sections.

Refer to N2IWF Technical Guide for details of the configuration allowed for credit control.

Reauthorization is not supported by N2IWF.

4.4.1 Credit Control Messages

N2IWF sends CCR messages to charging servers and receives CCA messages in response

4.4.1.1 Credit-Control-Request Messages

N2IWF sends CCR messages as shown below. Note that this is expected to be only the base of any charging control messaging for all but the simplest applications, and additional AVPs (either from the 3GPP standard or vendor-specific requirements) may be required to support rich charging definitions. In particular, the contents of the Service-Information AVP is expected to be greatly expanded to supply the OCS with appropriate network-level information for charging. Refer to section *Table 12: N2IWF compliance to TS 32.299* for details of the child AVPs available for such information.

Field	Vendor ID	AVP Code	Data Type	Presence				Notes
				I	U	T	E	
Session-Id	0	263	UTF8String	1	1	1	1	Set as per *Table 10: N2IWF compliance to RFC 6733*.
Origin-Host	0	264	DiameterIdentity	1	1	1	1	Set as per N2IWF CER/CEA.
Origin-Realm	0	296	DiameterIdentity	1	1	1	1	Set as per N2IWF CER/CEA.
Destination-Realm	0	283	DiameterIdentity	1	1	1	1	Set as per OCS CER/CEA.
Auth-Application-Id	0	258	Unsigned32	1	1	1	1	Set to 4.
Service-Context-Id	0	461	UTF8String	1	1	1	1	Set globally or based on network information according to N2IWF configuration.
CC-Request-Type	0	461	Enumerated	1	1	1	1	Set as per *Table 11: N2IWF compliance to RFC 8506*.
CC-Request-Number	0	415	Unsigned32	1	1	1	1	Set to 0 for first session request and incremented by 1 for each subsequent request.
Destination-Host	0	293	DiameterIdentity	0-1	0-1	0-1	0-1	Sent according to global N2IWF configuration. Set from OCS CER/CEA.
User-Name	0	1	UTF8String	0-1	0-1	0-1	0-1	Sent according to global N2IWF configuration. Set according to global N2IWF configuration.
CC-Sub-Session-Id	0	419	Unsigned64	0	0	0	0	Not sent.
Acct-Multi-Session-Id	0	50	UTF8String	0	0	0	0	Not sent.
Origin-State-Id	0	278	Unsigned32	0-1	0-1	0-1	0-1	Set as per *Table 10: N2IWF compliance to RFC 6733*.
Event-Timestamp	0	55	Time	1	1	1	1	Set as the time corresponding to the network event.
Subscription-Id	0	443	Grouped	1+	1+	1+	1+	Set from network information according to N2IWF configuration.
Subscription-Id-Type	0	450	Enumerated	1	1	1	1	Set based on network information.

Field	Vendor ID	AVP Code	Data Type	Presence				Notes
				I	U	T	E	
Subscription-Id-Data	0	444	UTF8String	1	1	1	1	Set based on network information.
Service-Identifier	0	439	Unsigned32	1 or 0	1 or 0	1 or 0	1 or 0	Set based on network information according to N2IWF configuration. Sent at root level only if SCP is configured not to use MSCC.
Rating-Group	0	432	Unsigned32	1 or 0	1 or 0	1 or 0	1 or 0	Set based on network information according to N2IWF configuration. Sent at root level only if SCP is configured not to use MSCC.
Termination-Cause	0	295	Enumerated	0	0	0-1	0	Sent according to global N2IWF configuration. Set based on network information according to N2IWF configuration.
Requested-Service-Unit	0	437	Grouped	1 or 0	1 or 0	0	1 or 0	Set based on network information according to N2IWF configuration. Sent at root level only if SCP is configured not to use MSCC. Refer to *Multiple-Services-Credit-Control → Requested-Service-Unit* for child details.
Requested-Action	0	436	Enumerated	0	0	0	1	Set as per *Table 11: N2IWF compliance to RFC 8506*.
AoC-Request-Type	10415	2055	Enumerated	0-1	0-1	0-1	0-1	Set as per *Table 12: N2IWF compliance to TS 32.299*.
Used-Service-Unit	0	446	Grouped	0	1 or 0	1 or 0	0	Set based on network information according to N2IWF configuration. Sent at root level only if SCP is configured not to use MSCC. Refer to *Multiple-Services-Credit-Control → Used-Service-Unit* for child details.
Multiple-Services-Indicator	0	455	Enumerated	1	1	1	1	Set according to global N2IWF configuration.
Multiple-Services-Credit-Control	0	456	Grouped	0+	0+	0+	0+	Sent according to global N2IWF configuration.
Requested-Service-Unit	0	437	Grouped	1	1	0	1	Set based on network information according to N2IWF configuration. Sent at MSCC level only if SCP is configured to use MSCC. Only a single unit type will be present.
CC-Time	0	420	Unsigned32	0-1	0-1	0	0-1	Set based on network information according to N2IWF configuration.
CC-Money	0	413	Grouped	-	-	-	-	Not sent.
CC-Total-Octets	0	421	Unsigned64	-	-	-	-	Not sent.
CC-Input-Octets	0	412	Unsigned64	-	-	-	-	Not sent.
CC-Output-Octets	0	414	Unsigned64	-	-	-	-	Not sent.

Field	Vendor ID	AVP Code	Data Type	Presence				Notes
				I	U	T	E	
CC-Service-Specific-Units	0	417	Unsigned64	0-1	0-1	0	0-1	Set based on network information according to N2IWF configuration.
Used-Service-Unit	0	446	Grouped	0	1	1	0	Set based on network information according to N2IWF configuration. Sent at MSCC level only if SCP is configured to use MSCC. Only a single unit type will be present.
Reporting-Reason	10415	872	Enumerated	1	1	1	0	Set as per *Table 12: N2IWF compliance to TS 32.299*.
Tariff-Change-Usage	0	452	Enumerated	-	-	-	-	Not sent.
CC-Time	0	420	Unsigned32	0	0-1	0-1	0	Set based on network information according to N2IWF configuration.
CC-Money	0	413	Grouped	-	-	-	-	Not sent.
CC-Total-Octets	0	421	Unsigned64	-	-	-	-	Not sent.
CC-Input-Octets	0	412	Unsigned64	-	-	-	-	Not sent.
CC-Output-Octets	0	414	Unsigned64	-	-	-	-	Not sent.
CC-Service-Specific-Units	0	417	Unsigned64	0	0-1	0-1	0	Set based on network information according to N2IWF configuration.
Event-Charging-Timestamp	10415	1258	Time	0-1	0-1	0-1	0-1	Set based on network information according to N2IWF configuration.
Service-Identifier	0	439	Unsigned32	0+	0+	0+	0+	Set based on network information according to N2IWF configuration. Sent at MSCC level only if SCP is configured to use MSCC.
Rating-Group	0	432	Unsigned32	0-1	0-1	0-1	0-1	Set based on network information according to N2IWF configuration. Sent at MSCC level only if SCP is configured to use MSCC.
Trigger	10415	1264	Grouped	-	-	-	-	Not sent.
Refund-Information	10415	2022	OctetString	0	0	0	0-1	Set as per *Table 12: N2IWF compliance to TS 32.299*.
Reporting-Reason	10415	872	Enumerated	0	1	1	0	Set as per *Table 12: N2IWF compliance to TS 32.299*.
AF-Correlation-Information	10415	1276	Grouped	-	-	-	-	Not sent.
Envelope	10415	1266	Grouped	-	-	-	-	Not sent.
Time-Quota-Mechanism	10415	1270	Grouped	-	-	-	-	Not sent.
Service-Specific-Info	10415	1249	Grouped	0+	0+	0+	0+	Set as per *Table 12: N2IWF compliance to TS 32.299*.
Service-Specific-Data	10415	863	UTF8String	0-1	0-1	0-1	0-1	Set as per *Table 12: N2IWF compliance to TS 32.299*.

Field	Vendor ID	AVP Code	Data Type	Presence				Notes
				I	U	T	E	
Service-Specific-Type	10415	1257	Unsigned32	0-1	0-1	0-1	0-1	Set as per *Table 12: N2IWF compliance to TS 32.299*.
QoS-Information	10415	1016	Grouped	-	-	-	-	Not sent.
3GPP-RAT-Type	10415	21	OctetString	0-1	0-1	0-1	0-1	Set as per *Table 12: N2IWF compliance to TS 32.299*.
Related-Trigger	10415	3926	Grouped	-	-	-	-	Not sent.
Service-Parameter-Info	0	440	Grouped	0+	0+	0+	0+	May be used as required for additional rating enrichment; refer to N2IWF Technical Guide.
CC-Correlation-Id	0	411	OctetString	-	-	-	-	Not sent.
User-Equipment-Info	10415	458	Grouped	0-1	0-1	0-1	0-1	Set as per *Table 12: N2IWF compliance to TS 32.299*.
User-Equipment-Info-Type	10415	459	Enumerated	1	1	1	1	Set as per *Table 12: N2IWF compliance to TS 32.299*.
User-Equipment-Info-Value	10415	460	OctetString	1	1	1	1	Set as per *Table 12: N2IWF compliance to TS 32.299*.
Proxy-Info	0	284	Grouped	-	-	-	-	Not sent.
Route-Record	0	282	DiameterIdentity	-	-	-	-	Not sent.
Service-Information	10415	873	Grouped	0-1	0-1	0-1	0-1	Set as per *Table 12: N2IWF compliance to TS 32.299*.according to N2IWF configuration.
(other AVPs)	*	*	*	*	*	*	*	Not sent by default. N2IWF may be configured to send IETF, 3GPP, or custom AVPs for additional rating enrichment; refer to N2IWF Technical Guide.

Table 6: Credit-Control-Request message parameters (sent from N2IWF)

4.4.1.2 Credit-Control-Answer Messages

The expected parameters for a CCA message sent to N2IWF from the OCS are shown below.

Field	Vendor ID	AVP Code	Data Type	Presence				Notes
				I	U	T	E	
Session-Id	0	263	UTF8String	1	1	1	1	Must match sent CCR value.
Result-Code	0	268	Unsigned32	1	1	1	1	Interpreted by N2IWF service configuration. Indicates status of credit control.
Experimental-Result	0	297	Grouped	-	-	-	-	Not used.
Origin-Host	0	264	DiameterIdentity	1	1	1	1	Must match sent CER/CEA value.
Origin-Realm	0	296	DiameterIdentity	1	1	1	1	Must match sent CER/CEA value.
Auth-Application-Id	0	258	Unsigned32	1	1	1	1	Must be set to 4.
CC-Request-Type	0	461	Enumerated	1	1	1	1	Must match sent CCR value.
CC-Request-Number	0	415	Unsigned32	1	1	1	1	Must match sent CCR value.
User-Name	0	1	UTF8String	0-1	0-1	0-1	0-1	Ignored if present.
CC-Session-Failover	0	418	Enumerated	0-1	0-1	0-1	0-1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
CC-Sub-Session-Id	0	419	Unsigned64	-	-	-	-	Not used.
Acct-Multi-Session-Id	0	50	UTF8String	-	-	-	-	Not used.
Origin-State-Id	0	278	Unsigned32	-	-	-	-	Not used.
Event-Timestamp	0	55	Time	-	-	-	-	Not used.
Granted-Service-Unit	0	431	Grouped	1 or 0	1 or 0	0	1 or 0	Must be at the same level as Requested-Service-Unit sent by N2IWF. Refer to *Multiple-Services-Credit-Control → Granted-Service-Unit* for child details.
Service-Identifier	0	439	Unsigned32	-	-	-	-	Not used.
Rating-Group	0	432	Unsigned32	-	-	-	-	Not used.
Multiple-Services-Credit-Control	0	456	Grouped	0+	0+	0+	0+	Must match sent CCR value.
Tariff-Time-Change	10415	451	Time	-	-	-	-	Not used.
Granted-Service-Unit	0	431	Grouped	0-1	0-1	0	0-1	Must be at the same level as Requested-Service-Unit sent by N2IWF. Only a single unit type may be present.
CC-Time	0	420	Unsigned32	0-1	0-1	0	0-1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.

Field	Vendor ID	AVP Code	Data Type	Presence				Notes
				I	U	T	E	
CC-Money	0	413	Grouped	-	-	-	-	Not used.
CC-Total-Octets	0	421	Unsigned64	-	-	-	-	Not used.
CC-Input-Octets	0	412	Unsigned64	-	-	-	-	Not used.
CC-Output-Octets	0	414	Unsigned64	-	-	-	-	Not used.
CC-Service-Specific-Units	0	417	Unsigned64	0-1	0-1	0	0-1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Service-Identifier	0	439	Unsigned32	-	-	-	-	Not used.
Rating-Group	0	432	Unsigned32	-	-	-	-	Not used.
G-S-U-Pool-Reference	10415	457	Grouped	-	-	-	-	Not used.
Validity-Time	0	448	Unsigned32	1	1	0	0	Treated as per *Table 11: N2IWF compliance to RFC 8506*. CCRs will be sent when this period is exhausted at the latest.
Result-Code	0	268	Unsigned32	1	1	1	1	Interpreted by N2IWF service configuration. Indicates status of credit control.
Final-Unit-Indication	0	430	Grouped	0-1	0-1	0	0	Must be at the same level as Requested-Service-Unit sent by N2IWF. Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Final-Unit-Action	0	449	Enumerated	1	1	-	-	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Restriction-Filter-Rule	10415	438	IPFilterRule	-	-	-	-	Not used.
Filter-Id	0	11	UTF8String	-	-	-	-	Not used.
Redirect-Server	0	434	Grouped	0-1	0-1	-	-	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Redirect-Address-Type	0	433	Enumerated	1	1	-	-	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Redirect-Server-Address	0	435	UTF8String	1	1	-	-	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Time-Quota-Threshold	10415	868	Unsigned32	-	-	-	-	Not used.
Volume-Quota-Threshold	10415	869	Unsigned32	-	-	-	-	Not used.
Unit-Quota-Threshold	10415	1226	Unsigned32	-	-	-	-	Not used.
Quota-Holding-Time	10415	871	Unsigned32	-	-	-	-	Not used.
Quota-Consumption-Time	10415	881	Unsigned32	-	-	-	-	Not used.
Trigger	10415	1264	Grouped	-	-	-	-	Not used.
PS-Furnish-Charging-Information	10415	865	Grouped	-	-	-	-	Not used.
3GPP-Charging-Id	10415	2	OctetString	1	1	1	1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
PS-Free-Format-Data	10415	866	OctetString	1	1	1	1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.

Field	Vendor ID	AVP Code	Data Type	Presence				Notes
				I	U	T	E	
PS-Append-Free-Format-Data	10415	867	Enumerated	0-1	0-1	0-1	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Refund-Information	10415	2022	OctetString	0	0	0	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Envelope-Reporting	10415	1268	Grouped	-	-	-	-	Not used.
Time-Quota-Mechanism	10415	1270	Grouped	-	-	-	-	Not used.
Announcement-Information	10415	3904	Grouped	0+	0+	0+	0+	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Announcement-Identifier	10415	3905	Unsigned32	1	1	1	1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Variable-Part	10415	3907	Grouped	0+	0+	0+	0+	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Variable-Part-Order	10415	3908	Unsigned32	1	1	1	1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Variable-Part-Type	10415	3909	Unsigned32	1	1	1	1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Variable-Part-Value	10415	3910	UTF8String	1	1	1	1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Time-Indicator	10415	3911	Unsigned32	0-1	0-1	0-1	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Quota-Indicator	10415	3912	Enumerated	0-1	0-1	0-1	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Announcement-Order	10415	3906	Unsigned32	0-1	0-1	0-1	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Play-Alternative	10415	3913	Enumerated	0-1	0-1	0-1	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Privacy-Indicator	10415	3915	Enumerated	0-1	0-1	0-1	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Language	10415	3914	UTF8String	0-1	0-1	0-1	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Cost-Information	0	423	Grouped	0	0-1	0-1	0-1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Unit-Value	0	445	Grouped	0	1	1	1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Value-Digits	0	447	Integer64	0	1	1	1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Exponent	0	429	Integer32	0	1	1	1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Currency-Code	0	425	Unsigned32	0	0-1	0-1	0-1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Cost-Unit	0	424	UTF8String	0	0-1	0-1	0-1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Low-Balance-Indication	10415	2020	Enumerated	0-1	0-1	0-1	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Remaining-Balance	10415	2020	Grouped	0-1	0-1	0-1	0-1	Treated as per *Table 12: N2IWF compliance to TS 32.299*.
Unit-Value	0	445	Grouped	1	1	1	1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Value-Digits	0	447	Integer64	1	1	1	1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Exponent	0	429	Integer32	1	1	1	1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Currency-Code	0	425	Unsigned32	0-1	0-1	0-1	0-1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.

Field	Vendor ID	AVP Code	Data Type	Presence				Notes
				I	U	T	E	
Final-Unit-Indication	0	430	Grouped	0-1 or 0	0-1 or 0	0	0	Must be at the same level as Requested-Service-Unit sent by N2IWF. Treated as per *Table 11: N2IWF compliance to RFC 8506*. Refer to *Multiple-Services-Credit-Control → Final-Unit-Indication* for child details.
Check-Balance-Result	0	422	Enumerated	0	0	0	0-1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Credit-Control-Failure-Handling	0	427	Enumerated	1	1	0	0	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
Direct-Debiting-Failure-Handling	0	427	Enumerated	0	0	0	1	Treated as per *Table 11: N2IWF compliance to RFC 8506*.
OC-Supported-Features	0	621	Grouped	-	-	-	-	Not used.
OC-OLR	0	623	Grouped	-	-	-	-	Not used.
Redirect-Host	0	292	DiameterURI	-	-	-	-	Not used.
Redirect-Host-Usage	0	261	Enumerated	-	-	-	-	Not used.
Redirect-Max-Cache-Time	0	262	Unsigned32	-	-	-	-	Not used.
Proxy-Info	0	284	Grouped	-	-	-	-	Not used.
Route-Record	0	282	DiameterIdentity	-	-	-	-	Not used.
Failed-AVP	0	279	Grouped	-	-	-	-	Not used.
Service-Information	10415	873	Grouped	-	-	-	-	Not used.
(other AVPs)	*	*	*	*	*	*	*	Not used unless configured for charging control enrichment; refer to N2IWF Technical Guide.

Table 7: Credit-Control-Answer message parameters (sent to N2IWF)

4.4.2 Abort Session Messages

4.4.2.1 Abort-Session-Request Messages

The OCS may choose to stop an in-progress session on N2IWF.

Field	Vendor ID	AVP Code	Data Type	Presence	Notes
Session-Id	0	263	UTF8String	1	Must match sent CCR value.
Origin-Host	0	264	DiameterIdentity	1	Must match sent CER/CEA value.
Origin-Realm	0	296	DiameterIdentity	1	Must match sent CER/CEA value.
Destination-Host	0	293	DiameterIdentity	-	Not used.

Field	Vendor ID	AVP Code	Data Type	Presence	Notes
Destination-Realm	0	283	DiameterIdentity	1	Must match sent CER/CEA value.
Auth-Application-Id	0	258	Unsigned32	1	Must be set to 4.
(other AVPs)	*	*	*	*	Not used by default. N2IWF may be configured to receive IETF, 3GPP, or custom AVPs for additional rating enrichment; refer to N2IWF Technical Guide.

Table 8: Abort-Session-Request message parameters (sent to N2IWF)

4.4.2.2 Abort-Session-Answer Messages

N2IWF indicates to the OCS whether the session has been aborted successfully. No further CCRs for this request will be sent if successful.

Field	V ID	AVP Code	Data Type	Presence	Notes
Session-Id	0	263	UTF8String	1	Set from ASR.
Result-Code	0	268	Unsigned32	1	Set to DIAMETER_SUCCESS if the session was aborted successfully. Set to DIAMETER_UNKNOWN_SESSION_ID if the session was not active when the ASR was received. Otherwise set to DIAMETER_UNABLE_TO_COMPLY.
Origin-Host	0	264	DiameterIdentity	1	Set as per sent CER/CEA value.
Origin-Realm	0	296	DiameterIdentity	1	Set as per sent CER/CEA value.
User-Name	0	1	UTF8String	0-1	Sent according to global N2IWF configuration. Set according to global N2IWF configuration.
Error-Message	0	281	UTF8String	0-1	Sent only if Result-Code is not DIAMETER_SUCCESS.
Error-Reporting-Host	0	294	DiameterIdentity	-	Not sent.
Failed-AVP	0	279	Grouped	0-1	Sent only if received ASR cannot be parsed. Set as per *Table 10: N2IWF compliance to RFC 6733*.
Redirect-Host	0	292	DiameterURI	-	Not sent.
Redirect-Host-Usage	0	261	Enumerated	-	Not sent.
Redirect-Max-Cache-Time	0	262	Unsigned32	-	Not sent.
Proxy-Info	0	284	Grouped	-	Not sent.

Field	V ID	AVP Code	Data Type	Presence	Notes
(other AVPs)	*	*	*	*	Not sent by default. N2IWF may be configured to send IETF, 3GPP, or custom AVPs for additional rating enrichment; refer to N2IWF Technical Guide.

Table 9: Abort-Session-Answer message parameters (sent from N2IWF)

4.4.3 Reauthorization Messages

Reauthorization is not supported by N2IWF.

5 Diameter Charging Scenarios

Note that all scenarios in this section show charging interaction using the 3GPP model of decentralized unit determination with centralized rating, i.e. charging clients requesting specific units with rating granting those units.

N2IWF supports also supports the alternate 3GPP charging model for centralized unit determination and centralized rating, i.e. RSU sent with no unit type and units determined by the OCS. In the interests of brevity, this model is not shown in this section, but its alternate flows are referenced in-line underneath the associated diagram.

N2IWF does not support decentralized unit determination and decentralized rating, i.e. RSU sent with CC-Money unit type and CC-Money granted by the OCS, as this does not map to IN/NGIN messaging.

5.1 Call Session

5.1.1 Call Session, Success, OCS Termination

A user makes a call. The OCS grants the requested reservation but informs N2IWF that no more reservations are available. Once the user consumes the granted units, the user session is stopped and the OCS commits the reservation.

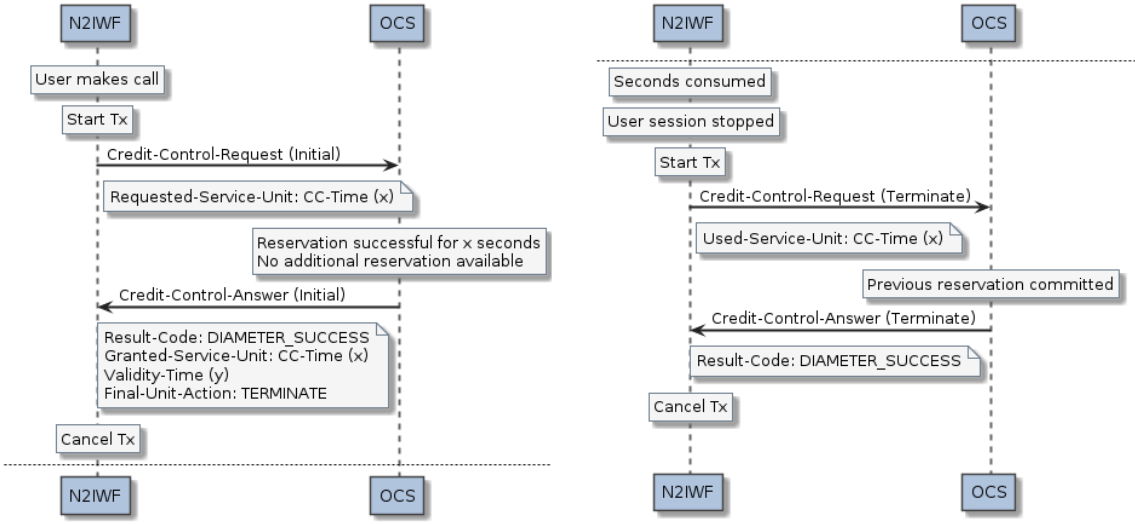

Figure A: Call session, success, OCS termination

This scenario is based on Appendix A: Flow VII in RFC 8506.

Note that the OCS instruction for final units can occur at any CCA, but this is not shown in the flow for simplicity.

5.1.2 Call Session, Success, User Termination

A user makes a call. The initial reservation is successful, and the user consumes some of the quota and then ends the session. The OCS commits the used quota from the reservation.

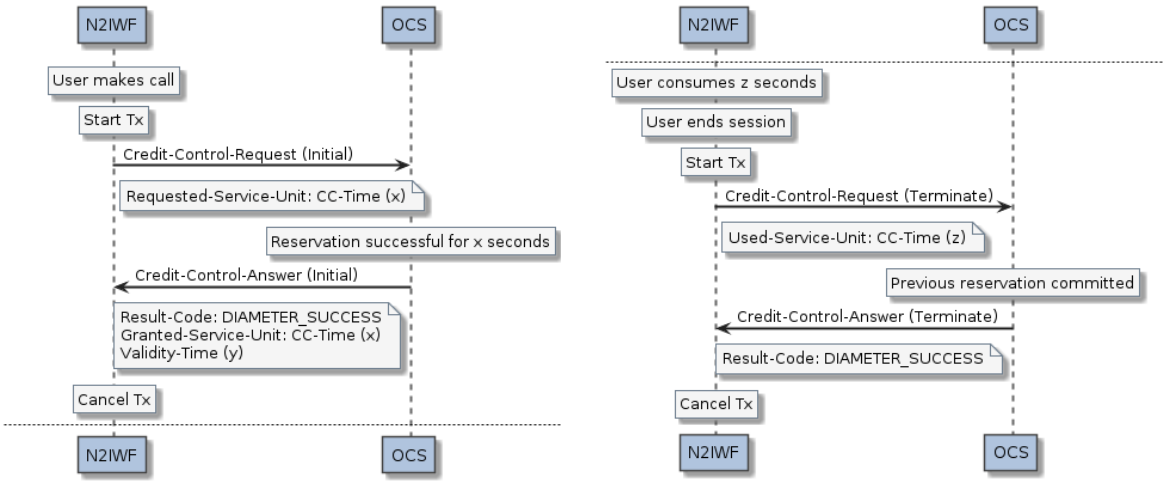

Figure B: Call session, success, user termination

This scenario is based on Appendix A: Flow I and Appendix A: Flow II in RFC 8506 and Figure 5.2.2.3.1.1 in 3GPP TS 32.299. With unit type substitution, it also reflects Figure 5.2.2.3.2.1, Figure 5.2.2.2.1.1, and Figure 5.2.2.2.2.1 in 3GPP TS 32.299.

5.1.3 Call Session, Continuation

A user exhausts the previously-given grant on a continuing call. N2IWF requests an additional reservation from the OCS. The OCS commits the used quota from the previous reservation and grants additional quota to the user. The charging session continues with the new quota.

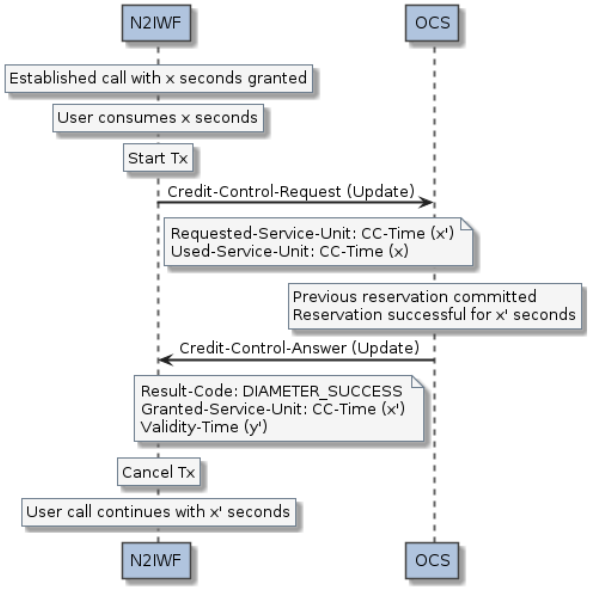

Figure C: Call session, session continuation

This scenario is based on Appendix A: Flow I and Appendix A: Flow II in RFC 8506 and Figure 5.2.2.3.1.1 in 3GPP TS 32.299. With unit type substitution, it also reflects Figure 5.2.2.3.2.1 in 3GPP TS 32.299.

5.1.4 Call Session, Validity Expiration

A user begins a call. The initial reservation is successful, and the user continues using the granted time. The user session does not report on the used time before the validity period expires. N2IWF relinquishes the granted quota and closes the OCS session. N2SCP BFT rules will be used after OCS session closure and may create EDRs for revenue control.

This is an exception scenario and is not expected to occur under BAU.

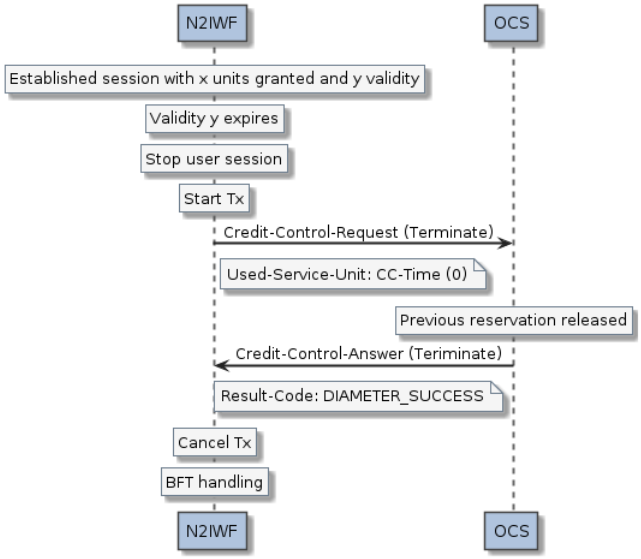

Figure D: Call session, validity expiration

5.1.5 Call Session, Denied

A user begins a charging session. No quota is granted by the OCS for the indicated reason returned to N2IWF; other results may also be used. The charging session is not allowed to start.

Note that the OCS may decline to grant quota at interim requests. Such cases are not shown for the sake of brevity but are handled identically.

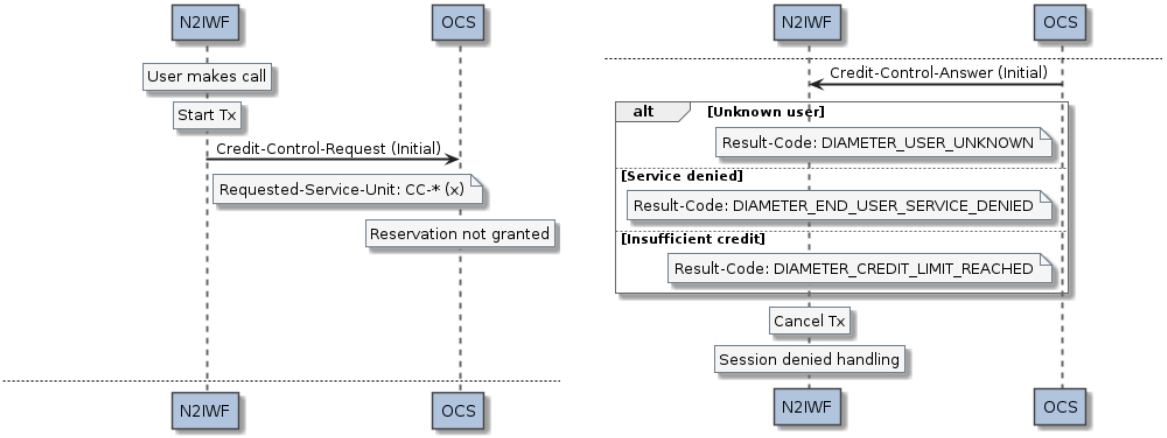

Figure E: Call session, unsuccessful

5.1.6 Call Session, Tx Timeout

A user begins a call. The OCS does not respond before the Tx timer expires, and the session is handled by BFT rules, as described in the N2SCP Technical Guide.

Note that the same scenario can also occur at interim and final interrogation. Such BFT handling (and the EDRs generated for revenue control as part of this) will be dealt with in the same fashion by N2SCP BFT rules and the flows are not shown here for brevity.

This is an exception scenario and is not expected to occur under BAU.

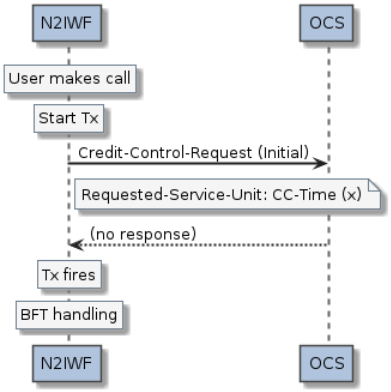

Figure F: Call session, Tx timeout

5.2 Event Reservation

5.2.1 Event Reservation, Success

A premium SMS is to be sent to a user, requiring delivery before charging. The OCS grants the reservation, and after successful delivery the reservation is confirmed.

Note that N2IWF is not intended to be used for long-held reservations. In such cases, the flows shown in *Figure K: Event debit, success* and *Figure L: Event debit, refund* should be used.

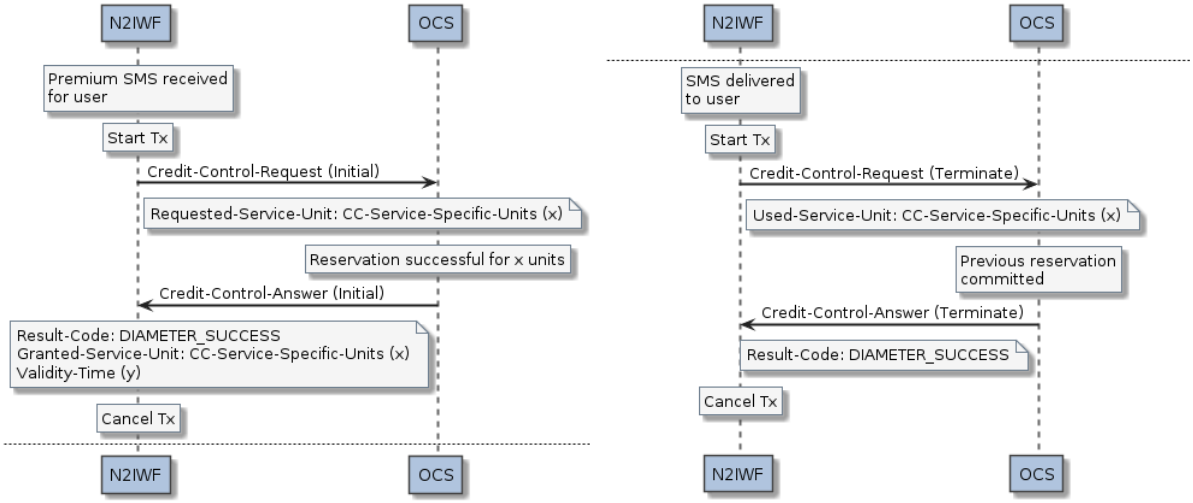

Figure G: Event reservation, success

5.2.2 Event Reservation, Revoke

A premium SMS is to be sent to a user, requiring delivery before charging. The OCS grants the reservation, but the SMS is unable to be delivered. The reservation on the OCS is revoked.

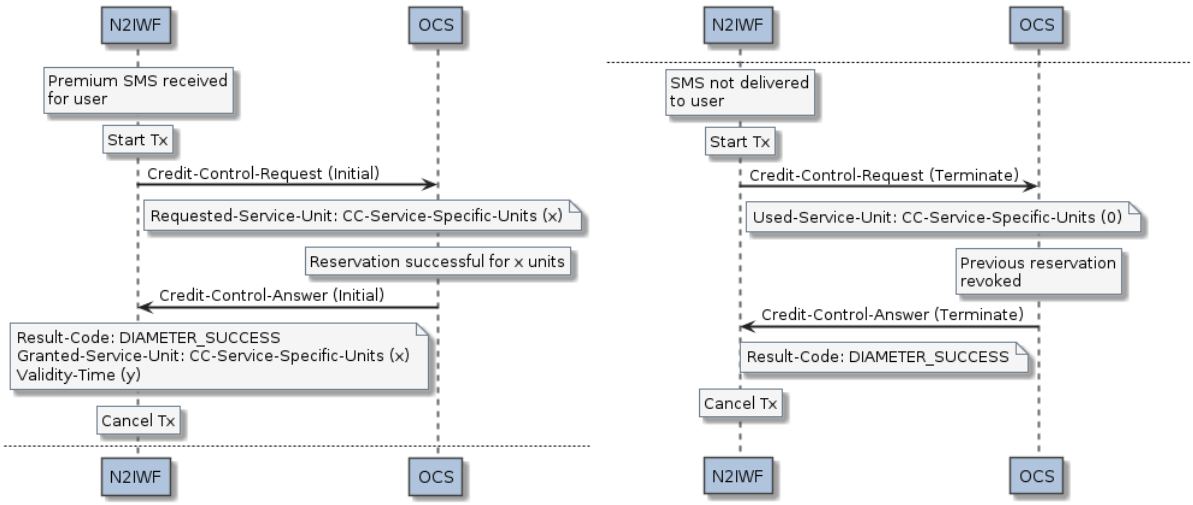

Figure H: Event reservation, revoke

5.2.3 Event Reservation, Denied

A premium SMS is to be sent to a user, requiring delivery before charging. No quota is granted by the OCS for the indicated reason returned to N2IWF; other results may also be used. The charging session is not allowed to start.

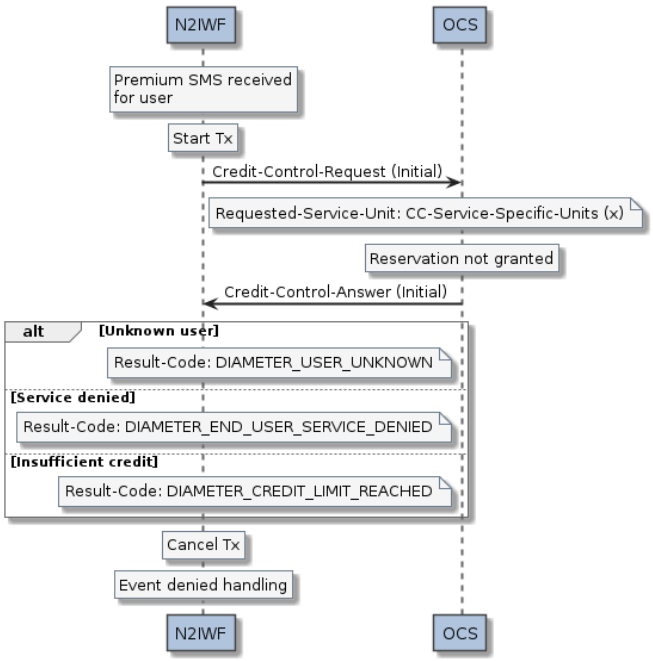

Figure I: Event reservation, denied

5.2.4 Event Reservation, Tx Timeout

A premium SMS is to be sent to a user, requiring delivery before charging. The OCS does not respond before the Tx timer expires, and the session is handled by BFT rules, as described in the N2SCP Technical Guide.

Note that the same scenario can also occur at interim interrogation. Such BFT handling (and the EDRs generated for revenue control as part of this) will be dealt with in the same fashion by N2SCP BFT rules and the flows are not shown here for brevity.

This is an exception scenario and is not expected to occur under BAU.

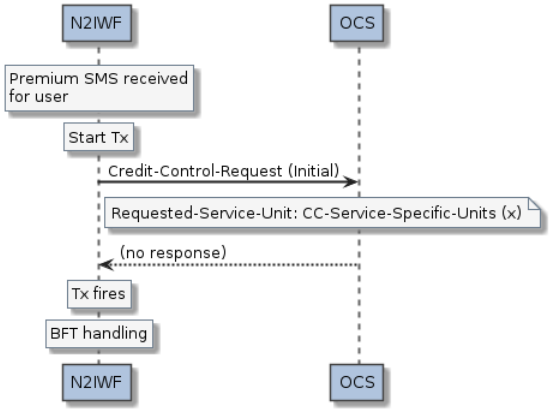

Figure J: Event reservation, Tx timeout

5.3 Event Debit

5.3.1 Event Debit, Success

A user sends an SMS. The event is debited on the OCS prior to delivery.

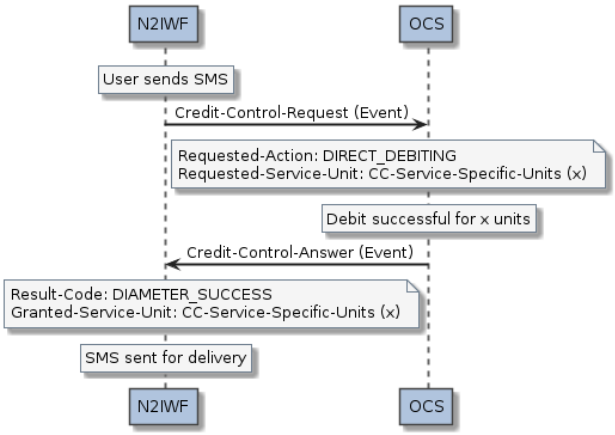

Figure K: Event debit, success

This scenario is based on Appendix A: Flow III in RFC 8506 and Figure 5.2.2.1.1.1 in 3GPP TS 32.299. WIth unit substitution, it also reflects both Figure 5.2.2.1.2.1 and Figure 5.2.2.1.3.1 in 3GPP TS 32.299.

5.3.2 Event Debit, Refund

A user sends an SMS. The event is debited on the OCS prior to delivery. Delivery fails, and the cost of the SMS is refunded on the OCS.

Note that the OCS may, instead of performing reverse rating, supply a refund ID that is expected to be returned in a refund request. This is not shown in the flows for simplicity. Note that If a refund ID is required and the delivery attempt(s) will be over a non-transactional period of time, the network elements must provide the refund ID when the refund is requested.

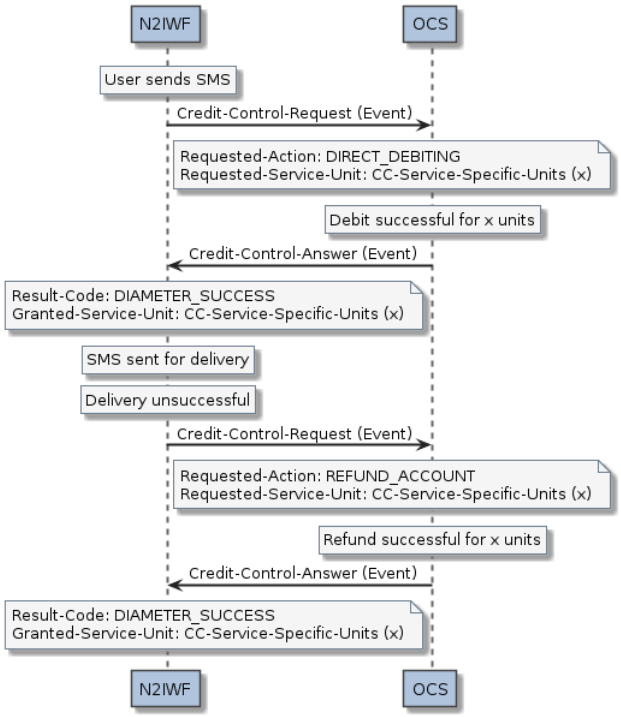

Figure L: Event debit, refund

This scenario is based on Appendix A: Flow VI in RFC 8506.

5.3.3 Event Debit, Denied

A user sends an SMS. The OCS does not allow the debit for the indicated reason returned to N2IWF; other results may also be used. The SMS charging attempt is disallowed..

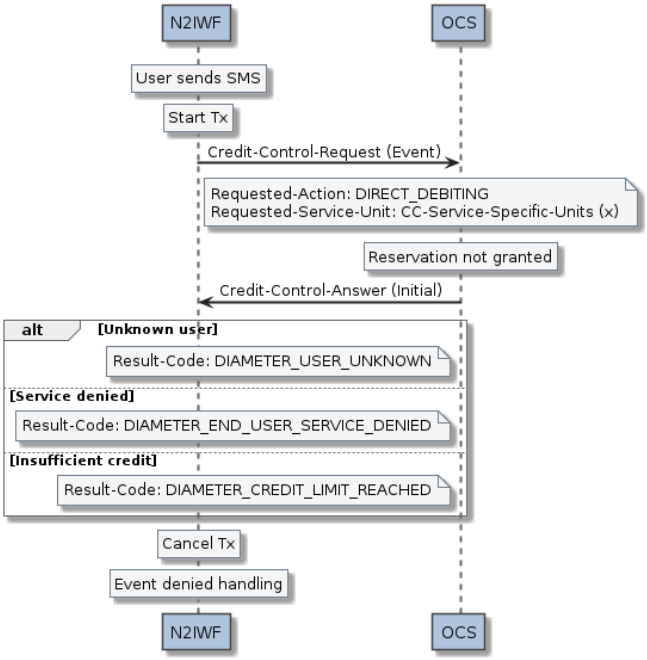

Figure M: Event debit, denied

5.3.4 Event Debit, Tx Timeout

A user sends an SMS. The OCS does not respond before the Tx timer expires, and the debit is handled by BFT rules, as described in the N2SCP Technical Guide.

Note that the same scenario can also occur at refund interrogation. Such BFT handling (and the EDRs generated for revenue control as part of this) will be dealt with in the same fashion by N2SCP BFT rules and the flows are not shown here for brevity.

This is an exception scenario and is not expected to occur under BAU.

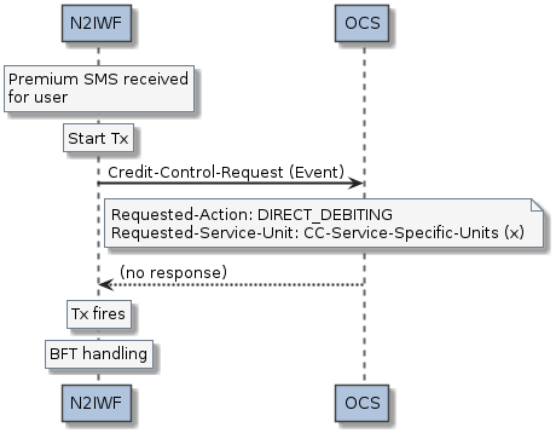

Figure N: Event debit, Tx timeout

5.4 Other Scenarios

5.4.1 Balance Check

N2IWF can query the OCS for a balance check as part of any processing scenario. This may include balance details for the subscriber where required, for example to present via SMS.

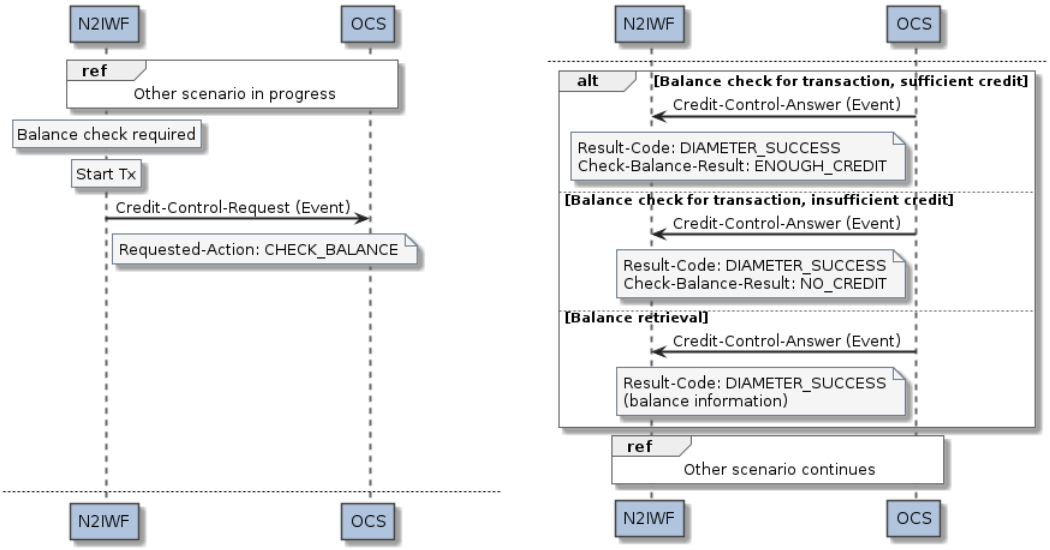

Figure O: Balance check

This scenario is based on Appendix A: Flow IV in RFC 8506.

6 RFC Compliance

6.1 Compliance to RFC 6733 (Diameter Base Protocol)

Section	Section Heading	Compliance	Notes
1	Introduction	Not applicable.	-
1.1	Diameter Protocol	Not applicable.	-
1.1.1	Description of the Document Set	Not applicable.	-
1.1.2	Conventions Used in This Document	Not applicable.	-
1.1.3	Changes from RFC3588	Not applicable.	-
1.2	Terminology	Not applicable.	-
1.3	Approach to Extensibility	Not applicable.	-
1.3.1	Defining New AVP Values	Not applicable.	-
1.3.2	Creating New AVPs	Not applicable.	-
1.3.3	Creating New Commands	Not applicable.	-
1.3.4	Creating New Diameter Applications	Not applicable.	-
2	Protocol Overview	Fully compliant.	-
2.1	Transport	Fully compliant.	-
2.1.1	SCTP Guidelines	Fully compliant.	-
2.2	Securing Diameter Messages	Partially compliant.	IPSec may be applied via an external gateway. TLS/DTLS not supported.
2.3	Diameter Application Compliance	Fully compliant.	-
2.4	Application Identifiers	Fully compliant.	-
2.5	Connections vs. Sessions	Not applicable.	-
2.6	Peer Table	Not applicable.	-
2.7	Routing Table	Fully compliant.	-
2.8	Role of Diameter Agents	Not applicable.	-

Section	Section Heading	Compliance	Notes
2.8.1	Relay Agents	Not applicable.	-
2.8.2	Proxy Agents	Not applicable.	-
2.8.3	Redirect Agents	Not applicable.	-
2.8.4	Translation Agents	Not applicable.	-
2.9	Diameter Path Authorization	Fully compliant.	-
3	Diameter Header	Fully compliant.	-
3.1	Command Codes	Partially compliant.	RAR/RAA, ACR/ACA, and STR/STA not supported.
3.2	Command Code Format Specification	Not applicable.	-
3.3	Diameter Command Naming Conventions	Not applicable.	-
4	Diameter AVPs	Fully compliant.	-
4.1	AVP Header	Fully compliant.	-
4.1.1	Optional Header Elements	Fully compliant.	-
4.2	Basic AVP Data Formats	Partially compliant.	Float32 and Float64 not supported.
4.3	Derived AVP Data Formats	Not applicable.	-
4.3.1	Common Derived AVP Data Formats	Partially compliant.	DiameterURI and IPFilterRule not supported.
4.4	Grouped AVP Values	Fully compliant.	-
4.4.1	Example AVP with a Grouped Data Type	Not applicable.	-
4.5	Diameter Base Protocol AVPs	Partially compliant.	DiameterURI not supported.
5	Diameter Peers	Not applicable.	-
5.1	Peer Connections	Fully compliant.	-
5.2	Diameter Peer Discovery	Fully compliant.	-
5.3	Capabilities Exchange	Partially compliant.	TLS/DTLS not supported.
5.3.1	Capabilities-Exchange-Request	Fully compliant.	-
5.3.2	Capabilities-Exchange-Answer	Fully compliant.	-
5.3.3	Vendor-Id AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
5.3.4	Firmware-Revision AVP	Fully compliant.	-
5.3.5	Host-IP-Address AVP	Fully compliant.	-
5.3.6	Supported-Vendor-Id AVP	Fully compliant.	-
5.3.7	Product-Name AVP	Fully compliant.	-
5.4	Disconnecting Peer Connections	Fully compliant.	-
5.4.1	Disconnect-Peer-Request	Fully compliant.	-
5.4.2	Disconnect-Peer-Answer	Fully compliant.	-
5.4.3	Disconnect-Cause AVP	Not applicable.	Not used.
5.5	Transport Failure Detection	Not applicable.	-
5.5.1	Device-Watchdog-Request	Fully compliant.	-
5.5.2	Device-Watchdog-Answer	Fully compliant.	-
5.5.3	Transport Failure Algorithm	Fully compliant.	-
5.5.4	Failover and Failback Procedures	Fully compliant.	-
5.6	Peer State Machine	Partially compliant.	Peer election not supported.
5.6.1	Incoming Connections	Fully compliant.	-
5.6.2	Events	Partially compliant.	Peer election not supported.
5.6.3	Actions	Partially compliant.	Peer election not supported.
5.6.4	The Election Process	Not compliant.	Peer election not supported.
6	Diameter Message Processing	Not applicable.	-
6.1	Diameter Request Routing Overview	Fully compliant.	-
6.1.1	Originating a Request	Fully compliant.	-
6.1.2	Sending a Request	Fully compliant.	-
6.1.3	Receiving Requests	Not compliant.	Loop checking not supported.
6.1.4	Processing Local Requests	Fully compliant.	-
6.1.5	Request Forwarding	Not compliant.	Forwarding not supported.

Section	Section Heading	Compliance	Notes
6.1.6	Request Routing	Not compliant.	Routing not supported.
6.1.7	Predictive Loop Avoidance	Not compliant.	Routing not supported.
6.1.8	Redirecting Requests	Not compliant.	Routing not supported.
6.1.9	Relaying and Proxying Requests	Not compliant.	Routing not supported.
6.2	Diameter Answer Processing	Fully compliant.	-
6.2.1	Processing Received Answers	Fully compliant.	-
6.2.2	Relaying and Proxying Answers	Not compliant.	Routing not supported.
6.3	Origin-Host AVP	Fully compliant.	-
6.4	Origin-Realm AVP	Fully compliant.	-
6.5	Destination-Host AVP	Fully compliant.	-
6.6	Destination-Realm AVP	Fully compliant.	-
6.7	Routing AVPs	Not applicable.	-
6.7.1	Route-Record AVP	Not compliant.	-
6.7.2	Proxy-Info AVP	Not compliant.	-
6.7.3	Proxy-Host AVP	Not compliant.	-
6.7.4	Proxy-State AVP	Not compliant.	-
6.8	Auth-Application-Id AVP	Fully compliant.	-
6.9	Acct-Application-Id AVP	Fully compliant.	-
6.10	Inband-Security-Id AVP	Not compliant.	-
6.11	Vendor-Specific-Application-Id AVP	Fully compliant.	-
6.12	Redirect-Host AVP	Not compliant.	Forwarding not supported.
6.13	Redirect-Host-Usage AVP	Not compliant.	Forwarding not supported.
6.14	Redirect-Max-Cache-Time AVP	Not compliant.	Forwarding not supported.
7	Error Handling	Fully compliant.	-
7.1	Result-Code AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.1.1	Informational	Fully compliant.	-
7.1.2	Success	Fully compliant.	-
7.1.3	Protocol Errors	Fully compliant.	-
7.1.4	Transient Failures	Fully compliant.	-
7.1.5	Permanent Failures	Fully compliant.	-
7.2	Error Bit	Fully compliant.	-
7.3	Error-Message AVP	Fully compliant.	-
7.4	Error-Reporting-Host AVP	Fully compliant.	-
7.5	Failed-AVP AVP	Fully compliant.	-
7.6	Experimental-Result AVP	Not compliant.	-
7.7	Experimental-Result-Code AVP	Not compliant.	-
8	Diameter User Sessions	Not applicable.	Not used for credit control.
8.1	Authorization Session State Machine	Fully compliant.	-
8.2	Accounting Session State Machine	Not applicable.	Not used for credit control.
8.3	Server-Initiated Re-Auth	Not compliant.	Reauthorization not supported.
8.3.1	Re-Auth-Request	Not compliant.	Reauthorization not supported.
8.3.2	Re-Auth-Answer	Not compliant.	Reauthorization not supported.
8.4	Session Termination	Fully compliant.	-
8.4.1	Session-Termination-Request	Not applicable.	Not used for credit control.
8.4.2	Session-Termination-Answer	Not applicable.	Not used for credit control.
8.5	Aborting a Session	Fully compliant.	-
8.5.1	Abort-Session-Request	Fully compliant.	-
8.5.2	Abort-Session-Answer	Fully compliant.	-
8.6	Inferring Session Termination from Origin-State-Id	Partially compliant.	Session state is not inferred from Origin-State-Id.
8.7	Auth-Request-Type AVP	Not applicable.	Not used for credit control.

Section	Section Heading	Compliance	Notes
8.8	Session-Id AVP	Fully compliant.	-
8.9	Authorization-Lifetime AVP	Not applicable.	Not used for credit control.
8.10	Auth-Grace-Period AVP	Not applicable.	Not used for credit control.
8.11	Auth-Session-State AVP	Not applicable.	Not used for credit control.
8.12	Re-Auth-Request-Type AVP	Not compliant.	Reauthorization not supported.
8.13	Session-Timeout AVP	Not applicable.	Not used for credit control.
8.14	User-Name AVP	Fully compliant.	-
8.15	Termination-Cause AVP	Fully compliant.	-
8.16	Origin-State-Id AVP	Fully compliant.	-
8.17	Session-Binding AVP	Not applicable.	Not used for credit control.
8.18	Session-Server-Failover AVP	Not applicable.	Not used for credit control.
8.19	Multi-Round-Time-Out AVP	Not applicable.	Not used for credit control.
8.20	Class AVP	Not compliant.	-
8.21	Event-Timestamp AVP	Fully compliant.	-
9	Accounting	Not applicable.	Not used for credit control.
9.1	Server Directed Model	Not applicable.	Not used for credit control.
9.2	Protocol Messages	Not applicable.	Not used for credit control.
9.3	Accounting Application Extension and Requirements	Not applicable.	Not used for credit control.
9.4	Fault Resilience	Not applicable.	Not used for credit control.
9.5	Accounting Records	Not applicable.	Not used for credit control.
9.6	Correlation of Accounting Records	Not applicable.	Not used for credit control.
9.7	Accounting Command Codes	Not applicable.	Not used for credit control.
9.7.1	Accounting-Request	Not applicable.	Not used for credit control.
9.7.2	Accounting-Answer	Not applicable.	Not used for credit control.
9.8	Accounting AVPs	Not applicable.	Not used for credit control.

Section	Section Heading	Compliance	Notes
9.8.1	Accounting-Record-Type AVP	Not applicable.	Not used for credit control.
9.8.2	Acct-Interim-Interval AVP	Not applicable.	Not used for credit control.
9.8.3	Accounting-Record-Number AVP	Not applicable.	Not used for credit control.
9.8.4	Acct-Session-Id AVP	Not applicable.	Not used for credit control.
9.8.5	Acct-Multi-Session-Id AVP	Not applicable.	Not used for credit control.
9.8.6	Accounting-Sub-Session-Id AVP	Not applicable.	Not used for credit control.
9.8.7	Accounting-Realtime-Required AVP	Not applicable.	Not used for credit control.
10	AVP Occurrence Tables	Fully compliant.	-
10.1	Base Protocol Command AVP Table	Partially compliant.	Refer to individual message definitions in previous sections.
10.2	Accounting AVP Table	Not applicable.	Not used for credit control.
11	IANA Considerations	Not applicable.	-
11.1	AVP Header	Fully compliant.	-
11.1.1	AVP Codes	Fully compliant.	-
11.1.2	AVP Flags	Fully compliant.	-
11.2	Diameter Header	Not applicable.	-
11.2.1	Command Codes	Not applicable.	No vendor-specific command codes.
11.2.2	Command Flags	Fully compliant.	-
11.3	AVP Values	Fully compliant.	-
11.3.1	Experimental-Result-Code AVP	Not compliant.	-
11.3.2	Result-Code AVP Values	Not applicable.	No IANA control required.
11.3.3	Accounting-Record-Type AVP Values	Not applicable.	No IANA control required.
11.3.4	Termination-Cause AVP Values	Not applicable.	No IANA control required.
11.3.5	Redirect-Host-Usage AVP Values	Not applicable.	No IANA control required.
11.3.6	Session-Server-Failover AVP Values	Not applicable.	No IANA control required.
11.3.7	Session-Binding AVP Values	Not applicable.	No IANA control required.

Section	Section Heading	Compliance	Notes
11.3.8	Disconnect-Cause AVP Values	Not applicable.	No IANA control required.
11.3.9	Auth-Request-Type AVP Values	Not applicable.	No IANA control required.
11.3.10	Auth-Session-State AVP Values	Not applicable.	No IANA control required.
11.3.11	Re-Auth-Request-Type AVP Values	Not applicable.	No IANA control required.
11.3.12	Accounting-Realtime-Required AVP Values	Not applicable.	No IANA control required.
11.3.13	Inband-Security-Id AVP (code299)	Not applicable.	No IANA control required.
11.4	_diameters Service Name and Port Number Registration	Not applicable.	No IANA control required.
11.5	SCTP Payload Protocol Identifiers	Not applicable.	No IANA control required.
11.6	S-NAPTR Parameters	Not applicable.	No IANA control required.
12	Diameter Protocol-Related Configurable Parameters	Fully compliant.	-
13	Security Considerations	Partially compliant.	IPSec may be applied via an external gateway. TLS/DTLS not supported.
13.1	TLS/TCP and DTLS/SCTP Usage	Not applicable.	TLS/DTLS not supported.
13.2	Peer-to-Peer Considerations	Not applicable.	TLS/DTLS not supported.
13.3	AVP Considerations	Partially compliant.	IPSec may be applied via an external gateway. TLS/DTLS not supported.
14	References	Not applicable.	-
14.1	Normative References	Not applicable.	-
14.2	Informative References	Not applicable.	-
Appendix A	Acknowledgements	Not applicable.	-
A.1	This Document	Not applicable.	-
A.2	RFC3588	Not applicable.	-
Appendix B	S-NAPTR Example	Not applicable.	-
Appendix C	Duplicate Detection	Not applicable.	-
Appendix D	Internationalized Domain Names	Not applicable.	-

Table 10: N2IWF compliance to RFC 6733

6.2 Compliance to RFC 8506 (Diameter Credit Control Application)

Section	Section Heading	Compliance	Notes
1	Introduction	Not applicable.	-
1.1	Requirements Language	Not applicable.	-
1.2	Terminology	Not applicable.	-
1.3	Advertising Application Support	Fully compliant.	-
2	Architecture Models	Fully compliant.	-
3	Credit-Control Messages	Fully compliant.	-
3.1	Credit-Control-Request (CCR) Command	Fully compliant.	-
3.2	Credit-Control-Answer (CCA) Command	Fully compliant.	-
4	Credit-Control Application Overview	Fully compliant.	-
4.1	Service-Specific Rating Input and Interoperability	Fully compliant.	-
4.1.1	Specifying Rating Input AVPs	Fully compliant.	-
4.1.2	Service-Specific Documentation	Fully compliant.	-
4.1.3	Handling of Unsupported/Incorrect Rating Input	Fully compliant.	-
4.1.4	RADIUS Vendor-Specific Rating Attributes	Fully compliant.	-
5	Session Based Credit-Control	Not applicable.	-
5.1	General Principles	Fully compliant.	-
5.1.1	Basic Tariff-Time Change Support	Not compliant.	Validity-Time is used instead of the tariff change mechanism.
5.1.2	Credit-Control for Multiple Services within a (sub-)Session	Partially compliant.	GSU pooling and tariff time change not supported.
5.2	First Interrogation	Fully compliant.	-
5.2.1	First Interrogation after Authorization and Authentication	Fully compliant.	-

Section	Section Heading	Compliance	Notes
5.2.2	Authorization Messages for First Interrogation	Fully compliant.	-
5.3	Intermediate Interrogation	Fully compliant.	-
5.4	Final Interrogation	Fully compliant.	-
5.5	Server-Initiated Credit Re-Authorization	Not compliant.	Reauthorization not supported.
5.6	Graceful Service Termination	Fully compliant.	-
5.6.1	Terminate Action	Fully compliant.	-
5.6.2	Redirect Action	Fully compliant.	-
5.6.3	Restrict Access Action	Not compliant.	-
5.6.4	Usage of the Server-Initiated Credit Re-Authorization	Fully compliant.	-
5.7	Failure Procedures	Fully compliant.	-
6	One Time Event	Fully compliant.	-
6.1	Service Price Enquiry	Not compliant.	-
6.2	Balance Check	Fully compliant.	-
6.3	Direct Debiting	Fully compliant.	-
6.4	Refund	Fully compliant.	-
6.5	Failure Procedure	Fully compliant.	-
7	Credit-Control Application State Machine	Fully compliant.	-
8	Credit-Control AVPs	Not applicable.	-
8.1	CC-Correlation-Id AVP	Fully compliant.	-
8.2	CC-Request-Number AVP	Fully compliant.	-
8.3	CC-Request-Type AVP	Fully compliant.	-
8.4	CC-Session-Failover AVP	Fully compliant.	-
8.5	CC-Sub-Session-Id AVP	Not compliant.	-
8.6	Check-Balance-Result AVP	Fully compliant.	-
8.7	Cost-Information AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
8.8	Unit-Value AVP	Fully compliant.	-
8.9	Exponent AVP	Fully compliant.	-
8.10	Value-Digits AVP	Fully compliant.	-
8.11	Currency-Code AVP	Fully compliant.	-
8.12	Cost-Unit AVP	Fully compliant.	-
8.13	Credit-Control AVP	Fully compliant.	-
8.14	Credit-Control-Failure-Handling AVP	Fully compliant.	-
8.15	Direct-Debiting-Failure-Handling AVP	Fully compliant.	-
8.16	Multiple-Services-Credit-Control AVP	Partially compliant.	GSU pooling and tariff time change not supported. Only a single Used-Service-Unit is supported.
8.17	Granted-Service-Unit AVP	Partially compliant.	Only a single unit type is supported.
8.18	Requested-Service-Unit AVP	Partially compliant.	Only a single unit type is supported.
8.19	Used-Service-Unit AVP	Partially compliant.	Only a single unit type is supported.
8.20	Tariff-Time-Change AVP	Not compliant.	-
8.21	CC-Time AVP	Fully compliant.	-
8.22	CC-Money AVP	Fully compliant.	-
8.23	CC-Total-Octets AVP	Fully compliant.	-
8.24	CC-Input-Octets AVP	Fully compliant.	-
8.25	CC-Output-Octets AVP	Fully compliant.	-
8.26	CC-Service-Specific-Units AVP	Fully compliant.	-
8.27	Tariff-Change-Usage AVP	Not compliant.	-
8.28	Service-Identifier AVP	Fully compliant.	-
8.29	Rating-Group AVP	Fully compliant.	-
8.30	G-S-U-Pool-Reference AVP	Not compliant.	-
8.31	G-S-U-Pool-Identifier AVP	Not compliant.	-
8.32	CC-Unit-Type AVP	Not compliant.	-

Section	Section Heading	Compliance	Notes
8.33	Validity-Time AVP	Fully compliant.	-
8.34	Final-Unit-Indication AVP	Fully compliant.	-
8.35	Final-Unit-Action AVP	Partially compliant.	Restricted access is not supported.
8.36	Restriction-Filter-Rule AVP	Not compliant.	-
8.37	Redirect-Server AVP	Fully compliant.	-
8.38	Redirect-Address-Type AVP	Fully compliant.	-
8.39	Redirect-Server-Address AVP	Fully compliant.	-
8.40	Multiple-Services-Indicator AVP	Fully compliant.	-
8.41	Requested-Action AVP	Partially compliant.	Value 3 (PRICE_ENQUIRY) not supported.
8.42	Service-Context-Id AVP	Fully compliant.	-
8.43	Service-Parameter-Info AVP	Fully compliant.	-
8.44	Service-Parameter-Type AVP	Fully compliant.	-
8.45	Service-Parameter-Value AVP	Fully compliant.	-
8.46	Subscription-Id AVP	Fully compliant.	-
8.47	Subscription-Id-Type AVP	Fully compliant.	-
8.48	Subscription-Id-Data AVP	Fully compliant.	-
8.49	User-Equipment-Info AVP	Fully compliant.	-
8.50	User-Equipment-Info-Type AVP	Fully compliant.	-
8.51	User-Equipment-Info-Value AVP	Fully compliant.	-
8.52	User-Equipment-Info-Extension AVP	Not compliant.	Not used.
8.53	User-Equipment-Info-IMEISV AVP	Not compliant.	Not used.
8.54	User-Equipment-Info-MAC AVP	Not compliant.	Not used.
8.55	User-Equipment-Info-EUI64 AVP	Not compliant.	Not used.
8.56	User-Equipment-Info-ModifiedEUI64 AVP	Not compliant.	Not used.
8.57	User-Equipment-Info-IMEI AVP	Not compliant.	Not used.

Section	Section Heading	Compliance	Notes
8.58	Subscription-Id-Extension AVP	Not compliant.	Not used.
8.59	Subscription-Id-E164 AVP	Not compliant.	Not used.
8.60	Subscription-Id-IMSI AVP	Not compliant.	Not used.
8.61	Subscription-Id-SIP-URI AVP	Not compliant.	Not used.
8.62	Subscription-Id-NAI AVP	Not compliant.	Not used.
8.63	Subscription-Id-Private AVP	Not compliant.	Not used.
8.64	Redirect-Server-Extension AVP	Not compliant.	Not used.
8.65	Redirect-Address-IPAddress AVP	Not compliant.	Not used.
8.66	Redirect-Address-URL AVP	Not compliant.	Not used.
8.67	Redirect-Address-SIP-URI AVP	Not compliant.	Not used.
8.68	QoS-Final-Unit-Indication AVP	Not compliant.	Not used.
9	Result Code AVP Values	Fully compliant.	-
9.1	Transient Failures	Fully compliant.	-
9.2	Permanent Failures	Fully compliant.	-
10	AVP Occurrence Table	Fully compliant.	-
10.1	Credit-Control AVP Table	Fully compliant.	-
10.2	Re-Auth-Request/Answer AVP Table	Fully compliant.	-
11	RADIUS/Diameter Credit-Control Interworking Model	Fully compliant.	-
12	IANA Considerations	Not applicable.	-
12.1	Application Identifier	Fully compliant.	-
12.2	Command Codes	Fully compliant.	-
12.3	AVP Codes	Fully compliant.	-
12.4	Result-Code AVP Values	Fully compliant.	-
12.5	CC-Request-Type AVP	Fully compliant.	-
12.6	CC-Session-Failover AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
12.7	CC-Unit-Type AVP	Fully compliant.	-
12.8	Check-Balance-Result AVP	Fully compliant.	-
12.9	Credit-Control AVP	Fully compliant.	-
12.10	Credit-Control-Failure-Handling AVP	Fully compliant.	-
12.11	Direct-Debiting-Failure-Handling AVP	Fully compliant.	-
12.12	Final-Unit-Action AVP	Fully compliant.	-
12.13	Multiple-Services-Indicator AVP	Fully compliant.	-
12.14	Redirect-Address-Type AVP	Fully compliant.	-
12.15	Requested-Action AVP	Fully compliant.	-
12.16	Subscription-Id-Type AVP	Fully compliant.	-
12.17	Tariff-Change-Usage AVP	Not compliant.	-
12.18	User-Equipment-Info-Type AVP	Fully compliant.	-
13	Credit-Control Application Related Parameters	Fully compliant.	-
14	Security Considerations	Partially compliant.	IPSec may be applied via an external gateway. TLS/DTLS not supported.
14.1	Direct Connection with Redirects	Not applicable.	-
15	Privacy Considerations	Fully compliant.	-
15.1	Privacy-Sensitive AVPs	Not applicable.	Network segregation is site-specific.
15.2	Data Minimization	Fully compliant.	-
15.3	Diameter Agents	Not applicable.	Network segregation is site-specific.
16	References	Not applicable.	-
16.1	Normative References	Not applicable.	-
16.2	Informative References	Not applicable.	-
16	Acknowledgements	Not applicable.	-
Appendix A	Credit-Control Sequences	Fully compliant.	-

Section	Section Heading	Compliance	Notes
A.1	Flow I	Fully compliant.	Refer to *Figure B: Call session, success, user termination* and *Figure C: Call session, session continuation*.
A.2	Flow II	Fully compliant.	Refer to *Figure B: Call session, success, user termination* and *Figure C: Call session, session continuation*.
A.3	Flow III	Fully compliant.	Refer to *Figure K: Event debit, success*.
A.4	Flow IV	Fully compliant.	Refer to *Figure O: Balance check*.
A.5	Flow V	Not compliant.	PRICE_ENQUIRY not supported.
A.6	Flow VI	Fully compliant.	Refer to *Figure L: Event debit, refund*.
A.7	Flow VII	Fully compliant.	Refer to *Figure A: Call session, success, OCS termination*.
A.8	Flow VIII	Not compliant.	Reauthorization not supported.
A.9	Flow IX	Not applicable.	IN/NGIN messaging does not support distinct services within a parent session.

Table 11: N2IWF compliance to RFC 8506

6.3 Compliance to 3GPP TS 32.299 (Release 16)

Note that compliance to individual AVP definitions is not limited to their defined purpose within the 3GPP message flow structure; N2IWF supports arbitrary AVP definitions for use in rating as set out in section *4.4: Credit Control Messaging*.

Section	Section Heading	Compliance	Notes
-	Foreword	Not applicable.	-
1	Scope	Not applicable.	-
2	References	Not applicable.	-
3	Definitions, symbols and abbreviations	Not applicable.	-
3.1	Definitions	Not applicable.	-
3.2	Symbols	Not applicable.	-
3.3	Abbreviations	Not applicable.	-
4	Architecture considerations	Not applicable.	-

Section	Section Heading	Compliance	Notes
4.1	High level architecture	Not applicable.	-
4.1.0	General	Fully compliant.	SCP functions as CTF over Ro.
4.1.1	Charging related transfer requirements	Fully compliant.	-
5	3GPP charging applications requirements	Not applicable.	-
5.1	Offline charging scenarios	Not applicable.	SCP functions as online charging with offline fallback.
5.1.1	Basic principles	Not applicable.	SCP functions as online charging with offline fallback.
5.1.1.0	Introduction	Not applicable.	SCP functions as online charging with offline fallback.
5.1.1.1	Event based charging	Not applicable.	SCP functions as online charging with offline fallback.
5.1.1.2	Session based charging	Not applicable.	SCP functions as online charging with offline fallback.
5.1.2	Basic operation	Not applicable.	SCP functions as online charging with offline fallback.
5.2	Online charging scenarios	Not applicable.	-
5.2.0	Introduction	Fully compliant.	SCP functions as CTF over Ro.
5.2.1	Basic principles	Fully compliant.	-
5.2.2	Charging scenarios	Not applicable.	-
5.2.2.0	Introduction	Fully compliant.	-
5.2.2.1	Immediate Event Debit (IEC)	Fully compliant.	Supported with CCR/CCA.
5.2.2.1.1	Decentralized Unit Determination and Centralized Rating	Fully compliant.	Supported with CCR/CCA.
5.2.2.1.2	Centralized Unit Determination and Centralized Rating	Fully compliant.	Supported with CCR/CCA.
5.2.2.1.3	Decentralized Unit Determination and Decentralized Rating	Fully compliant.	Supported with CCR/CCA.
5.2.2.1.4	Further options	Not applicable.	Service delivery is not a CTF function.
5.2.2.2	Event Debit with Unit Reservation (ECUR)	Fully compliant.	Supported with CCR/CCA.
5.2.2.2.1	Decentralized Unit Determination and Centralized Rating	Fully compliant.	Supported with CCR/CCA.
5.2.2.2.2	Centralized Unit Determination and Centralized Rating	Fully compliant.	Supported with CCR/CCA.

Section	Section Heading	Compliance	Notes
5.2.2.2.3	Decentralized Unit Determination and Decentralized Rating	Not applicable.	No suitable IN/NGIN messaging available.
5.2.2.3	Session charging with Reservation	Fully compliant.	Supported with CCR/CCA.
5.2.2.3.1	Decentralized Unit Determination and Centralized Rating	Fully compliant.	Supported with CCR/CCA.
5.2.2.3.2	Centralized Unit Determination and Centralized Rating	Fully compliant.	Supported with CCR/CCA.
5.2.2.3.3	Decentralized Unit Determination and Decentralized Rating	Not applicable.	No suitable IN/NGIN messaging available.
5.2.3	Basic operations	Partially compliant.	Supported with CCR/CCA. Forwarding not supported.
5.3	Other requirements	Not applicable.	-
5.3.1	Re-authorization	Fully compliant.	-
5.3.2	Threshold based re-authorization triggers	Not compliant.	-
5.3.3	Termination action	Fully compliant.	-
5.3.4	Account expiration	Not compliant.	-
6	3GPP charging applications – Protocol aspects	Not applicable.	-
6.1	Basic principles for Diameter offline charging	Not applicable.	-
6.1.0	Introduction	Not applicable.	SCP functions as online charging with offline fallback.
6.1.1	Event based charging	Not applicable.	SCP functions as online charging with offline fallback.
6.1.2	Session based charging	Not applicable.	SCP functions as online charging with offline fallback.
6.1.3	Offline charging error cases - Diameter procedures	Not applicable.	SCP functions as online charging with offline fallback.
6.1.3.1	CDF connection failure	Not applicable.	SCP functions as online charging with offline fallback.
6.1.3.2	No reply from CDF	Not applicable.	SCP functions as online charging with offline fallback.
6.1.3.3	Duplicate detection	Not applicable.	SCP functions as online charging with offline fallback.
6.1.3.4	CDF detected failure	Not applicable.	SCP functions as online charging with offline fallback.
6.2	Message contents for offline charging	Not applicable.	SCP functions as online charging with offline fallback.

Section	Section Heading	Compliance	Notes
6.2.1	Summary of offline charging message formats	Not applicable.	SCP functions as online charging with offline fallback.
6.2.1.1	General	Not applicable.	SCP functions as online charging with offline fallback.
6.2.1.2	Structure for the Accounting message formats	Not applicable.	SCP functions as online charging with offline fallback.
6.2.2	Accounting-Request message	Not applicable.	SCP functions as online charging with offline fallback.
6.2.3	Accounting-Answer (ACA) message	Not applicable.	SCP functions as online charging with offline fallback.
6.3	Basic principles for Diameter online charging	Not applicable.	-
6.3.1	Online Specific Credit-Control application requirements	Fully compliant.	-
6.3.2	Diameter description on the Ro reference point	Not applicable.	-
6.3.2.1	Basic principles	Fully compliant.	-
6.3.3	Immediate Event Debit (IEC)	Partially compliant.	PRICE_ENQUIRY not supported.
6.3.4	Event Debit with Unit Reservation (ECUR)	Fully compliant.	-
6.3.5	Session Charging with Unit Reservation (SCUR)	Fully compliant.	-
6.3.6	Error cases and scenarios	Not applicable.	-
6.3.6.0	Introduction	Not applicable.	-
6.3.6.1	Duplicate detection	Fully compliant.	-
6.3.6.2	Reserve Units / Debit Units operation failure	Not applicable.	-
6.3.7	Support of tariff changes during an active user session	Not applicable.	-
6.3.7.1	Support of tariff changes using the tariff switch mechanism	Not compliant.	Validity-Time is used instead of the tariff change mechanism.
6.3.7.2	Support of tariff changes using Validity-Time AVP	Fully compliant.	-
6.3.8	Support of re-authorization	Fully compliant.	-
6.3.9	Support of failure handling	Not applicable.	-
6.3.10	Support of failover	Not applicable.	-
6.3.11	Credit pooling	Not compliant.	-
6.4	Message formats for online charging	Not applicable.	-
6.4.1	Summary of online charging message formats	Not applicable.	-

Section	Section Heading	Compliance	Notes
6.4.1.1	General	Fully compliant.	-
6.4.1.2	Structure for the Credit-Control message formats	Fully compliant.	-
6.4.2	Credit-Control-Request message	Partially compliant.	Refer to *Table 6: Credit-Control-Request message parameters (sent from N2IWF)*.
6.4.3	Credit-Control-Answer message	Partially compliant.	Refer to *Table 7: Credit-Control-Answer message parameters (sent to N2IWF)*.
6.4.4	Re-Auth-Request message	Not compliant.	Reauthorization not supported.
6.4.5	Re-Auth-Answer message	Not compliant.	Reauthorization not supported.
6.4.6	Capabilities-Exchange-Request message	Partially compliant.	Refer to *Table 3: Capability exchange message parameters*.
6.4.7	Capabilities-Exchange-Answer message	Partially compliant.	Refer to *Table 3: Capability exchange message parameters*.
6.4.8	Device-Watchdog-Request message	Partially compliant.	Refer to *Table 5: Device watchdog message parameters*.
6.4.9	Device-Watchdog-Answer message	Partially compliant.	Refer to *Table 5: Device watchdog message parameters*.
6.4.10	Disconnect-Peer-Request message	Partially compliant.	Refer to *Table 4: Disconnect peer message parameters*.
6.4.11	Disconnect-Peer-Answer message	Partially compliant.	Refer to *Table 4: Disconnect peer message parameters*.
6.4.12	Abort-Session-Request message	Partially compliant.	Refer to *Table 8:4.4.2.1 Abort-Session-Request message parameters (sent to N2IWF)*.
6.4.13	Abort-Session -Answer message	Partially compliant.	Refer to *Table 9: Abort-Session-Answer message parameters (sent from N2IWF)*.
6.5	Other procedural description of the 3GPP charging applications	Not applicable.	-
6.5.1	Re-Authorization	Not applicable.	-
6.5.1.1	Idle timeout	Not compliant.	-
6.5.1.2	Change of charging conditions	Not compliant.	-
6.5.1.3	Reporting quota usage	Not compliant.	Quota threshold reauthorization not supported.
6.5.1.4	Quota consumption	Not compliant.	-
6.5.2	Threshold based Re-Authorization triggers	Not compliant.	-
6.5.3	Termination action	Fully compliant.	-

Section	Section Heading	Compliance	Notes
6.5.4	Quota consumption time	Not compliant.	Validity-Time is used instead of the quota consumption time mechanism.
6.5.5	Service termination	Fully compliant.	-
6.5.6	Envelope reporting	Not applicable.	-
6.5.6.1	Envelope reporting in Online Charging	Not compliant.	Envelope charging not supported.
6.5.6.2	Envelope reporting in Offline Charging	Not compliant.	Envelope charging not supported.
6.5.6.3	Envelope reporting - Quota consumption time	Not compliant.	-
6.5.6.4	Envelope reporting - Combinational quota	Not compliant.	-
6.5.7	Combinational quota	Not compliant.	-
6.5.8	Online control of offline charging information	Not compliant.	-
6.5.9	Support of multiple service	Fully compliant.	-
6.5.10	Supported Features mechanism	Not applicable.	-
6.5.10.1	Introduction	Not applicable.	-
6.5.10.2	Defining a feature	Not compliant.	-
6.5.10.3	Supported Feature handling	Not compliant.	-
6.6	Bindings of the operation to protocol application	Not applicable.	-
6.6.0	General	Fully compliant.	-
6.6.1	Bindings of Charging Data Transfer to Accounting	Not applicable.	Not used for credit control.
6.6.2	Bindings of Debit / Reserve Units to Credit-Control	Fully compliant.	-
6.7	Securing Diameter messages	-	Refer to Table 10: N2IWF compliance to RFC 6733.
7	Summary of used Attribute Value Pairs	Not applicable.	-
7.1	Diameter AVPs	Not applicable.	-
7.1.0	General	Partially compliant.	Refer to individual AVP compliance.
7.1.1	Accounting-Input-Octets AVP	Not applicable.	Not used for credit control.
7.1.2	Void	Not applicable.	-
7.1.3	Accounting-Output-Octets AVP	Not applicable.	Not used for credit control.

Section	Section Heading	Compliance	Notes
7.1.4	Void	Not applicable.	-
7.1.5	Acct-Application-Id AVP	Not applicable.	Not used for credit control.
7.1.6	Auth-Application-Id AVP	Fully compliant.	-
7.1.7	Called-Station-Id AVP	Fully compliant.	-
7.1.8	Event-Timestamp AVP	Fully compliant.	-
7.1.8A	Experimental-Result AVP	Not compliant.	-
7.1.9	Multiple-Services-Credit-Control AVP	Partially compliant.	GSU pooling, quota management, envelope reporting, triggering, and tariff time change not supported. Only a single Used-Service-Unit is supported. Additional AVPs are supported.
7.1.10	Rating-Group AVP	Fully compliant.	-
7.1.11	Result-Code AVP	Fully compliant.	-
7.1.12	Service-Context-Id AVP	Fully compliant.	-
7.1.13	Service-Identifier AVP	Fully compliant.	-
7.1.14	Used-Service-Unit AVP	Partially compliant.	Only a single unit type is supported.
7.1.15	User-Name AVP	Fully compliant.	-
7.1.16	Vendor-Id AVP	Fully compliant.	-
7.1.17	User-Equipment-Info AVP	Fully compliant.	-
7.2	3GPP specific AVPs	Not applicable.	-
7.2.0	General	Not applicable.	-
7.2.0A	Access-Network-Info-Change AVP	Fully compliant.	-
7.2.0aA	3GPP-PS-Data-Off-Status AVP	Fully compliant.	-
7.2.1	Access-Network-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.1A	Access-Transfer-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.1B	Access-Transfer-Type AVP	Fully compliant.	-
7.2.2	Account-Expiration AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.3	Accumulated-Cost AVP	Not applicable.	Refer to child AVP compliance.
7.2.4	Adaptations AVP	Fully compliant.	-
7.2.5	Additional-Content-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.5A	Additional-Exception-Reports AVP	Fully compliant.	-
7.2.6	Additional-Type-Information AVP	Fully compliant.	-
7.2.7	Address-Data AVP	Fully compliant.	-
7.2.8	Address-Domain AVP	Not applicable.	Refer to child AVP compliance.
7.2.9	Address-Type AVP	Fully compliant.	-
7.2.10	Addressee-Type AVP	Fully compliant.	-
7.2.11	AF-Correlation-Information AVP	Not compliant.	-
7.2.12	Alternate-Charged-Party-Address AVP	Fully compliant.	-
7.2.12aA	Announcement-Identifier AVP	Fully compliant.	-
7.2.12aB	Announcement-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.12aC	Announcement-Order AVP	Fully compliant.	-
7.2.12aD	Announcing-PLMN-ID AVP	Fully compliant.	-
7.2.12A	Announcing-UE-HPLMN-Identifier AVP	Fully compliant.	-
7.2.12B	Announcing-UE-VPLMN-Identifier AVP	Fully compliant.	-
7.2.13	AoC-Cost-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.14	AoC-Format AVP	Fully compliant.	-
7.2.15	AoC-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.16	AoC-Request-Type AVP	Fully compliant.	-
7.2.17	AoC-Service AVP	Not applicable.	Refer to child AVP compliance.
7.2.18	AoC-Service-Obligatory-Type AVP	Fully compliant.	-
7.2.19	AoC-Service-Type AVP	Fully compliant.	-
7.2.20	AoC-Subscription-Information AVP	Not applicable.	Refer to child AVP compliance.

Section	Section Heading	Compliance	Notes
7.2.20aA	API-Content AVP	Fully compliant.	-
7.2.20bA	API-Direction AVP	Fully compliant.	-
7.2.20cA	API-Identifier AVP	Fully compliant.	-
7.2.20dA	API-Invocation-Timestamp AVP	Fully compliant.	-
7.2.20eA	API-Network-Service-Node AVP	Fully compliant.	-
7.2.20fA	API-Result-Code AVP	Fully compliant.	-
7.2.20gA	API-Size AVP	Fully compliant.	-
7.2.20A	APN-Rate-Control AVP	Not applicable.	Refer to child AVP compliance.
7.2.20B	APN-Rate-Control-Downlink AVP	Not applicable.	Refer to child AVP compliance.
7.2.20C	APN-Rate-Control-Uplink AVP	Not applicable.	Refer to child AVP compliance.
7.2.21	Applic-ID AVP	Fully compliant.	-
7.2.22	Application-Provided-Called-Party-Address AVP	Fully compliant.	-
7.2.23	Application-Server AVP	Fully compliant.	-
7.2.24	Application-Server-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.24A	Application-Specific-Data AVP	Fully compliant.	-
7.2.25	Associated-Party-Address AVP	Fully compliant.	-
7.2.26	Associated-URI AVP	Fully compliant.	-
7.2.27	Authorised-QoS AVP	Fully compliant.	-
7.2.28	Aux-Applic-Info AVP	Fully compliant.	-
7.2.29	Base-Time-Interval AVP	Not compliant.	-
7.2.29A	Basic-Service-Code AVP	Not applicable.	Refer to child AVP compliance.
7.2.29B	Bearer-Capability AVP	Fully compliant.	-
7.2.30	Bearer-Service AVP	Fully compliant.	-
7.2.30A	BSSID AVP	Fully compliant.	-
7.2.31	Called-Asserted-Identity AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.31A	Called-Identity AVP	Fully compliant.	-
7.2.31B	Called-Identity-Change AVP	Not applicable.	Refer to child AVP compliance.
7.2.32	Called-Party-Address AVP	Fully compliant.	-
7.2.33	Calling-Party-Address AVP	Fully compliant.	-
7.2.34	Carrier-Select-Routing-Information AVP	Fully compliant.	-
7.2.35	Cause-Code AVP	Fully compliant.	-
7.2.35A	Cellular-Network-Information AVP	Fully compliant.	-
7.2.35B	Civic-Address-Information AVP	Fully compliant.	-
7.2.36	CG-Address AVP	Fully compliant.	-
7.2.37	Change-Condition AVP	Fully compliant.	-
7.2.38	Change-Time AVP	Fully compliant.	-
7.2.38A	Charge-Reason-Code AVP	Fully compliant.	-
7.2.39	Charged-Party AVP	Fully compliant.	-
7.2.39A	Charging-Characteristics-Selection-Mode AVP	Fully compliant.	-
7.2.39B	Charging-Per-IP-CAN-Session-Indicator AVP	Fully compliant.	-
7.2.40	Class-Identifier AVP	Fully compliant.	-
7.2.41	Client-Address AVP	Fully compliant.	-
7.2.41A	CN-Operator-Selection-Entity AVP	Fully compliant.	-
7.2.42	Content-Class AVP	Fully compliant.	-
7.2.43	Content-Disposition AVP	Fully compliant.	-
7.2.44	Content-Length AVP	Fully compliant.	-
7.2.45	Content-Size AVP	Fully compliant.	-
7.2.46	Content-Type AVP	Fully compliant.	-
7.2.46aA	Coverage-Status AVP	Fully compliant.	-
7.2.46aaA	Coverage-Info AVP	Not applicable.	Refer to child AVP compliance.

Section	Section Heading	Compliance	Notes
7.2.46abA	CP-CIoT-EPS-Optimisation-Indicator AVP	Fully compliant.	-
7.2.46acA	CPDT-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.46A	CSG-Access-Mode AVP	Fully compliant.	-
7.2.46B	CSG-Membership-Indication AVP	Fully compliant.	-
7.2.47	Current-Tariff AVP	Not applicable.	Refer to child AVP compliance.
7.2.48	CUG-Information AVP	Fully compliant.	-
7.2.49	Data-Coding-Scheme AVP	Fully compliant.	-
7.2.50	DCD-Information AVP	Fully compliant.	-
7.2.51	Deferred-Location-Event-Type AVP	Fully compliant.	-
7.2.52	Delivery-Report-Requested AVP	Fully compliant.	-
7.2.53	Destination-Interface AVP	Not applicable.	Refer to child AVP compliance.
7.2.54	Diagnostics AVP	Fully compliant.	-
7.2.54A	Discoveree-UE-HPLMN-Identifier AVP	Fully compliant.	-
7.2.54B	Discoveree-UE-VPLMN-Identifier AVP	Fully compliant.	-
7.2.54C	Discoverer-UE-HPLMN-Identifier AVP	Fully compliant.	-
7.2.54D	Discoverer-UE-VPLMN-Identifier AVP	Fully compliant.	-
7.2.55	Domain-Name AVP	Fully compliant.	-
7.2.56	DRM-Content AVP	Fully compliant.	-
7.2.57	Dynamic-Address-Flag AVP	Fully compliant.	-
7.2.57A	Dynamic-Address-Flag-Extension AVP	Fully compliant.	-
7.2.58	Early-Media-Description AVP	Not applicable.	Refer to child AVP compliance.
7.2.58A	Enhanced-Diagnostics AVP	Not applicable.	Refer to child AVP compliance.
7.2.59	Envelope AVP	Not compliant.	-
7.2.60	Envelope-End-Time AVP	Not compliant.	-
7.2.61	Envelope-Reporting AVP	Not compliant.	-

Section	Section Heading	Compliance	Notes
7.2.62	Envelope-Start-Time AVP	Not compliant.	-
7.2.62A	EPDG-Address AVP	Fully compliant.	-
7.2.63	Event AVP	Fully compliant.	-
7.2.64	Event-Charging-TimeStamp AVP	Fully compliant.	-
7.2.65	Event-Type AVP	Not applicable.	Refer to child AVP compliance.
7.2.66	Expires AVP	Fully compliant.	-
7.2.66A	FE-Identifier-List AVP	Fully compliant.	-
7.2.66aA	Exposure-Function-API-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.67	File-Repair-Supported AVP	Fully compliant.	-
7.2.67aA	Forwarding-Pending AVP	Fully compliant.	-
7.2.67A	From-Address AVP	Fully compliant.	-
7.2.68	GGSN-Address AVP	Fully compliant.	-
7.2.69	IM-Information AVP	Fully compliant.	-
7.2.70	Incremental-Cost AVP	Not applicable.	Refer to child AVP compliance.
7.2.70A	Instance-Id AVP	Fully compliant.	-
7.2.71	Interface-Id AVP	Fully compliant.	-
7.2.72	Interface-Port AVP	Fully compliant.	-
7.2.73	Interface-Text AVP	Fully compliant.	-
7.2.74	Interface-Type AVP	Fully compliant.	-
7.2.74aA	Inter-UE-Transfer AVP	Fully compliant.	-
7.2.74A	IMS-Application-Reference-Identifier AVP	Fully compliant.	-
7.2.75	IMS-Charging-Identifier AVP	Fully compliant.	-
7.2.76	IMS-Communication-Service-Identifier AVP	Fully compliant.	-
7.2.76A	IMS-Emergency-Indicator AVP	Fully compliant.	-
7.2.77	IMS-Information AVP	Not applicable.	Refer to child AVP compliance.

Section	Section Heading	Compliance	Notes
7.2.77A	IMS-Visited-Network-Identifier AVP	Fully compliant.	-
7.2.78	IMSI-Unauthenticated-Flag AVP	Fully compliant.	-
7.2.79	Incoming-Trunk-Group-ID AVP	Fully compliant.	-
7.2.79A	Initial-IMS-Charging-Identifier AVP	Fully compliant.	-
7.2.80	Inter-Operator-Identifier AVP	Not applicable.	Refer to child AVP compliance.
7.2.80A	IP-Realm-Default-Indication AVP	Fully compliant.	-
7.2.80B	ISUP-Cause AVP	Not applicable.	Refer to child AVP compliance.
7.2.80C	ISUP-Cause-Diagnostics AVP	Fully compliant.	-
7.2.80D	ISUP-Cause-Location AVP	Fully compliant.	-
7.2.80E	ISUP-Cause-Value AVP	Fully compliant.	-
7.2.80F	ISUP-Location-Number AVP	Fully compliant.	-
7.2.80Fa	Language AVP	Fully compliant.	-
7.2.80G	Layer-2-Group-ID AVP	Fully compliant.	-
7.2.81	LCS-APN AVP	Fully compliant.	-
7.2.82	LCS-Client-Dialed-By-MS AVP	Fully compliant.	-
7.2.83	LCS-Client-External-ID AVP	Fully compliant.	-
7.2.84	LCS-Client-ID AVP	Not applicable.	Refer to child AVP compliance.
7.2.85	LCS-Client-Name AVP	Not applicable.	Refer to child AVP compliance.
7.2.86	LCS-Client-Type AVP	Fully compliant.	-
7.2.87	LCS-Data-Coding-Scheme AVP	Fully compliant.	-
7.2.88	LCS-Format-Indicator AVP	Fully compliant.	-
7.2.89	LCS-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.90	LCS-Name-String AVP	Fully compliant.	-
7.2.91	LCS-Requestor-ID AVP	Not applicable.	Refer to child AVP compliance.
7.2.92	LCS-Requestor-ID-String AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.92A	Local-GW-Inserted-Indication AVP	Fully compliant.	-
7.2.93	Local-Sequence-Number AVP	Fully compliant.	-
7.2.94	Location-Estimate AVP	Fully compliant.	-
7.2.95	Location-Estimate-Type AVP	Fully compliant.	-
7.2.95A	Location-Info AVP	Not applicable.	Refer to child AVP compliance.
7.2.96	Location-Type AVP	Not applicable.	Refer to child AVP compliance.
7.2.97	Low-Balance-Indication AVP	Fully compliant.	-
7.2.97A	Low-Priority-Indicator AVP	Fully compliant.	-
7.2.97B	MBMS-Charged-Party AVP	Fully compliant.	-
7.2.98	MBMS-GW-Address AVP	Fully compliant.	-
7.2.99	MBMS-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.100	MBMS-User-Service-Type AVP	Fully compliant.	-
7.2.101	Media-Initiator-Flag AVP	Fully compliant.	-
7.2.102	Media-Initiator-Party AVP	Fully compliant.	-
7.2.103	Message-Body AVP	Not applicable.	Refer to child AVP compliance.
7.2.104	Message-Class AVP	Not applicable.	Refer to child AVP compliance.
7.2.105	Message-ID AVP	Fully compliant.	-
7.2.106	Message-Size AVP	Fully compliant.	-
7.2.107	Message-Type AVP	Fully compliant.	-
7.2.108	MM-Content-Type AVP	Not applicable.	Refer to child AVP compliance.
7.2.109	MMBox-Storage-Requested AVP	Fully compliant.	-
7.2.110	MMS-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.111	MMTel-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.111A	MMTel-SService-Type AVP	Fully compliant.	-
7.2.111Aa	Monitored-PLMN-Identifier AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.111AaA	Monitoring-Event-Configuration-Activity AVP	Fully compliant.	-
7.2.111AaB	Monitoring-Event-Functionality AVP	Fully compliant.	-
7.2.111AaC	Monitoring-Event-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.111AaD	Monitoring-Event-Report-Data AVP	Not applicable.	Refer to child AVP compliance.
7.2.111AaE	Monitoring-Event-Report-Number AVP	Fully compliant.	-
7.2.111Ab	Monitoring-UE-HPLMN-Identifier AVP	Fully compliant.	-
7.2.111Ac	Monitoring-UE-Identifier AVP	Fully compliant.	-
7.2.111Ad	Monitoring-UE-VPLMN-Identifier AVP	Fully compliant.	-
7.2.111B	MSC-Address AVP	Fully compliant.	-
7.2.111C	MTC-IWF-Address AVP	Fully compliant.	-
7.2.111D	Neighbour-Node-Address AVP	Fully compliant.	-
7.2.111E	Network-Call-Reference-Number AVP	Fully compliant.	-
7.2.112	Next-Tariff AVP	Not applicable.	Refer to child AVP compliance.
7.2.112aA	NIDD-Submission AVP	Not applicable.	Refer to child AVP compliance.
7.2.112A	NNI-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.112B	NNI-Type AVP	Fully compliant.	-
7.2.113	Node-Functionality AVP	Fully compliant.	-
7.2.114	Node-Id AVP	Fully compliant.	-
7.2.115	Number-Of-Diversions AVP	Fully compliant.	-
7.2.116	Number-Of-Messages-Sent AVP	Fully compliant.	-
7.2.117	Number-Of-Participants AVP	Fully compliant.	-
7.2.118	Number-Of-Received-Talk-Bursts AVP	Fully compliant.	-
7.2.119	Number-Of-Talk-Bursts AVP	Fully compliant.	-
7.2.120	Number-Portability-Routing-Information AVP	Fully compliant.	-
7.2.121	Offline-Charging AVP	Not applicable.	Refer to child AVP compliance.

Section	Section Heading	Compliance	Notes
7.2.122	Online-Charging-Flag AVP	Fully compliant.	-
7.2.123	Originating-IOI AVP	Fully compliant.	-
7.2.124	Originator AVP	Fully compliant.	-
7.2.125	Originator-Address AVP	Not applicable.	Refer to child AVP compliance.
7.2.126	Originator-Interface AVP	Not applicable.	Refer to child AVP compliance.
7.2.127	Originator-Received-Address AVP	Fully compliant.	-
7.2.128	Originator-SCCP-Address	Fully compliant.	-
7.2.128A	Outgoing-Session-Id AVP	Fully compliant.	-
7.2.129	Outgoing-Trunk-Group-ID AVP	Fully compliant.	-
7.2.130	Participants-Involved AVP	Fully compliant.	-
7.2.131	Participant-Group AVP	Not applicable.	Refer to child AVP compliance.
7.2.132	Participant-Access-Priority AVP	Fully compliant.	-
7.2.133	Participant-Action-Type AVP	Fully compliant.	-
7.2.134	Void	Not applicable.	-
7.2.135	Void	Not applicable.	-
7.2.135A	PC3-Control-Protocol-Cause AVP	Fully compliant.	-
7.2.135B	PC3-EPC-Control-Protocol-Cause AVP	Fully compliant.	-
7.2.136	PDN-Connection-Charging-ID AVP	Fully compliant.	-
7.2.137	PDP-Address AVP	Fully compliant.	-
7.2.137A	PDP-Address-Prefix-Length AVP	Fully compliant.	-
7.2.138	PDP-Context-Type AVP	Fully compliant.	-
7.2.138A	Play-Alternative AVP	Fully compliant.	-
7.2.139	PoC-Change-Condition AVP	Fully compliant.	-
7.2.140	PoC-Change-Time AVP	Fully compliant.	-
7.2.141	PoC-Controlling-Address AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.142	PoC-Event-Type AVP	Not applicable.	Refer to child AVP compliance.
7.2.143	PoC-Group-Name AVP	Fully compliant.	-
7.2.144	PoC-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.145	PoC-Server-Role AVP	Fully compliant.	-
7.2.146	PoC-Session-Id AVP	Fully compliant.	-
7.2.147	PoC-Session-Initiation-Type AVP	Fully compliant.	-
7.2.148	PoC-Session-Type AVP	Fully compliant.	-
7.2.149	PoC-User-Role AVP	Not applicable.	Refer to child AVP compliance.
7.2.150	PoC-User-Role-IDs AVP	Fully compliant.	-
7.2.151	PoC-User-Role-Info-Units AVP	Fully compliant.	-
7.2.152	Positioning-Data AVP	Fully compliant.	-
7.2.153	Preferred-AoC-Currency AVP	Fully compliant.	-
7.2.154	Priority AVP	Fully compliant.	-
7.2.154aA	Privacy-Indicator AVP	Fully compliant.	-
7.2.154A	ProSe-3rd-Party-Application-ID AVP	Fully compliant.	-
7.2.154Aa	ProSe-Direct-Communication-Reception-Data-Container AVP	Not applicable.	Refer to child AVP compliance.
7.2.154B	ProSe-Direct-Communication-Transmission-Data-Container AVP	Not applicable.	Refer to child AVP compliance.
7.2.154C	ProSe-Direct-Discovery-Model AVP	Fully compliant.	-
7.2.154D	ProSe-Event-Type AVP	Fully compliant.	-
7.2.154E	ProSe-Function-IP-Address AVP	Fully compliant.	-
7.2.154F	ProSe-Function-PLMN-Identifier AVP	Fully compliant.	-
7.2.154G	ProSe-Functionality AVP	Fully compliant.	-
7.2.154H	ProSe-Group-IP-Multicast-Address AVP	Fully compliant.	-
7.2.154I	ProSe-Information AVP	Not applicable.	Refer to child AVP compliance.

Section	Section Heading	Compliance	Notes
7.2.154J	ProSe-Range-Class AVP	Not compliant.	-
7.2.154K	ProSe-Reason-For-Cancellation AVP	Fully compliant.	-
7.2.154L	ProSe-Request-Timestamp AVP	Fully compliant.	-
7.2.154M	ProSe-Role-Of-UE AVP	Fully compliant.	-
7.2.154N	ProSe-Source-IP-Address AVP	Fully compliant.	-
7.2.154O	ProSe-UE-ID AVP	Fully compliant.	-
7.2.154Oa	ProSe-UE-to-Network-Relay-UE-ID AVP	Fully compliant.	-
7.2.154Ob	ProSe-Target-Layer-2-ID AVP	Fully compliant.	-
7.2.154P	Proximity-Alert-Indication AVP	Fully compliant.	-
7.2.154Q	Proximity-Alert-Timestamp AVP	Fully compliant.	-
7.2.154R	Proximity-Cancellation-Timestamp AVP	Fully compliant.	-
7.2.155	PS-Append-Free-Format-Data AVP	Fully compliant.	-
7.2.156	PS-Free-Format-Data AVP	Fully compliant.	-
7.2.157	PS-Furnish-Charging-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.158	PS-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.159	Quota-Consumption-Time AVP	Not compliant.	Validity-Time is used instead of the quota consumption mechanism.
7.2.160	Quota-Holding-Time AVP	Not compliant.	Validity-Time is used instead of the quota consumption mechanism.
7.2.160aA	Quota-Indicator AVP	Not compliant.	-
7.2.160A	Radio-Frequency AVP	Fully compliant.	-
7.2.160B	Radio-Parameter-Set-Info AVP	Not applicable.	Refer to child AVP compliance.
7.2.160C	Radio-Parameter-Set-Values AVP	Fully compliant.	-
7.2.160D	Radio-Resources-Indicator AVP	Fully compliant.	-
7.2.160Da	RAN-End-Timestamp AVP	Fully compliant.	-
7.2.160Db	RAN-Secondary-RAT-Usage-Report AVP	Not applicable.	Refer to child AVP compliance.

Section	Section Heading	Compliance	Notes
7.2.160Dc	RAN-Start-Timestamp AVP	Fully compliant.	-
7.2.160E	Rate-Control-Max-Message-Size AVP	Fully compliant.	-
7.2.160F	Rate-Control-Max-Rate AVP	Fully compliant.	-
7.2.160G	Rate-Control-Time-Unit AVP	Fully compliant.	-
7.2.161	Rate-Element AVP	Not applicable.	Refer to child AVP compliance.
7.2.162	Read-Reply-Report-Requested AVP	Fully compliant.	-
7.2.163	Void	Not applicable.	-
7.2.164	Real-Time-Tariff-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.164A	Reason-Header AVP	Fully compliant.	-
7.2.165	Received-Talk-Burst-Time AVP	Fully compliant.	-
7.2.166	Received-Talk-Burst-Volume AVP	Fully compliant.	-
7.2.167	Recipient-Address AVP	Not applicable.	Refer to child AVP compliance.
7.2.168	Recipient-Info AVP	Not applicable.	Refer to child AVP compliance.
7.2.169	Recipient-Received-Address AVP	Not applicable.	Refer to child AVP compliance.
7.2.170	Recipient-SCCP-Address	Fully compliant.	-
7.2.171	Refund-Information AVP	Fully compliant.	-
7.2.171A	Relationship-Mode AVP	Fully compliant.	-
7.2.171Aa	Related-Change-Condition-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.171Ab	Related-Trigger AVP	Not compliant.	-
7.2.171B	Related-IMS-Charging-Identifier AVP	Fully compliant.	-
7.2.171C	Related-IMS-Charging-Identifier-Node AVP	Fully compliant.	-
7.2.171D	Relay-IP-address AVP	Fully compliant.	-
7.2.172	Remaining-Balance AVP	Not applicable.	Refer to child AVP compliance.
7.2.173	Reply-Applic-ID AVP	Fully compliant.	-
7.2.174	Reply-Path-Requested AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.175	Reporting-Reason AVP	Fully compliant.	-
7.2.176	Requested-Party-Address AVP	Fully compliant.	-
7.2.176A	Requested-PLMN-Identifier AVP	Fully compliant.	-
7.2.176B	Requestor-PLMN-Identifier AVP	Fully compliant.	-
7.2.177	Role-Of-Node AVP	Fully compliant.	-
7.2.177aA	Role-Of-ProSe-Function AVP	Fully compliant.	-
7.2.177A	Route-Header-Received AVP	Fully compliant.	-
7.2.177B	Route-Header-Transmitted AVP	Fully compliant.	-
7.2.178	Scale-Factor AVP	Not applicable.	Refer to child AVP compliance.
7.2.178aA	SCEF-Address AVP	Fully compliant.	-
7.2.178A	SCS-Address AVP	Fully compliant.	-
7.2.178B	SCS-AS-Address AVP	Not applicable.	Refer to child AVP compliance.
7.2.178C	SCS-Realm AVP	Fully compliant.	-
7.2.179	SDP-Answer-Timestamp AVP	Fully compliant.	-
7.2.180	SDP-Media-Component AVP	Not applicable.	Refer to child AVP compliance.
7.2.181	SDP-Media-Description AVP	Fully compliant.	-
7.2.182	SDP-Media-Name AVP	Fully compliant.	-
7.2.183	SDP-Offer-Timestamp AVP	Fully compliant.	-
7.2.184	SDP-Session-Description AVP	Fully compliant.	-
7.2.185	SDP-TimeStamps AVP	Not applicable.	Refer to child AVP compliance.
7.2.186	SDP-Type AVP	Fully compliant.	-
7.2.186A	Session-Direction AVP	Fully compliant.	-
7.2.187	Served-Party-IP-Address AVP	Fully compliant.	-
7.2.188	Void	Not applicable.	-
7.2.188A	Secondary-RAT-Type AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.189	Service-Data-Container AVP	Not applicable.	Refer to child AVP compliance.
7.2.190	Service-ID AVP	Fully compliant.	-
7.2.191	Service-Generic-Information AVP	Fully compliant.	-
7.2.192	Service-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.193	Service-Mode AVP	Fully compliant.	-
7.2.194	Service-Specific-Data AVP	Fully compliant.	-
7.2.195	Service-Specific-Info AVP	Not applicable.	Refer to child AVP compliance.
7.2.196	Service-Specific-Type AVP	Fully compliant.	-
7.2.197	Void	Not applicable.	-
7.2.197a	Serving-Node-Identity	Fully compliant.	-
7.2.198	Serving-Node-Type AVP	Fully compliant.	-
7.2.198A	SGi-PtP-Tunnelling-Method AVP	Fully compliant.	-
7.2.199	SGSN-Address AVP	Fully compliant.	-
7.2.199A	SGW-Address AVP	Fully compliant.	-
7.2.200	SGW-Change AVP	Fully compliant.	-
7.2.201	SIP-Method AVP	Fully compliant.	-
7.2.202	SIP-Request-Timestamp AVP	Fully compliant.	-
7.2.203	SIP-Request-Timestamp-Fraction AVP	Fully compliant.	-
7.2.204	SIP-Response-Timestamp AVP	Fully compliant.	-
7.2.205	SIP-Response-Timestamp-Fraction AVP	Fully compliant.	-
7.2.205A	SM-Device-Trigger-Indicator AVP	Fully compliant.	-
7.2.205B	SM-Device-Trigger-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.206	SM-Discharge-Time AVP	Fully compliant.	-
7.2.207	SM-Message-Type AVP	Fully compliant.	-
7.2.208	SM-Protocol-Id AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.208A	SM-Sequence-Number AVP	Fully compliant.	-
7.2.209	SM-Status AVP	Fully compliant.	-
7.2.210	SM-User-Data-Header AVP	Fully compliant.	-
7.2.211	SMS-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.212	SMS-Node AVP	Fully compliant.	-
7.2.212A	SMS-Result AVP	Fully compliant.	-
7.2.213	SM-Service-Type AVP	Fully compliant.	-
7.2.214	SMSC-Address AVP	Fully compliant.	-
7.2.214A	Start-of-Charging AVP	Fully compliant.	-
7.2.215	Start-Time AVP	Fully compliant.	-
7.2.215A	Status-AS-Code AVP	Fully compliant.	-
7.2.216	Stop-Time AVP	Fully compliant.	-
7.2.217	Submission-Time AVP	Fully compliant.	-
7.2.218	Subscriber-Role AVP	Fully compliant.	-
7.2.219	Supplementary-Service AVP	Not applicable.	Refer to child AVP compliance.
7.2.219A	TAD-Identifier AVP	Fully compliant.	-
7.2.220	Talk-Burst-Exchange AVP	Not applicable.	Refer to child AVP compliance.
7.2.221	Talk-Burst-Time AVP	Fully compliant.	-
7.2.222	Talk-Burst-Volume AVP	Fully compliant.	-
7.2.222A	Target-IP-Address AVP	Fully compliant.	-
7.2.223	Tariff-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.224	Tariff-XML AVP	Fully compliant.	-
7.2.224A	Teleservice AVP	Fully compliant.	-
7.2.225	Terminating-IOI AVP	Fully compliant.	-
7.2.225A	Time-First-Reception AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.225B	Time-First-Transmission AVP	Fully compliant.	-
7.2.226	Time-First-Usage AVP	Fully compliant.	-
7.2.226A	Time-Indicator AVP	Fully compliant.	-
7.2.227	Time-Last-Usage AVP	Fully compliant.	-
7.2.228	Time-Quota-Mechanism	Not compliant.	-
7.2.229	Time-Quota-Threshold AVP	Not compliant.	-
7.2.230	Time-Quota-Type AVP	Not compliant.	-
7.2.231	Time-Stamps AVP	Not applicable.	Refer to child AVP compliance.
7.2.232	Time-Usage AVP	Fully compliant.	-
7.2.232A	TLTRI AVP	Fully compliant.	-
7.2.233	Traffic-Data-Volumes AVP	Not applicable.	Refer to child AVP compliance.
7.2.233A	Transcoder-Inserted-Indication AVP	Fully compliant.	-
7.2.233B	Transit-IOI-List AVP	Fully compliant.	-
7.2.233C	Transmitter-Info AVP	Not applicable.	Refer to child AVP compliance.
7.2.234	Token-Text AVP	Fully compliant.	-
7.2.235	Trigger AVP	Not compliant.	-
7.2.236	Trigger-Type AVP	Not compliant.	-
7.2.237	Trunk-Group-ID AVP	Not applicable.	Refer to child AVP compliance.
7.2.237aA	Void	Not applicable.	-
7.2.237A	Void	Not applicable.	-
7.2.237B	Void	Not applicable.	-
7.2.237Ba	TWAG-Address AVP	Fully compliant.	-
7.2.237C	TWAN-User-Location-Info AVP	Not applicable.	Refer to child AVP compliance.
7.2.238	Type-Number AVP	Fully compliant.	-
7.2.238A	UNI-PDU-CP-Only-Flag AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.2.239	Unit-Cost AVP	Not applicable.	Refer to child AVP compliance.
7.2.240	Unit-Quota-Threshold AVP	Not compliant.	-
7.2.240a	Unused-Quota-Timer AVP	Not compliant.	-
7.2.240A	User-CSG-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.240B	Usage-Information-Report-Sequence-Number AVP	Fully compliant.	-
7.2.241	User-Participating-Type AVP	Fully compliant.	-
7.2.242	User-Session-Id AVP	Fully compliant.	-
7.2.242aaA	UWAN-User-Location-Info AVP	Not applicable.	Refer to child AVP compliance.
7.2.242aA	Variable-Part AVP	Not applicable.	Refer to child AVP compliance.
7.2.242aB	Variable-Part-Order AVP	Fully compliant.	-
7.2.242aC	Variable-Part-Type AVP	Fully compliant.	-
7.2.242aD	Variable-Part-Value AVP	Fully compliant.	-
7.2.242A	VCS-Information AVP	Not applicable.	Refer to child AVP compliance.
7.2.242B	VLR-Number AVP	Fully compliant.	-
7.2.243	Volume-Quota-Threshold AVP	Not compliant.	-
7.2.244	Void	Not applicable.	-
7.2.245	Void	Not applicable.	-
7.2.246	Void	Not applicable.	-
7.2.247	Void	Not applicable.	-
7.2.248	Void	Not applicable.	-
7.2.249	Void	Not applicable.	-
7.2.250	Void	Not applicable.	-
7.2.251	WLAN-Operator-Id AVP	Not applicable.	Refer to child AVP compliance.
7.2.252	WLAN-Operator-Name AVP	Fully compliant.	-
7.2.253	WLAN-PLMN-Id AVP	Fully compliant.	-

Section	Section Heading	Compliance	Notes
7.3	3GPP2 specific AVPs	Not compliant.	-
7.4	ETSI specific AVPs	Not compliant.	-
7.5	oneM2M specific AVPs	Not compliant.	-
Annex A	Bibliography	Not applicable.	-
Annex B	Change history	Not applicable.	-

Table 12: N2IWF compliance to TS 32.299

7 Appendix A: Example CAMEL-Diameter Mapping

An example mapping of information for credit control requests between CAMEL and Diameter for voice calls is shown below.

7.1 Example Credit-Control-Request for CAMEL

Field	Vendor ID	AVP Code	Data Type	Presence (MO)			Presence (MF)			Presence (MT)			Notes
				I	U	T	I	U	T	I	U	T	
Session-Id	0	263	UTF8String	1	1	1	1	1	1	1	1	1	-
Origin-Host	0	264	DiameterIdentity	1	1	1	1	1	1	1	1	1	-
Origin-Realm	0	296	DiameterIdentity	1	1	1	1	1	1	1	1	1	-
Destination-Realm	0	283	DiameterIdentity	1	1	1	1	1	1	1	1	1	-
Auth-Application-Id	0	258	Unsigned32	1	1	1	1	1	1	1	1	1	Set to 4 (DIAMETER_CREDIT_CONTROL).
Service-Context-Id	0	461	UTF8String	1	1	1	1	1	1	1	1	1	-
CC-Request-Type	0	461	Enumerated	1	1	1	1	1	1	1	1	1	Initial interrogation: Set to 1 (INITIAL_REQUEST) Interim interrogation: Set to 2 (UPDATE_REQUEST) Final interrogation: Set to 3 (TERMINATION_REQUEST)
CC-Request-Number	0	415	Unsigned32	1	1	1	1	1	1	1	1	1	-
Event-Timestamp	0	55	Time	1	1	1	1	1	1	1	1	1	Set to the time that this request was sent.
Subscription-Id	0	443	Grouped	1	1	1	1	1	1	1	1	1	-
Subscription-Id-Type	0	450	Enumerated	1	1	1	1	1	1	1	1	1	Set to 0 (END_USER_E164).
Subscription-Id-Data	0	444	UTF8String	1	1	1	1	1	1	1	1	1	MO: Set to CAMEL *Calling Party Number*. MF: Set to CAMEL *Last Redirecting Party Number*. MT: Set to CAMEL *Called Party Number*.
Multiple-Services-Indicator	0	455	Enumerated	1	1	1	1	1	1	1	1	1	Set to 1 (MULTIPLE_SERVICES_SUPPORTED).
Multiple-Services-Credit-Control	0	456	Grouped	1	1	1	1	1	1	1	1	1	-
Requested-Service-Unit	0	437	Grouped	1	1	0	1	1	0	1	1	0	-
CC-Time	0	420	Unsigned32	1	1	0	1	1	0	1	1	0	-
Used-Service-Unit	0	446	Grouped	0	1	1	0	1	1	0	1	1	-
CC-Time	0	420	Unsigned32	0	1	1	0	1	1	0	1	1	-

Field	Vendor ID	AVP Code	Data Type	Presence (MO)			Presence (MF)			Presence (MT)			Notes
				I	U	T	I	U	T	I	U	T	
Service-Identifier	0	439	Unsigned32	1	1	1	1	1	1	1	1	1	-
Rating-Group	0	432	Unsigned32	1	1	1	1	1	1	1	1	1	-
Service-Information	10415	873	Grouped	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	-
VCS-Information	10416	874	Grouped	1	1	1	1	1	1	1	1	1	-
Bearer-Capability	10415	3412	OctetString	1	1	1	1	1	1	1	1	1	Set according to ETSI 300 356-1 based on information provided by the network. Voice: set to 0x00. Video: set to 0x08.
MSC-Address	10415	3417	OctetString	1	1	1	1	1	1	1	1	1	Set to the CAMEL *MSC Address*, as provided by the network.
ISUP-Location-Number	10415	3414	OctetString	0-1	0-1	0	0-1	0-1	0	0-1	0-1	0	MO: Set to CAMEL *Location Information → VLR Number*, if provided by the network. MF: Set to CAMEL *MSC Address*, as provided by the network. MT: Set to CAMEL *Location Information → VLR Number*, if provided by the network.
VLR-Number	10415	3420		0-1	0-1	0	0	0	0	0-1	0-1	0	Set to CAMEL *Location Information → VLR Number*, if provided by the network.
LCS-Information	10415	878	Grouped	1	1	1	1	1	1	1	1	1	-
3GPP-IMSI	10415	1	UTF8String	1	1	1	1	1	1	1	1	1	Set to the CAMEL *IMSI*, as provided by the network.
IMS-Information	10415	876	Grouped	1	1	1	1	1	1	1	1	1	-
Calling-Party-Address	10415	831	UTF8String	1	1	1	1	1	1	1	1	1	Set to the calling party number, normalised from the CAMEL *Calling Party Number* received from the network. Note: this does not include the URI prefix as it will always be E.164, i.e. *tel*.
Called-Party-Address	10415	832	UTF8String	1	1	1	1	1	1	1	1	1	Set to the called party number, normalised preferentially from the CAMEL *Called Party Number* or CAMEL *Called Party BCD Number*, received from the network. Note: this does not include the URI prefix as it will always be E.164, i.e. *tel*.
Event-Type	10415	823	Grouped	1	1	0	1	1	0	1	1	0	-

Field	Vendor ID	AVP Code	Data Type	Presence (MO)			Presence (MF)			Presence (MT)			Notes
				I	U	T	I	U	T	I	U	T	
Event	10415	825	UTF8String	1	1	1	1	1	1	1	1	1	MO: Set to *MO*. MF: Set to *MF*. MT: Set to *MT*.
Requested-Party-Address	10415	1251	UTF8String	1	1	1	1	1	1	1	1	1	Set to the dialled digits, as provided by the network. MO: Set to CAMEL *Called Party BCD Number.* MF: Set to CAMEL *Original Called Party* ID. MT: Set to CAMEL *Called Party Number*.
MMTel-Information	10415	2030	Grouped	0	0	0	0	0	0	0-1	0-1	0-1	-
Supplementary-Service	10415	2048	Grouped	0	0	0	0	0	0	1	1	0	-
MMTel-SService-Type	10415	2031	UTF8String	0	0	0	0	0	0	1	1	1	Whether the calling party presentation restriction indicator is set by the network, i.e. the calling party should remain anonymous. Restricted: set to 1. Otherwise: not included.

Table 13: Example Credit-Control-Request for CAMEL charging

7.2 Example Credit-Control-Answer for CAMEL

Field	Vendor ID	AVP Code	Data Type	Presence (MO)			Presence (MF)			Presence (MT)			Notes
				I	U	T	I	U	T	I	U	T	
Session-Id	0	263	UTF8String	1	1	1	1	1	1	1	1	1	-
Result-Code	0	268	Unsigned32	1	1	1	1	1	1	1	1	1	-
Origin-Host	0	264	DiameterIdentity	1	1	1	1	1	1	1	1	1	-
Origin-Realm	0	296	DiameterIdentity	1	1	1	1	1	1	1	1	1	-
Auth-Application-Id	0	258	Unsigned32	1	1	1	1	1	1	1	1	1	-
CC-Request-Type	0	461	Enumerated	1	1	1	1	1	1	1	1	1	-
CC-Request-Number	0	415	Unsigned32	1	1	1	1	1	1	1	1	1	-
Multiple-Services-Credit-Control	0	456	Grouped	1	1	1	1	1	1	1	1	1	-
Granted-Service-Unit	0	431	Grouped	0-1	0-1	0	0-1	0-1	0	0-1	0-1	0	-
CC-Time	0	420	Unsigned32	1	1	0	1	1	0	1	1	0	The number of seconds to allow for charging.
Service-Identifier	0	439	Unsigned32	1	1	1	1	1	1	1	1	1	-

Field	Vendor ID	AVP Code	Data Type	Presence (MO)			Presence (MF)			Presence (MT)			Notes
				I	U	T	I	U	T	I	U	T	
Rating-Group	0	432	Unsigned32	1	1	1	1	1	1	1	1	1	-
Validity-Time	0	448	Unsigned32	1	1	0	1	1	0	1	1	0	Must be greater than the CC-Time value plus the longest possible routing and ringing time.
Result-Code	0	268	Unsigned32	1	1	1	1	1	1	1	1	1	Indicates status of credit control.
Final-Unit-Indication	0	430	Grouped	0-1	0-1	0	0-1	0-1	0	0-1	0-1	0	Indicates that no further reservations will be granted for this session.
Final-Unit-Action	0	449	Enumerated	1	1	-	1	1	-	1	1	-	Set to 0 (TERMINATE).

Table 14: Example Credit-Control-Answer for CAMEL charging

8 Appendix B: N-Squared Diameter AVPs

The N2IWF natively supports the following N-Squared vendor-specific AVPs. These AVPs are used to carry additional information that is not easily transmissible using IANA and 3GPP standard AVPs. These AVPs are not sent or read by default but may be configured as required. Refer to the N2IWF Technical Guide [R-2] for further details.

All N-Squared vendor-specific AVPs have a Diameter Vendor-Id of **56540** (**N-Squared Software (NZ) Limited**) and have both the **V** and **M** flags set, i.e. are vendor-specific and are mandatory.

Name	Code	Type	Notes
Address-Digits	102	UTF8String	The telephony digits of a network endpoint, as received from the network.
Address-Digits-Derived	106	UTF8String	The normalised telephony digits of a network endpoint, as determined by the N2IWF based on the received address information from the network.
Address-Plan	104	Enumerated	The numbering plan of a network endpoint, as determined by the N2IWF based on the received address information from the network. Possible values are: • E.164/ISDN: set to 1. • E.212: set to 2. • Other: set to 3.
Address-Presentation	105	Enumerated	The presentation restriction type of a network endpoint, as determined by the N2IWF based on the received address information from the network. Possible values are: • Not restricted: set to 1. • Restricted: set to 2. • Unknown: set to 3.
Address-Type	103	Enumerated	The type of address of a network endpoint, as determined by the N2IWF based on the received address information from the network. Possible values are: • International: set to 1. • Unknown: set to 2. • National: set to 3. • Other: set to 4.
Bearer-Capability	107	OctetString	Set according to ETSI 300 356-1 based on information provided by the network.
CGI-Cell-Id	114	OctetString	Contains the Initial DP CGI cell ID, as provided by the network.
CGI-Location-Area-Code	113	OctetString	Contains the Initial DP CGI LAC, as provided by the network.
CGI-Mobile-Country-Code	111	Unsigned32	Contains the Initial DP CGI MCC, as provided by the network.
CGI-Mobile-Network-Code	112	Unsigned32	Contains the Initial DP CGI MNC, as provided by the network.
IMSI	108	UTF8String	Set to the Initial DP *IMSI*, as provided by the network.

Name	Code	Type	Notes
INAP-Called-Party-Address	12	Grouped	Contains information for INAP or CAMEL called party information. `<INAP-Called-Party-Address> ::= < AVP Header: 12 > { Address-Digits } { Address-Type } { Address-Plan } { Address-Presentation } { Address-Digits-Derived } * [ AVP ]`
INAP-Calling-Party-Address	11	Grouped	Contains information for INAP or CAMEL calling party information. `<INAP-Calling-Party-Address> ::= < AVP Header: 11 > { Address-Digits } { Address-Type } { Address-Plan } { Address-Presentation } { Address-Digits-Derived } * [ AVP ]`
INAP-Information	1	Grouped	Contains information for call triggers received from INAP or CAMEL networks. `<INAP-Information> ::= < AVP Header: 1 > { INAP-Trigger-Type } { INAP-Calling-Party-Address } { INAP-Called-Party-Address } { Bearer-Capability } { MSC-Address } [VLR-Number] [INAP-Redirecting-Party-Address] [IMSI] [CGI-Mobile-Country-Code] [CGI-Mobile-Network-Code] [CGI-Location-Area-Code] [CGI-Cell-Id] [Location-Number] [Location-Number-LI] [Location-Age] * [AVP]`

Name	Code	Type	Notes

INAP-Redirecting-Party-Address	13	Grouped	Contains information for INAP or CAMEL redirecting party information.
			`<INAP-Redirecting-Party-Address> ::= < AVP Header: 13 >`
			`{ Address-Digits }`
			`{ Address-Type }`
			`{ Address-Plan }`
			`{ Address-Presentation }`
			`{ Address-Digits-Derived }`
			`* [ AVP ]`

INAP-Trigger-Type	101	Enumerated	The derived type of call attempt for INAP or CAMEL calls. Possible values are: • Originating call attempt: set to 1. • Forwarding call attempt: set to 2. • Terminating call attempt: set to 3.
Location-Age	115	Unsigned32	The age of the Initial DP location information details, as provided by the network.
Location-Number	116	OctetString	Set to the Initial DP *Location Number*, as provided by the network.
Location-Number-LI	117	OctetString	Set to the Initial DP *Location Information* → *Location Number*, as provided by the network.
MSC-Address	109	UTF8String	Set to the Initial DP *MSC Address*, as provided by the network.

Tag-Information	2	Grouped	Contains information for a single N2IWF tag and its derived value. Refer to the N2IWF Technical Guide [R-2] for further details.
			`<Tag-Information> ::= < AVP Header: 2 >`
			`{ Tag-Name }`
			`{ Tag-Value }`
			`* [ AVP ]`

Tag-Name	201	UTF8String	The name of the tag, as configured in N2IWF. Refer to the N2IWF Technical Guide [R-2] for further details.
Tag-Value	202	UTF8String	The stringified value of the tag, set as configured in N2IWF. Refer to the N2IWF Technical Guide [R-2] for further details.
VLR-Number	110	UTF8String	Set to the Initial DP *VLR Number*, as provided by the network.

Table 15: N-Squared vendor-specific AVPs