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ACR Format

PRINTOUT DESCRIPTION

8/190 83-AXB 250 12-V3 Uen Z

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Contents

1 Introduction

This document describes the structure and content of the Accounting-Request (ACR) Rf file format generated by the EPG during Rf charging.

For more information about Rf messages, refer to SGW Rf Interface Descriptionand PGW Rf Interface Description.

2 Overview

The EPG uses the ACR file format to write Diameter Base Protocol (DBP) ACR messages to a Virtual Service-Forwarder (vSFO). If the EPG cannot reach the configured Charging Data Functions (CDFs), then ACR messages are stored to disk. When the EPG restores Diameter connectivity with a CDF, the EPG sends new ACR messages to the CDF using the Diameter connection instead of storing the messages on the vSFO.

The CDFs use Secure File Transfer Protocol (SFTP) to pull the ACR files from the specified directory on the EPG.

3 ACR File Format

ACR files consist of a variable length ACR File Header followed by one or more ACR records. Each individual ACR record consist of an ACR Record Header, followed by a Diameter Header, followed by Attribute Value Pairs (AVPs).

Figure 1 illustrates the contents of an ACR file.

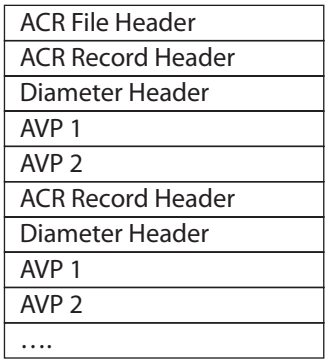

Figure 1 ACR File Format

The ACR file is written in binary encoded format by the EPG that acts as the Charging Trigger Function (CTF). For more information about the CTF, refer to 3GPP TS 32.240.

3.1 ACR File Header

The ACR File Header contains information about the ACR records in the ACR file. As the contents of the ACR File Header are based on the ACR records in the ACR file, the ACR File Header is populated after the last ACR record is included and the ACR file is ready to be closed.

Figure 2 illustrates the contents of the ACR File Header for Release 9. Figure 3 illustrates the contents of the ACR File Header for Releases 10, 11, 12, 13, 14, and 15.

Bits								
Octets	8	7	6	5	4	3	2	1
1..4	File length							
5..8	Header length							
9	High Release Identifier			High Version Identifier				
10	Low Release Identifier			Low Version Identifier				
11..14	File opening timestamp							
15..18	Timestamp when last ACR was appended to file							
19..22	Number of ACRs in file							
23..26	File sequence number							
27	File Closure Trigger Reason							
28..47	IP Address of Node that generated file							
48	Lost ACR indicator							
49..50	Length of ACR routing filter							

Figure 2 ACR File Header Format for Release 9

Bits								
Octets	8	7	6	5	4	3	2	1
1..4	File length							
5..8	Header length							
9	High Release Identifier			High Version Identifier				
10	Low Release Identifier			Low Version Identifier				
11..14	File opening timestamp							
15..18	Timestamp when last ACR was appended to file							
19..22	Number of ACRs in file							
23..26	File sequence number							
27	File Closure Trigger Reason							
28..47	IP Address of Node that generated file							
48	Lost ACR indicator							
49..50	Length of ACR routing filter							
51..xy	ACR routing filter							
xy+1..xy+2	Length of Private Extension							
xy+3..n	Private Extension							
n+1	High Release Identifier extension							
n+2	Low Release Identifier extension							

Figure 3 ACR File Header Format for Releases 10, 11, 12, 13, 14, and 15

The following sections detail the individual fields that compose the ACR File Header.

By default, all fields are mandatory and are always included in the ACR File Header. Exceptions are included in the individual field descriptions below.

3.1.1 File Length

The File Length field, made up of 4 octets, contains a binary value that indicates the total length of the ACR file in octets, including the file header and the total ACR payload length.

3.1.2 Header Length

The Header Length field, made up of 4 octets, contains a binary value that indicates the total length of the ACR File Header in octets.

3.1.3 High Release Identifier / High Version Identifier

The High Release Identifier field contains the highest release of ACR records in the ACR file. The High Version Identifier field contains the highest version of the highest release of ACR records in the ACR file. The highest release number is stored on the most significant 3 bits of the octet, and the highest version number is stored on the least significant 5 bits of the same octet. For the High Release Identifier, a value of 110 indicates Release 9, and a value of 111 indicates Releases 10, 11 12, 13, 14, and 15. For the High Version Identifier, a value of 00110 indicates Release version 6, a value of 01001 indicates Release version 9, a value of 01101 indicates Release version 13, and a value of 00010 indicates Release version 2.

For more information, refer to SoC with 3GPP TS 32.299.

3.1.4 Low Release Identifier / Low Version Identifier

The Low Release Identifier field contains the lowest release of ACR records in the ACR file. The Low Version Identifier field contains the lowest version of the lowest release of ACR records in the ACR file. The lowest release number is stored on the most significant 3 bits of the octet, and the lowest version number is stored on the least significant 5 bits of the same octet. For the Low Release Identifier, a value of 110 indicates Release 9, and a value of 111 indicates Releases 10, 11, 12, 13, 14, and 15. For the Low Version Identifier, a value of 00110 indicates Release version 6, a value of 01001 indicates Release version 9, a value of 01101 indicates Release version13, and a value of 00010 indicates Release version 2.

For more information, refer to SoC with 3GPP TS 32.299.

3.1.5 File Opening Timestamp

The File Opening Timestamp field, made up 4 octets, contains the time the ACR file was opened. The time values are spread out over 4 octets according to the format described below:

— Binary bits 1 to 4 indicate the month (1...12) according to the local time zone of the EPG.

— Binary bits 5 to 9 indicate the day (1...31) according to the local time zone of the EPG.

— Binary bits 10 to 14 indicate the hour (0...23) according to the local time zone of the EPG.

— Binary bits 15 to 20 indicate the minute (0...59) according to the local time zone of the EPG.

— Binary bit 21 indicates the sign of the deviation of the local time of the EPG from Coordinated Universal Time (UTC). A bit value of 1 expresses + time deviation, while a bit value of 0 expresses - time deviation. In case there is no time deviation from UTC, the binary bit can take either value.

— Binary bits 22 to 26 indicate the hour (0...23) deviation of the local time of the EPG from UTC.

— Binary bits 27 to 32 indicate the minute (0...59) deviation of the local time of the EPG from UTC.

3.1.6 Last ACR Append Timestamp

The Last ACR Append Timestamp field, made up of 4 octets, contains the time the last ACR was appended to the ACR file. The time values are spread out over 4 octets according to the format described below:

— Binary bits 1 to 4 indicate the month (1...12) according to the local time zone of the EPG.

— Binary bits 5 to 9 indicate the day (1...31) according to the local time zone of the EPG.

— Binary bits 10 to 14 indicate the hour (0...23) according to the local time zone of the EPG.

— Binary bits 15 to 20 indicate the minute (0...59) according to the local time zone of the EPG.

— Binary bit 21 indicates the sign of the deviation of the local time of the EPG from Universal Time Coordinated (UTC). A bit value of 1 expresses + time deviation, while a bit value of 0 expresses - time deviation. In case there is no time deviation from UTC, the binary bit can take either value.

— Binary bits 22 to 26 indicate the hour (0...23) deviation of the local time of the EPG from UTC.

— Binary bits 27 to 32 indicate the minute (0...59) deviation of the local time of the EPG from UTC.

3.1.7 Number of ACRs in File

The Number of ACRs in File field, made up of 4 octets, contains a binary value that specifies the total number of ACR records that are included in the ACR file.

3.1.8 File Sequence Number

The File Sequence Number field, made up of 4 octets, contains a binary value that identifies the running number of the ACR files generated by the EPG. The running count of the File Sequence Number field starts from 0.

The first ACR file generated by the EPG carries the sequence number 1, and each additional ACR file generated increases the running number by 1. The sequence number is reset to 1 when the running number reaches the maximum value of 65534. This is because only 2 of the File Sequence Number field octets are used for the sequence number in the EPG.

3.1.9 File Closure Trigger Reason

The File Closure Trigger Reason field, made up of 1 octet, contains a binary value that identifies the reason the ACR file was closed by the EPG.

The EPG uses only the value 0, meaning an undefined normal closure reason.

3.1.10 Lost ACR Indicator

The Lost ACR Indicator field, made up of 1 octet, contains a binary value that indicates if any ACRs were lost during processing in the EPG, and an approximate number of lost ACRs in case there were ACRs lost. As the EPG cannot determine if any ACR records were lost during processing, the value included in this field in ACR files created by the EPG is always 00000000, which corresponds to the indication "no ACRs lost".

3.1.11 Length of ACR Routing Filter

The Length of ACR Routing Filter field, made up of 2 octets, contains a binary value that specifies the length of the following ACR Routing Filter field.

This field is not supported in ACR files created by the EPG. The EPG uses the value 00000000.

3.1.12 High Release Identifier Extension

The High Release Identifier extension field, made up of 1 octet, contains a binary value that indicates the 3GPP Release of TS 32.298 for a High Release Identifier beyond Release 9.

Table 1 shows the 3GPP Releases of TS 32.298 indicated by the binary values for a High Release Identifier Extension.

Table 1 High Release Identifier Extension

Binary Value	3GPP Release of TS 32.298
0	Release 10
1	Release 11
2	Release 12
3	Release 13
4	Release 14
5	Release 15

This field is only present when the High Release Identifier value is 111.

3.1.13 Low Release Identifier Extension

The Low Release Identifier extension field, made up of 1 octet, contains a binary value that indicates the 3GPP Release of TS 32.251 for a Low Release Identifier beyond Release 9.

Table 2 shows the 3GPP Releases of TS 32.298 indicated by the binary values for a Low Release Identifier Extension.

Table 2 Low Release Identifier Extension

Binary Value	3GPP Release of TS 32.298
0	Release 10
1	Release 11
2	Release 12
3	Release 13
4	Release 14
5	Release 15

This field is only present when the Low Release Identifier value is 111.

3.2 ACR Record Header

Each individual ACR record consists of an ACR Record Header, followed by a Diameter Header, followed by AVPs.

Figure 4 illustrates the contents of the ACR Record Header.

Bits								
Octets	8	7	6	5	4	3	2	1
1..2	ACR length							
3	Release Identifier			Version Identifier				
4	Data Record Format			TS number				
5	Release Identifier extension							

Figure 4 ACR Record Header Format

The following sections describe in detail the individual fields that make up the ACR Record Header.

3.2.1 ACR Length

The ACR Length, made up of 2 octets, contains a binary value that specifies the length of the following ACR, not including the length of its associated header.

3.2.2 Release Identifier / Version Identifier

The Release Identifier field contains the release of the following ACR. The Version Identifier field contains the version of the following ACR. The release number is stored on the most significant 3 bits of the octet, and the version number is stored on the least significant 5 bits of the same octet.

The Release Identifier value is 110 for Release 9, and 111 for Releases 10, 11 12, 13, 14, and 15. For the Version Identifier, a value of 00110 indicates Release version 6, a value of 01001 indicates Release version 9, a value of 01101 indicates Release version13, and a value of 00010 indicates Release version 2.

For more information, refer to SoC with 3GPP TS 32.299.

3.2.3 Data Record Format / TS Number

The Data Record Format field contains a binary value that identifies the ACR encoding used in the following ACR. The TS Number field contains a binary value that identifies the 3GPP TS the encoding is based on. The data record format is stored on the most significant 3 bits of the octet, and the TS number is stored on the least significant 5 bits of the same octet.

The encoding used in the EPG is ACR Data File. The value included in the Data Record Format field is always 101 in ACRs.

The encoding is based on TS 32.251. The value included in TS Number is always 00111.

For more information, refer to SoC with 3GPP TS 32.299.

3.2.4 Release Identifier Extension

The Release Identifier extension field, made up of 1 octet, contains a binary value that identifies the 3GPP Release of TS 32.298 for releases beyond Release 9.

Table 3 shows the 3GPP Releases of TS 32.298 indicated by the binary values for a Release Identifier Extension.

Table 3 Release Identifier Extension

Binary Value	3GPP Release of TS 32.298
0	Release 10
1	Release 11
2	Release 12
3	Release 13
4	Release 14
5	Release 15

This field is only present when the Release Identifier value is 111.

3.3 Diameter Header

The Diameter headers used in ACR files are the same as the ones used in generic ACR Rf charging.

For a complete description of Diameter headers used in ACR Rf charging, refer to SGW Rf Interface Descriptionand PGW Rf Interface Description.

3.4 AVPs

The AVPs used in ACR files are the same as the ones used in generic ACR Rf charging.

For a complete description of AVPs used in ACR Rf charging, refer to SGW Rf Interface Description and PGW Rf Interface Description.

4 Naming and Storing Conventions of ACR Files

The file naming and file storing conventions ensure that ACR file names are unique among a large number of CTF nodes over an extended period of time, and that stored ACR files can be retrieved without the need for manual assistance.

The file name includes the following information:
nodeID_-_sequence.date_-_time

Table 4 describes the fields that make up the file name.

Table 4 Fields Included in the ACR File Name

nodeID	Includes the name of the SGW or PGW that generates the ACR file.
sequence	Includes a running count of the ACR files generated by the CTF. The running count starts with a value of 1 and is incremented by 1 each time the CTF starts generating an ACR file. A progressive integer generated by the a central function in the node (range [1–65535]). This sequence number wraps around when 65535 has been reached. The sequence number integrity is assured across system restarts, such as reload, RPSW switchover, graceful restart, or a local board restart, but may be broken following a software upgrade or if the system fails.
date	Includes the date when the ACR file was closed in ASCII. The contents of the field are in the format **yyyymmdd**, where: • **yyyy** is the year the ACR file was closed in four digit notation. • **mm** is the month the ACR file was closed in two digit notation (01...12). • **dd** is the day the ACR file was closed in two digit notation (01...31).
time	Includes the time when the ACR file was closed in ASCII. The contents of the field are in the format **hhmmtimezone** • **hh**is the hour of local time the ACR file was closed in two digit notation, based on a 24 hour clock (00...23). • **mm** is the minute of local time the ACR file was closed in two digit notation (00...59). • **timezone** indicates the local time deviation from UTC (-1200 to +1200). Both -0000 and +0000 indicate no deviation from UTC.

The following example shows the file name of ACR sequence number **44** for the EPG named **PGWEast01** would generate on the **5th of May 2010** at **18:00** in Stockholm.

```
PGWEast01_-_44.20100505_-_1800+0200
```

Example 1 File Naming

The EPG stores ACR files that are closed and ready for transfer to the CDF in the following directories:

— **/var/opt/services/epg/rfcdr** (if `separateOfflineDirectories` command is disabled)

— **/var/opt/services/epg/sgw_rfcdr** (if `separateOfflineDirectories` command is enabled)

For more information about `separateOfflineDirectories` command, see Offline Charging Configuration.

5 Basic File Transport Mechanism

ACR files that are closed and ready for transfer to the CDF are transferred in pull mode from the ACR file directory of the EPG using the SFTP protocol.

Reference List

Standards

[1] 3rd Generation Partnership Project; Technical Specification Group Service and System Aspects; Charging management; Charging architecture and principles, 3GPP TS 32.240, 3GPP TS 32.240