



Capability to Record and Produce Call Transactions

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Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	ePDG
Applicable Platform(s)	<ul style="list-style-type: none"> • ASR 5500 • VPC-DI • VPC-SI
Feature Default	Disabled - Configuration Required
Related Changes in This Release	Not Applicable
Related Documentation	<i>ePDG Administration Guide</i>

Revision History

Revision Details	Release
Added RTT Record Schema table.	21.26
ePDG supports capability to record and produce call transactions.	21.23
First Introduced.	Release 20

Feature Description

Real Time Tool (RTT) is used in Regions and Network Operations Center (NOC) for debugging network issues and to understand user behavior. All call transactions in ePDG are generated in RTT files. The ePDG support allows to understand service impact on the ePDG chassis for WLAN offload service. ePDG transfers RTT files to the external server through SSH File Transfer Protocol (SFTP). The RTT files that are in comma separated values (.CSV) format are transferred either in compressed or non-compressed format based on the configuration to the external servers such as servers in customer network either directly or through the Cisco Collector server.



Note RTT Record Schema and its procedure numbers are genericized to Gateway RTT. Contact your Cisco account representative for detailed information on specific RTT Record Schema.

How It Works

This section describes the RTT procedures and schema.

RTT Procedures

The following table lists the RTT procedures that are specific to ePDG, P-GW and SaMOG:

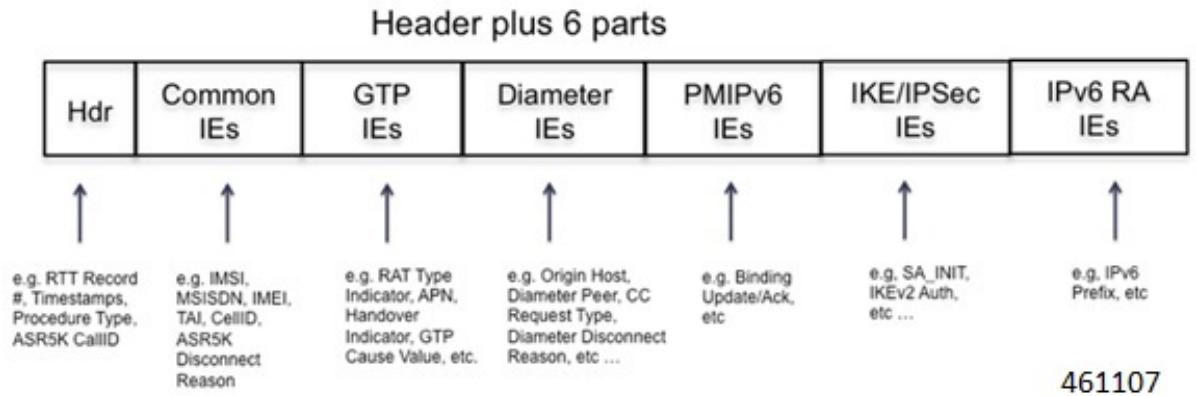
Procedure Number	Procedure Name	Applicability
1	S5/S8/S2b GTP Create Session	P-GW, ePDG, SaMOG
2	S5/S8/S2b GTP Create Bearer	P-GW, ePDG, SaMOG
3	S5/S8/S2b GTP Delete Session	P-GW, ePDG, SaMOG
4	S5/S8/S2b GTP Delete Bearer	P-GW, ePDG, SaMOG
5	GTP Modify Bearer	P-GW
6	S5/S8/S2b GTP Update Bearer	P-GW, ePDG, SaMOG
7	S6b/SWm – Diameter AAR/ AAA	P-GW, ePDG, SaMOG
8	S6b/SWm – Diameter RAR/RAA	P-GW, ePDG, SaMOG
9	S6b/SWm – Diameter Session Termination	P-GW, ePDG, SaMOG
10	S6b/SWm – Abort Session	P-GW, ePDG, SaMOG
11	Diameter Gx – CCR-I/CCA-I	P-GW
12	Diameter Gx – CCR-U/CCA-U	P-GW

Procedure Number	Procedure Name	Applicability
13	Diameter Gx – CCR-T/CCA-T	P-GW
14	Diameter Gx – RAR/RAA	P-GW
15	Diameter Gy – CCR-I/CCA-I	P-GW
16	Diameter Gy – CCR-U/CCA-U	P-GW
17	Diameter Gy – CCR-T/CCA-T	P-GW
18	Diameter Gy – RAR/RAA	P-GW
19	PMIPv6 S2a – Binding Update/Acknowledgement	P-GW
20	PMIPv6 S2a Revocation Update/Acknowledgement	P-GW
21	SWu – IKEv2 SA INIT/Resp	ePDG
22	SWu – IKEv2 Auth Req/Resp	ePDG
23	SWu – IKEv2 Information Req/Resp	ePDG
24	SWm – Diameter EAP Request/Answer	ePDG, SaMOG
25	ePDG Router Advertisement	ePDG, SaMOG
26	SWu – CREATE_CHILD_SA Req/Resp	ePDG
27	Radius – WLC-SaMOG Access Request/Challenge	SaMOG
28	Radius – WLC-SaMOG Access Request/Accept	SaMOG
29	Radius – WLC-SaMOG Disconnect Request/Response	SaMOG
30	Radius – WLC-SaMOG Accounting Request/Response	SaMOG
31	Radius – SaMOG-Radius Server Accounting Req/Res	SaMOG
32	WLC – SaMOG DHCP Discover/Offer	SaMOG
33	WLC – SaMOG DHCP Request/Ack/Nak	SaMOG
34	WLC – SaMOG DHCP Release/Ack/Nak	SaMOG

RTT Record Schema

The following figure details the new RTT schema.

Figure 1: RTT Record Schema



RTT schema has a Header and the following six blocks of Information Elements (IEs). There are totally 170 IEs that are grouped in 6 blocks. Contact your Cisco account representative for the complete list of RTT Record Schema IEs.

- Common IEs
- GPRS Tunneling Protocol (GTP) IEs. These IEs are existing and are re-used.
- Diameter IEs (new IEs)
- Proxy Mobile IPv6 IEs
- Internet Key Exchange (IKE)/ Internet Protocol Security (IPsec) IEs
- Internet Protocol v6 Router Advertisement (IPv6 RA IEs)



Note IKE/IPSec and IPv6 RA IEs are new and they are contained inside new blocks. Diameter IEs are new and are appended to the existing Diameter IE blocks.

The RTT Record schemas are listed in the following table:

Table 1:

IE	Description	Format Example	Relevant Procedures
1	Gateway RTT Record Number	Counter in <proclat-type> <instance-id> <RTT-record-#>	All
2	Gateway RTT Version Number	Version 3 in R20.0	All
3	Procedure Number	Defined in CFS Table 1	All
4	Gateway Name	Host Name of the Chassis	All

IE	Description	Format Example	Relevant Procedures
5	Procedure Start Time (GMT)	Time in UTC, (to ms accuracy)	All
6	Procedure End Time (GMT)	Time in UTC, (to ms accuracy)	All
7	ASR5K CallID	Internal CallID, for example [376efb10]	All
8 to 10	Reserved		
11	IMSI	Example [311480076488840]	1 11 12 13 22 24
12	MSISDN	Example [19728256305]	1 5 7 15 16 17
13	IMEISV	Example [9900028823793406]	1 11 15
14	TAI - MCC/MNC/TAC	Example string [311-480-0x3B00]	1 through 6 11 12 15 16
15	Cell ID	ECI. Example [0xE70D01]	1 through 6 11 12 15 16
16	ASR5K Disconnect Reason	Internal reason for session disconnect (Example: timeout, error).	All (pending error)
17 to 20	Reserved		
21	Serving Network	MCC MNC. Example [311480]	1 5
22	Radio Access Technology	Defined in TS29.274, example [6 = E-UTRAN]	22
23	Handover Indicator	HI field in Indication attribute; example [0 = New PDN; 1 = Handover]	1 5
24	SGW/HSGW/ePDG TEID	Tunnel Identifier for Peer. Example [0x26B609F0]	1 2 5
25	PGW TEID	Tunnel Identifier for PGW. Example [0x084BC005]	1 2
26	AN GW Address	IP Address of Remote GW: HSGW or SGW	1 2 5

IE	Description	Format Example	Relevant Procedures
27	Access Point Name	String, example: [Customer.mnc311.mcc4803 gppnetwork.org]	1
28	Framed-IP Address	UE assigned IPv4 address	1 11 12 13
29	Framed-IPv6 Address	UE assigned IPv6 prefix/address	1 11 12 13
30	Uplink AMBR	In Kbps; example [0-4294967295]	1 6
31	Downlink AMBR	In Kbps; example [0-4294967295]	1 6
32	PCO DNS IPv6 Address – Primary	IPv6 Address of Primary DNS server	1
33	PCO DNS IPv6 Address – Secondary^Tertiary	Secondary IPv6 Address ^ Tertiary IPv6 Address for DNS	1
34	PCO DNS IPv4 Address – Primary	IPv4 address	1
35	PCO DNS IPv4 Address - Secondary	Secondary IPv4 Address ^ Tertiary IPv6 Address for DNS	1
36	List of EPS Bearer IDs (Successful)	Each bearer Id shall be separated by a “ ” Example 1 3 5	1 2 4 5 6
37	Linked Bearer Identity	Based on TS29.274, example [0-15]	2 3 4 5
38	Uplink MBR	In Kbps. MBR. Example 1234 3456 567 MBR of each bearer shall be separated by “ ” and has the same order as of IE 37	1 6
39	Downlink MBR	Same as Uplink MBR	1 6
40	Uplink GBR	In Kbps. GBR. Example 1234 3456 567 MBR of each bearer shall be separated by “ ” and has same order as of IE 37	1 6

IE	Description	Format Example	Relevant Procedures
41	Downlink GBR	Same as Uplink GBR	1 6
42	GTP Cause Value	Based on TS29.274 Request/Acceptance/Rejection Cause, example [1-255]	1 to 6
43	Piggyback Record Indicator	Explicit indication of piggyback message record, example (0=no; 1=yes)	2 5
44 to 50	Reserved		
51	Session ID	Session-ID for Authentication Session, example, UTF8 String [0004-diamproxy.WSBOMAGJPNC.S6b.vzims.com; 21604107; 449305093; 536f9359-503]	7 to 18 24
52	Auth-Application ID	Example [S6b = 16777999 , Gx = 16777238, Gy = 4]	7 to 18 24
53	PGW-Host (Origin Host)	FQDN of PGW, example [0004-diamproxy.WSBOMAGJPNC.Gy.vzims.com]	7 to 18 24
54	Diameter Peer Address Realm	FQDN of 3GPP AAA, PCRF OCS realm, example [Customerims.com]	7 to 18 24
55	Dest Peer Host	FQDN of 3GPP AAA, PCRF, OCS host, example [njbbpcrf1a.vzims.com]	7 to 18 24
56	CC Request Type	Example Enumerated [1-3, for I, U, T]	11 12 13 15 16 17
57	CC Request Number	Example [0]	11 12 13 15 16 17
58	Result Code	Diameter Result Code based on RFC3588, example [2001]	7 to 18 24
59	Origin State ID	Example [1366695723]	7 to 18

IE	Description	Format Example	Relevant Procedures
60	Service-Selection	AVP used for providing APN name for authorization, example [Customerinternet]	12 24
61	Charging Gateway Function Host	FQDN of CGF, example [cgf1.NEE29.vzims.com]	5 7
62	Charging Group ID	Charging ID of each bearer shall be separated by “ ” in the order same as that of IE 37 followed by 44	5 7
63	Server-Name (CSCF Address)	Only on IMS APN, example [pcscf1.CTX07.vzims.com]	7
64	Framed-pool	Pool name from which IPv4 address is to be allocated, example [int41]	7
65	Framed-IPv6-Pool	Pool name from which IPv6 prefix is to be allocated, example [ims61]	7
66	Auth-Request-Type	Based on TS29.273 and 29.212. Example Enumerated [1-3]	7 24
67	Re-Auth-Request-Type	Based on TS29.273 and 29.212. Example Enumerated [0-1]	8 14 18
68	Diameter Termination Cause	Based on TS29.273 and 29.212. Example Enumerated [1-8]	9 13 17
69	QoS Class Identifier	QCI, example [8]	11 12 15 16
70	IP-CAN Type	Example [5 = 3GPP-EPS]	11 12 14
71	Event Trigger	Based on TS29.212, Series of Pipe Delimited Triggers, example [1 = QOS_CHANGE]	11 12
72	Reserved IE / Unused		

IE	Description	Format Example	Relevant Procedures
73	Charging-Rule-Remove	Name of the removed Charging rule, example String [RTRRule3300]	12
74	Charging-Rule-Install	Name of the installed Charging rule, example String[RTRRule3300]	11
75	Multiple Services Indicator	Based on TS32.299, example Enumerated [0-1]	15 16 17
76	Multiple Services Credit Control Rating-Group	Identifier of Rating Troup, example [3300]	15 16 17
77	Multiple Services Credit Control Granted Service Unit	CC-Total-Octets, example [524288000]	15
78	Reserved		
79	Reserved		
80	Reserved		
81	EAP Auth-Session-State	Example: STATE_MAINTAINED (0)	24
82	WLAN User-Name	Example: 0311150123456701@wlan.mnc150.mcc311.3gppnetwork.org	24
83	RAT Type	Example: 0 = WLAN	24
84	Visited Network Identifier	Example: mnc150mcc311.3gppnetwork.org	24
85	EAP-Master-Session-Key	MSK	24
86	APN Configuration	PDN-Type Service = Selection Gateway	24
87 to 90	Reserved		
91	MAG IP Address	MAG IP Address	19 20
92	LMA IP Address	LMA IP Address	19 20

IE	Description	Format Example	Relevant Procedures
93	IMSI-NAI	Example: 631148000021024@nai.epc. mnc480. mcc311.3 gppnetwork.org	19 20
94	Service Selection Mobility Option	Set to EPS APN Name, formatted as 3GPP TS 23.003, example, Customerims	19 20
95	Home Network Prefix Option	Dynamic or Static Prefix assigned plus IID allocated for UE	19 20
96	IPv4 Address Request	Address/Prefix, example. 1.1.1.1/32	19
97	IPv4 Address Acknowledgement	Status:Address/Prefix, example. 0:1.1.1.1/32	19
98	IPv4 Default Router	IPv4 Address, example. 2.2.2.2	19
99	Uplink GRE key	Hex, e.g. 0x004D90CC	19
100	Downlink GRE key	Hex, example. 0xCC904D00	19
101	Charging Characteristics	Hex, example. 0x0A	19
102	Charging ID	Hex, example. 0x5E9BD665	19
103	Serving Network	MCC-MNC	19
104	Base Station ID	Hex, example. 001C0001008A	19
105	MEID	Decimal String, example. 99000044001930	
106	Binding Sequence #	16 bit unsigned integer for Binding Update and Ack	19
107	Lifetime	16 bit unsigned integer representing ime before binding unit is considered expired. Example. 0x0708	19
108	Handoff Indicator Option	HO Indicator Example. 0x01 = new attachment	19

IE	Description	Format Example	Relevant Procedures
109	Access Technology Type (ATT)	Example. 0x09 = eHRPD	19
110	Proxy Binding Status	8-bit unsigned integer indicating status of BU processing.	19
111	PCO DNS IPv6 Address	DNS IPv6 Address. if multiple, format = "Addr1 Addr2"	19
112	PCO DNS IPv4 Address	DNS IPv4 Address. if multiple, format = "Addr1 Addr2"	19
113	P-CSCF Address	P-CSCF IPv6 Address (if multiple, format = "Addr1!Addr2"	19
114	Binding Revocation Status	8-bit unsigned integer indicating result of processing BRI. Values less than 128 indicates success	20
115	Binding Revocation Sequence #	Sequence number to match BRI and BRA messages	20
116	Revocation Trigger	8-bit unsigned integer indicating per UE or global reasons for trigger	20
117	Revocation Flag	Hex, example. 0x4	20
118 to 130	Reserved		
131	UE IP Address	UE IP address	21 22 23 26
132	UE UDP Port for SA_INIT	UE UDP Source Port for SA_INIT	21 22 23 26
133	ePDG Address	ePDG IP address for SA_INIT	21 22 23 26
134	ePDG Port	ePDG UDP Port for SA_INIT (example: 4500 for IKE)	21 22 23 26
135	Initiator SPI	Initiator (UE) SPI	21 22 26
136	Responder SPI	Responder (ePDG) SPI	21 22 26

IE	Description	Format Example	Relevant Procedures
137	Transform Header Type and ID	TypeID negotiated value is entered. x y z w U (Enc/prf/Integrity/Dhg/ESN) In case value is not negotiated, then -1 is entered. Example: PRF is not present in IKE_Auth. Value will be IANA standard number for these protocols.	21 22 26
138	KE DH Group	Diffie Hellman Group Number	21 26
139	Notify Message Type	Example: NAT_Detection IP Type (delimited as necessary) will be delimited as x y z^a b c where x/y/z are notify in Procedure request and a/b are notify in Procedure response. If either Request or Response doesn't have any Notify, it will be blank either before or after the delimiter ^.	21 26
140	IDi	Identification Initiator: RFC822 Address, example: 0311150123456701@wlan.mcc311.3gppnetwork.org	22
141	IDr	Identification Responder: IKEv2 FQDN ID, example: apncf.w-apn.mnc150.mcc311.pub.3gppnetwork.org	22
142	TSi	Protocol Type Address Range Port Range (Can be delimited by ^ if more than one TS)	22

IE	Description	Format Example	Relevant Procedures
143	TSr	Protocol Type Address Range Port Range (Can be delimited by ^ if more than one TS)	22
144	EAP Message Status Code	Example: . SUCCESS This will assume last value in the response	22
145	EAP Message Identifier	EAP Message Identifier	22
146	EAP Type	Example: AKA (0x17) for ePDG EAP-AKA (0x17)	22
147	Configured Attribute Auth Method	Shared Key as String. Example: local_method remote_method where local/remote could be PSK/EAP/CERT	22
148	IKEv2 Config Attribute Internal IP4/IPv6	Example: UE address x^y where x is IPv4 and y is IPv6	22
149	IKEv2_CFG_ATTRIBUTE_INTERNAL_IP4_NETMASK	Example: 255.255.255.255	22
150	IKEv2_CFG_ATTRIBUTE_INTERNAL_DNS_IPV4	x^y^z where x,y,z will be IPv4 address. Maximum of 3 entries possible in IKE_Auth_reply.	22
151	IKEv2_CFG_ATTRIBUTE_INTERNAL_DNS_IPV6	x^y^z where x,y,z will be IPv6 address. Maximum of 3 entries possible in IKE_Auth_reply. This IE is missing. New one needs to be added	22
152	P-CSCF IPv4	x^y^z where x,y, z will be IPv4 address. Maximum of 3 entries possible in IKE_Auth_reply.	
153	P-CSCF IPv6	x^y^z where x,y,z will be IPv6 address. Maximum of 3 entries possible in IKE_Auth_reply.	22
154	SA Protocol ID	Example: ESP (0x03)	22

IE	Description	Format Example	Relevant Procedures
155	SA SPI UE	Example: 0x020000BA	22
156	SA SPI ePDG	Similar to SA SPI UE. This is missing. Needs to be added	
157	Informational Request Type	Delete, DPD, and so on.	23
158	IKEv2 Notify – Error Codes	Reference IKEv2 standard Error Codes and Customer Custom Codes per SWu Call Flow: Finally received /sent Notify error code is updated. This could be the Verison custom code if configured, or standard code otherwise.	21 22 23 26
159 to 160	Reserved		
161	IPv6 Advertised Prefix	Advertised IPv6 Prefixes as part of Router Advertisement	25
162 to 170	Reserved		

Capacity and Performance

When a chassis runs in peak traffic, around 10% of the performance impact is observed while generating RTT records. Depending on the memory, an approximately 40kb zip file will be generated for 10 subscribers and transferred to the server. Based on the RTT record intervals are configured (example: 5 minutes, 10 minutes), all the subscriber records within that time period will be accumulated into a zip file and transferred.

Limitations

- When the ePDG handles any corrupted packet, it will not be able to create a RTT record as it is being rejected at the NPU level (lower layer).
- Statistics recovery is out of scope as per the current implementation.
- RTT record generation during Session Recovery or Card Migration is not supported.
- RTT records will not be generated for re-transmitted messages.
- All module configurations (EDR/UDR/EVENT/DIAMETER/HEXDUMP/CELLTRACE) should be part of the same context.
- When multiple retries are configured, only one RTT record will be generated during retry scenarios. The RTT record will be generated after the final retry.

- Only details specific to the RTT record size will be provided, based on which the customer shall dimension the external collection server.
- **Session Recovery:** During Session Recovery, some control messages may be lost, and the corresponding RTT records will also be lost or not generated. In case the CDRMOD task gets terminated, it simply respawns, and anything it has not written on RAMFS is lost, even though the session manager statistics show that the RTT record has been generated.
- **ICSR:** RTT records generation with ICSR is not supported.
- **Card Migration:** During DPC migration, CDRMOD is stopped on the old DPC and restarted on the new DPC. As a result, there is a chance of losing RTT records during card migration.

Configuring RTT for ePDG

This section provides RTT configuration information for ePDG.

Enabling RTT to Record and Produce Call Transactions

Use the following configuration for enabling RTT to record and produce call transactions.

```
configure
    context context_name
        epdg-service service_name
            [ no ] reporting-action event-record
    end
```

NOTES:

- **reporting-action event-record:** Enables event reporting through RTT in ePDG.
- **no:** Disables event reporting through RTT in ePDG.

Configuring RTT

Use the following CLI commands to configure the RTT feature in ePDG.

```
configure
    context context_name
        session-event-module
            event transfer-mode push primary url URL_address
            file name file_name|rotation volume volume_size|rotation time
rotation_time|compression compression_type|extension extension_type
            event use-harddisk
            event remove-file-after-transfer
            event push-interval interval_time
            event purge time-limit seconds
            event purge storage-limit megabytes
    end
```

NOTES:

- **transfer-mode:** Enables the transfer mode in RTT.
- **push primary url:** Specifies the external server location where the records are transferred from ePDG.
- **file name:** Specifies the RTT file name where the records are stored.
- **rotation volume:** The volume based on which the RTT file is generated.
- **rotation time:** The time based on which the RTT file is generated.



Note The RTT files are pushed to the external server based on the rotation volume or rotation time, whichever occurs first.

- **compression:** Specifies the file compression type. If enabled, the RTT file is generated as a Gzip file, else it is generated as a normal file.
- **extension:** Specifies the RTT file extension (.csv).
- **use-harddisk:** Specifies hard disk as the storage space for the RTT file generation.
- **remove-file-after-transfer:** Specifies RTT files to be removed after pushing the files to the external server.
- **push-interval:** Specifies the push interval time at which the RTT file are transferred from ePDG to the external server.
- **purge time-limit:** Specifies the time to delete internal files when external server is down.
- **purge storage-limit:** Specifies the storage limit to delete internal files when external server is down.

Monitoring and Troubleshooting

This section provides information on how to monitor and troubleshoot using show commands to support this feature.

Show Commands and Output

This section provides information regarding show commands and their outputs for this feature.

show Event-Record Statistics ePDG

This command displays the number of RTT record types generated based on different event types.

Table 2: show event-record statistics ePDG Command Output Descriptions

Field	Description
Total Number of Event Records	The total number of event records (GTPv2 + Diameter + IKE + RA).
GTPv2 Event Records	The total number of GTPv2 records

Field	Description
CSR	The total number of CSR (Create Session Request) events.
CBR	The total number of CBR (Create Bearer Request) events.
DSR	The total number of DSR (Delete Session Request) events.
DBR	The total number of DBR (Delete Bearer Request) events.
UBR	The total number of UBR (Update Bearer Request) events.
IKEv2 Event Records	The total number of IKE events.
IKE_SA_INIT	The total number of IKE_SA_INIT events.
IKE_AUTH	The total number of IKE_AUTH events.
IKE_INFORMATION	The total number of IKE_INFORMATION events.
CREATE_CHILD_SA	The total number of CREATE_CHILD_SA events.
IPV6 RA Event Records	The total number of IPV6 RA event records.
RA Prefix	The total number of RA prefix events.
Diameter Event Records	The total number of Diameter event records.
SWm Procedures	The total number of SWm interface specific events.
AAR	The total number AAR (AA-Request) events.
RAR	The total number of RAR (Re-Auth-Request) events
ASR	The total number of ASR (Abort Session Request) events
STR	The total number of STR (Session Termination Request) events.
DER	The total number of DER (DE-Request) events.

