

# Packet Capture (PCAP) Trace


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## Feature Information

**Summary Data**

| | |
|---|---|
| Applicable Product(s) or Functional Area | • ePDG<br>• IPSec<br>• MME<br>• SaMOG |
| Applicable Platform(s) | ASR 5500<br>VPC-DI<br>VPC-SI |
| Feature Default | Disabled |
| Related Changes in This Release | Not Applicable |
| Related Documentation | • *ASR 5000 System Administration Guide*<br>• *ASR 5500 System Administration Guide*<br>• *Command Line Interface Reference Guide*<br>• *ePDG Administration Guide*<br>• *IPSec Reference Guide*<br>• *SaMOG Administration Guide*<br>• *VPC-SI System Administration Guide* |

### Revision History



**Important** Revision history details are not provided for features introduced before release 21.2.

| Revision Details | Release |
|---|---|
| PCAP Tracing support for MME S1-AP interface is added in this release. | 21.4 |
| First introduced. | 21.2 |

# Feature Description

This feature enables the output of the **monitor subscriber** and **monitor protocol** commands to be captured using the packet capture (PCAP) functionality. The output can be stored in a text file in a hard disk, and later transferred to an external server through SFTP using a PUSH or PULL method. The text file can then be converted to a pcap file using external tools such as text2pcap, or imported directly as PCAP using packet analyzer tools such as wireshark.

PCAP trace and hexdump file collection can be enabled or disabled under the **monitor protocol** and **monitor subscriber** commands. For more information, refer *Enabling or Disabling Hexdump* section of this chapter.



**Note** For VPC-DI deployments, a separate function is available to perform packet captures on specific cards (VMs) and card interfaces on the internal DI-network. Refer to the Exec mode command **system packet-dump** command in the *Command Line Interface Reference* for more information.

# Configuring PCAP Trace

## Enabling Multiple Instances of CDRMOD

Use the following configuration to enable multiple instances of CDRMOD (one per packet processing card):

```
config
   cdr-multi-mode
   end
```

**Notes:**

- Although hexdump record generation is supported on both single-mode and multi-mode, it is recommended to enable the CDR multi-mode.

**Important** After you configure the **cdr-multi-mode** CLI command, you must save the configuration and then reload the chassis for the command to take effect. For information on saving the configuration file and reloading the chassis, refer to the *System Administration Guide* for your deployment.

- Use the **default cdr-multi-mode** command to configure this command with its default setting.

**Important** After you configure the **default cdr-multi-mode** CLI command, you must save the configuration and then reload the chassis for the command to take effect. For information on saving the configuration file and reloading the chassis, refer to the *System Administration Guide* for your deployment.

- **Default**: Single CDRMOD mode

# Configuring the Hexdump Module

Use the following configuration to specify the handling characteristics of the hexdump files:

```
config
   context context_name
      hexdump-module
         hexdump { purge { storage-limit megabytes | time-limit seconds } [
 max-files max_records ] | push-interval interval | push-trigger
space-usage-percent trigger_percent | remove-file-after-transfer |
transfer-mode { pull [ module-only ] | push primary { encrypted-url | url
 } url [ secondary { encrypted-secondary-url | secondary-url } secondary_url
 ] [ via local-context ] [ max-files files ] [ max-tasks max_tasks ] [
module-only ] } | use-harddisk }
         end
```

**Notes:**

- Use the **default hexdump [ purge | push-interval | push-trigger [ space-usage-percent ] | remove-file-after-transfer | transfer-mode [ module-only ] | use-harddisk ] +** command to configure the keywords to its the default setting.
  - **purge**: Not enabled
  - **push-interval**: 60 seconds
  - **push-trigger**: 80 percent
  - **remove-file-after-transfer**: Disabled
  - **transfer mode**: PUSH
  - **use-harddisk**: Disabled
- Use the **no hexdump [ purge | remove-file-after-transfer | use-harddisk ] +** command to disable the configured hexdump file storage and processing.

- **purge**: Disables the deleting of record files on the hard disk based on a storage limit or a time limit.
- **remove-file-after-transfer**: Retains a copy of the file even after it has been pushed or pulled to another server.
- **use-harddisk**: Disables data storage on the system's hard disk.

- Use the **purge { storage-limit** *megabytes* **| time-limit** *seconds* **} [ max-files** *max_records* **]** keywords to configure parameters for deleting hexdump records from the hard drive. This command is not enabled by default.
  - **storage-limit** *megabytes*: Specifies that hexdump records are to be deleted from the hard drive upon reaching a storage limit defined in megabytes.

    **bytes** must be an integer from 10 through 143360.
  - **time-limit** *seconds*: Specifies that hexdump records are to be deleted from the hard drive upon reaching a time limit defined in seconds.

    *seconds* must be an integer from 600 through 2592000.
  - **max-files** *max_records*: Specifies the maximum number of files to purge. If configured to 0, all records will be purged until the limit is reached.

    *max_records* must be an integer that is of value 0, or from 1000 through 10000.

- Use the **push-interval** *interval*keyword to specify the transfer interval (in seconds) when hexdump files will be pushed to an external file server.
  - *interval* must be an integer from 30 through 3600.
  - **Default**: 60

- Use the **push-trigger space-usage-percent** *trigger_percent* to specify the disk space utilization percentage threshold at which an automatic push is triggered and files are transferred to the external server.
  - *trigger_percent* must be an integer from 10 through 80.
  - **Default**: 80

- Use the **remove-file-after-transfer** keyword to specify that the system must delete hexdump files after they have been transferred to the external file server.

  Default: Disabled.



**Important** This keyword must be enabled for hexdump records.

- Use the **transfer-mode { pull [ module-only ] | push primary { encrypted-url | url }** *url* **[ secondary { encrypted-secondary-url | secondary-url }** *secondary_url* **] [ via local-context ] [ max-files** *files* **] [ max-tasks** *max_tasks* **] [ module-only ] }** keywords to specify the transfer mode to be used when transferring hexdump files to an external file server
  - **pull**: Specifies that the destination server (external storage) will pull the hexdump files.
  - **push**: Specifies that the system will push hexdump files to the destination server. This is the default mode.

- **primary encrypted-url** *url*: Specifies the primary URL location to which the system pushes the files in encrypted format.

  *url* must be an alphanumeric string of 1 through 8192 characters.

- **primary url** *url*: Specifies the primary URL location to which the system pushes the hexdump files.

  **url** must be an alphanumeric string of 1 through 1024 characters in the format: *//user:password@host:[port]/direct*.

- **secondary encrypted-secondary-url** *secondary_url*: Specifies the secondary URL location to which the system pushes the files in encrypted format.

  *secondary_url* must be an alphanumeric string of 1 through 8192 characters.

- **secondary secondary-url** *secondary_url*: Specifies the secondary URL location to which the system pushes the hexdump files.

  *secondary_url* must be an alphanumeric string of 1 through 1024 characters in the format: *//user:password@host:[port]/direct*.

- **via local-context**: Specifies that the local context, and, subsequently, the SPIO management ports, will be used to pull or push hexdump files.

- **max-files** *files*: Specifies the maximum number of files that can be transferred per push.

  *files* must be an integer from 4 to 4000.

- **max-tasks** *max_tasks*: Specifies the maximum number of files per push.

  *max_tasks* must be an integer from 4 through 8.

- **module-only**: Specifies that the transfer of hexdump records is to be applied only to the module type for which the configuration was originally created. If this option is not enabled, the transfer will occur for all record types.

- Use the **use-harddisk** keyword to specify that the hard disk drive on the SMC is to be used to store hexdump records.

  **Default**: Disabled.

**Important** This keyword must be enabled for hexdump records.

# Configuring the Hexdump File Parameters

Use the following configuration to specify the format of the hexdump files:

```
config
   context context_name
      hexdump-module
         file [ compression { gzip | none } | current-prefix prefix |
delete-timeout seconds | directory directory_name | exclude-checksum-record |
 field-separator { hyphen | omit | underscore } | headers | name file_name
 | reset-indicator | rotation { num-records number | tariff-time minute
```

```
minutes hour hours | time seconds | volume bytes } | sequence-number { length
 length | omit | padded | padded-six-length | unpadded } | storage-limit
limit | time-stamp { expanded-format | rotated-format | unix-format } |
trailing-text string | trap-on-file-delete | xor-final-record ] +
          end
```

**Notes:**

- Use the **default file [ compression | current-prefix | delete-timeout | directory | field-separator | headers | name | reset-indicator | rotation { num-records | tariff-time | time | volume } | sequence-number | storage-limit | time-stamp | trailing-text | trap-on-file-delete ] +** command to configure the default setting for the specified keyword(s).
- Use the **compression { gzip | none }** keyword to specify the compressions of hexdump files.
  - **gzip**: Enables GNU zip compression of the hexdump file at approximately 10:1 ratio.
  - **none**: Disables Gzip compression.
- Use the **current-prefix** *prefix* keyword to specify a string to add at the beginning of the hexdump file that is currently being used to store records.
  - *prefix* must be an alphanumeric string of 1 through 31 characters.
  - **Default**: curr
- Use the **delete-timeout** *seconds* keyword to specify a time period, in seconds, after which the hexdump files are deleted. By default, files are never deleted.
  - *seconds* must be an integer from 3600 through 31536000.
  - **Default**: Disabled
- Use the **directory** *directory_name* keyword to specify a subdirectory in the default directory in which to store hexdump files.
  - *directory_name* must be an alphanumeric string of 0 through 191 characters.
  - **Default**: */records/hexdump*
- Use the **exclude-checksum-record** keyword to exclude the final record containing #CHECKSUM followed by the 32-bit Cyclic Redundancy Check (CRC) of all preceding records from the hexdump file.

  **Default**: Disabled (a checksum record is included in the hexdump file header)
- Use the **field-separator { hyphen | omit | underscore }** to specify the type of separators between two fields of a hexdump file name:
  - **hyphen**: Specifies the field separator as a "-" (hyphen) symbol between two fields.
  - **omit**: Omits the field separator between two fields.
  - **underscore**: Specifies the field separator as an "_" (underscore) symbol between two fields.
- Use the **headers** keyword to include a file header summarizing the record layout.
- Use the **name** *file_name* to specify a string to be used as the base file name for hexdump files.

*file_name* must be an alphanumeric string from 1 through 31 characters.

- Use the **reset-indicator** to specify the inclusion of the reset indicator counter (value from 0 through 255) in the hexdump file name.

  The counter is incremented whenever any of the following conditions occur:

  - A peer chassis has taken over in compliance with Interchassis Session Recovery (ICSR).
  - The sequence number (see **sequence-number** keyword) has rolled over to zero.

- Use the **rotation { num-records** *number* **| tariff-time minute** *minutes* **hour** *hours* **| time** *seconds* **| volume** *bytes* **}** keyword to specify when to close a hexdump file and create a new one.

  - **num-records** *number*: Specifies the maximum number of records that should be added to a hexdump file. When the number of records in the file reaches this value, the file is complete.

    *number* must be an integer from 100 through 10240. **Default**: 1024

  - **tariff-time minute** *minutes* **hour** *hours*: Specifies to close the current hexdump file and create a new one based on the tariff time (in minutes and hours).

    *minutes* must be an integer from 0 through 59.

    *hours* must be an integer from 0 through 23.

  - **time** *seconds*: Specifies the period of time to wait (in seconds) before closing the current hexdump file and creating a new one.

    *seconds* must be an integer from 30 through 86400. **Default**: 3600



**Important** It is recommended to set the rotation time to 30 seconds.

  - **volume** *bytes*: Specifies the maximum size of the hexdump file (in bytes) before closing it and creating a new one.

    *bytes* must be an integer from 51200 through 62914560. Note that a higher setting may improve the compression ratio when the compression keyword is set to gzip. **Default**: 102400

- Use the **sequence-number { length** *length* **| omit | padded | padded-six-length | unpadded }** keyword to exclude or include the sequence number with a specified format in the file name.

  - **length** *length*: Includes the sequence number with the specified length.

    *length* must be the file sequence number length with preceding zeroes in the file name, and must be an integer from 1 through 9.

  - **omit**: Excludes the sequence number from the file name.
  - **padded**: Includes the padded sequence number with preceding zeros in the file name. This is the default setting.
  - **padded-six-length**: Includes the padded sequence number with six preceding zeros in the file name.
  - **unpadded**: Includes the unpadded sequence number in the file name.

- Use the **storage-limit** *limit* keyword to set the storage limit. Files will be deleted when the specified amount of space (in bytes) is reached.

  *limit* must be an integer from 10485760 through 268435456.

- Use the **time-stamp { expanded-format | rotated-format | unix-format }** keyword to specify the format of the file creation timestamp to be included in the file name.
  - **expanded-format**: Specifies the UTC (Universal Time Coordinated) MMDDYYYYHHMMSS format.
  - **rotated-format**: Specifies the time stamp format to YYYYMMDDHHMMSS format.
  - **unix-format**: Specifies the UNIX format of x.y, where x is the number of seconds since 1/1/1970 and y is the fractional portion of the current second that has elapsed.

- Use the **trailing-text** *string* keyword to specify the inclusion of an arbitrary text string in the file name as an alphanumeric string of 1 through 30 characters.

  *string* must be an alphanumeric string from 1 through 30 characters.

- Use the **trap-on-file-delete** keyword to instruct the system to send an SNMP notification (trap) when a hexdump file is deleted due to lack of space.

  **Default**: Disabled

- Use the **xor-final-record** keyword to insert an exclusive OR (XOR) checksum (instead of a CRC checksum) into the hexdump file header, if the exclude-checksum-record is left at its default setting.

  **Default**: Disabled

- The + symbol indicates that more than one of the previous keywords can be entered within a single command.

# Enabling or Disabling Hexdump

Hexdump captures can be enabled for protocols in the **monitor subscriber** and **monitor protocol** commands in the Exec Mode. Subscriber information for PCAP trace can be specified using the filters in the **monitor subscriber** command. For protocols and filters supported for a specific product, refer the respective product Administration and Reference guides.

When the **monitor subscriber** or **monitor protocol** command is running, use the **U** or **V** option to enable hexdump capturing:

- **U - Mon Display (ON)**: Use this option to display message captures on the terminal.
  - **Default**: ON
  - When this option is turned off, monitoring will still run in the background.

- **V - PCAP Hexdump (NONE)**: Use this option to enable or disable capturing hexdump packets globally.
  - **Default**: None
  - **V - PCAP Hexdump (ON)**: Hexdump capture is enabled with the prompt:

    *Warning :Turning ON/OFF will impact other cli logging terminals, You will interupt others already using hexdump.*

- **V - PCAP Hexdump (OFF)**: Hexdump capture is disabled (paused).

# Enabling PCAP Trace for MME

This section describes how to enable PCAP trace for MME S1-AP interface and SGsAP interface.

- Under monitor protocol (monpro), enable S1-AP and SGS, or SCTP protocol option along with V - PCAP Hexdump (ON), to capture all S1-AP messages in PCAP hexdump.
- Monitor subscriber (monsub) supports PCAP tracing on S1-AP and SGS filter options.
- When S1-AP or SGS filter option is selected in monpro/monsub, PCAP Hexdump will have dummy SCTP header. The following fields are set as dummy in the SCTP header:
  - Verification tag
  - Checksum
  - Chunk flags
  - Transmission Sequence Numbers (TSN)
  - Stream identifier
  - Stream sequence number
- When the SCTP protocol option is selected in monpro, PCAP hexdump will have the original SCTP header.

# Monitoring and Troubleshooting PCAP Trace

# Show Command(s) and/or Outputs

The show command(s) in this section are available in support of PCAP trace.

## show cdr statistics

The following fields are available in the output of the **show cdr statistics** command in support of this feature:

```
EDR-UDR file Statistics:
------------------------
CDRMOD Instance Id: 2
 Hexdump-module Record Specific Statistics:
  Hexdump-module files rotated:                      0
  Hexdump-module files rotated due to volume limit:  0
  Hexdump-module files rotated due to time limit:    0
  Hexdump-module files rotated due to tariff-time:   0
  Hexdump-module files rotated due to records limit: 0
  Hexdump-module file rotation failures:             0
  Hexdump-module files deleted:                      0
  Hexdump-module records deleted:                    0
  Hexdump-module records received:                   0
  Current open Hexdump-module files:                 0
  Time of last Hexdump-module file deletion:         0
```

*Table 1: **show cdr statistics** Command Output Descriptions*

| Field | Description |
|---|---|
| **EDR-UDR file Statistics:** | |
| CDRMOD Instance Id | Indicates the CDRMOD instance id for which the statistics are collected. |
| **Hexdump-module Record Specific Statistics:** | |
| Hexdump-module files rotated | Total number of times a hexdump file was closed and a new hexdump file was created. |
| Hexdump-module files rotated due to volume limit | Total number of times a hexdump file was closed and a new hexdump file was created since the volume limit was reached. |
| Hexdump-module files rotated due to time limit | Total number of times a hexdump file was closed and a new hexdump file was created since the time limit was reached. |
| Hexdump-module files rotated due to tariff-time | Total number of times a hexdump file was closed and a new hexdump file was created since the tariff time was reached. |
| Hexdump-module files rotated due to records limit | Total number of times a hexdump file was closed and a new hexdump file was created since the records limit was reached. |
| Hexdump-module file rotation failures | Total number of times hexdump file rotation failed. |
| Hexdump-module files deleted | Total number of times hexdump files were deleted. |
| Hexdump-module records deleted | Total number of times hexdump records were deleted. |
| Hexdump-module records received | Total number of times hexdump records were received. |
| Current open Hexdump-module files | Total number of hexdump files currently open. |
| Time of last Hexdump-module file deletion | Time of the last deleted hexdump file. |

## show { hexdump-module | cdr } file-space-usage

The following fields are available in the output of the **show { hexdump-module | cdr } file-space-usage** command in support of this feature:

```
CDRMOD Instance Id: 2
   Hexdump-module File Storage LIMIT              : 33554432 bytes
   Hexdump-module File Storage USAGE              : 196608 bytes
   Percentage of Hexdump-module file store usage  : 0.585938
```

*Table 2: **show { hexdump-module | cdr } file-space-usage** Command Output Descriptions*

| Field | Description |
|---|---|
| CDRMOD Instance Id | Indicates the CDRMOD instance id for which the statistics are collected. |
| Hexdump-module File Storage LIMIT | Indicates the maximum storage space (in bytes) that can be used for hexdump files. |
| Hexdump-module File Storage USAGE | Indicates the total storage space (in bytes) used for hexdump files. |
| Percentage of Hexdump-module file store usage | Indicates the total percentage of storage used for hexdump files. |

## show hexdump-module statistics

The following fields are available in the output of the **show hexdump-module statistics** command in support of this feature.

```
Hexdump-module-Record file Statistics:
-----------------------
CDRMOD Instance Id: 2
  Hexdump-module files rotated:                       0
  Hexdump-module files rotated due to volume limit:  0
  Hexdump-module files rotated due to time limit:    0
  Hexdump-module files rotated due to tariff-time:   0
  Hexdump-module files rotated due to records limit: 0
  Hexdump-module file rotation failures:             0
  Hexdump-module files deleted:                      0
  Hexdump-module records deleted:                    0
  Hexdump-module records received:                   0
  Current open Hexdump-module files:                 0
  Time of last Hexdump-module file deletion:         0

Hexdump-module PUSH Statistics:
-----------------------------------
  Successful File Transfers   : 0
  Failed File Transfers       : 0
  Num of times PUSH initiated : 0
  Num of times PUSH Failed    : 0
  Num of times PUSH cancelled
            due to HD failure : 0
  Num of periodic PUSH        : 0
  Num of manual PUSH          : 0
  Current status of PUSH      : Not Running
  Last completed PUSH time    : N/A

Primary Server Statistics:
  Successful File Transfers   : 0
  Failed File Transfers       : 0
  Num of times PUSH initiated : 0
  Num of times PUSH Failed    : 0
  Num of periodic PUSH        : 0
  Num of manual PUSH          : 0
  Current status of PUSH      : Not Running
  Last completed PUSH time    : N/A

Secondary Server Statistics:
```

```
Successful File Transfers   : 0
Failed File Transfers       : 0
Num of times PUSH initiated : 0
Num of times PUSH Failed    : 0
Num of periodic PUSH        : 0
Num of manual PUSH          : 0
Current status of PUSH      : Not Running
Last completed PUSH time    : N/A
```



**Important** Use the **clear hexdump-module statistics** command under the Exec Mode to clear and reset the hexdump module statistics.

*Table 3: **show hexdump-module statistics** Command Output Descriptions*

| Field | Description |
|---|---|
| **Hexdump-module-Record file Statistics:** | |
| CDRMOD Instance Id | Indicates the CDRMOD instance id for which the statistics are collected. |
| Hexdump-module files rotated | Total number of times a hexdump file was closed and a new hexdump file was created. |
| Hexdump-module files rotated due to volume limit | Total number of times a hexdump file was closed and a new hexdump file was created since the volume limit was reached. |
| Hexdump-module files rotated due to time limit | Total number of times a hexdump file was closed and a new hexdump file was created since the time limit was reached. |
| Hexdump-module files rotated due to tariff-time | Total number of times a hexdump file was closed and a new hexdump file was created since the tariff time was reached. |
| Hexdump-module files rotated due to records limit | Total number of times a hexdump file was closed and a new hexdump file was created since the records limit was reached. |
| Hexdump-module file rotation failures | Total number of times hexdump file rotation failed. |
| Hexdump-module files deleted | Total number of times hexdump files were deleted. |
| Hexdump-module records deleted | Total number of times hexdump records were deleted. |
| Hexdump-module records received | Total number of times hexdump records were received. |
| Current open Hexdump-module files | Total number of hexdump files currently open. |
| Time of last Hexdump-module file deletion | Time of the last deleted hexdump file. |
| **Hexdump-module PUSH Statistics:** | |
| Successful File Transfers | Total number of hexdump files that were successfully transferred. |
| Failed File Transfers | Total number of hexdump files that failed to transfer. |

| Field | Description |
|---|---|
| Num of times PUSH initiated | Total number of times the PUSH operation was initiated. |
| Num of times PUSH Failed | Total number of times PUSH operation failed. |
| Num of times PUSH cancelled due to HD failure | Total number of times PUSH operation failed due to hard disk failure. |
| Num of periodic PUSH | Total number of periodic times PUSH operation was performed. |
| Num of manual PUSH | Total number of times the PUSH operation was performed manually. |
| Current status of PUSH | Indicates if the PUSH operation is currently running. |
| Last completed PUSH time | Indicates the time when the last PUSH operation was completed. |
| **Primary Server Statistics:** | |
| Successful File Transfers | Total number of hexdump files successfully transferred to the primary storage server. |
| Failed File Transfers | Total number of hexdump files that failed transfer to the primary storage server. |
| Num of times PUSH initiated | Total number of times PUSH operation was initiated to transfer hexdump files to the primary storage server. |
| Num of times PUSH Failed | Total number of times PUSH operation failed to transfer hexdump files to the primary storage server. |
| Num of periodic PUSH | Total number of periodic times PUSH operation was performed to the primary storage server. |
| Num of manual PUSH | Total number of times the PUSH operation to the primary storage server was performed manually. |
| Current status of PUSH | Indicates if the PUSH operation to the primary storage server is currently running. |
| Last completed PUSH time | Indicates the time when the last PUSH operation to the primary storage server was completed. |
| **Secondary Server Statistics:** | |
| Successful File Transfers | Total number of hexdump files successfully transferred to the secondary storage server. |
| Failed File Transfers | Total number of hexdump files that failed transfer to the secondary storage server. |
| Num of times PUSH initiated | Total number of times PUSH operation was initiated to transfer hexdump files to the secondary storage server. |

| Field | Description |
|---|---|
| Num of times PUSH Failed | Total number of times PUSH operation failed to transfer hexdump files to the secondary storage server. |
| Num of periodic PUSH | Total number of periodic times PUSH operation was performed to the secondary storage server. |
| Num of manual PUSH | Total number of times the PUSH operation to the secondary storage server was performed manually. |
| Current status of PUSH | Indicates if the PUSH operation to the secondary storage server is currently running. |
| Last completed PUSH time | Indicates the time when the last PUSH operation to the secondary storage server was completed. |