Pivotal

PRODUCT DOCUMENTATION

Pivotal Greenplum Command Center

Version 1.2.2

Administrator Guide

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Contents

Chapter 1 Overview

Pivotal Greenplum Command Center is a management tool for the Greenplum Big Data Platform. This section introduces key concepts about Greenplum Command Center and its components.

Topics:

Introduction

Greenplum Command Center monitors system performance metrics, analyzes system health, and allows administrators to perform management tasks such as start, stop, and recovery of systems in a Greenplum environment. The Greenplum Command Center Console is an interactive graphical web application that may be installed on a web server on the master host. Users view and interact with the collected Greenplum system data through this application.

Greenplum Command Center is comprised of data collection agents that run on the master host and each segment host (either Greenplum Hadoop or Greenplum Database hosts). The agents collect data about queries and system utilization and send it to the Greenplum master host at regular intervals. Greenplum Command Center stores its data and metrics in a dedicated Greenplum database (the Command Center database) whose information is distributed among the master host and segment hosts, like any other Greenplum Database. You can access the data stored in the Greenplum Command Center database through the Greenplum Command Center Console and through SQL queries.

Greenplum Database is required to operate Command Center because Command Center stores its information in a Greenplum database.

Supported Greenplum Platforms

Greenplum Command Center is currently certified for the Greenplum Data Computing Appliance (DCA) and Greenplum Database software-only environments. Command Center monitors the following for each environment:

Greenplum Data Computing Appliance:

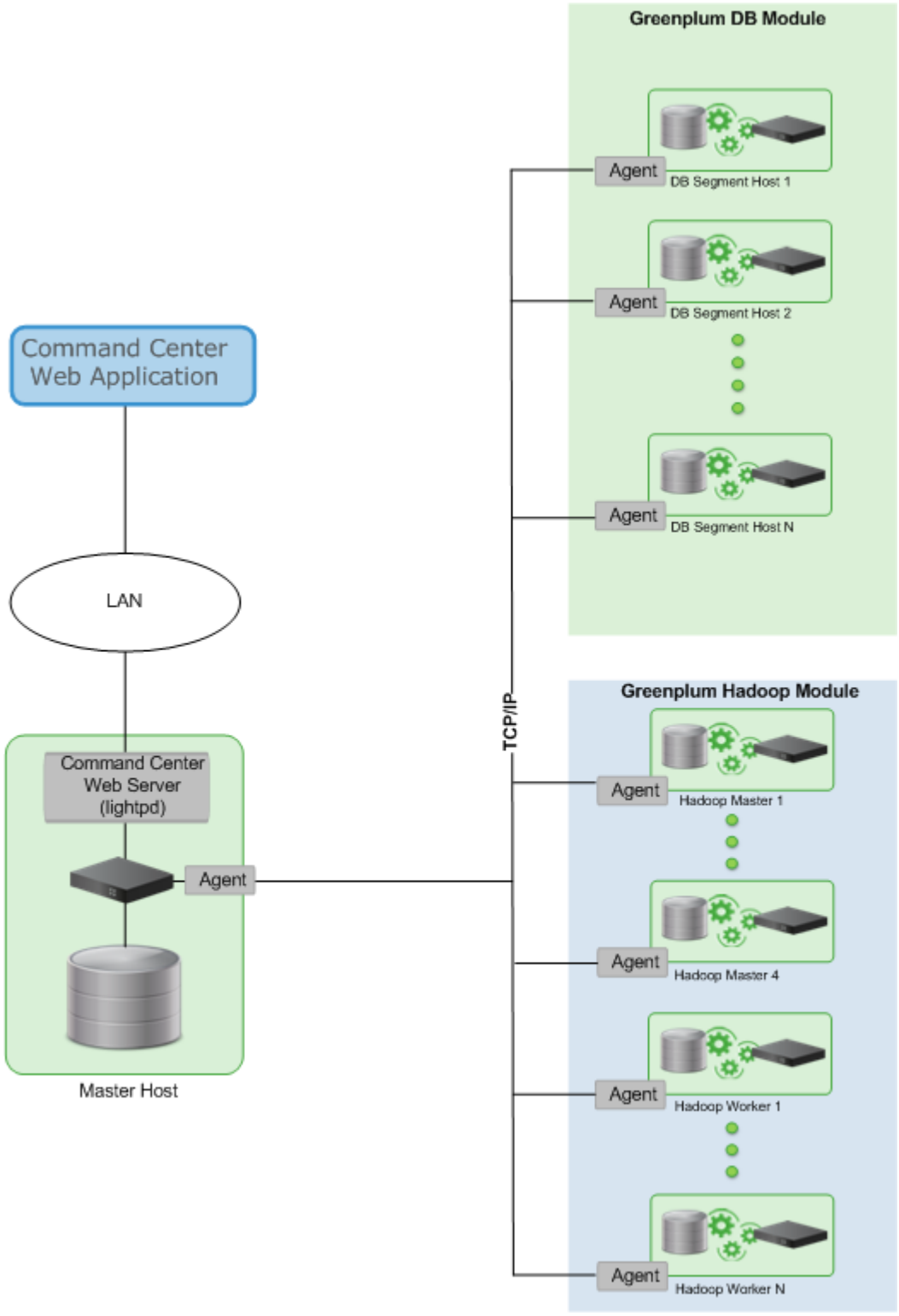
- Greenplum Database Module (4.2.6.3 or higher; 4.2.7.1 is recommended for full functionality of this release)
- Greenplum Hadoop (HD) Module (version 1.1 and 1.2 only)
- Greenplum Data Integration Accelerator (DIA) Module
- Greenplum Data Computing Appliance Hardware (V1.2.x and V2.x)

Greenplum Database (software-only environments):

- Greenplum Database (4.2.6.3 or higher; 4.2.7.1 is recommended for full functionality of this release)

Architecture

Note that the Hadoop nodes in this diagram are only applicable to Data Computing Appliance environments.



Greenplum Data Collection Agents

You can enable or disable Command Center using the `gp_enable_gpperfmon` server configuration parameter. After it is enabled, data collection agents run on all Greenplum hosts (master and segments), and start and stop along with Greenplum Database server processes.

The master agent polls all segment agents for system metrics and other data at a configurable interval (called the quantum). The master agent amasses the data from all segments, stores it in flat files, and periodically commits the data in the files to the Greenplum Command Center database.

Greenplum Command Center Database

The Greenplum Command Center database (gpperfmon) is a database within your Greenplum system dedicated to storing and serving system data. Your Greenplum installation includes setup scripts to install the Command Center database (gpperfmon).

When this document refers to the Command Center database, it is referring to the database named gpperfmon.

Greenplum administrators can connect to the Command Center database using client programs such as psql or application programming interfaces (APIs) such as JDBC (Java Database Connectivity) and ODBC (Open Database Connectivity). Administrators can also use the Greenplum Command Center Console to view reports on current and historical performance and perform other managment tasks.

The Command Center database consists of three sets of tables; now tables store data on current system metrics such as active queries, history tables store data on historical metrics, and tail tables are for data in transition. Tail tables are for internal use only and should not be queried by users. The now and tail data are stored as text files on the master host file system, and the Command Center database accesses them via external tables. The history tables are regular database tables stored within the Command Center (gpperfmon) database. See Command Center Database Reference section for the schema definitions of these tables.

Greenplum Command Center Console

Greenplum Command Center provides a graphical console for viewing Greenplum System metrics and performing certain database administrative tasks. This browser-based application provides the following functionality:

Database administrative Controls

- Ability to stop/start the database
- Ability to recover/rebalance segments

An interactive View of System Metrics

- Realtime
- Historic (configurable by time)

An Interactive View of System Hardware Health

- This functionality is only available for Greenplum Data Computing Appliance environments.

Database Query Monitoring

- Ability to view, search, prioritize, or cancel any query in the system.
- Ability to view the internals of any query, including the query plan, query plan iterator-level details, and real-time information about individual scans and joins.

Database Workload Management

- Ability to configure resource queues
- Ability to prioritize users

If you have multiple Greenplum environments, you can create separate Command Center instances for them. Each separate console instance operates on a unique port and has its own unique configuration options. For more information, see “Installing the Greenplum Command Center Console” in Setting Up Greenplum Command Center.

Greenplum Command Center Web Service

The Greenplum Command Center Console queries the Command Center database through a web service framework composed of a lightweight lighttpd web server and Python-based middleware. The lighttpd server is an open-source web server with a low memory footprint and light CPU load. For more information, see http://www.lighttpd.net/.

The console setup utility sets up the lighttpd web server and web service, prompting you for basic configuration information on the desired port and SSL options. Under normal conditions, the web server and web service API require minimal maintenance and administration, as described in “Web Server Administration” in Configuration File Reference.

Chapter 2 Setting Up Greenplum Command Center

This section describes how to install and set up your Pivotal Greenplum Command Center and includes the following:

Topics:

Data Computing Applicance (DCA) Environments

The Greenplum Data Computing Appliance (DCA) version of Pivotal Greenplum Command Center is already installed on the appliance (versions 1.2.x and 2.x). EMC Services will work with you to configure Command Center for your environment.

For more information about setting up and configuring Greenplum Command Center on a Greenplum DCA, refer to the relevant versions of:

- *Greenplum Data Computing Appliance Software Upgrade Guide*
- *Greenplum Data Computing Appliance Installation and Configuration Guide.*

Greenplum Database Software Environments

If you are using Greenplum Command Center in a software-only environment, installing and enabling Greenplum Command Center is a two-step process. First, you create the Greenplum Command Center database (gpperfmon) and enable the data collection agents within your Greenplum system. After data collection is enabled, the next (optional) step is to install and configure the Greenplum Command Center Console (the Web application used to view the Command Center data stored in Greenplum Database).

Greenplum Command Center software for Greenplum Database software-only environments is available as a separate download. Download the installer file from Pivotal Network or from the EMC Download Center. Installer files are available for RedHat 64-bit.

Enabling the Data Collection Agents

This section describes how to create the Command Center database and enable the Command Center data collection agents. When the data collection agents are enabled, their processes are started and stopped along with the Greenplum Database server processes (using `gpstart` and `gpstop`).

Greenplum provides a `gpperfmon_install` utility that performs the following tasks:

- Creates the Command Center database (gpperfmon).
- Creates the Command Center superuser role (gpmon).
- Configures Greenplum Database server to accept connections from the Command Center superuser role (edits the `pg_hba.conf` and `.pgpass` files).
- Sets the Command Center server configuration parameters in the Greenplum Database server `postgresql.conf` files.

To enable the Collection Agents:

1. Log in to the Greenplum master host as the `gpadmin` user.
   ```
   $ su - gpadmin
   ```
2. Source the path file from your master host's Greenplum Database installation directory:
   ```
   # source /usr/local/greenplum-db/greenplum_path.sh
   ```
3. Run the `gpperfmon_install` utility with the `--enable` option. You must supply the connection port of the Greenplum Database master server process, and set the password for the gpmon superuser that will be created. For example:
   ```
   $ gpperfmon_install --enable --password p@$$word --port 5432
   ```
4. When the utility completes, restart Greenplum Database server. The data collection agents will not start until the database is restarted:
   ```
   $ gpstop -r
   ```
5. Using the `ps` command, verify that the data collection process is running on the Greenplum master. For example:
   ```
   $ ps -ef | grep gpmmon
   ```
6. Run the following command to verify that the data collection processes are writing to the Command Center database. If all of the segment data collection agents are running, you should see one row per segment host.
   ```
   $ psql gpperfmon -c 'SELECT * FROM system_now;'
   ```

The data collection agents are now running, and your Greenplum system now has a gpperfmon database installed. This is the database where Command Center data is stored. You can connect to it as follows:

```
$ psql gpperfmon
```

To configure a standby master host (if enabled):

1. Copy the `$MASTER_DATA_DIRECTORY/pg_hba.conf` file from your primary master host to your standby master host. This ensures that the required connection options are also set on the standby master.
2. Copy your `~/.pgpass` file from your primary master host to your standby master host. This file usually resides in the gpadmin user's home directory. Note that the permissions on `.pgpass` must be set to 600 (for example: `chmod 0600 ~/.pgpass`).

Installing the Greenplum Command Center Console

The Command Center Console provides a graphical interface for viewing performance data and for administering certain aspects of your Greenplum system. Normally installed on the Greenplum master host, the console is a web-based user interface accessed through a supported browser.

The Command Center Console is typically installed on the Greenplum Database master host. However, you have the option to install the console on a host different from the master host. Note that this setup incurs a performance penalty due to the numerous database connections the console must open over the network.

If you have multiple Greenplum Database instances, you can create separate Command Center Console instances for each of them. Each separate console instance operates on a unique port and has its own unique configuration options.

The Command Center Console supports for any browsers that have at a minimum Adobe Flash 9.0 (GPCC 1.2.2.2 and earlier) or Adobe Flash 11.0 (GPCC 1.2.2.3) enabled.

IMPORTANT

We recommend that you always install the latest version of Adobe Flash Player to ensure you receive the latest security updates from Adobe.

For example, the following browsers are supported:

- Internet Explorer for Windows XP and Vista
- Mozilla Firefox for Windows and Linux
- Apple’s Safari browser for Macintosh
- Google’s Chrome

The Command Center Console runs on a lighttpd web server. The default web server port is 28080. For more information about the web server, see Administering Greenplum Command Center.

Installing the Command Center Console involves the following high-level tasks:

- Install the Command Center Console — Create the software installation directory.
- Set up the Greenplum Command Center Console — Set up the environment variables and create and configure a Command Center Console instance and its supporting web services.

Install the Command Center Console

If you are installing the Command Center Console on a remote system (that is, not the same system on which you installed Greenplum Database), you must also install Greenplum Database installation binary files on the remote system. After installing the binary files, source `greenplum_path.sh`, then perform the Console installation steps described below. Note that you do not need to initiate the database. See the *Greenplum Database Installation Guide* for more information.

1. Download the installer file from Pivotal Network or from the EMC Download Center. Installer files are available for the RedHat 64-bit platform.
   You do not need to download the installer file if you are installing the console on an EMC Data Computing Appliance; the installer file is already loaded on DCAs

2. Unzip the installer file where PLATFORM is RHEL5-x86_64 (RedHat 64-bit). For example:
   ```
   # unzip greenplum-cc-web-versionx.x-PLATFORM.zip
   ```

3. Login in as `gpadmin`.

4. Launch the installer using bash. For example:
   ```
   # /bin/bash greenplum-cc-web-versionx.x-PLATFORM.bin
   ```

5. Type `yes` to accept the license agreement.

6. The installer prompts you to provide an installation path. Press ENTER to accept the default install path (`/usr/local/greenplum-cc-web-versionx.x`), or enter an absolute path to an install location. You must have write permissions to the location you specify.

7. Once the installation has completed successfully, create a host file listing all remaining hostnames, including the Standby Master host. Note that hostnames must be DNS resolvable.

8. The installation directory contains a `gpcc_path.sh` file with path and environment settings for the Console. Source this and the Greenplum path, as follows:
   ```
   $ source /usr/local/greenplum-db/greenplum_path.sh
   $ source /usr/local/greenplum-cc-web-versionx.x/gpcc_path.sh
   ```

Note: if you have performed the previous steps as any other user than `gpadmin`, you need to change ownership and permissions to the installation directory before you continue:

Change the ownership of the installation directory:
```
$ chown -R gpadmin:gpadmin greenplum-cc-web-versionx.x
```

Change the permissions of the installation directory:
```
$ chmod -R 755 greenplum-cc-web-versionx.x
```

9. As `gpadmin`, run the `gpccinstall` utility to install Command Center on all hosts listed in the host file you created.

   `$ gpccinstall -f hostfilename` Where `hostfilename` is the name of the host file you created earlier in this procedure.

10. Configure the Console as described in *Set Up the Command Center Console* , next.

Set Up the Command Center Console

The `gpcmdr` utility sets up the Command Center Console on the current host. On hosts other than the Greenplum master host, the console experiences slower performance due to frequent connections to the gpperfmon database.

Set up the Command Center Environment Variable

During the setup process, the utility prompts you for values to configure Console connections to a single Greenplum Database instance. To configure connections to multiple Greenplum Database instances, run the setup routine multiple times. To accept the displayed default values for any of these parameters at configuration time, hit the ENTER key.

Set up the Greenplum Command Center Console

1. Log in as the Greenplum administrator (`gpadmin`).

2. Stop the Greenplum Database.

3. Add the following environmental variable in your user's startup shell profile (such as `~/.bashrc`)

   `GPPERFMONHOME` – the Command Center home directory
   For example:
   ```
   GPPERFMONHOME=/usr/local/greenplum-cc-web-versionx.x
   source $GPPERFMONHOME/gpcc_path.sh
   ```
   Ensure that this file has entries for `greenplum_path.sh` file and `MASTER_DATA_DIRECTORY`. See the *Greenplum Database Installation Guide* for details.

4. Save and source the `.bashrc` file.

5. Start the Database.

6. With the Greenplum Database instance running, launch the setup utility. For example:
   ```
   $ gpcmdr --setup
   ```

7. Provide an instance name for the Greenplum Database instance monitored by this Console. To monitor multiple instances, you must run the setup utility separately for each instance.

8. Select y or n to specify if the Greenplum Database master for this instance is on a remote host. Note that Console performance is better when the Console and Greenplum Database master are on the same host. If the master host is remote, enter y and enter the hostname of the master at the prompt.
9. Provide a display name for the instance. This name is shown in the Console user interface. This prompt does not appear if the master host is remote.
10. Provide the port for the Greenplum Database master instance.
11. Provide a port number for the Command Center Console web server. The default is 28080.
12. (Optional) Enter y or n to set up SSL connections for the Command Center Console. If you enter Y, you are prompted for the following distinguished name (DN) information used to create an unsigned certificate for the Command Center Console. For example:
    ```
    Country Name (2 letter code) [GB]:US
    State or Province Name (full name) [Berkshire]:California
    Locality Name (eg, city) [Newbury]:San Mateo
    Organization Name (eg, company) [My Company Ltd]:Greenplum
    Organizational Unit Name (eg, section) []:Engineering
    Common Name (eg, your name or your server's hostname) []:mdw1
    Email Address []:gpadmin@greenplum.com
    ```

    
    Because database login information is sent over the network, we recommend you use SSL to encrypt these communications.

13. Enter y to enable IPv6 support. IPv6 support is disabled by default.
14. Enter y or n to specify whether you want this installation copied to a Standby Master. If you enter y, you are subsequently prompted for the Standby Master host name.
15. Start and log into the Console. See *Connecting to the Greenplum Command Center Console* , next. You can also configure authentication so that other Greenplum users can log into the Console, see Configuring Authentication for the Command Center Console for details.

Connecting to the Greenplum Command Center Console

Start the Greenplum Command Center Console by entering:

```
gpcmdr --start
```

If you do not specify an instance name, all Command Center Console instances are started. To start a particular instance, you can specify the name of the instance. For example:

```
gpcmdr --start "instance_name"
```

See Administering Greenplum Command Center for a complete list of administrative commands.

After the instance is running, you can open the Command Center Console in a supported browser using the correct hostname and port. For example, to open a Command Center instance running on port 28080 on the local host with SSL, use the following web address:
`https://master_host_name:28080/`

At the login prompt, enter the user name and password of a Greenplum role that has been properly configured to allow authentication to Greenplum Command Center (for example, `gpmon`), then click **Login**. This opens the Dashboard page of the Command Center Console, which provides a graphical system snapshot and a summary view of active queries. See the Command Center Console online help for more information.

You must be a Greenplum administrator to fully use the Greenplum Command Center Console. Administrators can view information for all queries as well as system metrics, while regular database users can only monitor their own queries.

Configuring Authentication for the Command Center Console

When you installed Greenplum Command Center database and enabled the data collection agents, a gpmon superuser was created by the installation utility. This is the Greenplum role used to manage the Command Center components and data within the Greenplum environment. The gpmon role is configured to use md5-encrypted password authentication to connect to the Greenplum Database instance.

Typically, you will not be connecting to the Command Center Console as `gpmon`, and instead connect as another Greenplum user. The Command Center Console is configured by default to require md5-encrypted password authentication, so make sure the Greenplum role has an md5-encrypted password set.

If you are using Greenplum Database version 4.2.1 or higher, you have the option of using SHA-256-encrypted password authentication. You can specify SHA-256 authentication by changing the `password_hash_algorithm` server parameter. This parameter can be set either system-wide or on a session level.

The Command Center administrative user, `gpmon`, is created automatically by the `dca_setup` utility on the Data Computing Appliance, and by the `gpperfmon_install` utility in a Greenplum Database software-only environment.

Any other Greenplum Database users with appropriate privileges can access Command Center.

To create a new Command Center user, first you have to create a Greenplum Database user, then edit the `pg_hba.conf` file to give that user access to Command Center. The following is an example of the steps necessary to create a new user for Command Center. This example uses the psql command line to create a user with read-only privileges.

See the *GPDB Database Administrator Guide* for more detailed information about creating database users and roles.

1. On the Master host, login as `gpadmin`.

2. Start psql:
   ```
   $psql
   ```
3. Enter the create role command to create a read-only user:
   ```
   # create role CC_user with login password ‘new_password’;
   ```
   To create a role with superuser privileges:
   ```
   # create role CC_user with login password ‘new_password’ superuser createdb ;
   ```
4. Verify that the user was created successfully using the following command:
   ```
   # \du
   ```
5. The new user you just created should be returned, along with the attributes you specified.
6. Exit psql.
7. Edit the `pg_hba.conf` file to give the new user access to Command Center:
   ```
   $ vi $MASTER_DATA_DIRECTORY/pg_hba.conf
   ```
   Scroll to the bottom of the file and insert the following text to give the new user, `CC_user`, access from any IP address using password authentication:
   ```
   host all CC_user 127.0.0.1/28 md5
   ```

   ⚠ If you subsequently have issues logging in to Command Center it may be due to your specific environment; check the following log file for authentication errors:

   `$GPPERFMON/instances/instance_name/logs/gpmonws.log`

   Edit the `pg_hba.conf` based on the error message and your specific environment.

8. Save the file and exit the editor.
9. Enter the following command to reload Greenplum Database processes.

```
# gpstop -u
```

Using SSL Encryption

If you enable SSL at setup time, the installer creates a self-signed certificate and uses OpenSSL encryption for all connections to the Command Center web server.

Because this is a self-signed certificate, supported browsers may need to be configured to accept or allow it as a security exception. This does not detract from the added security gained from encrypting communications between the browser client and the web server.

Optionally, you can obtain and use a certificate signed by a trusted certificate authority such as Verisign. If you use a trusted certificate, edit the `lighttpd.conf` file (located in `$GPPERFMONHOME/instances/instance_name/conf`), and set the `ssl.pemfile` to point to the location of the certificate. For example:

```
ssl.pemfile = "$GPPERFMONHOME/instances/instance_name/conf/cert.pem"
```

For more information on the `lighttpd.conf` file, see “Web Server Administration” in the Configuration File Reference section.

About the Command Center Installation

The installation and setup procedures create a software installation directory and a directory containing files and folders to support each Greenplum Command Center Console instance.

Software Installation Directory

The following files and first-level subdirectories are copied into the installation folder that you specified when you installed Greenplum Command Center Console. This location is referred to as `$GPPERFMONHOME`.

- `gpcc_path.sh` — file containing environment variables for Command Center
- `bin` — program files for Greenplum Command Center
- `etc` — contains `openssl.conf` file
- `ext` — Python directory and files
- `instances` — contains a subdirectory of resources for each Greenplum Database instance monitored by the console
- `lib` — library files for Greenplum Command Center
- `www` — web service and user interface files

Instances Directory

The `$GPPERFMONHOME/instances` directory contains subdirectories named for each instance created during console setup. The `conf` subdirectory contains configuration files that you can edit. Other files and folders are used by the web services for the instance, and should not be modified or deleted.

Each subdirectory contains the following files and first-level subdirectories:

- `lighttpd.pid` — file containing an updated process ID for the web server process for the instance
- `conf` — console and web server configuration files, `gpperfmonui.conf` and `lighttpd.conf`
- `logs` — logs for the web server for this instance

- `perfmon.fastcgi.socket-0` — dynamically updated socket information, which cannot be viewed or updated
- `sessions` — files storing information about session state
- `tmp` — temporary files used by the web server
- `web` — symbolic links to web server files in the installation directory

Uninstalling Greenplum Command Center

To uninstall, you must stop both the Command Center Console and disable the data collection agents. Optionally, you may also want to remove any data associated with Greenplum Command Center by removing your Command Center Console installation and the Command Center database.

To uninstall the Command Center Console:

1. Stop Command Center Console if it is currently running. For example:
   ```
   $ gpcmdr --stop
   ```
2. Remove the Command Center installation directory from all hosts. For example:
   ```
   $ rm -rf /usr/local/greenplum-cc-web-version
   ```

To disable the Data Collection Agents:

1. Log in to the master host as the Greenplum administrative user (`gpadmin`):
   ```
   su - gpadmin
   ```
2. Edit `$MASTER_DATA_DIRECTORY/postgresql.conf` and disable the data collection agents:
   ```
   gp_enable_gpperfmon = off
   ```
3. Remove or comment out the gpmon entries in `pg_hba.conf`. For example:
   ```
   #local gpperfmon gpmon md5
   #host gpperfmon gpmon 0.0.0.0/0 md5
   ```
4. Drop the Command Center superuser role from the database. For example:
   ```
   $ psql template1 -c 'DROP ROLE gpmon;'
   ```
5. Restart the Greenplum Database instance:
   ```
   $ gpstop -r
   ```
6. Clean up any uncommitted Command Center data and log files that reside on the master file system:
   ```
   $ rm -rf $MASTER_DATA_DIRECTORY/gpperfmon/data/*
   $ rm -rf $MASTER_DATA_DIRECTORY/gpperfmon/logs/*
   ```
7. If you do not want to keep your historical Command Center data, drop the gpperfmon database:
   ```
   $ dropdb gpperfmon
   ```

Chapter 3 Administering Greenplum Command Center

After installation and startup, Greenplum Command Center requires minimal maintenance by administrators. Tasks for administration of the web server or the Command Center database are performed with native tools or Command Center utilities, as described in this section.

Topics:

Starting and Stopping Greenplum Command Center

Starting and Stopping Command Center Agents

Whenever the Greenplum Database server configuration parameter `gp_enable_gpperfmon` is enabled in the master `postgresql.conf` file, the Command Center agents will run and collect data. These agents are automatically stopped and started together along with the Greenplum Database instance.

If you wish to disable the Command Center data collection agents, you must disable the `gp_enable_gpperfmon` parameter, and restart the Greenplum Database instance.

Starting and Stopping Command Center Console

You can start, stop and restart Greenplum Command Center Console instances with the following commands:

```
$ gpcmdr --start ["instance name"]
```

```
$ gpcmdr --stop ["instance name"]
```

```
$ gpcmdr --restart ["instance name"]
```

If you do not specify an instance name, all instances are started, stopped or restarted at once. You can check the status of instances using:

```
$ gpcmdr --status ["instance name"]
```

Configuring Greenplum Command Center

Configuration parameters for Greenplum Command Center are stored in the following configuration files:

Agent Configuration

Changes to these files require a restart of the Greenplum Database instance (`gpstop -r`).

- `$MASTER_DATA_DIRECTORY/gpperfmon/conf/gpperfmon.conf`
- `$MASTER_DATA_DIRECTORY/postgresql.conf`

Console Configuration

Changes to these files require a restart of Command Center Console (gpcmdr --restart).

- `$GPPERFMONHOME/instances/instance_name/conf/gpperfmonui.conf`
- `$GPPERFMONHOME/instances/instance_name/conf/lighttpd.conf`

See the Configuration File Reference section for a description of the configuration parameters in these files.

You should not need to manually edit any of the files. Running the Command Center setup utility will make all the necessary modifications to these configuration files.

Command Center Agent Administration

This section describes basic agent administration tasks, including adding hosts and viewing agent log files.

Adding and Removing Hosts

Segment agents on new hosts are detected automatically by the master agent. Whenever `gp_enable_gpperfmon` is enabled on the master, the master monitor agent automatically detects, starts, and begins harvesting data from new segment agents.

To verify the addition of a new monitored host, you can check for the new hostname in the Greenplum Command Center Console System Metrics view described in the Greenplum Command Center Console online help. Alternately, you can query the `system_now` table for the row containing current metrics for each host. For example:

```
# SELECT * FROM system_now WHERE hostname='new_hostname';
```

Viewing and Maintaining Master Agent Log Files

Log messages for the master agent are written to `$MASTER_DATA_DIRECTORY/gpperfmon/logs/gpmmon.log` by default. To change the log file location, edit the `log_location` parameter in `gpperfmon.conf`.

On the segment hosts, agent log messages are written to a `gpsmon.log` file in the segment instance's data directory. For a host with multiple segments, the agent log file is located in the data directory of the first segment, as listed in the `gp_configuration` table by dbid. If the segment agent is unable to log into this directory, it will log messages to the home directory of the user running Command Center (typically `gpadmin`)

Configuring Log File Rollover

At higher logging levels, the size of the log files may grow dramatically. To prevent the log files from growing to excessive size, you can add an optional log rollover parameter to `gpperfmon.conf`. The value of this parameter is measured in bytes. For example:

```
max_log_size = 10485760
```

With this setting, the log files will grow to 10MB before the system rolls over the log file. The timestamp is added to the log file name when it is rolled over. Administrators must periodically clean out old log files that are no longer needed.

Command Center Database Administration

Data collected by Command Center agents is stored in a dedicated database called gpperfmon within the Greenplum Database instance. This database requires the typical database maintenance tasks such as clean up of old historical data and periodic ANALYZE.

See the Command Center Database Reference section for a reference of the tables and views in the gpperfmon database.

Connecting to the Command Center Database

Database administrators can connect directly to the Command Center database (`gpperfmon`) using any Greenplum Database-compatible client program (such as psql). For example:

```
$ psql -d gpperfmon -h master_host -p 5432 -U gpadmin
```

Backing Up and Restoring the Command Center Database

The history tables of the Command Center database (`gpperfmon`) can be backed up and restored using the Greenplum Database parallel backup and restore utilities (`gp_dump`, `gp_restore`, `gpcrondump`, `gpdbrestore`). See the *Greenplum Database Utility Guide* for more information.

Because the Command Center database has a low number of tables, you may prefer to devise a backup plan using the table-level backup features of `gp_dump`. For example, you can create scripts to run `gp_dump` to back up the monthly partitions of the historical data tables on a monthly schedule. Alternately, you can back up your Command Center database at the database level.

Maintaining the Historical Data Tables

All of the `*_history` tables stored in the Command Center database (gpperfmon) are partitioned into monthly partitions. A January 2010 partition is created at installation time as a template partition (it can be deleted once some current partitions are created). The Command Center agents automatically create new partitions in two month increments as needed. Administrators must periodically drop partitions for the months that are no longer needed in order to maintain the size of the Command Center database.

See the *GPDB Database Administrator Guide* for more information on dropping partitions of a partitioned table.

Web Server Administration

The Lighttpd web server and web service middleware are installed in the `www` directory of your Greenplum Command Center installation. For detailed information on Lighttpd administration, see http://www.lighttpd.net/.

Configuring the Web Server

The Lighttpd web server configuration file is stored in `$GPPERFMONHOME/instances/instance_name/conf/lighttpd.conf`. Some of the parameters in this configuration file are set by the `gpcmdr` setup utility, including the web server port and SSL options. See the *Web Server Parameters* section of Configuration File Reference for a description of the parameters in this file.

You should not need to manually edit this file, if you do, you may break some functionality. Contact Support if you want to make custom modifications to this file.

Viewing and Maintaining Web Server Log Files

Web server access and error logs are written to `$GPPERFMONHOME/instances/instance_name/logs`. These two logs are:

- `lighttpd-access.log`
- `lighttpd-error.log`

If you experience errors viewing the Greenplum Command Center Console, refer to these logs for more information.

To prevent web server logs from growing to excessive size, you can set up log file rotation using `logrotate` or `cronolog`, both of which are widely used with Lighttpd.

Chapter 4 Utility Reference

Greenplum provides two utilities: the `gpperfmon_install` utility that enables the data collection agents and the `gpcmdr` utility that sets up and manages the web application.

Topics:

gpperfmon_install

Installs the Command Center database (gpperfmon) and optionally enables the data collection agents.

Synopsis

```
gpperfmon_install

[--enable --password gpmon_password --port gpdb_port]

[--pgpass path_to_file]

[–verbose]

gpperfmon_install --help | -h | -?
```

Description

The gpperfmon_install utility automates the steps required to enable the Command Center data collection agents. You must be the Greenplum system user (gpadmin) in order to run this utility. If using the --enable option, Greenplum Database instance must be restarted after the utility completes.

When run without any options, the utility will just create the Command Center database (gpperfmon). When run with the --enable option, the utility will also run the following additional tasks necessary to enable the Command Center data collection agents:

1. Creates the gpmon superuser role in Greenplum Database. The Command Center data collection agents require this role to connect to the database and write their data. The gpmon superuser role uses MD5-encrypted password authentication by default. Use the --password option to set the gpmon superuser's password. Use the --port option to supply the port of the Greenplum Database master instance.

2. Updates the $MASTER_DATA_DIRECTORY/pg_hba.conf file. The utility will add the following line to the host-based authentication file (pg_hba.conf). This allows the gpmon user to locally connect to any database using MD5-encrypted password authentication:
   `local all gpmon md5`

3. Updates the password file (.pgpass). In order to allow the data collection agents to connect as the gpmon role without a password prompt, you must have a password file that has an entry for the gpmon user. The utility add the following entry to your password file (if the file does not exist, the utility will create it):
   `*:5432:gpperfmon:gpmon:gpmon_password`
   If your password file is not located in the default location (~/.pgpass), use the --pgpass option to specify the file location.

4. Sets the server configuration parameters for Command Center. The following parameters must be enabled in order for the data collection agents to begin collecting data. The utility will set the following parameters in the postgresql.conf configuration files:

```
gp_enable_gpperfmon=on (in all postgresql.conf files)

gpperfmon_port=8888 (in all postgresql.conf files)

gp_external_enable_exec=on (in the master postgresql.conf file)
```

Options

`--enable`

In addition to creating the `gpperfmon` database, performs the additional steps required to enable the Command Center data collection agents. When `--enable` is specified the utility will also create and configure the gpmon superuser account and set the Command Center server configuration parameters in the `postgresql.conf` files.

`--password gpmon_password`

Required if `--enable` is specified. Sets the password of the gpmon superuser.

`--port gpdb_port`

Required if `--enable` is specified. Specifies the connection port of the Greenplum Database master.

`--pgpass path_to_file`

Optional if `--enable` is specified. If the password file is not in the default location of `~/.pgpass,` specifies the location of the password file.

`--verbose`

Sets the logging level to verbose.

`--help | -h | -?`

Displays the online help.

Examples

Create the Command Center database (`gpperfmon`) only:

```
$ su - gpadmin

$ gpperfmon_install
```

Create the Command Center database (`gpperfmon`), create the `gpmon` superuser, and enable the Command Center agents:

```
$ su - gpadmin
```

```
$ gpperfmon_install --enable --password p@$$word --port 5432
```

```
$ gpstop -r
```

gpcmdr

Configures and manages instances of the Command Center Console.

Synopsis

```
gpcmdr --setup [instance_name]

| --start [instance_name]

| --stop [instance_name]

| --restart [instance_name]

| --status [instance_name]
```

Description

The `gpcmdr` utility sets up and configures Command Center Console instances, starts and stops instances, and provides status information.

For all actions, including starting and stopping, you can specify a console instance name. If you do not specify a name, the action applies to all existing console instances.

Options

`--setup`

Configures console components on the installation host. With this option, `gpcmdr` prompts for values to configure the components and writes the values to `gpperfmonui.conf` and `lighttpd.conf`. For more information on these configuration parameters, see Appendix C, “Command Center Configuration File Reference”.

`--start`

Starts the specified instance (or all instances by default) and its associated web service.

`--stop`

Stops the specified instance (or all instances by default) and its associated web service.

`--restart`

Restarts the specified instance (or all instances by default) and its associated web service.

`--status`

Displays the status, either `Running` or `Stopped`, of the web service.

`--version`

Displays the version of the `gpperfmon` utility and the lighttpd web service.

Examples

Start the utility in order to install and configure a new instance:

```
$ gpcmdr --setup
```

Check the status of Command Center:

```
$ gpcmdr --status
```

Chapter 5 Configuration File Reference

Configuration parameters for Greenplum Command Center are stored in these files:

- `$MASTER_DATA_DIRECTORY/gpperfmon/conf/gpperfmon.conf` — stores configuration parameters for the Greenplum Command Center agents.
- `$GPPERFMONHOME/instances/instance_name/conf/gpperfmonui.conf` and **`lighttpd.conf`** — stores configuration parameters for the Command Center web application and web server.
- **`$MASTER_DATA_DIRECTORY/postgresql.conf`** — stores configuration parameters to enable the Greenplum Command Center feature for Greenplum Database server.

Any system user with write permissions to these directories can edit these configuration files.

This rest of this section provides more details about the configuration file parameters:

Topics:

Command Center Agent Parameters

The `$MASTER_DATA_DIRECTORY/gpperfmon/conf/gpperfmon.conf` stores configuration parameters for the Command Center agents. For configuration changes to these options to take effect, you must save `gpperfmon.conf` and then restart Greenplum Database server (`gpstop -r`).

To enable the Command Center agents within Greenplum Database server, you must also set the Greenplum Database Server Configuration Parameters, see Command Center Database Reference for details.

`log_location`

Specifies a directory location for Command Center log files. Default is `$MASTER_DATA_DIRECTORY/gpperfmon/logs`.

`min_query_time`

Specifies the minimum query run time in seconds for statistics collection. Command Center logs all queries that run longer than this value in the queries_history table. For queries with shorter run times, no historical data is collected. Defaults to 20 seconds.

If you know that you want to collect data for all queries, you can set this parameter to a low value. Setting the minimum query run time to zero, however, collects data even for the numerous queries run by Command Center itself, creating a large amount of data that may not be useful.

`min_detailed_query_time`

Specifies the minimum iterator run time in seconds for statistics collection. Command Center logs all iterators that run longer than this value in the iterators_history table. For iterators with shorter run times, no data is collected. Minimum value is 10 seconds.

This parameter's value must always be equal to, or greater than, the value of `min_query_time`. Setting `min_detailed_query_time` higher than `min_query_time` allows you to log detailed query plan iterator data only for especially complex, long-running queries, while still logging basic query data for shorter queries.

Given the complexity and size of iterator data, you may want to adjust this parameter according to the size of data collected. If the `iterators_*` tables are growing to excessive size without providing useful information, you can raise the value of this parameter to log iterator detail for fewer queries.

`max_log_size`

This parameter is not included in `gpperfmon.conf`, but it may be added to this file for use with Greenplum Command Center.

To prevent the log files from growing to excessive size, you can add the `max_log_size` parameter to `gpperfmon.conf`. The value of this parameter is measured in bytes. For example:

```
max_log_size = 10485760
```

With this setting, the log files will grow to 10MB before the system rolls over to a new log file.

`partition_age`

The number of months that Greenplum Command Center statistics data will be retained. The default it is 0, which means we won't drop any data.

`quantum`

Specifies the time in seconds between updates from Command Center agents on all segments. Valid values are 10, 15, 20, 30, and 60. Defaults to 15 seconds.

If you prefer a less granular view of performance, or want to collect and analyze minimal amounts of data for system metrics, choose a higher quantum. To collect data more frequently, choose a lower value.

`smdw_aliases`

This parameter allows you to specify additional host names for the standby master. For example, if the standby master has two NICs, you can enter:

```
smdw_aliases= smdw-1,smdw-2
```

This optional fault tolerance parameter is useful if the Greenplum Command Center loses connectivity with the standby master. Instead of continuously retrying to connect to host smdw, it will try to connect to the NIC-based aliases of `smdw-1` and/or `smdw-2`. This ensures that the Command Center Console can continuously poll and monitor the standby master.

Command Center Console Parameters

These parameters only applies to Greenplum Data Computing Appliance platforms.

Each instance of the Command Center Console has two configuration files located in `$GPPERFMONHOME/instances/instance_name/conf`. The web application file is `gpperfmonui.conf` and the web server file is `lighttpd.conf`.

After editing these files, reload the configuration by restarting the Command Center Console instance (`gpperfmon --restart "instance_name"`).

Web Application Parameters

(`gpperfmonui.conf`)

`allow_trust_logon`

Determines whether to allow access to the Greenplum Command Center Console for any user listed in `pg_hba.conf` using the trust authentication method. When set to yes, trusted Greenplum users are allowed to login to the Command Center console without a password. By default, this parameter is commented out.

`server_name`

Specifies the instance name displayed on the login page of the Greenplum Command Center Console. This value can be any name you want to display to users, expressed as a text string. Defaults to the instance name you specified when setting up the Command Center Console.

`master_port`

Specifies the port number of the Greenplum Database master that this instance is monitoring.

Web Server Parameters

(`lighttpd.conf`)

This file has several configuration parameters, however these are the parameters most likely to change for a Command Center Console installation. For more information on the other parameters in this configuration file, see the lighttpd documentation.

`server.port`

Sets the web server port number. The default HTTP port is 28080.

`ssl.engine`

Determines whether SSL encryption is used for client connections. Valid values are enable and disable. If you enable SSL at installation time, this is set to enable.

`ssl.pemfile`

Specifies the path to the PEM file for SSL support. If you enable SSL at installation time, this parameter points to a self-signed certificate. If you use a trusted signed certificate, you must specify it with this parameter.

Greenplum Database Server Configuration Parameters

The following parameters must be uncommented and set in the server configuration file (`postgresql.conf`) in order to enable the Command Center data collection agents:

`gp_enable_gpperfmon` and `gpperfmon_port` must be set in both the master and segment `postgresql.conf` files.

`gp_enable_gpperfmon` and `gp_enable_gpperfmon` only need to be set in the master `postgresql.conf` file.

After changing these settings, the Greenplum Database instance must be restarted for the changes to take effect.

`gp_enable_gpperfmon`

Turns on the Command Center data collection agent for a segment. Must be set in all `postgresql.conf` files (master and all segments).

`gpperfmon_port`

The default port for the Command Center agents is 8888, but you can set this parameter to a different port if required (master and all segments).

`gp_gpperfmon_send_interval`

Sets the frequency in seconds that the Greenplum Database server processes send query execution updates to the Command Center agent processes.

`gp_external_enable_exec`

This parameter is enabled by default and must remain enabled. It allows the use of external tables that execute OS commands or scripts on the segment hosts. The Command Center agents use this type of external tables to collect current system metrics from the segments.

`gpperfmon_log_alert_level`

Controls which message levels are written to the gpperfmon log. Each level includes all the levels that follow it. The later the level, the fewer messages are sent to the log. The default value is warning.

Chapter 6 Command Center Database Reference

This is the schema reference for the tables and views in the Greenplum Command Center database (`gpperfmon`) and contains the following information:

Topics:

Overview

The Command Center database consists of three sets of tables; `now` tables store data on current system metrics such as active queries, `history` tables store data on historical metrics, and `tail` tables are for data in transition. `Tail` tables are for internal use only and should not be queried by users. The `now` and `tail` data are stored as text files on the master host file system, and accessed by the Command Center database via external tables. The `history` tables are regular database tables stored within the Command Center (`gpperfmon`) database.

The database consists of three sets of tables:

- `now` tables store data on current system metrics such as active queries.
- `history` tables store data historical metrics.
- `tail` tables are for data in transition. These tables are for internal use only and should not be queried by endusers.

There are the following categories of tables:

- The `database_*` tables store query workload information for a Greenplum Database instance.
- The `emcconnect_history` table displays information about ConnectEMC events and alerts. ConnectEMC events are triggered based on a hardware failure, a fix to a failed hardware component, or a Greenplum Database startup. Once an ConnectEMC event is triggered, an alert is sent to EMC Support.
- The `filerep_*` tables store health and status metrics for the file replication process. This process is how high-availability/mirroring is achieved in Greenplum Database instance. Statistics are maintained for each primary-mirror pair.
- The `health_*` tables store system health metrics for the EMC Data Computing Appliance.
- The `interface_stats_*` tables store statistical metrics for each active interface of a Greenplum Database instance. Note: These tables are in place for future use and are not currently populated.
- The `iterators_*` tables store information about query plan iterators and their metrics. A query iterator refers to a node or operation in a query plan.
- The `log_alert_*` tables store information about pg_log errors and warnings.
- The `queries_*` tables store high-level query status information.
- The `segment_*` tables store memory allocation statistics for the Greenplum Database segment instances.
- The `socket_stats_*` tables store statistical metrics about socket usage for a Greenplum Database instance.
  Note: These tables are in place for future use and are not currently populated.

- The `system_*` tables store system utilization metrics.
- The `tcp_stats_*` tables store statistical metrics about TCP communications for a Greenplum Database instance.
  Note: These tables are in place for future use and are not currently populated.
- The `udp_stats_*` tables store statistical metrics about UDP communications for a Greenplum Database instance.
  Note: These tables are in place for future use and are not currently populated.

The Command Center database also contains the following views:

- The `dynamic_memory_info` view shows an aggregate of all the segments per host and the amount of dynamic memory used per host.
- The `iterators_*_rollup` set of views summarize the query iterator metrics across all segments in the system.
- The `memory_info` view shows per-host memory information from the `system_history` and `segment_history` tables.

database_*

The `database_*` tables store query workload information for a Greenplum Database instance. There are three database tables, all having the same columns:

- `database_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. Current query workload data is stored in `database_now` during the period between data collection from the Command Center agents and automatic commitment to the `database_history` table.
- `database_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for query workload data that has been cleared from database_now but has not yet been committed to `database_history`. It typically only contains a few minutes worth of data.
- `database_history` is a regular table that stores historical database-wide query workload data. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
`ctime`	timestamp	Time this row was created.
`queries_total`	int	The total number of queries in Greenplum Database at data collection time.
`queries_running`	int	The number of active queries running at data collection time.
`queries_queued`	int	The number of queries waiting in a resource queue at data collection time.

emcconnect_history

The `emcconnect_history` table displays information about ConnectEMC events and alerts. ConnectEMC events are triggered based on a hardware failure, a fix to a failed hardware component, or a Greenplum Database instance startup. Once an ConnectEMC event is triggered, an alert is sent to EMC Support.

This table is pre-partitioned into monthly partitions. Partitions are automatically added in one month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

This table only applies to Greenplum Data Computing Appliance platforms.

Column	Type	Description
`ctime`	timestamp(0) without time zone	Time this ConnectEMC event occurred.
`hostname`	varchar(64)	The hostname associated with the ConnectEMC event.
`symptom_code`	int	A general symptom code for this type of event. For a list of symptom codes, see the EMC Greenplum DCA Installation and Configuration Guide.
`detailed_symptom_code`	int	A specific symptom code for this type of event.
`description`	text	A description of this type of event, based on the `detailed_symptom_code` .
`snmp_oid`	text	The SNMP object ID of the element/component where the event occurred, where applicable.
`severity`	text	The severity level of the ConnectEMC event. One of: `WARNING`: A condition that might require immediate attention. `ERROR`: An error occurred on the DCA. System operation and/or performance is likely affected. This alert requires immediate attention. `UNKNOWN`: This severity level is associated with hosts and devices on the DCA that are either disabled (due to hardware failure) or unreachable for some other reason. This alert requires immediate attention. `INFO`: A previously reported error condition is now resolved. Greenplum Database startup also triggers an INFO alert.
`status`	text	The current status of the system. The status is always `OK` unless a connection to the server/switch cannot be made, in which case the status is `FAILED`.
`attempted_transport`	boolean	`True` if an attempt was made to send an alert to EMC support. `False` if your system was configured not to send alerts.

Column	Type	Description
message	text	The text of the error message created as a result of this event.

filerep_*

The `filerep*` tables store high-availability file replication process information for a Greenplum Database instance. There are three filerep tables, all having the same columns:

- `filerep_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. Current file replication data is stored in `filerep_now` during the period between data collection from the Command Center agents and automatic commitment to the `filerep_history` table.
- `filerep_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for file replication data that has been cleared from `filerep_now` but has not yet been committed to `filerep_history`. It typically only contains a few minutes worth of data.
- `filerep_history` is a regular table that stores historical database-wide file replication data. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
`ctime`	timestamp	Time this row was created.
`primary_measurement_microsec`	bigint	The length of time over which primary metrics (contained in UDP messages) were gathered.
`mirror_measurement_microsec`	bigint	The length of time over which mirror metrics (contained in UDP messages) were gathered.
`primary_hostname`	varchar(64)	The name of the primary host.
`primary_port`	int	The port number of the primary host.
`mirror_hostname`	varchar(64)	The name of the mirror host.
`mirror_port`	int	The port number of the mirror host.
`primary_write_syscall_bytes_avg`	bigint	The average amount of data written to disk on the primary for write system calls per interval.
`primary_write_syscall_byte_max`	bigint	The maximum amount of data written to disk on the primary for write system calls per interval.
`primary_write_syscall_microsecs_avg`	bigint	The average time required for a write system call to write data to disk on the primary per interval.
`primary_write_syscall_microsecs_max`	bigint	The maximum time required for a write system call to write data to disk on the primary per interval.
`primary_write_syscall_per_sec`	double precision	The number of write system calls on the primary per second. It reflects only the time to queue the write to disk in memory.

Column	Type	Description
primary_fsync_syscall_microsec_avg	bigint	The average amount of time required for a file sync system call to write data to disk on the primary per interval.
primary_fsync_syscall_microsec_max	bigint	The maximum amount of time required for a file sync system call to write data to disk on the primary per interval.
primary_fsync_syscall_per_sec	double precision	The number of file sync system calls on the primary per second. Unlike write system calls which return immediately after the data is posted/queued, file sync system calls wait for all outstanding writes to be written to disk. File sync system call values in this column reflect actual disk access times for potentially large amounts of data.
primary_write_shmem_bytes_avg	bigint	The average amount of data written to shared memory on the primary per interval.
primary_write_shmem_bytes_max	bigint	The maximum amount of data written to shared memory on the primary per interval.
primary_write_shmem_microsec_avg	bigint	The average amount of time required to write data to shared memory on the primary per interval.
primary_write_shmem_microsec_max	bigint	The maximum amount of time required to write data to shared memory on the primary per interval.
primary_write_shmem_per_sec	double precision	The number of writes to shared memory on the primary per second.
primary_fsync_shmem_microsec_avg	bigint	The average amount of time required by the file sync system call to write data to shared memory on the primary per interval.
primary_fsync_shmem_microsec_max	bigint	The maximum amount of time required by the file sync system call to write data to shared memory on the primary per interval.
primary_fsync_shmem_per_sec	double precision	The number of file sync calls to shared memory on the primary per second. File sync system call values in this column reflect actual disk access times for potentially large amounts of data.
primary_write_shmem_per_sec	double precision	The number of writes to shared memory on the primary per second.
primary_fsync_shmem_microsec_avg	bigint	The average amount of time required by the file sync system call to write data to shared memory on the primary per interval.
primary_fsync_shmem_microsec_max	bigint	The maximum amount of time required by the file sync system call to write data to shared memory on the primary per interval.

Column	Type	Description
primary_fsync_shmem_per_sec	double precision	The number of file sync calls to shared memory on the primary per second. File sync system call values in this column reflect actual disk access times for potentially large amounts of data.
primary_roundtrip_fsync_msg_microsec_avg	bigint	The average amount of time required for a roundtrip file sync between the primary and the mirror per interval. This includes: 1. The queuing of a file sync message from the primary to the mirror. 2. The message traversing the network. 3. The execution of the file sync by the mirror. 4. The file sync acknowledgement traversing the network back to the primary.
primary_roundtrip_fsync_msg_microsec_max	bigint	The maximum amount of time required for a roundtrip file sync between the primary and the mirror per interval. This includes: 1. The queuing of a file sync message from the primary to the mirror. 2. The message traversing the network. 3. The execution of the file sync by the mirror. 4. The file sync acknowledgement traversing the network back to the primary.
primary_roundtrip_fsync_msg_per_sec	double precision	The number of roundtrip file syncs per second.
primary_roundtrip_test_msg_microsec_avg	bigint	The average amount of time required for a roundtrip test message between the primary and the mirror to complete per interval. This is similar to primary_roundtrip_fsync_msg_microsec_avg , except it does not include a disk access component. Because of this, this is a useful metric that shows the average amount of network delay in the file replication process.

Column	Type	Description
primary_roundtrip_test_msg_microsec_max	bigint	The maximum amount of time required for a roundtrip test message between the primary and the mirror to complete per interval. This is similar to primary_roundtrip_fsync_msg_microsec_max, except it does not include a disk access component. Because of this, this is a useful metric that shows the maximum amount of network delay in the file replication process.
primary_roundtrip_test_msg_per_sec	double precision	The number of roundtrip file syncs per second. This is similar to primary_roundtrip_fsync_msg_per_sec, except it does not include a disk access component. As such, this is a useful metric that shows the amount of network delay in the file replication process. Note that test messages typically occur once per minute, so it is common to see a value of “0” for time periods not containing a test message.
mirror_write_syscall_size_avg	bigint	The average amount of data written to disk on the mirror for write system calls per interval.
mirror_write_syscall_size_max	bigint	The maximum amount of data written to disk on the mirror for write system calls per interval.
mirror_write_syscall_microsec_avg	bigint	The average time required for a write system call to write data to disk on the mirror per interval.
mirror_write_syscall_microsec_max	bigint	The maximum time required for a write system call to write data to disk on the mirror per interval.
primary_roundtrip_test_msg_per_sec	double precision	The number of roundtrip file syncs per second. This is similar to primary_roundtrip_fsync_msg_per_sec, except it does not include a disk access component. As such, this is a useful metric that shows the amount of network delay in the file replication process. Note that test messages typically occur once per minute, so it is common to see a value of “0” for time periods not containing a test message.
mirror_write_syscall_size_avg	bigint	The average amount of data written to disk on the mirror for write system calls per interval.
mirror_write_syscall_size_max	bigint	The maximum amount of data written to disk on the mirror for write system calls per interval.
mirror_write_syscall_microsec_avg	bigint	The average time required for a write system call to write data to disk on the mirror per interval.

health_*

The `health_*` tables store system health metrics for the EMC Data Computing Appliance. There are three health tables, all having the same columns:

This table only applies to Greenplum Data Computing Appliance platforms.

- `health_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. Current system health data is stored in `system_now` during the period between data collection from the Command Center agents and automatic commitment to the `system_history` table.
- `health_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for system health data that has been cleared from `system_now` but has not yet been committed to `system_history`. It typically only contains a few minutes worth of data.
- `health_history` is a regular table that stores historical system health metrics. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
ctime	timestamp(0) without time zone	Time this snapshot of health information about this system was created.
hostname	varchar(64)	Segment or master hostname associated with this health information.
`symptom_code`	int	The symptom code related to the current health/status of an element or component of the system.
`detailed_symptom_code`	int	A more granular symptom code related to the health/status of a element or component of the system.
`description`	text	A description of the health/status of this symptom code.
`snmp_oid`	text	The SNMP object ID of the element/component where the event occurred, where applicable.
`status`	text	The current status of the system. The status is always `OK` unless a connection to the server/switch cannot be made, in which case the status is `FAILED`.
`message`	text	The text of the error message created as a result of this event.

interface_stats_*

The `interface_stats_*` tables store statistical metrics about communications over each active interface for a Greenplum Database instance.

These tables are in place for future use and are not currently populated.

There are three `interface_stats` tables, all having the same columns:

- `interface_stats_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`.
- `interface_stats_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for statistical interface metrics that has been cleared from `interface_stats_now` but has not yet been committed to `interface_stats_history`. It typically only contains a few minutes worth of data.
- `interface_stats_history` is a regular table that stores statistical interface metrics. It is pre-partitioned into monthly partitions. Partitions are automatically added in one month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
`interface_name`	string	Name of the interface. For example: eth0, eth1, lo.
`bytes_received`	bigint	Amount of data received in bytes.
`packets_received`	bigint	Number of packets received.
`receive_errors`	bigint	Number of errors encountered while data was being received.
`receive_drops`	bigint	Number of times packets were dropped while data was being received.
`receive_fifo_errors`	bigint	Number of times FIFO (first in first out) errors were encountered while data was being received.
`receive_frame_errors`	bigint	Number of frame errors while data was being received.
`receive_compressed_packets`	int	Number of packets received in compressed format.
`receive_multicast_packets`	int	Number of multicast packets received.
`bytes_transmitted`	bigint	Amount of data transmitted in bytes.
`packets_transmitted`	bigint	Amount of data transmitted in bytes.
`packets_transmitted`	bigint	Number of packets transmitted.
`transmit_errors`	bigint	Number of errors encountered during data transmission.
`transmit_drops`	bigint	Number of times packets were dropped during data transmission.
`transmit_fifo_errors`	bigint	Number of times fifo errors were encountered during data transmission.

Column	Type	Description
transmit_collision_errors	bigint	Number of times collision errors were encountered during data transmission.
transmit_carrier_errors	bigint	Number of times carrier errors were encountered during data transmission.
transmit_compressed_packets	int	Number of packets transmitted in compressed format.

iterators_*

The `iterators_*` tables store information about query plan iterators and their metrics. A query iterator refers to a node or operation in a query plan. For example, a sequential scan operation on a table may be one type of iterator in a particular query plan.

The `tmid`, `ssid` and `ccnt` columns are the composite key that uniquely identifies a particular query. These columns can be used to join with the `queries_*` data tables.

There are three iterator tables, all having the same columns:

- `iterators_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. Current query plan iterator data is stored in `iterators_now` during the period between data collection from the Command Center agents and automatic commitment to the `iterators_history` table.
- `iterators_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for query plan iterator data that has been cleared from `iterators_now` but has not yet been committed to `iterators_history`. It typically only contains a few minutes worth of data.
- `iterators_history` is a regular table that stores historical query plan iterator data. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

See also the `iterator_rollup` views for summary metrics of the query plan iterator data.

Column	Type	Description
`ctime`	timestamp	Time this row was created.
`tmid`	int	A time identifier for a particular query. All iterator records associated with the query will have the same tmid.
`ssid`	int	The session id as shown by the `gp_session_id` parameter. All iterator records associated with the query will have the same `ssid`.
`ccnt`	int	The command number within this session as shown by `gp_command_count` parameter. All iterator records associated with the query will have the same `ccnt`.
`segid`	int	The segment ID (`dbid` from `gp_segment_configuration`).
`pid`	int	The postgres process ID for this iterator.
`nid`	int	The query plan node ID from the Greenplum slice plan.
`pnid`	int	The parent query plan node ID from the Greenplum slice plan.
`hostname`	varchar(64)	Segment hostname.
`ntype`	varchar(64)	The iterator operation type. Possible values are listed in Iterator Metrics.

Column	Type	Description
nstatus	varchar(64)	The status of this iterator. Possible values are: Initialize, Executing and Finished.
tstart	timestamp	Start time for the iterator.
tduration	int	Duration of the execution.
pmemsize	bigint	Maximum work memory allocated by the Greenplum planner to this iterator's query process.
memsize	bigint	OS memory allocated to this iterator's process.
memresid	bigint	Resident memory allocated to this iterator's process (as opposed to shared memory).
memshare	bigint	Shared memory allocated to this iterator's process.
cpu_elapsed	bigint	Total CPU usage of the process executing the iterator.
cpu_currpct	float	The percentage of CPU currently being utilized by this iterator process. This value is always zero for historical (completed) iterators.
rowsout	bigint	The actual number of rows output by the iterator.
rowsout_est	bigint	The query planner's estimate of rows output by the iterator.
m0_name	varchar(64)	Each operation in a query plan (ntype) has metrics associated with it. For all operations, this metric name is `Rows In`.
m0_unit	varchar(64)	The unit of measure for this metric. For all operations (`ntype`), this unit of measure is `Rows`.
m0_val	bigint	The value of this metric.
m0_est	bigint	The estimated value of this metric.
m1_name	varchar(64)	Each operation in a query plan (`ntype`) has metrics associated with it. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m1_unit	varchar(64)	The unit of measure for this metric. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m1_val	bigint	The value of this metric.
m1_est	bigint	The estimated value of this metric.
m2_name	varchar(64)	Each operation in a query plan (`ntype`) has metrics associated with it. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m2_unit	varchar(64)	The unit of measure for this metric. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m2_val	bigint	The value of this metric.
m2_est	bigint	The estimated value of this metric.
m3_name	varchar(64)	Each operation in a query plan (`ntype`) has metrics associated with it. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m3_unit	varchar(64)	The unit of measure for this metric. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m3_val	bigint	The value of this metric.

Column	Type	Description
m3_est	bigint	The estimated value of this metric.
m4_name	varchar(64)	Each operation in a query plan (ntype) has metrics associated with it. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m4_unit	varchar(64)	The unit of measure for this metric. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m4_val	bigint	The value of this metric.
m4_est	bigint	The estimated value of this metric.
m5_name	varchar(64)	Each operation in a query plan (ntype) has metrics associated with it. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m5_unit	varchar(64)	The unit of measure for this metric. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m5_val	bigint	The value of this metric.
m5_est	bigint	The estimated value of this metric.
m6_name	varchar(64)	Each operation in a query plan (ntype) has metrics associated with it. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m6_unit	varchar(64)	The unit of measure for this metric. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m6_val	bigint	The value of this metric.
m6_est	bigint	The estimated value of this metric.
m7_name	varchar(64)	Each operation in a query plan (ntype) has metrics associated with it. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m7_unit	varchar(64)	The unit of measure for this metric. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m7_val	bigint	The value of this metric.
m7_est	bigint	The estimated value of this metric.
m8_name	varchar(64)	Each operation in a query plan (ntype) has metrics associated with it. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m8_unit	varchar(64)	The unit of measure for this metric. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m8_val	bigint	The actual value of this metric.
m8_est	bigint	The estimated value of this metric.
m9_name	varchar(64)	Each operation in a query plan (ntype) has metrics associated with it. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m9_unit	varchar(64)	The unit of measure for this metric. See Iterator Metrics for a complete list of iterator attributes and their corresponding units.
m9_val	bigint	The actual value of this metric.

Column	Type	Description
m9_est	bigint	The estimated value of this metric.
m10_name - m15_name	varchar(64)	The iterator name (ntype) associated with this metric. Metrics m10 through m15 are currently not used.
m10_unit - m15_unit	varchar(64)	The unit of measure for this metric. Metrics m10 through m15 are currently not used.
m10_value - m15_value	bigint	The actual value of this metric. Metrics m10 through m15 are currently not used.
m10_est - m15_est	bigint	The estimated value of this metric. Metrics m10 through m15 are currently not used.
t0_name	varchar(64)	This column is a label for t0_val. Its value is always Name.
t0_val	varchar(128)	The name of the relation being scanned by an iterator. This metric is collected only for iterators that perform scan operations such as a sequential scan or function scan.

Iterator Metrics

The tables in this section list all possible iterators in a query on Greenplum Database instance. The iterator tables include the metric name, the column in the `iterators_*` table in the `gpperfmon` database where the metric appears, how the metric is measured (unit), and a description of the metric.

Metric Terminology

The following information explains some of the database terms and concepts that appear in iterator metrics in Greenplum Database:

- **Node**: Refers to a step in a query plan. A query plan has sets of operations that Greenplum Database performs to produce the answer to a given query. A node in the plan represents a specific database operation, such as a table scan, join, aggregation, sort, etc.
- **Iterator**: Represents the actual execution of the node in a query plan. Node and iterator are sometimes used interchangeably.
- **Tuple**: Refers to a row returned as part of a result set from a query, as well as a record in a table.
- **Spill**: When there is not enough memory to perform a database operation, data must be written (or spilled) to disk.
- **Passes**: Occur when an iterator must scan (or pass) over spilled data to obtain a result. A pass represents one pass through all input tuples, or all data in batch files generated after spill, which happens hierarchically. In the first pass, all input tuples are read, and intermediate results are spilled to a specified number of batch files. In the second pass, the data in all batch files is processed. If the results are still too large to store in memory, the intermediate results are spilled to the second level of spill files, and the process repeats again.
- **Batches**: Refers to the actual files created when data is spilled to disk. This is most often associated to Hash operations.
- **Join**: This clause in a query joins two or more tables. There are three types of Join algorithms in Greenplum Database instance:
  - Hash Join
  - Merge Join
  - Nested Loop

Each of these operations include their own respective Join semantics. The Command Center Console displays iterator metrics for each of these semantics.

Append

An Append iterator has two or more input sets. Append returns all rows from the first input set, then all rows from the second input set, and so on, until all rows from all input sets are processed. Append is also used when you select from a table involved in an inheritance hierarchy.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Append Current Input Source	`m1_name`	Inputs	The number of the current table being scanned.

Append-Only Scan

This iterator scans append-only type-tables.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Append-only Scan Rescan	`m1_name`	Rescans	The number of append-only rescans by this iterator.

Append-only Columnar Scan

This iterator scans append-only columnar-type tables.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Append-Only Columnar Scan Rescan	`m1_name`	Rescans	The number of append-only columnar rescans by this iterator.

Aggregate

The query planner produces an aggregate iterator whenever the query includes an aggregate function. For example, the following functions are aggregate functions: `AVG()`, `COUNT()`, `MAX()`, `MIN()`, `STDDEV()`, `SUM()`, and `VARIANCE()`. Aggregate reads all the rows in the input set and computes the aggregate values. If the input set is not grouped, Aggregate produces a single result row.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Aggregate Total Spill Tuple	`m1_name`	Tuples	The number of tuples spilled to disk

Metric	Metric Column	Unit	Description
Aggregate Total Spill Bytes	m2_name	Bytes	The number of bytes spilled to disk.
Aggregate Total Spill Batches	m3_name	Batches	The number of spill batches required.
Aggregate Total Spill Pass	m4_name	Passes	The number of passes across all of the batches.
Aggregate Current Spill Pass Read Tuples	m5_name	Tuples	The number of bytes read in for this spill batch.
Aggregate Current Spill Pass Read Bytes	m6_name	Bytes	The number of tuples read in for this spill batch.
Aggregate Current Spill Pass Tuples	m7_name	Tuples	The number of tuples that are in each spill file in the current pass.
Aggregate Current Spill Pass Bytes	m8_name	Bytes	The number of bytes that are in each spill file in the current pass.
Aggregate Current Spill Pass Batches	m9_name	Batches	The number of batches created in the current pass.

BitmapAnd

This iterator takes the bitmaps generated from multiple BitmapIndexScan iterators, puts them together with an AND clause, and generates a new bitmap as its output.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.

BitmapOr

This iterator takes the bitmaps generated from multiple BitmapIndexScan iterators, puts them together with an OR clause, and generates a new bitmap as its output.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.

Bitmap Append-Only Scan

This iterator retrieves all rows from the bitmap generated by BitmapAnd, BitmapOr, or BitmapIndexScan and accesses the append-only table to retrieve the relevant rows.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.

Bitmap Heap Scan

This iterator retrieves all rows from the bitmap generated by BitmapAnd, BitmapOr, or BitmapIndexScan and accesses the heap table to retrieve the relevant rows.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Bitmap Heap Scan Pages	`m1_name`	Pages	The number of bitmap heap pages scanned.
Bitmap Heap Scan Rescan	`m2_name`	Rescans	The number of bitmap heap page rescans by this iterator.

Bitmap Index Scan

This iterator produces a bitmap that corresponds to the rules that satisfy the query plan.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Bitmap Index Scan Rescan	`m1_name`	Rescans	The number of bitmap index rescans by this iterator.

Broadcast Motion

Note that the `Motion` metrics for the iterator are useful when investigating potential networking issues in the Greenplum Database system. Typically, the "Ack Time" values should be very small (microseconds or milliseconds). However if the "Ack Time" values are one or more seconds (particularly the "Motion Min Ack Time" metric), then a network performance issue likely exists.

Also, if there are a large number of packets being dropped because of queue overflow, you can increase the value for the `gp_interconnect_queue_depth` system configuration parameter to improve performance. See the *Greenplum Database Reference Guide* for more in formation about system configuration parameters.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Motion Bytes Sent	`m1_name`	Bytes	The number of bytes sent by the iterator.
Motion Total Ack Time	`m2_name`	Microseconds	The total amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Average Ack Time	`m3_name`	Microseconds	The average amount of time that the iterator waited for an acknowledgement after sending a packet of data.

Metric	Metric Column	Unit	Description
Motion Max Ack Time	`m4_name`	Microseconds	The maximum amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Min Ack Time	`m5_name`	Microseconds	The minimum amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Count Resent	`m6_name`	Packets	The total number of packets that the iterator did not acknowledge when they first arrived in the queue.
Motion Max Resent	`m7_name`	Packets	The maximum number of packets that the iterator did not acknowledge when they first arrived in the queue. This metric is applied on a per packet basis. For example, a value of "10" indicates that a particular packet did not get acknowledged by this iterator 10 times, and that this was the maximum for this iterator.
Motion Bytes Received	`m8_name`	Bytes	The number of bytes received by the iterator.
Motion Count Dropped	`m9_name`	Packets	The number of packets dropped by the iterator because of buffer overruns.

Explicit Redistribute Motion

The Explicit Redistribute iterator moves tuples to segments explicitly specified in the segment ID column of the tuples. This differs from a Redistribute Motion iterator, where target segments are indirectly specified through hash expressions. The Explicit Redistribute iterator is used when the query portion of a DML planned statement requires moving tuples across distributed tables.

Note that the Motion metrics for the iterator are useful when investigating potential networking issues in the Greenplum Database system. Typically, the "Ack Time" values should be very small (microseconds or milliseconds). However if the "Ack Time" values are one or more seconds (particularly the "Motion Min Ack Time" metric), then a network performance issue likely exists.

Also, if there are a large number of packets being dropped because of queue overflow, you can increase the value for the `gp_interconnect_queue_depth` system configuration parameter to improve performance. See the *Greenplum Database Reference Guide* for more in formation about system configuration parameters.

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Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.

Metric	Metric Column	Unit	Description
Motion Bytes Sent	`m1_name`	Bytes	The number of bytes sent by the iterator.
Motion Total Ack Time	`m2_name`	Microseconds	The total amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Average Ack Time	`m3_name`	Microseconds	The average amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Max Ack Time	`m4_name`	Microseconds	The maximum amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Min Ack Time	`m5_name`	Microseconds	The minimum amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Count Resent	`m6_name`	Packets	The total number of packets that the iterator did not acknowledge when they first arrived in the queue.
Motion Max Resent	`m7_name`	Packets	The maximum number of packets that the iterator did not acknowledge when they first arrived in the queue. This metric is applied on a per packet basis. For example, a value of "10" indicates that a particular packet did not get acknowledged by this iterator 10 times, and that this was the maximum for this iterator.
Motion Bytes Received	`m8_name`	Bytes	The number of bytes received by the iterator.
Motion Count Dropped	`m9_name`	Packets	The number of packets dropped by the iterator because of buffer overruns.

External Scan

This iterator scans an external table.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
External Scan Rescan	`m1_name`	Rescans	The number of external table rescans by this iterator.

Function Scan

This iterator returns tuples produced by a function.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.

Gather Motion

This iterator gathers streams of tuples that are sent by "sending" motions. If a merge key is specified, it merges many streams into a single order-preserved stream.

Note that the Motion metrics for the iterator are useful when investigating potential networking issues in the Greenplum Database system. Typically, the "Ack Time" values should be very small (microseconds or milliseconds). However if the "Ack Time" values are one or more seconds (particularly the "Motion Min Ack Time" metric), then a network performance issue likely exists.

Also, if there are a large number of packets being dropped because of queue overflow, you can increase the value for the `gp_interconnect_queue_depth` system configuration parameter to improve performance. See the *Greenplum Database Reference Guide* for more in formation about system configuration parameters.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.
Motion Bytes Sent	m1_name	Bytes	The number of bytes sent by the iterator.
Motion Total Ack Time	m2_name	Microseconds	The total amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Average Ack Time	m3_name	Microseconds	The average amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Max Ack Time	m4_name	Microseconds	The maximum amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Min Ack Time	m5_name	Microseconds	The minimum amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Count Resent	m6_name	Packets	The total number of packets that the iterator did not acknowledge when they first arrived in the queue.
Motion Max Resent	m7_name	Packets	The maximum number of packets that the iterator did not acknowledge when they first arrived in the queue. This metric is applied on a per packet basis. For example, a value of "10" indicates that a particular packet did not get acknowledged by this iterator 10 times, and that this was the maximum for this iterator.

Metric	Metric Column	Unit	Description
Motion Bytes Received	m8_name	Bytes	The number of bytes received by the iterator.
Motion Count Dropped	m9_name	Packets	The number of packets dropped by the iterator because of buffer overruns.

Group Aggregate

The GroupAggregate iterator is a way to compute vector aggregates, and it is used to satisfy a GROUP BY clause. A single input set is required by the GroupAggregate iterator, and it must be ordered by the grouping column(s). This iterator returns a single row for a unique value of grouping columns.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.
Aggregate Total Spill Tuples	m1_name	Tuples	The number of tuples spilled to disk.
Aggregate Total Spill Bytes	m2_name	Bytes	The number of bytes spilled to disk.
Aggregate Total Spill Batches	m3_name	Batches	The number of spill batches required.
Aggregate Total Spill Pass	m4_name	Passes	The number of passes across all of the batches.
Aggregate Current Spill Pass Read Tuples	m5_name	Tuples	The number of bytes read in for this spill batch
Aggregate Current Spill Pass Read Bytes	m6_name	Bytes	The number of tuples read in for this spill batch
Aggregate Current Spill Pass Tuples	m7_name	Tuples	The number of tuples that are in each spill file in the current pass.
Aggregate Current Spill Pass Bytes	m8_name	Bytes	The number of bytes that are in each spill file in the current pass.
Aggregate Current Spill Pass Batches	m9_name	Batches	The number of batches created in the current pass.

Hash Join

The Hash Join iterator requires two input sets - the outer and inner tables.

The Hash Join iterator starts by creating its inner table using the Hash operator. The Hash operator creates a temporary Hash index that covers the join column in the inner table. When the hash table (that is, the inner table) is created, Hash Join reads each row in the outer table, hashes the join column (from the outer table), and searches the temporary Hash index for a matching value.

In a Greenplum Database instance, a Hash Join algorithm can be used with the following join semantics:

- Left Join
- Left Anti Semi Join
- Full Join
- Right Join
- EXISTS Join
- Reverse In Join
- Unique Inner Join
- Unique Outer Join

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Hash Spill Batches	`m1_name`	Batches	The current batch being spilled.
Hash Spill Tuples	`m2_name`	Tuples	The current number of spilled tuples.
Hash Spill Bytes	`m3_name`	Bytes	The current number of bytes spilled to disk.

HashAggregate

The HashAggregate iterator is similar to the GroupAggregate iterator. A single input set is required by the HashAggregate iterator and it creates a hash table from the input. However, it does not require its input to be ordered.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Aggregate Total Spill Tuples	`m1_name`	Tuples	The number of tuples spilled to disk.
Aggregate Total Spill Bytes	`m2_name`	Bytes	The number of bytes spilled to disk.
Aggregate Total Spill Batches	`m3_name`	Batches	The number of spill batches required.
Aggregate Total Spill Pass	`m4_name`	Passes	The number of passes across all of the batches.
Aggregate Current Spill Pass Read Tuples	`m5_name`	Tuples	The number of bytes read in for this spill batch
Aggregate Current Spill Pass Read Bytes	`m6_name`	Bytes	The number of tuples read in for this spill batch
Aggregate Current Spill Pass Tuples	`m7_name`	Tuples	The number of tuples that are in each spill file in the current pass.

Metric	Metric Column	Unit	Description
Aggregate Current Spill Pass Bytes	m8_name	Bytes	The number of bytes that are in each spill file in the current pass.
Aggregate Current Spill Pass Batches	m9_name	Batches	The number of batches created in the current pass.

Index Scan

An Index Scan operator traverses an index structure. If you specify a starting value for an indexed column, the Index Scan will begin at the appropriate value. If you specify an ending value, the Index Scan will complete as soon as it finds an index entry greater than the ending value. A query planner uses an Index Scan operator when it can reduce the size of the result set by traversing a range of indexed values, or when it can avoid a sort because of the implicit ordering offered by an index.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.
Index Scan Restore	m1_name	Restores	The number of restores.
Index Scan Rescan	m2_name	Rescans	The number of rescans.

Limit

The Limit operator is used to limit the size of a result set. A Greenplum Database instance uses the Limit operator for both Limit and Offset processing. The Limit operator works by discarding the first x rows from its input set, returning the next y rows, and discarding the remainder. If the query includes an OFFSET clause, x represents the offset amount; otherwise, x is zero. If the query includes a LIMIT clause, y represents the Limit amount; otherwise, y is at least as large as the number of rows in the input set.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.

Materialize

The materialize iterator is used for some sub-select operations. The query planner can decide that it is less expensive to materialize a sub-select one time than it is to repeat the work for each top-level row. Materialize is also used for some merge/join operations.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.
	m1_name	Rescans	

Metric	Metric Column	Unit	Description
Materialize Rescan			The number of times the executor requested to rescan the date for this iterator.

Merge Join

The Merge Join iterator joins two tables. Like the Nested Loop iterator, Merge Join requires two input sets: An outer table and an inner table. Each input set must be ordered by the join columns. In a Greenplum Database instance, the Merge Join algorithm can be used with the following join semantics:

- Left Join
- Left Anti Semi Join
- Full Join
- Right Join
- EXISTS Join
- Reverse In Join
- Unique Outer joins
- Unique Inner Join

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Merge Join Inner Tuples	`m1_name`	Tuples	The number of rows from the inner part of the query plan.
Merge Join Outer Tuples	`m2_name`	Tuples	The number of rows from the Outer part of the query plan.

Nested Loop

The Nested Loop iterator is used to perform a join between two tables, and as a result requires two input sets. It fetches each table from one of the input sets (called the outer table). For each row in the outer table, the other input (called the inner table) is searched for a row that meets the join qualifier. In a Greenplum Database instance, a Merge Join algorithm can be used with the following join semantics:

- Left Join
- Left Anti Semi Join
- Full Join
- Right Join

- EXISTS Join
- Reverse In Join
- Unique Outer Join
- Unique Inner Join

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Nested Loop Inner Tuples	`m1_name`	Tuples	The number of rows from the inner part of the query plan.
Nested Loop Outer Tuples	`m2_name`	Tuples	The number of rows from the outer part of the query plan.

Redistribute Motion

This iterator sends an outbound tuple to only one destination based on the value of a hash.

Note that the Motion metrics for the iterator are useful when investigating potential networking issues in the Greenplum Database system. Typically, the "Ack Time" values should be very small (microseconds or milliseconds). However if the "Ack Time" values are one or more seconds (particularly the "Motion Min Ack Time" metric), then a network performance issue likely exists.

Also, if there are a large number of packets being dropped because of queue overflow, you can increase the value for the `gp_interconnect_queue_depth` system configuration parameter to improve performance. See the *Greenplum Database Reference Guide* for more in formation about system configuration parameters.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Motion Bytes Sent	`m1_name`	Bytes	The number of bytes sent by the iterator.
Motion Total Ack Time	`m2_name`	Microseconds	The total amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Average Ack Time	`m3_name`	Microseconds	The average amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Max Ack Time	`m4_name`	Microseconds	The maximum amount of time that the iterator waited for an acknowledgement after sending a packet of data.
Motion Min Ack Time	`m5_name`	Microseconds	The minimum amount of time that the iterator waited for an acknowledgement after sending a packet of data.

Metric	Metric Column	Unit	Description
Motion Count Resent	m6_name	Packets	The total number of packets that the iterator did not acknowledge when they first arrived in the queue.
Motion Max Resent	m7_name	Packets	The maximum number of packets that the iterator did not acknowledge when they first arrived in the queue. This metric is applied on a per packet basis. For example, a value of "10" indicates that a particular packet did not get acknowledged by this iterator 10 times, and that this was the maximum for this iterator.
Motion Bytes Received	m8_name	Bytes	The number of bytes received by the iterator.
Motion Count Dropped	m9_name	Packets	The number of packets dropped by the iterator because of buffer overruns.

Result

The Result iterator is used to either (1) execute a query that does not retrieve data from a table, or evaluate the parts of a WHERE clause that do not depend on data retrieved from a table. It can also be used if the top node in the query plan is an Append iterator.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.

Repeat

This iterator repeats every input operator a certain number of times. This is typically used for certain grouping operations.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.

Seq Scan

The Seq Scan iterator scans heap tables, and is the most basic query iterator. Any single-table query can be done by using the Seq Scan iterator. Seq Scan starts at the beginning of a heap table and scans to the end of the heap table. For each row in the heap table, Seq Scan evaluates the query constraints (the WHERE clause). If the constraints are satisfied, the required columns are added to the result set.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.
Seq Scan Page Stats	m1_name	Pages	The number of pages scanned.
Seq Scan Restore Pos	m2_name	Restores	The number of times the executor restored the scan position.
Seq Scan Rescan	m3_name	Rescans	The number of times the executor requested to rescan the date for this iterator.

SetOp

There are four SetOp iterators:

- Intersect
- Intersect All
- Except
- Except All

These iterators are produced only when the query planner encounters an `INTERSECT`, `INTERSECT ALL`, `EXCEPT`, or `EXCEPT ALL` clause, respectively.

All SetOp iterators require two input sets. They combine the input sets into a sorted list, and then groups of identical rows are identified. For each group, the SetOp iterators counts the number of rows contributed by each input set, then uses the counts to determine the number of rows to add to the result set.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.

Shared Scan

This iterator evaluates the common parts of a query plan. It shares the output of the common sub-plans with all other iterators, so that the sub-plan only needs to execute one time.

Metric	Metric Column	Unit	Description
Rows in	m0_name	Rows	The number of tuples received by the iterator.
Seq Scan Page Stats	m1_name	Pages	The number of pages scanned.
	m2_name	Restores	The number of times the executor restored the scan position.

Metric	Metric Column	Unit	Description
Seq Scan Restore Pos			
Seq Scan Rescan	`m3_name`	Rescans	The number of times the executor requested to rescan the date for this iterator.

Sort

The Sort iterator imposes an ordering on the result set. A Greenplum Database instance uses two different sort strategies: An in-memory sort and an on-disk sort. If the size of the result set exceeds the available memory, the Sort iterator distributes the input set to a collection of sorted work files and then merges the work files back together again. If the result set is less than the available memory, the sort is done in memory.

The Sort iterator is used for many purposes. A Sort can be used to satisfy an `ORDER BY` clause. Also, some query operators require their input sets to be ordered.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Sort Memory Usage	`m1_name`	Bytes	The number of bytes used by the sort.
Sort Spill Tuples	`m2_name`	Tuples	The current number of spilled tuples.
Sort Spill Bytes	`m3_name`	Bytes	The current number of spilled bytes.
Sort Spill Pass	`m4_name`	Passes	The number of merge passes. Each merge pass merges several sorted runs into larger runs.
Sort Current Spill Pass Tuples	`m5_name`	Tuples	The number of tuples spilled in the current spill pass.
Sort Current Spill Pass Bytes	`m6_name`	Bytes	The number of bytes spilled in the current spill pass.

Subquery Scan

A Subquery Scan iterator is a pass-through iterator. It scans through its input set, adding each row to the result set. This iterator is used for internal purposes and has no affect on the overall query plan.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.
Subquery Scan Rescan	`m1_name`	Rescans	The number of times the executor requested to rescan the date for this iterator.

Tid Scan

The Tid Scan (tuple ID scan) iterator is used whenever the query planner encounters a constraint of the form `ctid = expression` or `expression = ctid`. This specifies a tuple ID, an identifier that is unique within a table. The tuple ID works like a bookmark, but is valid only within a single transaction. After the transaction completes, the tuple ID is not used again.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.

Unique

The Unique iterator eliminates duplicate values from the input set. The input set must be ordered by the columns, and the columns must be unique. The Unique operator removes only rows — it does not remove columns and it does not change the ordering of the result set. Unique can return the first row in the result set before it has finished processing the input set. The query planner uses the Unique operator to satisfy a `DISTINCT` clause. Unique is also used to eliminate duplicates in a `UNION`.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.

Values Scan

The Value Scan iterator is used to iterate over a set of constant tuples.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.

Window

The Window function performs calculations across sets of rows that are related to the current query row. The Window iterator computes Window functions on the input set of rows.

Metric	Metric Column	Unit	Description
Rows in	`m0_name`	Rows	The number of tuples received by the iterator.

log_alert_*

The `log_alert_*` tables store `pg_log` errors and warnings. There are three `log_alert` tables, all having the same columns:

- `log_alert_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. Current `pg_log` errors and warnings data is stored in `log_alert_now` during the period between data collection from the Command Center agents and automatic commitment to the `log_alert_history` table.
- `log_alert_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for query workload data that has been cleared from `log_alert_now` but has not yet been committed to `log_alert_history`. It typically only contains a few minutes worth of data.
- `log_alert_history` is a regular table that stores historical database-wide errors and warnings data. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
`logtime`	timestamp with time zone	Timestamp for this log
`loguser`	text	User of the query
`logdatabase`	text	The accessed database
`logpid`	text	Process id
`logthread`	text	Thread number
`loghost`	text	Host name or ip address
`logport`	text	Port number
`logsessiontime`	timestamp with time zone	Session timestamp
`logtransaction`	integer	Transaction id
`logsession`	text	Session id
`logcmdcount`	text	Command count
`logsegment`	text	Segment number
`logslice`	text	Slice number
`logdistxact`	text	Distributed transaction
`loglocalxact`	text	Local transaction
`logsubxact`	text	Subtransaction
`logseverity`	text	Log severity

Column	Type	Description
logstate	text	State
logmessage	text	Log message
logdetail	text	Detailed message
loghint	text	Hint info
logquery	text	Executed query
logquerypos	text	Query position
logcontext	text	Context info
logdebug	text	Debug
logcursorpos	text	Cursor position
logfunction	text	Function info
logfile	text	Source code file
logline	text	Source code line
logstack	text	Stack trace

queries_*

The `queries_*` tables store high-level query status information.

The `tmid`, `ssid` and `ccnt` columns are the composite key that uniquely identifies a particular query. These columns can be used to join with the `iterators_*` tables.

There are three queries tables, all having the same columns:

- `queries_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. Current query status is stored in `queries_now` during the period between data collection from the Command Center agents and automatic commitment to the `queries_history` table.
- `queries_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for query status data that has been cleared from `queries_now` but has not yet been committed to `queries_history`. It typically only contains a few minutes worth of data.
- `queries_history` is a regular table that stores historical query status data. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
`ctime`	timestamp	Time this row was created.
`tmid`	int	A time identifier for a particular query. All records associated with the query will have the same `tmid`.
`ssid`	int	The session id as shown by `gp_session_id`. All records associated with the query will have the same `ssid`.
`ccnt`	int	The command number within this session as shown by `gp_command_count`. All records associated with the query will have the same `ccnt`.
`username`	varchar(64)	Greenplum role name that issued this query.
`db`	varchar(64)	Name of the database queried.
`cost`	int	Not implemented in this release.
`tsubmit`	timestamp	Time the query was submitted.
`tstart`	timestamp	Time the query was started.
`tfinish`	timestamp	Time the query finished.
`status`	varchar(64)	Status of the query -- `start`, `done`, or `abort`.
	bigint	Rows out for the query.

Column	Type	Description
rows_out		
cpu_elapsed	bigint	CPU usage by all processes across all segments executing this query (in seconds). It is the sum of the CPU usage values taken from all active primary segments in the database system. Note that Greenplum Command Center logs the value as 0 if the query runtime is shorter than the value for the quantum. This occurs even if the query runtime is greater than the values for min_query_time and min_detailed_query, and these values are lower than the value for the quantum.
cpu_currpct	float	Current CPU percent average for all processes executing this query. The percentages for all processes running on each segment are averaged, and then the average of all those values is calculated to render this metric. Current CPU percent average is always zero in historical and tail data.
skew_cpu	float	Displays the amount of processing skew in the system for this query. Processing/CPU skew occurs when one segment performs a disproportionate amount of processing for a query. This value is the coefficient of variation in the CPU% metric of all iterators across all segments for this query, multiplied by 100. For example, a value of .95 is shown as 95.
skew_rows	float	Displays the amount of row skew in the system. Row skew occurs when one segment produces a disproportionate number of rows for a query. This value is the coefficient of variation for the rows_in metric of all iterators across all segments for this query, multiplied by 100. For example, a value of .95 is shown as 95.
query_hash	bigint	Not implemented in this release.
query_text	text	The SQL text of this query.
query_plan	text	Text of the query plan. Not implemented in this release.
application_name	varchar(64)	The name of the application.
rsqname	varchar(64)	The name of the resource queue.
rqppriority	varchar(64)	The priority of the query -- max, high, med, low, or min.

segment_*

The `segment_*` tables contain memory allocation statistics for the Greenplum Database segment instances. This tracks the amount of memory consumed by all postgres processes of a particular segment instance, and the remaining amount of memory available to a segment as per the setting of the `postgresql.conf` configuration parameter: `gp_vmem_protect_limit`. Query processes that cause a segment to exceed this limit will be cancelled in order to prevent system-level out-of-memory errors. See the *Greenplum Database Reference Guide* for more information about this parameter.

There are three segment tables, all having the same columns:

- `segment_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. Current memory allocation data is stored in `segment_now` during the period between data collection from the Command Center agents and automatic commitment to the segment_history table.
- `segment_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for memory allocation data that has been cleared from `segment_now` but has not yet been committed to `segment_history`. It typically only contains a few minutes worth of data.
- `segment_history` is a regular table that stores historical memory allocation metrics. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

A particular segment instance is identified by its `hostname` and `dbid` (the unique segment identifier as per the `gp_segment_configuration` system catalog table).

Column	Type	Description
`ctime`	timestamp(0) (without time zone)	The time the row was created.
`dbid`	int	The segment ID (`dbid` from `gp_segment_configuration`).
`hostname`	charvar(64)	The segment hostname.
`dynamic_memory_used`	bigint	The amount of dynamic memory (in bytes) allocated to query processes running on this segment.
`dynamic_memory_available`	bigint	The amount of additional dynamic memory (in bytes) that the segment can request before reaching the limit set by the `gp_vmem_protect_limit` parameter.

See also the views `memory_info` and `dynamic_memory_info` for aggregated memory allocation and utilization by host.

socket_stats_*

The `socket_stats_*` tables store statistical metrics about socket usage for a Greenplum Database instance. There are three system tables, all having the same columns:

These tables are in place for future use and are not currently populated.

- `socket_stats_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`.
- `socket_stats_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for socket statistical metrics that has been cleared from `socket_stats_now` but has not yet been committed to `socket_stats_history`. It typically only contains a few minutes worth of data.
- `socket_stats_history` is a regular table that stores historical socket statistical metrics. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
`total_sockets_used`	int	Total sockets used in the system.
`tcp_sockets_inuse`	int	Number of TCP sockets in use.
`tcp_sockets_orphan`	int	Number of TCP sockets orphaned.
`tcp_sockets_timewait`	int	Number of TCP sockets in Time-Wait.
`tcp_sockets_alloc`	int	Number of TCP sockets allocated.
`tcp_sockets_memusage_inbytes`	int	Amount of memory consumed by TCP sockets.
`udp_sockets_inuse`	int	Number of UDP sockets in use.
`udp_sockets_memusage_inbytes`	int	Amount of memory consumed by UDP sockets.
`raw_sockets_inuse`	int	Number of RAW sockets in use.
`frag_sockets_inuse`	int	Number of FRAG sockets in use.
`frag_sockets_memusage_inbytes`	int	Amount of memory consumed by FRAG sockets.

system_*

The `system_*` tables store system utilization metrics. There are three system tables, all having the same columns:

- `system_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. Current system utilization data is stored in `system_now` during the period between data collection from the Command Center agents and automatic commitment to the `system_history` table.
- `system_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for system utilization data that has been cleared from `system_now` but has not yet been committed to `system_history`. It typically only contains a few minutes worth of data.
- `system_history` is a regular table that stores historical system utilization metrics. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
`ctime`	timestamp	Time this row was created.
`hostname`	varchar(64)	Segment or master hostname associated with these system metrics.
`mem_total`	bigint	Total system memory in Bytes for this host.
`mem_used`	bigint	Used system memory in Bytes for this host.
`mem_actual_used`	bigint	Used actual memory in Bytes for this host (not including the memory reserved for cache and buffers).
`mem_actual_free`	bigint	Free actual memory in Bytes for this host (not including the memory reserved for cache and buffers).
`swap_total`	bigint	Total swap space in Bytes for this host.
`swap_used`	bigint	Used swap space in Bytes for this host.
`swap_page_in`	bigint	Number of swap pages in.
`swap_page_out`	bigint	Number of swap pages out.
`cpu_user`	float	CPU usage by the Greenplum system user.
`cpu_sys`	float	CPU usage for this host.
`cpu_idle`	float	Idle CPU capacity at metric collection time.
`load0`	float	CPU load average for the prior one-minute period.
`load1`	float	CPU load average for the prior five-minute period.
`load2`	float	CPU load average for the prior fifteen-minute period.

Column	Type	Description
quantum	int	Interval between metric collection for this metric entry.
disk_ro_rate	bigint	Disk read operations per second.
disk_wo_rate	bigint	Disk write operations per second.
disk_rb_rate	bigint	Bytes per second for disk write operations.
net_rp_rate	bigint	Packets per second on the system network for read operations.
net_wp_rate	bigint	Packets per second on the system network for write operations.
net_rb_rate	bigint	Bytes per second on the system network for read operations.
net_wb_rate	bigint	Bytes per second on the system network for write operations.

tcp_stats_*

The `tcp_stats_*` tables store statistical metrics about TCP communications for a Greenplum Database instance.

These tables are in place for future use and are not currently populated.

There are three system tables, all having the same columns:

- `tcp_stats_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`.
- `tcp_stats_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for TCP statistical data that has been cleared from `tcp_stats_now` but has not yet been committed to `tcp_stats_history`. It typically only contains a few minutes worth of data.
- `tcp_stats_history` is a regular table that stores historical TCP statistical data. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
`segments_received`	bigint	Number of TCP segments received.
`segments_sent`	bigint	Number of TCP segments sent.
`segments_retransmitted`	bigint	Number of TCP segments retransmitted.
`active_connections`	int	Number of active TCP connections.
`passive_connections`	int	Number of passive TCP connections.
`failed_connection_attempts`	int	Number of failed TCP connection attempts.
`connections_established`	int	Number of TCP connections established.
`connection_resets_received`	int	Number of TCP connection resets received.
`connection_resets_sent`	int	Number of TCP connection resets sent.

udp_stats_*

The `udp_stats_*` tables store statistical metrics about UDP communications for a Greenplum Database instance.

These tables are in place for future use and are not currently populated.

There are three system tables, all having the same columns:

- `udp_stats_now` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`.
- `udp_stats_tail` is an external table whose data files are stored in `$MASTER_DATA_DIRECTORY/gpperfmon/data`. This is a transitional table for UDP statistical data that has been cleared from `udp_stats_now` but has not yet been committed to `udp_stats_history`. It typically only contains a few minutes worth of data.
- `udp_stats_history` is a regular table that stores historical UDP statistical metrics. It is pre-partitioned into monthly partitions. Partitions are automatically added in two month increments as needed. Administrators must drop old partitions for the months that are no longer needed.

Column	Type	Description
`packets_received`	bigint	Number of UDP packets received.
`packets_sent`	bigint	Number of UDP packets sent.
`packets_received_unknown_port`	int	Number of UDP packets received on unknown ports.
`packet_receive_errors`	bigint	Number of errors encountered during UDP packet receive.

iterators_*_rollup

The `iterators_*_rollup` set of views aggregate the metrics stored in the `iterators_*` tables. A query iterator refers to a node or operation in a query plan. For example, a sequential scan operation may be one type of iterator in a particular query plan. For each iterator in a query plan, the `iterators_*` tables store the metrics collected from each segment instance. The `iterators_*_rollup` views summarize the query iterator metrics across all segments in the system.

The `tmid`, `ssid` and `ccnt` columns are the composite key that uniquely identifies a particular query.

There are three iterators rollup views, all having the same columns:

- The `iterators_now_rollup` view shows iterator data from the `interators_now` table aggregated across all segments in the system.
- The `iterators_tail_rollup` view shows iterator data from the `interators_tail` table aggregated across all segments in the system.
- The `iterators_history_rollup` shows iterator data from the `interators_history` table aggregated across all segments in the system.

See also the `iterators_*` tables for more information about the query plan iterator types and the metrics collected for each iterator.

Column	Type	Description
`sample_time`	timestamp	The `ctime` from the associated `iterators_*` table.
`tmid`	int	A time identifier for a particular query. All iterator records associated with the query will have the same `tmid`.
`ssid`	int	The session id as shown by the `gp_session_id` parameter. All iterator records associated with the query will have the same `ssid`.
`ccnt`	int	The command number within this session as shown by `gp_command_count` parameter. All iterator records associated with the query will have the same `ccnt`.
`nid`	int	The ID of this query plan node from the slice plan.
`pnid`	int	The `pnid` (slice plan parent node ID) from the associated `iterators_*` table.
`ntype`	text	The `ntype` (node/iterator type) from the associated `iterators_*` table.
`nstatus`	text	The accumulated status of this iterator. Possible values are: Initialize, Executing, or Finished.
`tstart`	timestamp	The average start time for this iterator.
`tduration`	numeric	The average execution time for this iterator.
`pmemsize`	numeric	The average work memory allocated by the Greenplum planner to this iterator's query processes.

Column	Type	Description
pmemmax	numeric	The average of the maximum planner work memory used by this iterator's query processes.
memsize	numeric	The average OS memory allocated to this iterator's processes.
memresid	numeric	The average resident memory allocated to this iterator's processes (as opposed to shared memory).
memshare	numeric	The average shared memory allocated to this iterator's processes.
cpu_elapsed	numeric	Sum of the CPU usage of all segment processes executing this iterator.
cpu_currpct	double precision	The current average percentage of CPU utilization used by this iterator's processes. This value is always zero for historical (completed) iterators.
rows_out	numeric	The total number of actual rows output for this iterator on all segments.
rows_out_est	numeric	The total number of output rows for all segments as estimated by the query planner.
skew_cpu	numeric	Coefficient of variation for cpu_elapsed of iterators across all segments for this query, multiplied by 100. For example, a value of .95 is rendered as 95.
skew_rows	numeric	Coefficient of variation for rows_out of iterators across all segments for this query, multiplied by 100. For example, a value of .95 is rendered as 95.
m0	text	The name (m0_name), unit of measure (m0_unit), average actual value (m0_val), and average estimated value (m0_est) for this iterator metric across all segments. The m0 metric is always rows for all iterator types.
m1	text	The name (m1_name), unit of measure (m1_unit), average actual value (m1_val), and average estimated value (m1_est) for this iterator metric across all segments.
m2	text	The name (m2_name), unit of measure (m2_unit), average actual value (m2_val), and average estimated value (m2_est) for this iterator metric across all segments.
m3	text	The name (m3_name), unit of measure (m3_unit), average actual value (m3_val), and average estimated value (m3_est) for this iterator metric across all segments.
m4	text	The name (m4_name), unit of measure (m4_unit), average actual value (m4_val), and average estimated value (m4_est) for this iterator metric across all segments.
m5	text	The name (m5_name), unit of measure (m5_unit), average actual value (m5_val), and average estimated value (m5_est) for this iterator metric across all segments.
m6	text	The name (m6_name), unit of measure (m6_unit), average actual value (m6_val), and average estimated value (m6_est) for this iterator metric across all segments.
m7	text	The name (m7_name), unit of measure (m7_unit), average actual value (m7_val), and average estimated value (m7_est) for this iterator metric across all segments.
m8	text	The name (m8_name), unit of measure (m8_unit), average actual value (m8_val), and average estimated value (m8_est) for this iterator metric across all segments.
m9	text	The name (m9_name), unit of measure (m9_unit), average actual value (m9_val), and average estimated value (m9_est) for this iterator metric across all segments.
m10 - m5	text	Metrics m10 through m15 are not currently used by any iterator types.
t0	text	

Column	Type	Description
		The name of the relation (`t0_val`) being scanned by this iterator. This metric is collected only for iterators that perform scan operations such as a sequential scan or function scan.

dynamic_memory_info

The `dynamic_memory_info` view shows a sum of the used and available dynamic memory for all segment instances on a segment host. Dynamic memory refers to the maximum amount of memory that Greenplum Database instance will allow the query processes of a single segment instance to consume before it starts cancelling processes. This limit is set by the `gp_vmem_protect_limit` server configuration parameter, and is evaluated on a per-segment basis.

Column	Type	Descriptoin
`ctime`	timestamp(0) without time zone	Time this row was created in the `segment_history` table.
`hostname`	varchar(64)	Segment or master hostname associated with these system memory metrics.
`dynamic_memory_used_mb`	numeric	The amount of dynamic memory in MB allocated to query processes running on this segment.
`dynamic_memory_available_mb`	numeric	The amount of additional dynamic memory (in MB) available to the query processes running on this segment host. Note that this value is a sum of the available memory for all segments on a host. Even though this value reports available memory, it is possible that one or more segments on the host have exceeded their memory limit as set by the `gp_vmem_protect_limit` parameter.

memory_info

The `memory_info` view shows per-host memory information from the `system_history` and `segment_history` tables. This allows administrators to compare the total memory available on a segment host, total memory used on a segment host, and dynamic memory used by query processes.

Column	Type	Description
`ctime`	timestamp(0) without time zone	Time this row was created in the `segment_history` table.
`hostname`	varchar(64)	Segment or master hostname associated with these system memory metrics.
`mem_total_mb`	numeric	Total system memory in MB for this segment host.
`mem_used_mb`	numeric	Total system memory used in MB for this segment host.
`mem_actual_used_mb`	numeric	Actual system memory used in MB for this segment host.
`mem_actual_free_mb`	numeric	Actual system memory free in MB for this segment host.
`swap_total_mb`	numeric	Total swap space in MB for this segment host.
`swap_used_mb`	numeric	Total swap space used in MB for this segment host.
`dynamic_memory_used_mb`	numeric	The amount of dynamic memory in MB allocated to query processes running on this segment.
`dynamic_memory_available_mb`	numeric	The amount of additional dynamic memory (in MB) available to the query processes running on this segment host. Note that this value is a sum of the available memory for all segments on a host. Even though this value reports available memory, it is possible that one or more segments on the host have exceeded their memory limit as set by the `gp_vmem_protect_limit` parameter.