Storage Unit entities

This section includes the following topics:

About Storage Unit entities

Storage Unit entities can be monitored in the Objects tab, if you have installed Precise for Database & Storage.

If you want to see the Storage Unit entities that are monitored, select Storage Units in the Association area of the Objects tab. The information shown will give the DBA answers on whether there is a contention on a device due to re-tiering by performing the following actions:

Table 1 Actions

Action	Indicator	Possible Solution
Examine the device's response time over time.	Marker on the Response Time graph.	Consider moving heavy files to other devices to split the I/O load or moving the data to a faster storage device.
Examine the device tier distribution and review other devices that share the same policy.	Marker on Tier Distribution graph.	Consider using a policy that secures more space on the high-end storage for the device. Verify if the policy is adequate for the type of activity.
Examine the device tier distribution and review other devices that share the same policy.	Marker on the Association table.	Consider moving other devices that use the fast (EFD) storage to another policy.

Other information related to the Storage Unit entities that can be read from the Objects tab are:

- The type of storage the application is using (Thin/Thick).
- The type of policy that is associated to each device.
- The pools the application is using.
- How full the pools are.
- Who else is using the pools.
- How much of each storage Tier is being used by each device.

About the Association area

In the Association area, you can select the entities from the dropdown menu. When choosing Storage Units to see all of the Storage units (storage arrays) that are connected to the monitored server (either physically or via a remote gatekeeper), two tabs are shown at the right side of the table:

- **Statistics**. Statistical data about the storage units
- **Configuration**. Data regarding the unit's configuration.

Each tab has its own columns in the table. The following tables describe the different column headings.

Table 2 Statistics

Column Name	Description
Type	Type of the device: Symmetrix or Clariion.
Unit ID	The ID of the unit.
Used By Instance	Shows whether the Oracle database instance is using the storage unit (the database has files on at least one storage device that belongs to that unit).
Read/Write Req.	The number of read and write requests.
Load	The amount of data that the unit handled within the timeframe.
Throughput	The amount of data per second (MB/Sec.).***
I/O Rate	The amount of requests to the unit per second.
Seq. Reads	The amount of sequential requests.
Cache Hit Ratio	The amount of requests that were answered by the cache in relation to the total amount (only for Symmetrix).

Read Hit Ratio	The percentage of read hits in relation to the total cache hit ratio (only for Symmetrix).
Write Hit Ratio	The percentage of write hits in relation to the total cache hit ratio (only for Symmetrix).

Table 3 Configuration

Column Name	Description
Type (Graphical)	Type of the device: Symmetrix or Clariion.
Unit ID	The ID of the unit.
Used By Instance	Shows whether the Oracle database instance is using the storage unit (the database has files on at least one storage device that belongs to that unit).
Unit Physical Disks	The amount of physical disks in the storage array.
Devices	The amount of storage devices.
Type	Type of the device: Symmetrix or Clariion.
Physical Disks	The amount of physical disks.***
Devices	The amount of devices.***
SQL Server Instances	The amount of SQL Server instances.***
Databases	***
Logical Files	***
Model	The unit's model.
Microcode Version	The microcode version of the unit.
Cache Size	The size of the cache.
Max. Write Slots	The maximum amount of pending write slots allowed before starting delayed fast writes (only for Symmetrix).***
Max. DA Write Slots	The maximum amount of pending write slots allowed for one DA (front director) before starting delayed fast writes (only for Symmetrix).***
Max. Device Write Slots	The maximum amount of pending write slots allowed for one device before starting delayed fast writes (only for Symmetrix).***

The following sections handle the different Storage Device entities:

- About the Storage Unit entity
- About the Symmetrix Unit entity
- About the Symmetrix Device entity
- About the Devices Sharing the Same Policy***
- About the Devices Sharing the Same Pool***
- About the Symmetrix Disk Director entity
- About the Symmetrix Front End Director entity
- About the Symmetrix Remote Director entity
- About the Clariion Unit entity
- About the Clariion Device entity
- About the Pools entity

About the Storage Unit entity

The Storage Unit entity displays a list of all storage entities connected to instances in the Tier. The Storage Unit entity can only be associated to from the Instance level.

About the Storage Unit entity Association area

You can view general details on the entities associated to the selected Storage Units in the Association area. This information is based on the mapping carried out by the Precise for SQL Server Storage agents that are installed.

About the Symmetrix Unit entity

The Symmetrix Unit entity displays general details and I/O activity of the selected Symmetrix unit. The following views are available:

- Overview

- Performance
- Load
- Throughput

About getting an overview of a Symmetrix unit

The Overview displays general details of the Symmetrix unit, number of I/O and hit ratios for the selected Symmetrix unit, over the selected time period, as collected by the Storage agent, as follows:

- **Properties**. Displays general Symmetrix unit details such as, ID, model, and number of physical disks.
- **Requests**. Displays number of I/O requests of the selected Symmetrix unit, over the selected time period, as collected by the Storage agent.
- **Hit Ratio**. Displays the hit ratio of the selected Symmetrix unit, over the selected time period, as collected by the Storage agent.

About viewing performance information for a Symmetrix unit

The Performance view displays requests counters vs. hit ratio counters of the selected Symmetrix unit broken down into read/writes, over the selected time period, as collected by the Storage agent, as follows:

- Requests. Displays number of I/O requests of the selected Symmetrix unit, over the selected time period, as collected by the Storage agent.
- **Hit Rati**o. Displays the hit ratio of the selected Symmetrix unit, over the selected time period, as collected by the Storage agent.

About viewing the I/O load of a Symmetrix unit

The Load view displays I/O load of the selected Symmetrix unit, over the selected time period, broken down into read/written.

About viewing throughput information for a selected Symmetrix unit

The Throughput view displays I/O rate vs. Throughput (in MB) of the selected Symmetrix unit, over the selected time period.

About the Symmetrix Unit entity Association area

You can view general details and statistics counters on the entities associated to the selected Symmetrix Unit entity in the Association area. It is possible to associate to a Symmetrix Unit entity from a Symmetrix Storage Device entity. The following tabs show additional information:

- **Overview**. Displays general details for the selected device.
- **Statistics**. Displays I/O statistics for the selected device as collected by the Storage agent.

About the Symmetrix Device entity

The Symmetrix Device entity displays general details, I/O activity and I/O performance of the selected Symmetrix Storage device.

The following views are available:

- Overview
- Hypers
- Ports
- Performance
- Load
- Throughput
- Scalability

About viewing general details of a selected Symmetrix device

The Overview displays the following information on a Symmetrix device:

- **Properties**. Displays general details of the Symmetrix device such as it's logical name and unit ID.
- **I/O Wait**. Displays the I/O wait data of the selected device, over the selected time period, as collected by the Storage agent.
- **Requests**. Displays number of I/O requests of the selected device, over the selected time period, as collected by the Storage agent.
- **Hit Ratio**. Displays hit ratios of the selected device, over the selected time period, as collected by the Storage agent. Load   Displays read/write load data for the selected device, over the selected time period, as collected by the Storage agent.

About viewing the list of all hypers included in a Symmetrix device

The Hypers view displays a list of all the Hypers included in the device.

About viewing a list of all the ports included in a device

The Ports view displays a list of all the device ports included in the device.

About viewing the performance of a Symmetrix device

The Performance view displays I/O requests vs. Hit Ratio of the selected device, over the selected time period, broken down into read/writes, as collected by the Storage agent.

About the View load data for a Symmetrix device

The Load view displays read/write data of the selected device, over the selected time period, as collected by the Storage agent.

About viewing throughput data for a Symmetrix device

The Throughput view displays I/O rate vs. Throughput (in MB) of the selected device, over the selected time period, as collected by the Storage agent.

About the scalability of a Symmetrix device

The Scalability view, in the Objects tab (only when choosing a specific device), shows the device's response time in relation to the requests on that device.

About the Symmetrix Device entity Association area

You can view general details and statistics counters on the entities associated to the selected Symmetrix Device entity in the Association area. It is possible to associate to the Symmetrix Device entity from the Database, Table, Index, DB File, File Group, Symmetrix Unit, Symmetrix Device, Symmetrix Disk Director and Symmetrix Front End Director entities. It is possible to associate from the Symmetrix Device entity to the devices on the same Raid Group. The following tabs are available in the Association area:

- **Overview**. Displays general details for the selected device.
- **Statistics**. Displays I/O statistics for the selected device as collected by the Storage agent.

About the Devices Sharing the Same Policy***

This entity is only available, in the Objects tab, if you have installed Precise for Database & Storage. For more information on the supported platforms, see the *Precise Installation Guide*.

About the Devices Sharing the Same Pool***

This entity is only available, in the Objects tab, if you have installed Precise for Database & Storage. For more information on the supported platforms, see the *Precise Installation Guide*.

About the Symmetrix Disk Director entity

The Symmetrix Disk Director entity displays general details and I/O activity of the selected device. The following views are available:

- Overview
- Performance
- Load
- Throughput

About the overview of a disk director

The Overview, in the Objects tab, displays general details of the disk director, such as director ID and director type.

About the performance of a disk director

The Performance view, in the Objects tab, displays two overtime graphs that illustrate the following information:

- The number of sequential reads and the total number of read and write requests during the selected time period.
- The read, write, and combined cache hit ratios over the selected time period.

About the load of a disk director

The Load view, in the Objects tab, displays an overtime graph of the megabytes of data read and written during the selected time period.

About the throughput of a disk director

The Throughput view, in the Objects tab, displays an overtime graph that illustrates the I/O rate (requests per second) and the throughput (megabytes per second) during the selected time period.

Associating a disk director with other entities

You can associate a disk director in the Main area of the Objects tab with devices. You can display additional entities by using the More... option.

About the Symmetrix Front End Director entity

The Symmetrix Front End Director entity displays general details and the I/O activity of the selected director.

About getting an overview of the Symmetrix Front End Director

The Overview displays general details of the Symmetrix front-end director, along with the number of I/O requests, hit ratio and I/O rate of the selected front-end director, as follows:

- **Properties**. Displays general details of the Symmetrix front-end director, such as Director ID, and Director Type.
- **Requests**. Displays the number of I/O requests for the selected front-end director, over the selected time period, as collected by the Storage agent.
- **Hit Ratio**. Displays the hit ratio of the selected front-end director, over the selected time period, as collected by the Storage agent.
- **I/O Rate**. Displays the I/O rate, of the selected front-end director, over the selected time period, as collected by the Storage agent.

About the Symmetrix Front End Director entity Association area

You can view general details and statistics counters on the entities associated to the selected Symmetrix Front End Director entity in the Association area. It is possible to associate to the Symmetrix Front End Director entity from the Symmetrix Unit and Symmetrix Device entities. The following tabs are displayed:

- **Overview**. Displays general details for the selected device.
- **Statistics**. Displays I/O statistics for the selected device as collected by the Storage agent.

About the Symmetrix Remote Director entity

The Symmetrix Remote Director entity displays general details and the I/O activity of the selected director.

About getting an overview of the Symmetrix Remote Director

The Overview displays general details of the Symmetrix storage remote director, along with the hit ratio, and I/O rate of the selected remote director, as follows:

- **Properties**. Displays general details of the Symmetrix storage remote director such as director ID, and director type.
- **Requests**. Displays the number of I/O requests for the selected remote director, over the selected time period, as collected by the Storage agent.
- **Hit Ratio**. Displays the hit ratio of the selected remote director, over the selected time period, as collected by the Storage agent.
- **I/O Rate**. Displays the I/O rate of the selected remote director, over the selected time period, as collected by the Storage agent.

About the Symmetrix Remote Director entity Association area

You can view general details and statistics counters on the entities associated to the selected Symmetrix Remote Director entity in the Association area. It is possible to associate to the Symmetrix Remote Director entity from the Symmetrix Storage Unit entity. The following tabs are displayed:

- **Overview**. Displays general details for the selected device.
- **Statistics**. Displays I/O statistics for the selected device as collected by the Storage agent.

About the Clariion Unit entity

The Clariion Unit entity displays general details and the I/O activity for the selected unit. The following views are available:

- Overview
- Performance
- Load
- Throughput

About getting an overview of the Clariion unit

The Overview displays general details of the Clariion unit such as its ID, and the number of SQL Server instances connected to it, as follows:

- **Requests**. Displays the number of I/O requests for the selected Clariion unit, over the selected time period, as collected by the Storage agent.
- **Load**. Displays the I/O load for the selected Clariion unit, over the selected time period.

About viewing the performance of a Clariion unit

The Performance view displays the I/O requests (broken down into read/write operations) for the selected Clariion units, over the selected time period, as collected by the Storage agent.

About viewing the load data of a Clariion unit

The Load view displays the I/O load (broken down into read/write operations) for the selected Clariion unit, over the selected time period.

About viewing throughput data of a Clariion unit

The Throughput view displays the I/O rate vs. throughput (in MB) of the selected unit, over the selected time period, as collected by the Storage agent.

About the Clariion Unit entity Association area

You can view general details and statistics counters on the entities associated to the selected Clariion Unit entity in the Association area. It is possible to associate to the Clariion Unit entity from a Clariion Storage Device entity. The following tabs are displayed:

- **Overview**. Displays general details for the selected device.
- **Statistics**. Displays I/O statistics for the selected device as collected by the Storage agent.

About the Clariion Device entity

The Clariion Device entity displays general details and the I/O activity of the selected device. The following views are available:

- Overview
- Performance
- Load
- Throughput

About getting an overview of a Clariion device

The Overview displays general details of the Clariion device such as unit ID, and number of DB files on the device, as follows:

- **I/O Wait**. Displays the I/O wait for the selected device, over the selected time period, as collected by the Storage agent.
- **Requests**. Displays the number of I/O requests for the selected device, over the selected time period, as collected by the Storage agent.
- **Load**. Displays the I/O load (broken down into read/write operations) for the selected Clariion device, over the selected time period.

About viewing the performance of a Clariion device

The Performance view displays the I/O requests (broken down into read/write operations), for the selected Clariion device, over the selected time period, as collected by the Storage agent.

About viewing load data of a Clariion device

The Load view displays the I/O load of the selected Clariion device (broken down into read/write operations), over the selected time period.

About viewing throughput data of a Clariion device

The Throughput view displays the I/O rate vs. throughput (in MB) of the selected device, over the selected time period, as collected by the Storage agent.

About the Clariion Device entity Association area

You can view general details and statistics counters on the entities associated to the selected Clariion Device entity in the Association area. It is possible to associate to the Clariion Device entity from the Database, Table, Index, Logical File, File Group and Clariion Storage Unit entities.

About the Devices on the same RAID Group entity (only for Clariion)

This entity is only available, in the Objects tab, if you have installed Precise for Database & Storage. For more information on the supported platforms, see the *Precise Installation Guide*.

When viewing a Thick Clariion Device (in the configuration tab), there is an option called "Devices on the same Raid Group" in the dropdown menu, that shows all of the devices who share the same Raid group as the selected device.

> ⓘ The graphs in the upper part of the screen (Overview, Performance, Load, and Throughput) - are the same graphs of that particular selected device - with no connection to the "Devices on the same Raid Group" option.

About the Pools entity

The Pools entity, in the Objects tab, is only available if you have installed Precise for Database & Storage. For more information on the supported platforms, see the *Precise Installation Guide*.

The following views are available:

- Overview
- Performance
- Load

- Throughput

About the overview of a pool

The Overview, in the Objects tab, displays general details of the pool.

About the performance of a pool

The Performance view, in the Objects tab, displays two overtime graphs that illustrate the following information:

- The number of deferred writes, read requests, and write requests during the selected time period.
- The read, write, and overall cache hit ratios over the selected time period.

About the load of a pool

The Load view, in the Objects tab, displays an overtime graph that illustrates the megabytes of data read and written during the selected time period.

About the throughput of a pool

The Throughput view, in the Objects tab, displays an overtime graph that illustrates the I/O rate (requests per second) and throughput (megabytes per second) during the selected time period.

Associating a pool with other entities

You can associate a pool in the Main area of the Objects tab with all the devices that are on the same disk as the hyper itself. You can display additional entities by using the More... option.

How the Objects tab can help you identify performance problems

The following section describes a few examples on how you can use the Objects tab to identify performance problems.

- Examining I/O load and performance of the various Storage entities

Examining I/O load and performance of the various Storage entities

In theory, database files should be spread over different physical disks so that the I/O for one database file will not interfere with the I/O of a different database file. Therefore, tuning the I/O on a large storage machine is a complex task. Moving a database file from one disk to another can speed up some parts of the application but may slow down others.

Precise for SQL Server includes storage points that can help you tune the I/O in your system. Storage points are agents that sample activity in the Storage units against which they are installed. They map data files to Storage devices and provide data that relates I/O wait of database objects to the Storage devices on which they are stored.

Before moving a database file to another physical disk, you can examine the I/O wait on the database file to find the time range with the most I/O waits. You may also want to examine I/O waits on a physical disk over time to identify a physical disk that experienced either none or very few I/O waits during the selected time period.

The decision as to which file to move and which storage device to move it to is based on many factors, such as free space on the device, performance of the device, load on the device, and other files on the device.

Precise for SQL Server displays all the information you require to reach the optimal decision regarding which storage device to move the file to. The Objects tab maps the storage devices to the logical files stored on them, in addition to the statistics gathered by the Precise for SQL Server Storage agent regarding the various storage devices (such as, Bytes, requests broken down into read/writes, and hit ratio of the storage device).

To examine I/O load and performance of the various Storage entities

1. In the Time Frame list, choose the period of time you want to analyze.
2. In the Instance list, choose the item you want to analyze.
3. On the Association controls in the Association area, click **Databases**. Drill down to the database you want to analyze.
4. On the Association controls in the Association area, click **Logical Files**. Drill down to a specific logical file.
5. On the View controls in the Main area, click **Overview** and observe the I/O statistics for the selected database file.