

# Using Automatic Memory Management

## Purpose

This module describes how you can use Enterprise Manager to proactively configure your instance.

## Topics

This module will discuss the following topics:

- ☒ [Overview](#)
- ☒ [Prerequisites](#)
- ☒ [Enabling Automated Shared Memory Management](#)
- ☒ [Change the Total SGA Size](#)
- ☒ [Using the PGA Advisor](#)



**Place the cursor on this icon to display all screenshots. You can also place the cursor on each icon to see only the screenshot associated with it.**

## Overview

[Back to List](#)

One of the core initiatives undertaken by Oracle Database 10G, is to simplify Oracle Database Administration. As part of that effort, many of the repetitive and manual tasks have been automated. In this section, you will proactively manage and automate some of the mundane tasks related to Oracle Instance Memory Configuration. By automating memory configuration, you have more time to deal with real application or business issues that affect your enterprise.

The Memory Advisor is an intelligent expert system within the Oracle database that proactively determines optimal settings for various SGA and PGA components. When automated, Oracle will automatically adjust the settings for the various pools and caches according to the requirements of the workload.

## Prerequisites

[Back to Topic List](#)

Before starting this module, you should have:

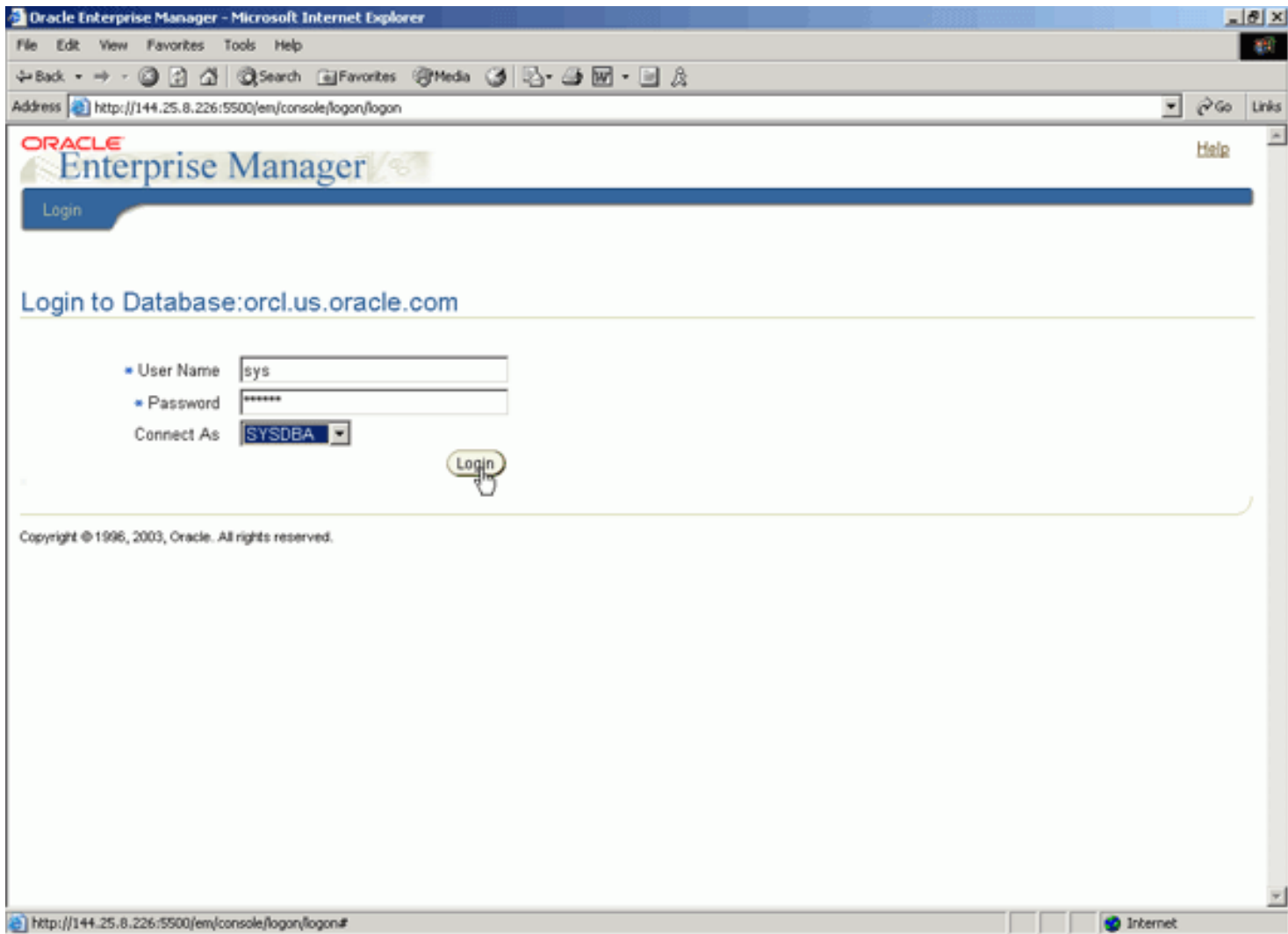
1. Completed the [Configuring Linux for the Installation of Oracle Database 10g](#) lesson
2. Completed the [Installing the Oracle Database 10g on Linux](#) lesson

## Enabling Automated Shared Memory Management

[Back to List](#)

To enable the memory of the SGA automatically, perform the following:

1. Login to Enterprise Manager as **sys/<password>** as **SYSDBA** and click **Login** .



2. Scroll down to the bottom of the home page and click on **Advisor Central** under Related Links.

Oracle Enterprise Manager (SYS) - Database: orcl.us.oracle.com - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Mail

Address http://144.25.8.226:5500/em/console/database/instance/sitemap?event=doLoad&target=orcl.us.oracle.com&type=oracle\_database&pageNum=1 Go Links

Severity	Category	Name	Message	Alert Triggered	Value	Time
	Invalid Objects by Schema	Owner's Invalid Object Count	20 object(s) are invalid in the PUBLIC schema.	Jan 12, 2004 10:20:19 AM	20	Jan 12, 2004 10:20:19 AM
	Invalid Objects by Schema	Owner's Invalid Object Count	18 object(s) are invalid in the SYS schema.	Jan 12, 2004 10:20:19 AM	18	Jan 12, 2004 10:20:19 AM

**Related Alerts**

Severity	Target Name	Target Type	Category	Name	Message	Alert Triggered	Last Value	Time
	edcd26p1.us.oracle.com Host	Host	Disk Activity	Disk Utilization (%)	Disk Utilization for hda is 97.82%	Jan 8, 2004 11:19:52 AM	99.62	Jan 12, 2004 11:49:52 AM
	edcd26p1.us.oracle.com Host	Host	Load	Swap Utilization (%)	Swap Utilization is 99.97%	Jan 12, 2004 9:48:55 AM	99.67	Jan 12, 2004 11:58:55 AM

**Job Activity**

Jobs scheduled to start no more than 7 days ago

Scheduled Executions 0 Suspended Executions 0

Running Executions 0 Problem Executions 0

**Critical Patch Advisories**

Patch Advisories 0

Patch Advisory information may be stale. Oracle MetaLink refresh job has not run successfully in 72 hours.

Job [RefreshFromMetalink](#)

**Home** [Performance](#) [Administration](#) [Maintenance](#)

**Related Links**

<a href="#">Advisor Central</a>	<a href="#">Alert History</a>	<a href="#">Alert Log Content</a>
<a href="#">All Metrics</a>	<a href="#">Blackouts</a>	<a href="#">iSQL*Plus</a>
<a href="#">Jobs</a>	<a href="#">Manage Metrics</a>	<a href="#">Metric Collection Errors</a>
<a href="#">Monitoring Configuration</a>	<a href="#">User-Defined Metrics</a>	

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[About Oracle Enterprise Manager 10g Database Control](#)

Database | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

http://144.25.8.226:5500/em/console/database/instance/advisorTasks?event=doLoad&dbPageNum=16&target=orcl.us.oracle.com&type=orac Internet

3. Select **Memory Advisor**.

http://144.25.8.226:5500/em/console/database/instance/advisorTasks?event=doLoad&dbPageNum=1&tar - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail

Address http://144.25.8.226:5500/em/console/database/instance/advisorTasks?event=doLoad&dbPageNum=1&target=orcl.us.oracle.com&type=oracle\_database Go Links

ORACLE Enterprise Manager 10g Database Control Setup Preferences Help Logout Database

Database: orcl.us.oracle.com > Advisor Central Logged in As SYS

### Advisor Central

Page Refreshed Jan 12, 2004 12:07:00 PM Refresh

**Advisors**

[ADDM](#)
[Memory Advisor](#)
[Segment Advisor](#)  
[SQL Tuning Advisor](#)
[MTTR Advisor](#)
[Undo Management](#)  
[SQL Access Advisor](#)

**Advisor Tasks** Change Default Expiration

**Search**

Select an advisory type and optionally enter a task name to filter the data that is displayed in your results set.

Advisory Type Task Name Advisor Runs

All Types Last Run Go

**Results**

View Result Delete Actions Re-schedule Go

Select	Advisory Type	Name	Description	User	Status	Start Time	End Time	Expires In (days)
<input checked="" type="radio"/>	SQL Access Advisor	<a href="#">OBE010904</a>	SQL Access Advisor	SYS	COMPLETED	Jan 9, 2004 9:55:13 AM	Jan 9, 2004 9:55:24 AM	27
<input type="radio"/>	SQL Tuning Advisor	<a href="#">SQL_TUNING_1073934340961</a>		SYS	COMPLETED	Jan 12, 2004 11:05:45 AM	Jan 12, 2004 11:05:58 AM	30
<input type="radio"/>	ADDM	<a href="#">ADDM:1042673101_1_310</a>	ADDM auto run: snapshots [309, 310], instance 1, database id 1042673101	SYS	COMPLETED	Jan 12, 2004 12:06:41 PM	Jan 12, 2004 12:06:41 PM	30

http://144.25.8.226:5500/em/console/database/instance/memory?advisorCentralURL=/em/console/database/instance/advisorTasks?dbPa Internet

- Click **Enable** for Automatic Shared Memory Management.

Oracle Enterprise Manager (SYS) - Memory Parameters - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://144.25.8.226:5500/em/console/database/instance/memory?advisoryCentralURL=/em/console/database/instance/advisorTasks%3FdbPageNum%3D1%26type%3Doracle> Go Links

ORACLE Enterprise Manager 10g Database Control

Database: orcl.us.oracle.com > Memory Parameters

Memory Parameters

Page Refreshed Jan 12, 2004 12:07:21 PM Refresh

SGA PGA

The System Global Area (SGA) is a group of shared memory structures that contains data and control information for one Oracle database system. The SGA is allocated in memory when an Oracle database instance is started.

Automatic Shared Memory Management **Disabled** [Enable](#)

Shared Pool 80 MB [Advice](#)

Buffer Cache 24 MB [Advice](#)

Large Pool 8 MB

Java Pool 48 MB

Other (MB) 1

Total SGA (MB) 161

SGA

Component	Percentage
Shared Pool	49.6%
Buffer Cache	14.9%
Large Pool	5%
Java Pool	29.8%
Other	0.8%

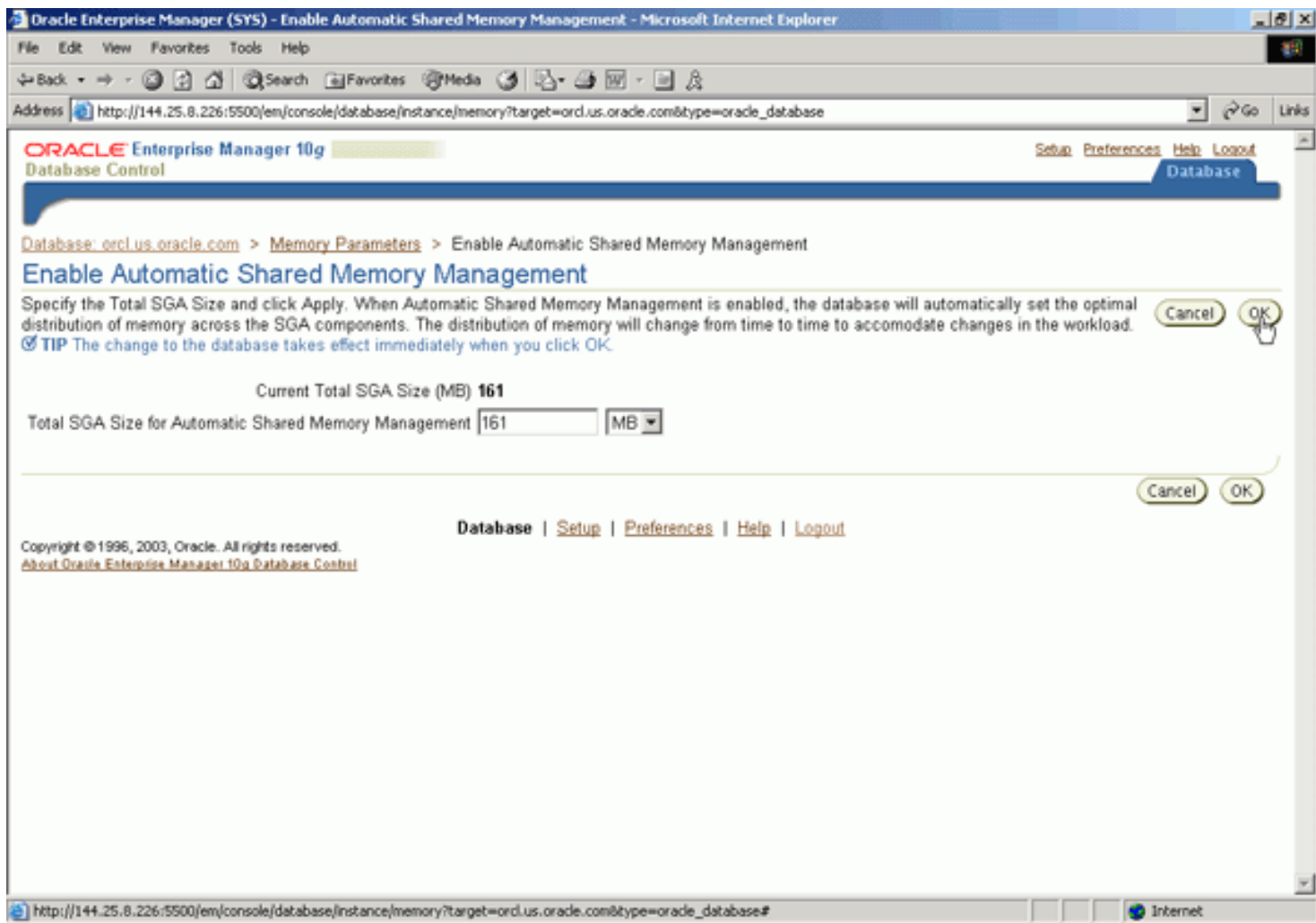
**Maximum SGA Size**

The Maximum SGA Size specifies how much memory is allocated when the database starts up. If you specify the Maximum SGA Size, you can later dynamically change SGA component sizes (provided the total SGA size does not exceed the Maximum SGA Size).

Maximum SGA Size\* (MB) 164

<http://144.25.8.226:5500/em/console/database/instance/memory?advisoryCentralURL=/em/console/database/instance/advisorTasks?dbPa> Internet

- Click **Apply** to enable Automatic Shared Memory Management.



6. Oracle will now automatically adjust the settings for the various pools and caches according to the requirements of the workload.

Oracle Enterprise Manager (SYS) - Memory Parameters - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address [http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle\\_database](http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle_database) Go Links

ORACLE Enterprise Manager Database

Database: orcl.us.oracle.com > Memory Parameters

**Information**

Automatic Shared Memory Management has been successfully enabled. The SGA component sizes will be adjusted automatically by the database to achieve optimal distribution of memory. The distribution of memory will change from time to time to accommodate changes in the workload.

### Memory Parameters

Collected From Target **September 17, 2003 9:10:34 AM PDT** Refresh


**SGA** PGA

The System Global Area (SGA) is a group of shared memory structures that contains data and control information for one Oracle database system. The SGA is allocated in memory when an Oracle database instance is started.

Automatic Shared Memory Management **Enabled** Disable

Total SGA Size (MB)

SGA component	Current Allocation (MB)
Shared Pool	100
Buffer Cache	24
Large Pool	8
Java Pool	100
Other	24



- Shared Pool (39.1%)
- Buffer Cache (9.4%)
- Large Pool (3.1%)
- Java Pool (39.1%)
- Other (9.4%)

### Maximum SGA Size

The Maximum SGA Size specifies how much memory is allocated when the database starts up. If you specify the Maximum SGA Size, you can later dynamically change the Total SGA Size above (provided Total SGA Size does not exceed the Maximum SGA Size).

[http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle\\_database#](http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle_database#) Internet

## Changing the Total SGA Size

[Back to List](#)

To change the total SGA size when in automated shared memory management mode, you will need to make sure the maximum SGA Size is large enough. Perform the following:



1. Scroll down the page. Change Maximum SGA Size to **261MB** and click **Apply** . Note: If you receive an error, click the Refresh button and try it again.

Oracle Enterprise Manager (SYS) - Memory Parameters - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address [http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle\\_database](http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle_database) Go Links

The System Global Area (SGA) is a group of shared memory structures that contains data and control information for one Oracle database system. The SGA is allocated in memory when an Oracle database instance is started.

Automatic Shared Memory Management **Enabled** [Disable](#)

Total SGA Size (MB)

SGA Component	Current Allocation (MB)
Shared Pool	80
Buffer Cache	24
Large Pool	8
Java Pool	48
Other	4

**Maximum SGA Size**

The Maximum SGA Size specifies how much memory is allocated when the database starts up. If you specify the Maximum SGA Size, you can later dynamically change the Total SGA Size above (provided Total SGA Size does not exceed the Maximum SGA Size).

Maximum SGA Size\* (MB)

**SGA** [PGA](#)

☐ Apply changes to SPFILE only. Otherwise the changes are made to both the SPFILE and the running instance which requires that you restart the database to invoke static parameters.

☒ **TIP** \* indicates controls, if changed, must restart database to invoke.

[Show SQL](#) [Revert](#) [Apply](#)

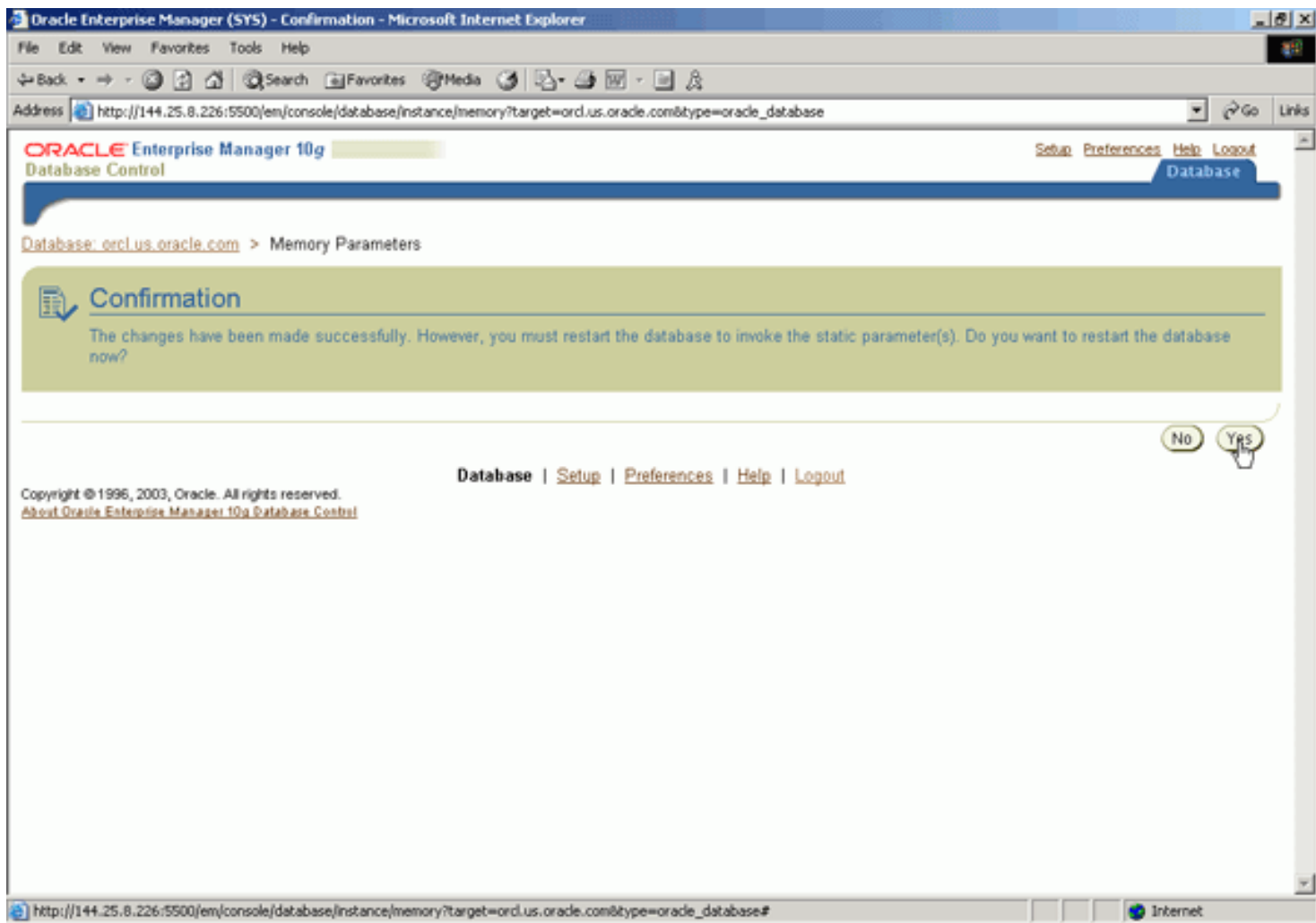
[Database](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

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[http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle\\_database#](http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle_database#) Internet

2. Click **Yes** to confirm the change.





3. Supply the host credentials and the database credentials then click **OK** .

Oracle Enterprise Manager (SYS) - Restart Database: Specify Host and Target Database Credentials - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address [http://144.25.8.226:5500/em/console/database/instance/changeState?event=restartDBWithInitParameters&target=orcl.us.oracle.com&type=oracle\\_database](http://144.25.8.226:5500/em/console/database/instance/changeState?event=restartDBWithInitParameters&target=orcl.us.oracle.com&type=oracle_database) Go Links

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database: [orcl.us.oracle.com](#) > Restart Database: Specify Host and Target Database Credentials Logged in As SYS

## Restart Database: Specify Host and Target Database Credentials

Specify the following credentials in order to restart the database.

### Host Credentials

Specify the OS user name and password to login to target database machine.

- Username
- Password

### Database Credentials

Specify the credentials for the target database.

To use OS authentication, leave the user name and password fields blank.

- Username
- Password
- Database
- Connect As
- ☒ Save as Preferred Credential

Note that you need to login to the database as SYSDBA or SYSOPER in order to restart the database.

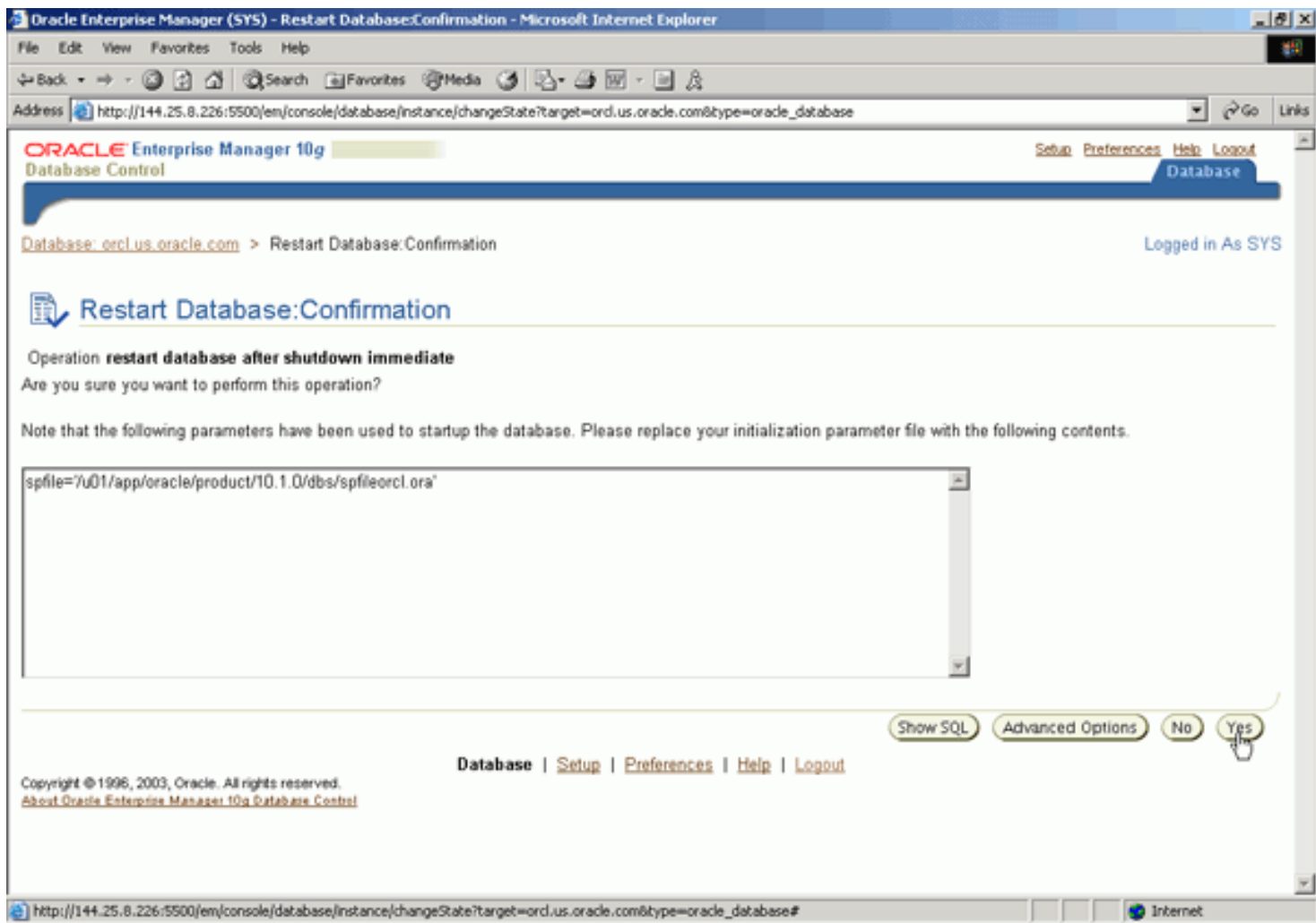
Cancel OK

Database | Setup | Preferences | Help | Logout

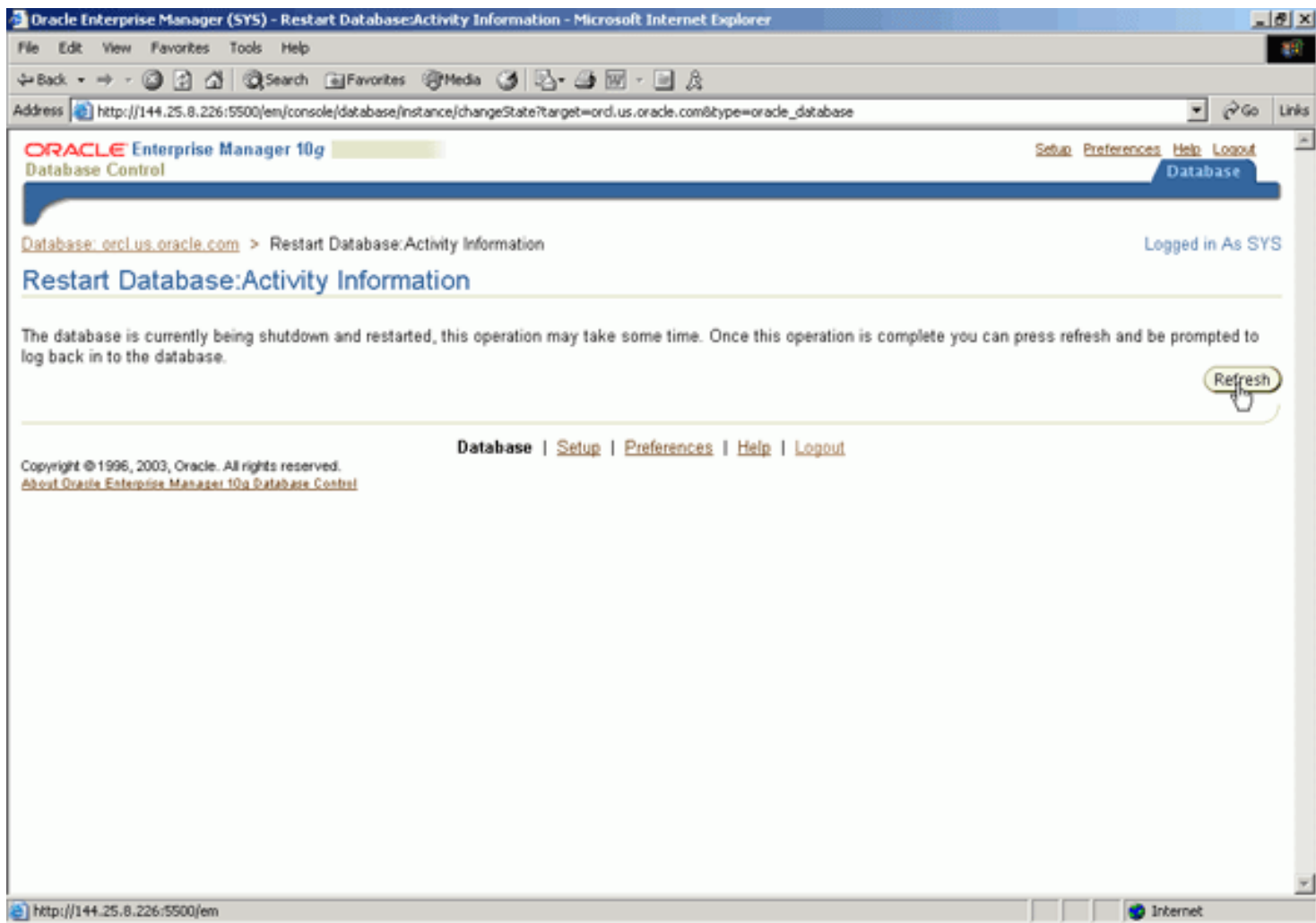
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[http://144.25.8.226:5500/em/console/database/instance/changeState?event=restartDBWithInitParameters&target=orcl.us.oracle.com&type=oracle\\_database](http://144.25.8.226:5500/em/console/database/instance/changeState?event=restartDBWithInitParameters&target=orcl.us.oracle.com&type=oracle_database) Internet

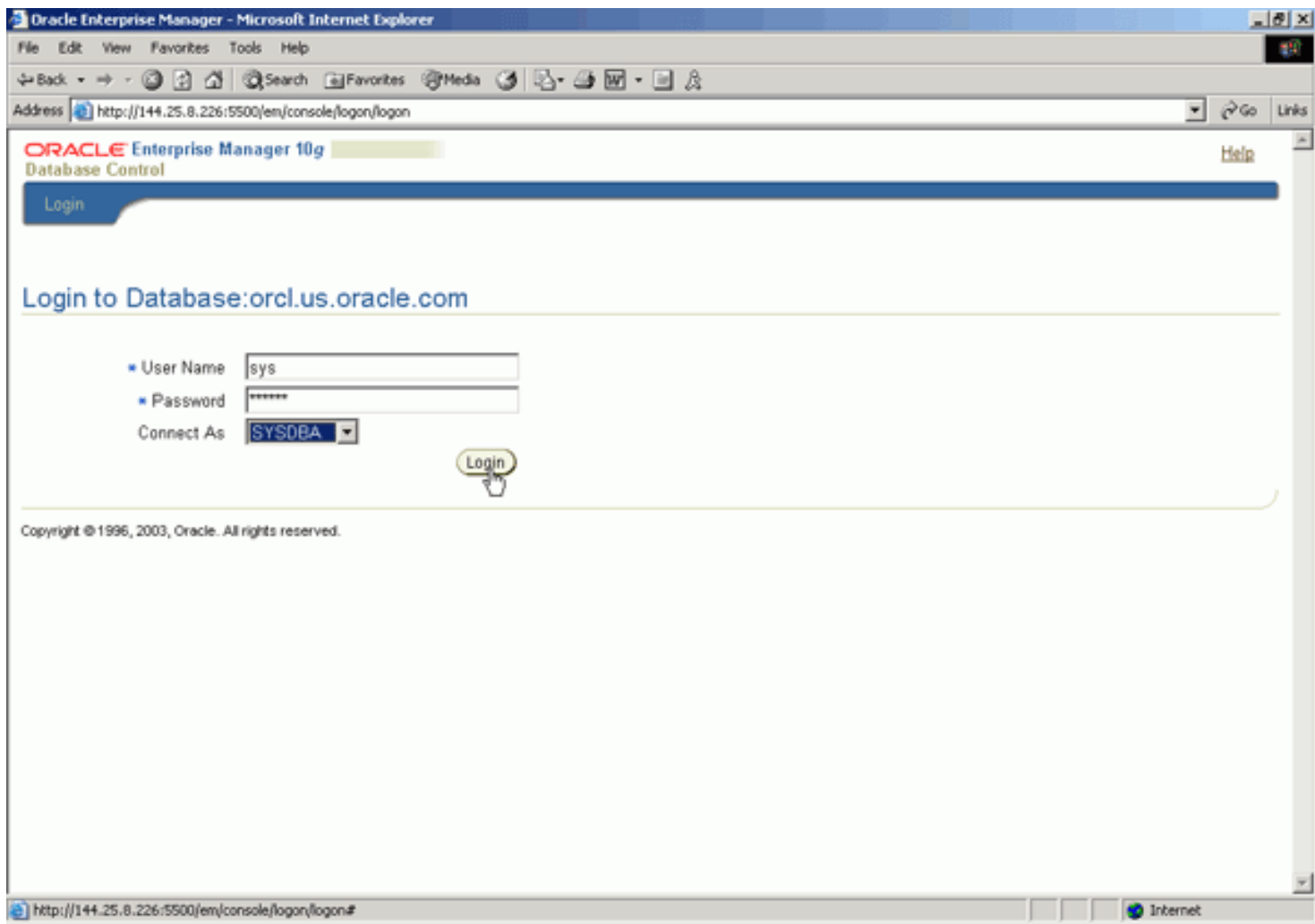
4. Changing the Max SGA Size parameter requires a restart of the database. Click **Yes** to confirm restart of the database.



5. The database restart process will start. Click **Refresh**.



6. Enter **sys/<password>** as **SYSDBA** and click **Login** .



7. Scroll down and click **Advisor Central** .

Oracle Enterprise Manager (SYS) - Database: orcl.us.oracle.com - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Mail

Address [http://144.25.8.226:5500/em/console/database/instance/sitemap?event=doLoad&target=orcl.us.oracle.com&type=oracle\\_database](http://144.25.8.226:5500/em/console/database/instance/sitemap?event=doLoad&target=orcl.us.oracle.com&type=oracle_database) Go Links

Severity	Category	Name	Message	Alert Triggered	Value	Time
	User Audit	Audited User	User SYS logged on from EDCDR26P1.	Jan 12, 2004 12:10:59 PM	0	Jan 12, 2004 12:27:30 PM
	Invalid Objects by Schema	Owner's Invalid Object Count	20 object(s) are invalid in the PUBLIC schema.	Jan 12, 2004 10:20:19 AM	20	Jan 12, 2004 10:20:19 AM
	Invalid Objects by Schema	Owner's Invalid Object Count	18 object(s) are invalid in the SYS schema.	Jan 12, 2004 10:20:19 AM	18	Jan 12, 2004 10:20:19 AM

**Related Alerts**

Severity	Target Name	Target Type	Category	Name	Message	Alert Triggered	Last Value	Time
	edcd/26p1.us.oracle.com	Host	Disk Activity	Disk Utilization (%)	Disk Utilization for hda is 97.82%	Jan 8, 2004 11:19:52 AM	99.61	Jan 12, 2004 12:22:12 PM

**Job Activity**

Jobs scheduled to start no more than 7 days ago

Scheduled Executions **0** Suspended Executions **0**

Running Executions **0** Problem Executions **0**

**Critical Patch Advisories**

Patch Advisories **0**

Patch Advisory information may be stale. Oracle MetaLink refresh job has not run successfully in 72 hours.

Job [RefreshFromMetalink](#)

**Home** [Performance](#) [Administration](#) [Maintenance](#)

**Related Links**

<a href="#">Advisor Central</a>	<a href="#">Alert History</a>	<a href="#">Alert Log Content</a>
<a href="#">All Metrics</a>	<a href="#">Blackouts</a>	<a href="#">iSQL*Plus</a>
<a href="#">Jobs</a>	<a href="#">Manage Metrics</a>	<a href="#">Metric Collection Errors</a>
<a href="#">Monitoring Configuration</a>	<a href="#">User-Defined Metrics</a>	

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<http://144.25.8.226:5500/em/console/database/instance/advisorTasks?event=doLoad&dbPageNum=16&target=orcl.us.oracle.com&type=orac> Internet

8. Click **Memory Advisor** .

Oracle Enterprise Manager 10g Database Control

Database: orcl.us.oracle.com > Advisor Central

Logged in As SYS

Page Refreshed Jan 12, 2004 12:34:15 PM [Refresh](#)

**Advisors**

[ADDM](#)
[SQL Tuning Advisor](#)
[SQL Access Advisor](#)
[Memory Advisor](#)
[MITR Advisor](#)
[Segment Advisor](#)
[Undo Management](#)

**Advisor Tasks** [Change Default Expiration](#)

**Search**

Select an advisory type and optionally enter a task name to filter the data that is displayed in your results set.

Advisory Type:  Task Name:  Advisor Runs:  [Go](#)

**Results**

[View Result](#) [Delete](#) [Actions](#) [Re-schedule](#) [Go](#)

Select	Advisory Type	Name	Description	User	Status	Start Time	End Time	Expires In (days)
<input checked="" type="radio"/>	SQL Access Advisor	<a href="#">OBE010904</a>	SQL Access Advisor	SYS	COMPLETED	Jan 9, 2004 9:55:13 AM	Jan 9, 2004 9:55:24 AM	27
<input type="radio"/>	SQL Tuning Advisor	<a href="#">SQL_TUNING_1073934340961</a>		SYS	COMPLETED	Jan 12, 2004 11:05:45 AM	Jan 12, 2004 11:05:58 AM	30
<input type="radio"/>	ADDM	<a href="#">ADDM:1042673101_1_313</a>	ADDM auto run: snapshots [312, 313], instance 1, database id 1042673101	SYS	COMPLETED	Jan 12, 2004 12:12:45 PM	Jan 12, 2004 12:12:45 PM	30

9. Change the Total SGA Size parameter to **260 MB**. Click **Apply** .

Note that the Max SGA Size parameter was automatically adjusted to conform to the memory granule size. Though you had set it to be 261MB originally, the Oracle server automatically changed it to 264MB.



Oracle Enterprise Manager (SYS) - Memory Parameters - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://144.25.8.226:5500/em/console/database/instance/memory?advisoryCentralURL=/em/console/database/instance/advisorTasks%3FdbPageNum%3D1%26type%3Doracle> Go Links

**SGA** **PGA**

The System Global Area (SGA) is a group of shared memory structures that contains data and control information for one Oracle database system. The SGA is allocated in memory when an Oracle database instance is started.

Automatic Shared Memory Management **Enabled** [Disable](#)

Total SGA Size (MB)

SGA Component	Current Allocation (MB)
Shared Pool	80
Buffer Cache	24
Large Pool	8
Java Pool	48
Other	4

Maximum SGA Size

The Maximum SGA Size specifies how much memory is allocated when the database starts up. If you specify the Maximum SGA Size, you can later dynamically change the Total SGA Size above (provided Total SGA Size does not exceed the Maximum SGA Size).

Maximum SGA Size\* (MB)

**SGA** **PGA**

☐ Apply changes to SPFILE only. Otherwise the changes are made to both the SPFILE and the running instance which requires that you restart the database to invoke static parameters.

☒ **TIP \*** indicates controls, if changed, must restart database to invoke.

[Show SQL](#) [Revert](#) [Apply](#)

Database | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

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<http://144.25.8.226:5500/em/console/database/instance/memory?advisoryCentralURL=/em/console/database/instance/advisorTasks?dbPa> Internet

10. Once you receive the confirmation notice that the parameter was changed successfully, you'll also notice that memory allocation to some of the SGA components was adjusted automatically.

Oracle Enterprise Manager (SYS) - Memory Parameters - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print View Source

Address http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle\_database

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database: orcl.us.oracle.com > Memory Parameters

**Update Message**  
The changes have been made successfully

### Memory Parameters

Page Refreshed Jan 12, 2004 12:35:54 PM Refresh


**SGA** **PGA**

The System Global Area (SGA) is a group of shared memory structures that contains data and control information for one Oracle database system. The SGA is allocated in memory when an Oracle database instance is started.

Automatic Shared Memory Management **Enabled** Disable

Total SGA Size (MB) 260

SGA Component	Current Allocation (MB)
Shared Pool	80
Buffer Cache	120
Large Pool	8
Java Pool	48
Other	4



Legend:

- Shared Pool(30.8%)
- Buffer Cache(46.2%)
- Large Pool(3.1%)
- Java Pool(18.5%)
- Other(1.5%)

### Maximum SGA Size

The Maximum SGA Size specifies how much memory is allocated when the database starts up. If you specify the Maximum SGA Size, you can later dynamically change the Total SGA Size above (provided Total SGA Size does not exceed the Maximum SGA Size).

http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle\_database#

Internet

## Using the PGA Advisor

[Back to List](#)

To allocated memory associated with the PGA, perform the following:

1. Click the **PGA** tab.

Oracle Enterprise Manager 10g Database Control

Database: orcl.us.oracle.com > Memory Parameters

**Update Message**  
The changes have been made successfully

**Memory Parameters**  
Page Refreshed Jan 12, 2004 12:35:54 PM Refresh

**SGA** **PGA**

The System Global Area (SGA) is a group of shared memory structures that contains data and control information for one Oracle database system. The SGA is allocated in memory when an Oracle database instance is started.

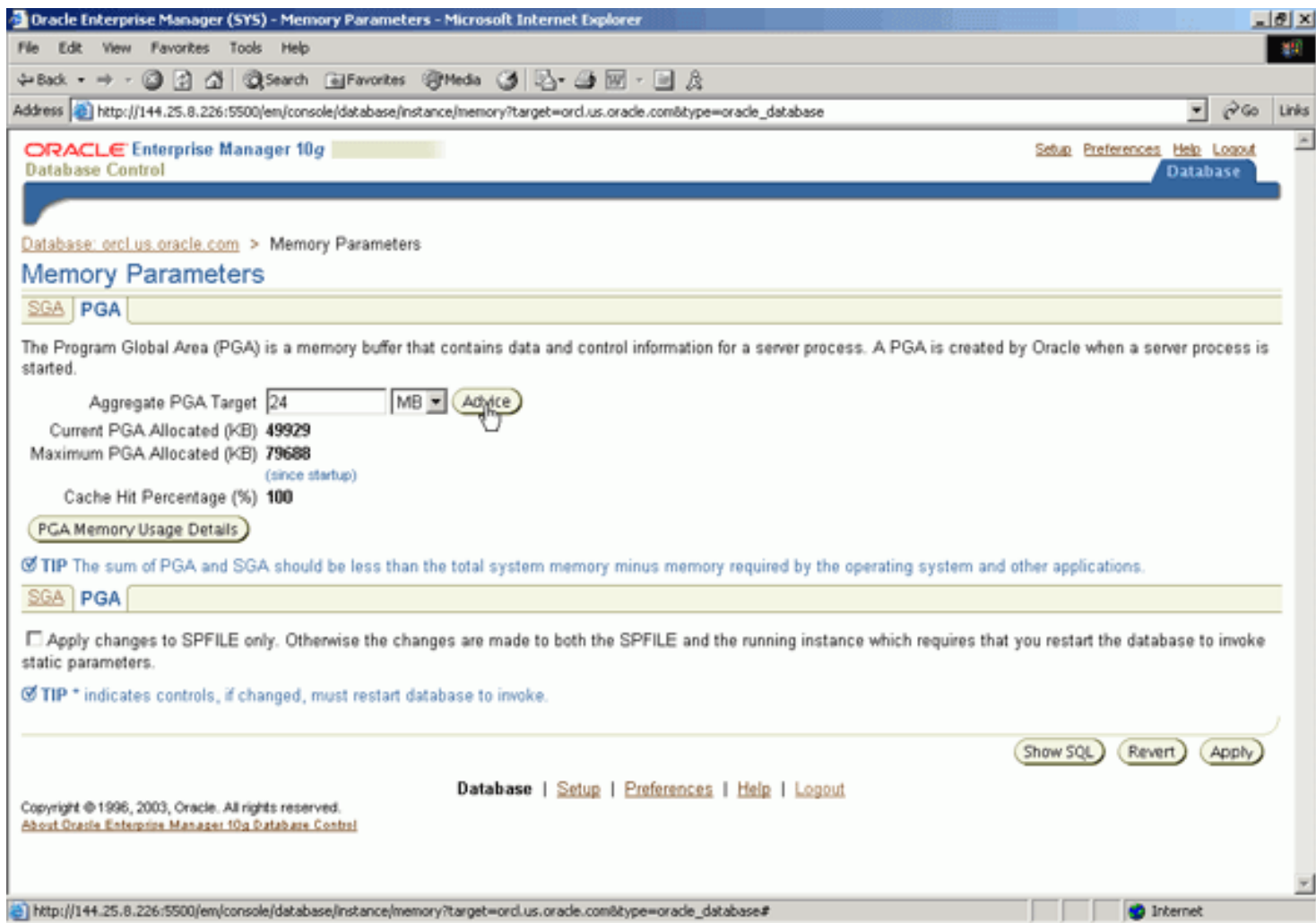
Automatic Shared Memory Management **Enabled** Disable

Total SGA Size (MB) 260

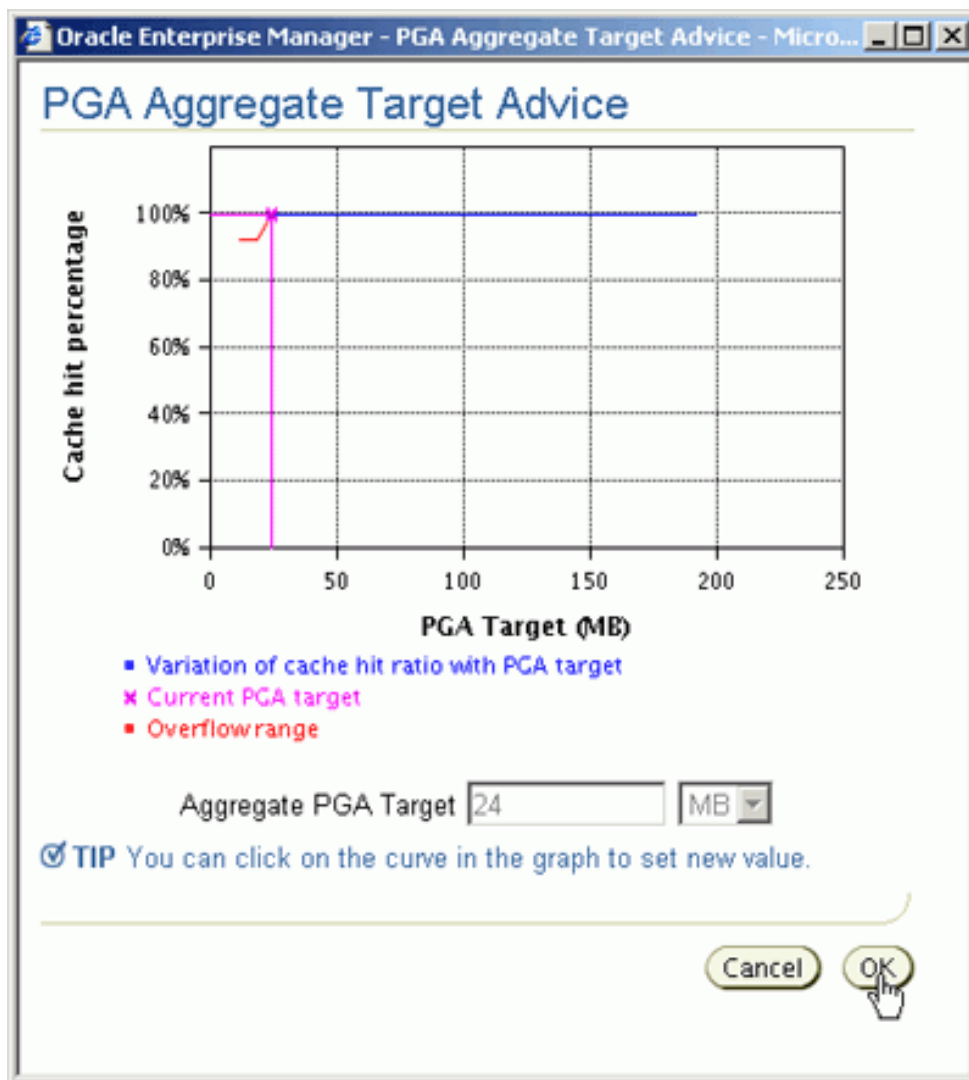
SGA Component	Current Allocation (MB)
Shared Pool	80
Buffer Cache	120
Large Pool	8
Java Pool	48
Other	4

**Maximum SGA Size**  
The Maximum SGA Size specifies how much memory is allocated when the database starts up. If you specify the Maximum SGA Size, you can later dynamically change the Total SGA Size above (provided Total SGA Size does not exceed the Maximum SGA Size).

2. Click **Advice** ....



3. The PGA Aggregate Target Advice graph shows the frequency in which data is found in cache so that you do not have to access disk. In this case, it should be noted that the current PGA Aggregate Size is set to approximately 24MB, and over 88% of all the requested services are gotten from memory. This also shows the overflow range which starts around 12MB. At 12MB, the PGA requests hit the cache around 90%. The PGA Aggregate Size implies that (based on current workloads and the number of sessions in the database), no more than 24MB should be allocated for all PGAs in this database. Click the **OK** button.



4. Click **PGA Memory Usage Details** .

Oracle Enterprise Manager (SYS) - Memory Parameters - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address [http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle\\_database#](http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle_database#) Go Links

ORACLE Enterprise Manager 10g Database Control

Database: orcl.us.oracle.com > Memory Parameters

## Memory Parameters

[SGA](#) [PGA](#)

The Program Global Area (PGA) is a memory buffer that contains data and control information for a server process. A PGA is created by Oracle when a server process is started.

Aggregate PGA Target  MB [Advice](#)

Current PGA Allocated (KB) **49929**

Maximum PGA Allocated (KB) **79688**  
(since startup)

Cache Hit Percentage (%) **100**

[PGA Memory Usage Details](#)

**TIP** The sum of PGA and SGA should be less than the total system memory minus memory required by the operating system and other applications.

[SGA](#) [PGA](#)

☐ Apply changes to SPFILE only. Otherwise the changes are made to both the SPFILE and the running instance which requires that you restart the database to invoke static parameters.

**TIP** \* indicates controls, if changed, must restart database to invoke.

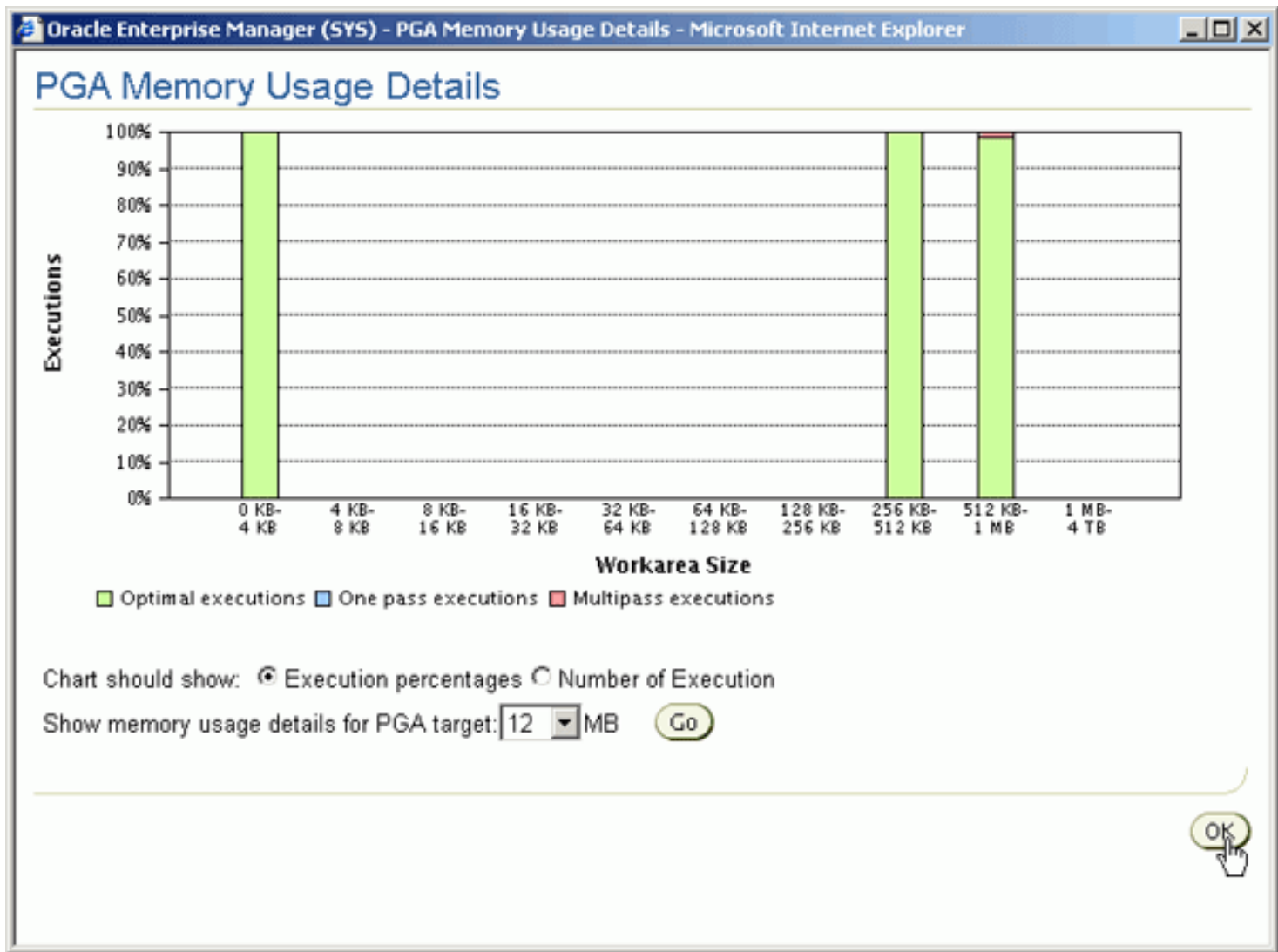
[Show SQL](#) [Revert](#) [Apply](#)

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[http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle\\_database#](http://144.25.8.226:5500/em/console/database/instance/memory?target=orcl.us.oracle.com&type=oracle_database#) Internet

5. This graph shows the usage details in memory size requests and executions percentages for various PGA memory requests. Click **OK**.



 Place the cursor on this icon to hide all screenshots.