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Document:

Dealing with Essbase Fragmentation

Description:

This is one of our documents from Essbase for beginner's series. The document focuses on the causes of fragmentation and their solutions. Essbase fragmentation is one of the major performance killing factors.

History:

Version	Description Change	Author	Publish Date
0.1	Initial Draft	Gaurav Shrivastava	19-Mar-2011
0.1	Review Level 1	Amit Sharma	21st May 2011

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Introduction

Fragmentation occurs in a dynamic memory allocation system when many of the free blocks are too small to satisfy any request.

External Fragmentation: External Fragmentation happens when a dynamic memory allocation algorithm allocates some memory and a small piece is left over that cannot be effectively used. If too much external fragmentation occurs, the amount of usable memory is drastically reduced. Total memory space exists to satisfy a request, but it is not contiguous.

Internal Fragmentation: Internal fragmentation is the space wasted inside of allocated memory blocks because of restriction on the allowed sizes of allocated blocks. Allocated memory may be slightly larger than requested memory; this size difference is memory internal to a partition, but not being used.

Fragmentation occurs on a hard drive, a memory module, or other media when data is not written close enough physically on the drive. When data is inserted into a particular application, then data load randomly into the Essbase cube or disk.

"Fragmentation is unused disk space".

Fragmentation occurs
1) When insert, update and delete operation perform
2) Database structure is not proper
3) When database has Dynamic Calc and store members

Example:- You can't store more than 10kb file in to fragmentized space, because no 10kb free block is available in the fragmentized disk. After defragmentation you have enough space to store then 10kb file size.
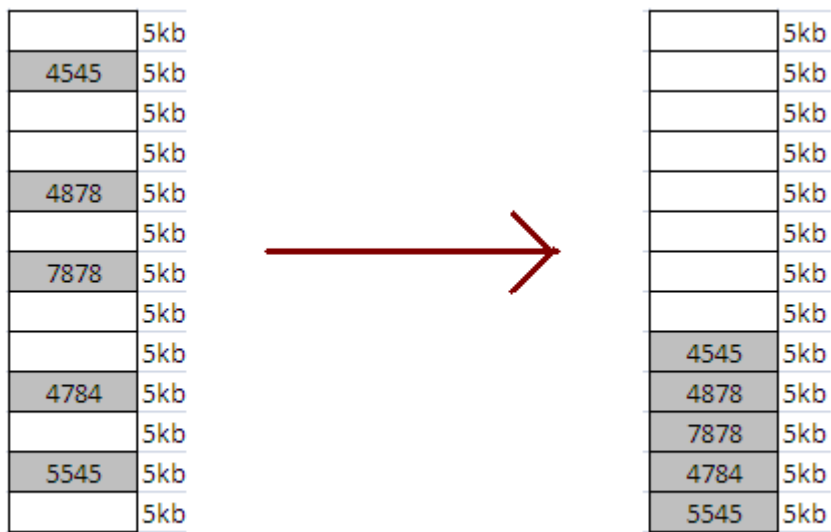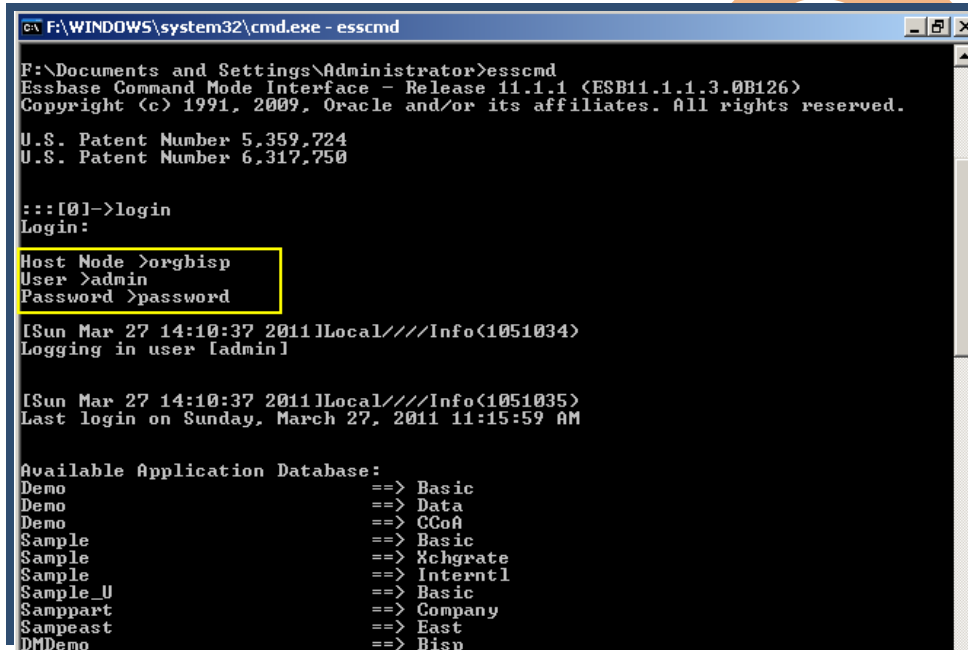

Before Defragmentation   After Defragmentation

Measuring Fragmentation: - There are two ways to measure fragmentation

  a. Using the Average Fragmentation Quotient
  b. Using the Average Clustering Ratio

Steps for Measuring Fragmentation:-

Step1- Login to Essbase Insert Host Name, User Name and Password

Step2- Select the application

Step3- Get data base stats through GETDBSTATS command

```
F:\WINDOWS\system32\cmd.exe - esscmd
MDemo                          ==> Bisp

orgbisp:::admin[1]->select MDemo
Select:

Enter database name >Bisp
orgbisp:MDemo:Bisp:admin[1]->getdbstats
GetDbStats:

-------Statistics of MDemo:Bisp -------

Dimension Name                 Type     Declared Size  Actual Size
==================================================================
Year                           DENSE    19             12
Measures                       DENSE    19             9
Product                        SPARSE   22             19
Market                         SPARSE   25             25
Scenario                       DENSE    5              2
Caffeinated                    SPARSE   3              0
Ounces                         SPARSE   5              0
Pkg Type                       SPARSE   3              0
Population                     SPARSE   15             0
Intro Date                     SPARSE   8              0

Number of dimensions                            : 10
Declared Block Size                             : 1805
Actual Block Size                               : 216
Declared Maximum Blocks                         : 550
Actual Maximum Blocks                           : 475
Number of Non Missing Leaf Blocks               : 177
Number of Non Missing Non Leaf Blocks           : 197
Number of Total Blocks                          : 374
Index Type                                      : B+ TREE
Average Block Density                           : 94.44444
Average Sparse Density                          : 78.73684
Block Compression Ratio                         : 0.9644444
Average Clustering Ratio                        : 0.4678156
Average Fragmentation Quotient                  : 50.37894
Free Space Recovery is Needed                   : No
Estimated Bytes of Recoverable Free Space       : 0

orgbisp:MDemo:Bisp:admin[1]->_
```

Through GETDBSTATS command we can get average fragmentation quotient. Reduce the fragmentation the performance of cube will increase.

Database Size	Fragmentation Quotient Threshold
Small (up to 200 MB)	60% or higher
Medium (up to 2 GB)	40% or higher
Large (greater than 2 GB)	30% or higher

Average Clustering Ratio Fragmentation

Statistics of Application shows the Average Clustering Ratio that indicates the fragmentation level of the data (.pag) files. The Clustering Ratio maximum value, 1, indicates no fragmentation.

Preventing or Removing Fragmentation: - We can prevent our cube for fragmentation through proper data load, update and delete manner. We can remove Fragmentation through Defragmentation process.

Prevent Fragmentation:-

1) Optimize data loads by sorting load records based upon sparse dimension members. For a comprehensive discussion of optimizing data load by grouping sparse members, see Grouping Sparse Member Combinations. Then load data so that fragmentation will be less.

Removing Fragmentation: -

1) There are three steps perform an export of the database, delete all data in the database with CLEARDATA, and reload the export file.
2) Force a dense restructure of the database.

Defragmentation occurs when Essbase queues blocks into the cache for calculation purposes, many passes of a database will result in the cache being filled and emptied depending on what is being calculated. This results in defragmentation as the logical storage order of these blocks is changed by the movement in and out of the cache.

This can sometimes, not always, result in performance degradation (as Essbase seeks out the correct blocks either from the cache or form the index), in the database stats an Average Clustering Ratio of 1 shows no defragmentation. If this value falls to below 0.1 then it would be deemed defragmented. Usually it sits between 1 and 0.5.

To correct a defragmented database either do a full export and re-import of data or force a dense restructure, analyze any benefits of doing this on calculation time before and after correction to see if this has improved performance, generally it has no major impact, if performance enhancements are required it is best looking at cache settings first.

Steps for database Fragmentation

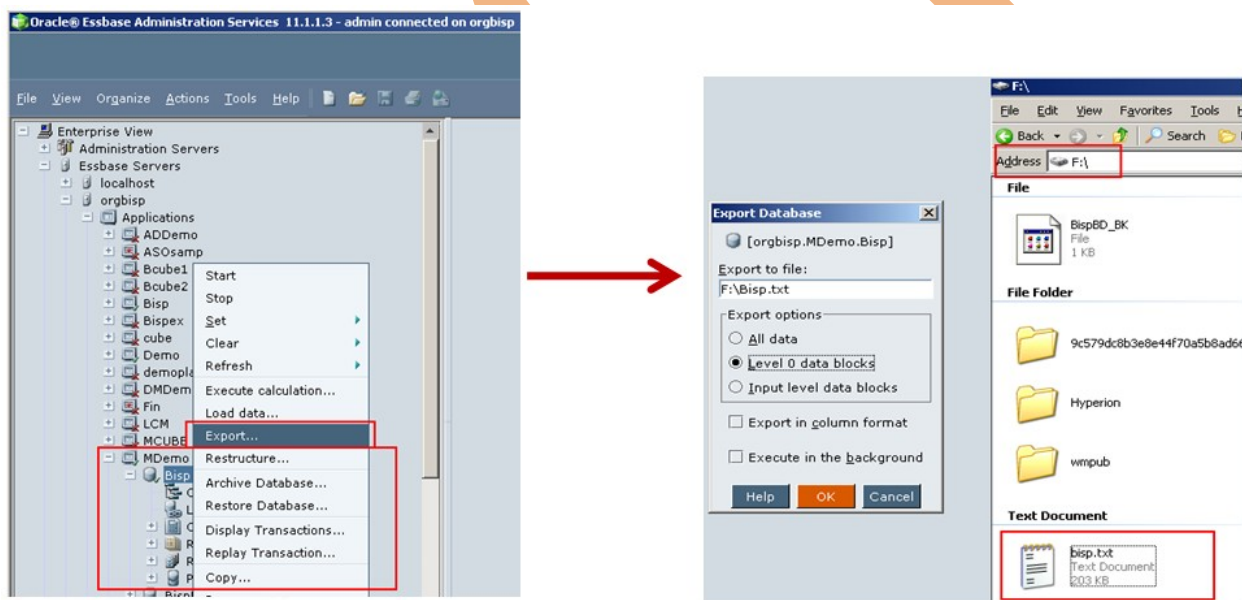There are three steps for removing Essbase fragmentation process.

Step1→ Exporting existing data

Step2 → Clear complete block

Step3 → Import Data

Exporting Data

Step1:- Right click on database and select Export.

Step2:- Define the path and give the name to database Exported file.

Step3:- Once data exported successfully, clear all data of database.
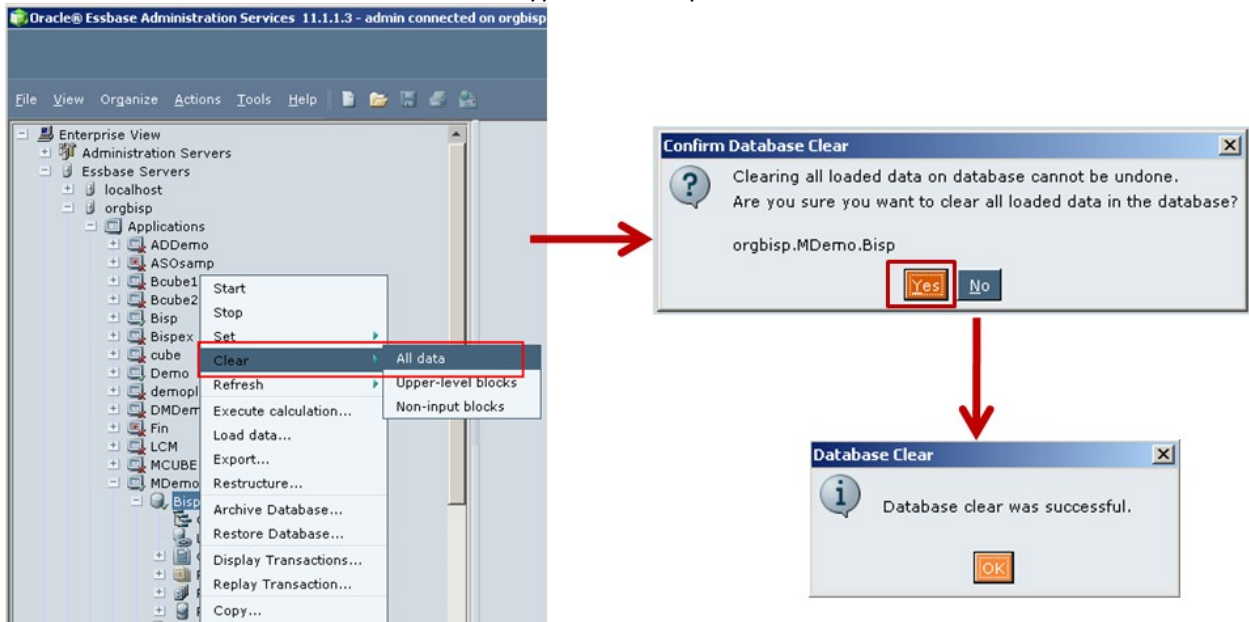
Step4:- Now Application has blank Database, Right click on Database and select "Load Data".

Step5:- Click on "Find Data File" and browse data file then click ok
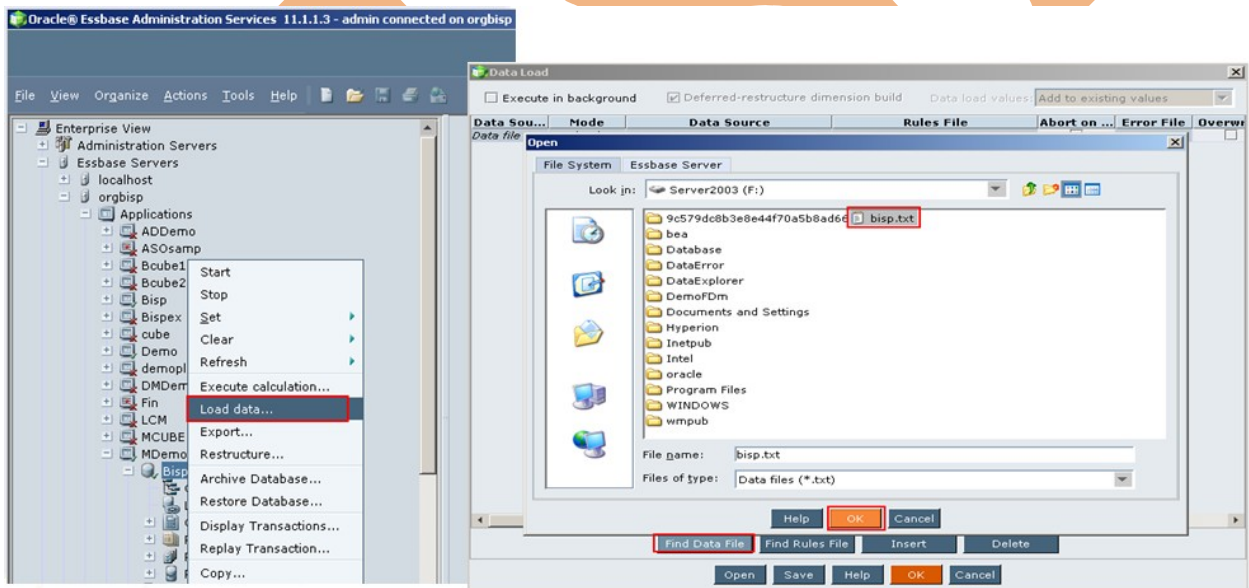
Load Data in to Application

Data loaded success fully
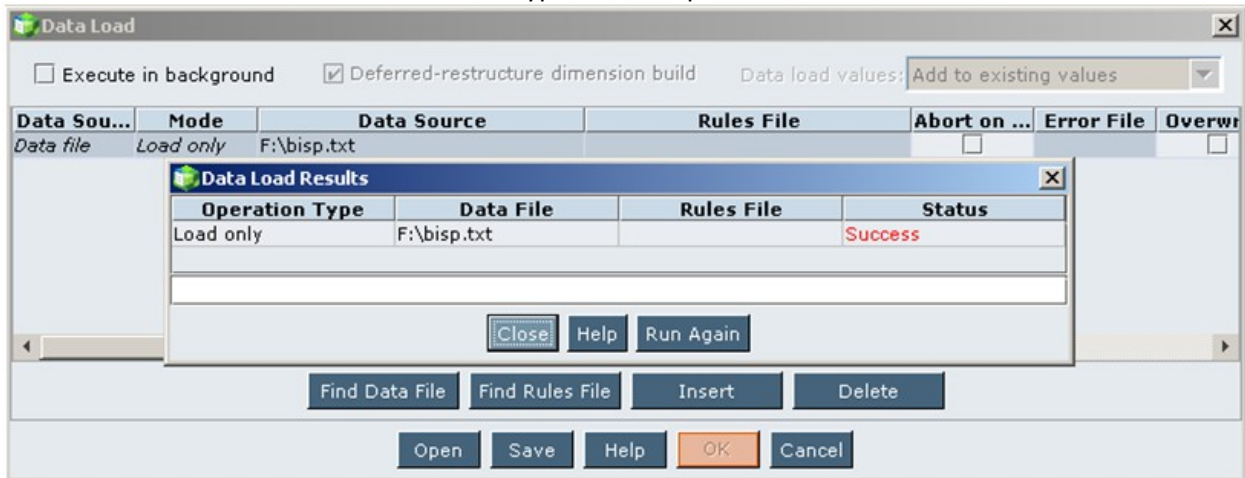
Now this application database is defragmented the performance of database will be better than the previous.

Reducing Database Fragmentation

Another way to reducing fragmentation is force a dense restructure of the database.
How to perform a full database restructure?

Step1:- Right click on database and select "Restructure"
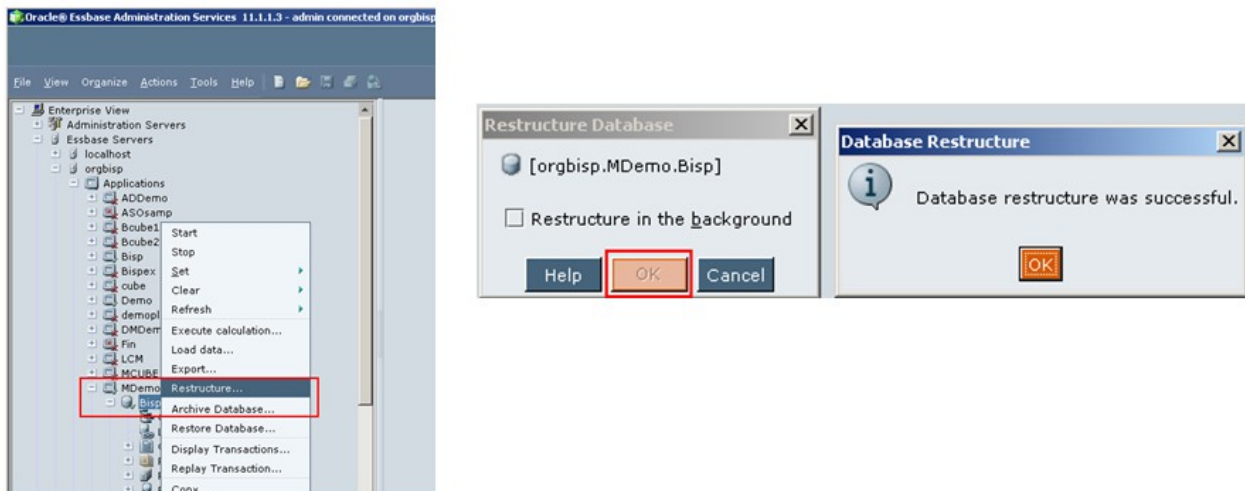
This action removes the fragmentation from the database.

Removing Security File Fragmentation

Now if there is update on security files, such as the addition or removal of users, groups, applications, or database, can gradually create security file fragmentation. The same way if fragmentation exists in any of these file the performance of that particular file will decrease.
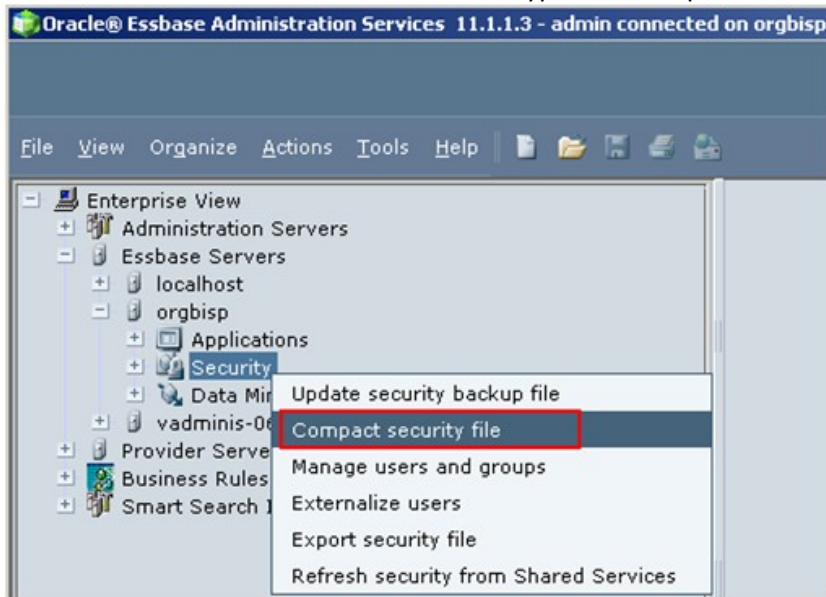
Automation Database Fragmentation

We can write MAXL script for automation off all tasks.
The script is divided in three parts.
1) Exporting Data
2) Clearing Data
3) Importing Data
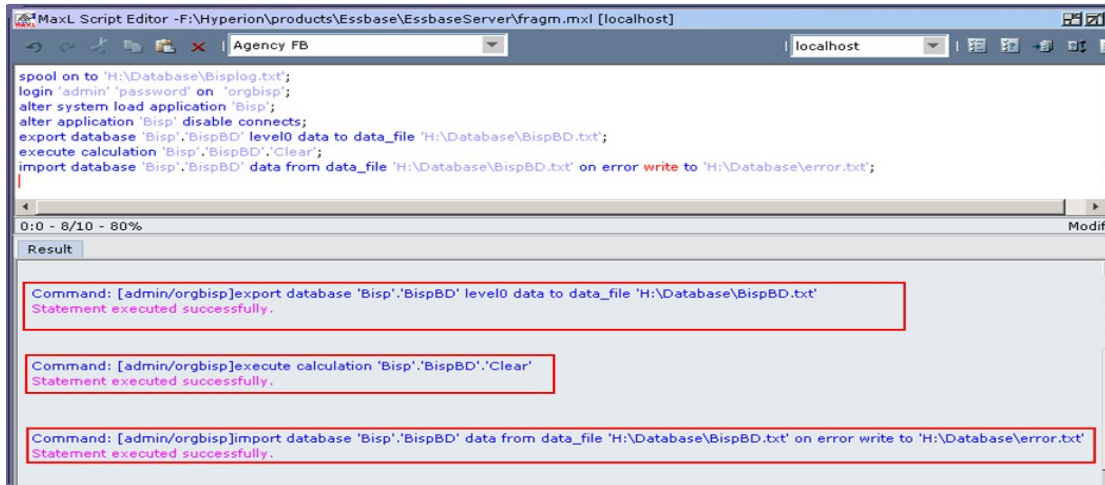
spool on to 'H:\Database\Bisplog.txt';
login 'admin' 'password' on 'orgbisp';
alter system load application 'Bisp';
alter application 'Bisp' disable connects;
export database 'Bisp'.'BispBD' level0 data to data_file 'H:\Database\BispBD.txt';
execute calculation 'Bisp'.'BispBD'.'Clear';
import database 'Bisp'.'BispBD' data from data_file 'H:\Database\BispBD.txt'on error write
to 'H:\Database\error.txt';
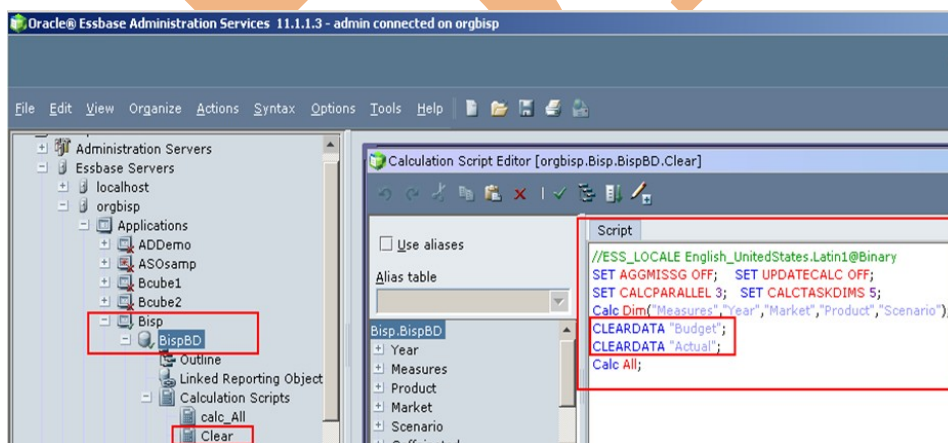
Clearing Database

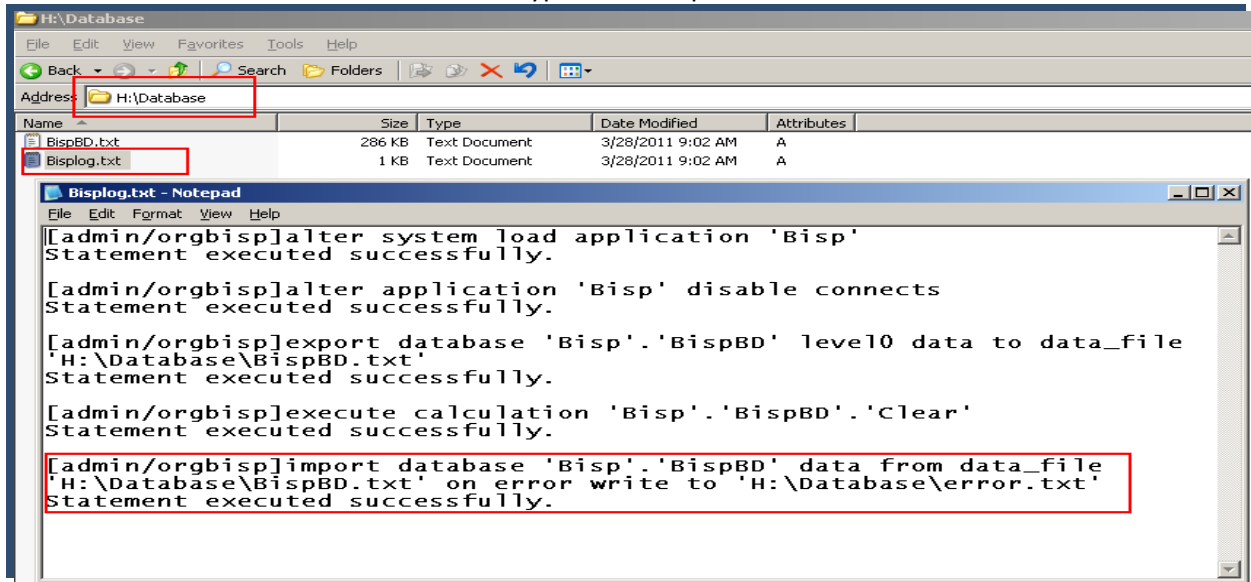This is the Calculation script for clearing data.

Automation Database Fragmentation

When you Execute script two text file will be generated first one is database backup file or Exported file of database.

This is data base log file you can see what actions are performed. If any error comes during automation error message will log into this file.

Bisplog.txt - Notepad

```
[admin/orgbisp]alter system load application 'Bisp'
Statement executed successfully.

[admin/orgbisp]alter application 'Bisp' disable connects
Statement executed successfully.

[admin/orgbisp]export database 'Bisp'.'BispBD' level0 data to data_file
'H:\Database\BispBD.txt'
Statement executed successfully.

[admin/orgbisp]execute calculation 'Bisp'.'BispBD'.'Clear'
Statement executed successfully.

[admin/orgbisp]import database 'Bisp'.'BispBD' data from data_file
'H:\Database\BispBD.txt' on error write to 'H:\Database\error.txt'
Statement executed successfully.
```