Oracle Database Administration

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Editorial Team

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INTRODUCTION

Government of Gujarat has already commissioned many important ICT projects in the state and it is still going further. In all the projects Database is playing vital role. There are many database products available in the market like Oracle (9i & 10g), DB2, Microsoft SQL, MySQL, MS Access etc. Most of the Departments are using either one of the above mentioned Database product. In this news letter we have covered overview and features of the Oracle database. In our further news letters, we will cover more Database products.

The main thrust of the latest features and enhancements for Oracle 10g are geared towards grid computing which is an extension of the clustering features (Real Application Clusters) introduced with Oracle 9i.

Oracle 9i is the version of the Oracle RDBMS. It comes in the form of releases one and two. In Oracle 9i release, Oracle has introduced new features and functionality throughout the database engine, and has also enhanced the functionality of many supporting products such as RMAN and OEM.

Overview - Oracle 10g

The main thrust of the new features and enhancements for Oracle 10g are geared towards grid computing which is an extension of the clustering features (Real Application Clusters) introduced with Oracle 9i.

But what exactly is grid computing?

Way back in the 1980s companies like Digital Equipment Corp (aka DEC - now part of HP Compaq) developed clustering technology which allowed two or more computers to to appear as if they were just one to the end-user, thereby enabling load-balancing and hot standby. Oracle (for release 9i) absorbed this technology into the database software so that databases could benefit from the load-balancing and hot-standby capabilities without having to worry about installing additional clustering software or manually switching users from one database instance to another should a failure occur and just as importantly, without the application having to be cluster-aware.

That was one stepping stone in the evolutionary process, but recently companies like Sun Microsystems have been extending the concept of clusters to be able to include different types (makes) of computers running different operating systems in a "pool" of computing resources that can be made available as and when required to meet peak demands and then released back into the pool when no longer needed (so that other applications may use the resources). The idea of Oracle 10g is that the database will be able to dynamically "requisition" resources from the pool (the grid) to meet levels of peak demand. Again the grid can be heterogeneous (i.e. different types of hardware and/or operating systems), but how this will work in practice in terms of licensing as not yet been announced.

The motivation for the development of grid computing is to reduce the need to have dedicated resources sized for peak capacity. Research has shown that the average CPU usage is only 15-20% and storage usage is only 50%. Having dedicated resources for each major application also means that there can be a large number of systems to maintain. The solution to this is to create a grid - a pool of low-cost servers + storage that can be allocated to applications to meet peak loads.

Other enhancements for Oracle 10g are aimed at reducing costs and improving the quality of service by making the database easier to deploy and manage including backup and recovery and data warehousing enhancements.

Features - Oracle 10g

⬇ Ease of Management

As with Oracle 9i, one of the major focuses of this release has been to reduce costs and increase database up-time by making the database easier to manage. One way of doing this is to automate takes that previously had to be done manually by the dba. To achieve this for Oracle 10g, a new Automated Storage Management (ASM) sub-system has been introduced. This feature removes the need to have a file system or a volume manager for managing the database files and eliminates the complexity of balancing data across disks and controllers manually. Instead, the ASM stripes data across the disks automatically, thereby maximizing throughput and minimizing the risk of data loss. The ASM also maintains the data striping as disks are added/removed and re-balances the i/o load dynamically.

Oracle 10g has also been given a self-management infrastructure which captures information about the running of the database and stores it in the Automatic Workload Repository. This information is used by tools such as the new Automatic Database Diagnostic Monitor (ADDM) which analyses data such as the top SQL statements and passes this onto the SQL Tuning Advisor which provides recommendation for improving performance. These recommendations can be implemented transparently to the application making it a useful feature for 3rd-party applications.

Other major enhancements in this area include:- enhancing Enterprise Manager to be able to manage the whole grid and the complete stack of resources and simplifying installation and configuration by reducing the number of initialization parameters - for example there are now just two memory size parameters, one each for the SGA and the PGA.

⬇ Availability

Real Application Clusters have been enhanced to provide Automatic Service Provisioning - servers are automatically allocated to work loads and clients are automatically assigned to the server with the least load. Also on failure of a server, the surviving servers are automatically re-allocated to work loads.

Other enhancements in this area include:

- flashback available at the row, transaction, table or database level;
- recovery area on disk that is maintained automatically by the database and contains only those blocks changed since the last backup - thereby enabling faster recovery from media failure;

- data guard (standby database) has been enhanced to enable compression and encryption of log traffic from the master database to the standby system;
- tables can now be re-defined without invalidating stored procedures;
- support for rolling upgrades of the hardware, operating system and the database to reduce planned down time.

Data Warehousing

Improvements in this area include increasing the size limits of the database to support ultra-large databases totaling millions of terabytes (hexabytes) with ultra-large files of terabytes in size. The 4GB restriction on LOBs has been raised to 128 terabytes.

Improvements to Real Application Clusters (RAC) enable resources to be allocated automatically and mean that operational data can be used immediately without the need to copy it to another database.

Enhancements to OLAP analytics, a data-mining GUI and a new SQL model allow query results to be treated as sets of multi-dimensional arrays on which complex inter-dependent operations - such as forecasting - can be run without the need to extract data to spreadsheets or perform complex joins and unions on the data.

A new changed data capture facility based on Oracle Streams provides low or zero latency trickle feeds that combined with integrated extraction, transformation and loading (etl) enable real-time warehousing.

Summary

As they did with Oracle 9i, Oracle have made many enhancements to support their largest customers in terms of database size limits and they have continued to remove complexity from the database to make the database easier to manage and thereby reduce the total cost of ownership (TCO), thereby keeping everyone happy and enhancing the competitiveness of Oracle compared to Microsoft, in particular, and IBM. With spending on technology beginning to increase slightly when compared to the past few years, more companies will start to consider upgrading to Oracle 10g, but there may not be many companies using the grid technology if the licensing proves to be complex. For that we'll have to wait and see.

Overview - Oracle 9i

Oracle9i is the version of the Oracle RDBMS. It comes in the form of releases one and two. In this (9i) release, Oracle has introduced new features and functionality throughout the database engine, and has also enhanced the functionality of many supporting products such as RMAN and OEM. This section will provide an initial introduction to these new features so you will be aware of them so you can take advantage of them when opportunity permits. While this is a quick introduction to these features a more detailed treatment of Oracle9i's new features is available in Oracle Press's Oracle9i New Features

Features - Oracle 9i

SVRMGRL and Connect Internal Desupport

Oracle has told it was coming, and now it's here. The Server Manager utility (svrmgrl) is no longer available in 9i. Now, database administration is done via SQL*Plus or OEM. Also, connect internal is no longer available in Oracle9i. To perform administrative activities on the database (like shutdown or startup) you need to login using an account that is assigned SYSDBA privileges, using the as SYSDBA login syntax. Here is an example of logging into the SYS account as SYSDBA using SQL*Plus:

sqlplus "sys/password as sysdba"

Other variations on the login syntax exist depending on if you are connecting locally or to a remote server/database. Oracle9i now comes with a new privilege called the grant any object privilege, that facilitates this ability. Of course, be careful granting this privilege to other accounts, as it is very powerful.

Security Enhancements Associated with the Database Creation Assistant and the SYS account

After the creation of a database with the Database Creation Assistant (DBCA) you will be prompted to enter new sys and system passwords of the database being created. Also, most user/schemas that are created by the DBCA, with the exception of SYS and SYSTEM, will be locked. Also note that SYS can now grant privileges on any object in the database. No longer do you have to grant privileges to sys to allow it to manage the grants on your objects.

🞢 Server Parameter Files (SPFILE)

Oracle9i offers to manage your database initialization file for you automatically in the form of a Server Parameter File (SPFILE). Rather than have to edit the database initialization file when you want to make a change, you simply issue an alter system command, to change the value in the SPFILE. When changing dynamic parameters you can opt to either dynamically change value for the current instance, but leave the SPFILE alone, or you can change it in the SPFILE and not impact the instance, or you can change both the instance and the SPFILE. If the parameter were a static parameter, then you would only change the SPFILE. Here is an example of changing a parameter in the SPFILE.

 Alter system set sort_area_size=100m scope=both;

 You can reset a parameter to it's default value using the alter system reset command. Additionally, you can open and read a SPFILE, as most of the settings are visible in it. The SPFILE should not be manually altered via any kind of text editor however, because Oracle includes information in the header and footer of the SPFILE to insure the integrity of the SPFILE.

You can convert an SPFILE to a text parameter file with the create pfile from spfile command. Conversely you can convert a text parameter file to a SPFILE with the create spfile from pfile command. If you are running RAC, Oracle9i allows your different instances to share the same initialization parameter file (SPFILE or text). You can define global parameters for all databases, or specific parameters for a specific database within the same parameter file.

🞢 Automated Undo Management

Rollback segment administration has been simplified in Oracle9i with the introduction of Automated Undo Management. With this feature, the allocation and management of rollback segments becomes Oracle's responsibility. This feature is fairly easy to use. You simply:

- Create an UNDO tablespace with the create undo tablespace command or even at database creation time. Note that you can create multiple UNDO tablespaces but only one can be in use at a time.
- Modify the database initialization parameters particular to automated UNDO. These parameters include undo_management, undo_tablespace and optionally undo_suppress_errors.
- Restart the database.

When using automated undo management, Oracle will size and create the rollback segments automatically. Generally it will create 10 undo segments, and add additional undo segments, as the system load requires.

Resumable Space Management

How many times have you started a bulk SQL*Loader process or were importing data into a table in your database and had the load fail because you ran out of space? Failure of loads because of lack of available space can be a huge problem. Typically you have a limited window in which to perform the load. Often space related failures occur in the middle or towards the end of the load, which is a big problem because you don't have enough time to restart the load. Oracle9i comes to the rescue with resumable space management.

With resumable space management certain space related errors cause the session encountering the error to suspend for a specified amount of time, allowing the DBA to correct the problem. Resumable space management can be used to suspend the session in the following circumstances:

- Running out of tablespace space.
- You have reached a max extent condition in the table or an associated index.
- You have exceeded a tablespace quota.

Most Oracle DML statements can use resumable space management features, though there are some restrictions with regards to objects in dictionary-managed tablespaces. Even parallel processing can take advantage of this feature. Also the Oracle Import utility and SQL*Loader utilities have new parameters that allow you to take advantage of this new feature.

To use resumable space management must you enable it on a session-by-session basis using the alter session enable resumable command. By default if the space condition is not corrected after 2 hours, then the transaction will fail. You can configure a larger or smaller value if your needs require. Once enabled, Oracle will automatically detect the space condition and suspend the session. Oracle will write an entry to the alert log that the session has been suspended. Additionally the DBA_RESUMABLE view maintains a record of all currently suspended sessions. Once the DBA has corrected the space problem the suspended session will automatically resume its operation at the point of suspension.

Oracle also provides an after suspend system trigger event, that allows you to automate your response to a session suspend condition. Further the dbms_resumable package is provided to allow for management of resumable space management from within SQL or PL/SQL.

Default Temporary Tablespaces

In previous versions of Oracle users were assigned SYSTEM as the default temporary tablespace. This could lead to problems if the DBA was not careful to assign the user to the correct temporary tablespace when creating the account. Oracle9i solves this problem with the introduction of the default temporary tablespace. When a default temporary tablespace is defined, Oracle will assign that tablespace to each new user account as it's created. Of course, if you define a temporary tablespace for that user account, then that setting will override the default setting.

You define an Oracle default tablespace by using the alter database default temporary tablespace command. You can also define the default temporary tablespace for the database within the confines of the create database command. If you want to change the currently defined default temporary tablespace, simply use the alter database default temporary tablespace command. All users assigned to the old default temporary tablespace will now be assigned to the newly defined default temporary tablespace. Users assigned to other temporary tablespaces will remain unchanged.

Oracle Managed Files

Oracle Managed Files (OMF) is a new feature from Oracle that allows the database to manage just about all facets of Oracle database file administration. With OMF configured properly, you don't need to define the names or locations of Oracle files, the size of the file and you don't need to worry about removing the datafile after you have created it. All the DBA need do is configuring a few parameters and Oracle will do the rest. OMF will manage creation of your database redo logs, control files and database datafiles for you automatically. If you drop a tablespace made up of OMF datafiles, Oracle will remove those datafiles from the file system.

Dynamic Memory Management

There are times when you want or need to modify the memory allocation of your Oracle database SGA. You might want to add memory to the database default buffer cache, or maybe the shared pool, you might even want to remove memory from one of these structures. Until Oracle9i the database had to be shutdown before you could make any modifications to memory allocations. Oracle9i offers the ability to dynamically alter many memory configurations via the alter system command. Note that there are still some memory areas that are not dynamic. This includes the java_pool. Also, if you continue to use the db_block_buffers, buffer_pool_keep and buffer_pool_recycle parameters you will not be able to dynamically alter these memory areas either.

An additional parameter called sga_max_size is used to define the maximum amount of memory that can be allocated to the SGA. This parameter defaults to the total amount of memory allocated to the SGA when the database is first started. You can override this default by setting the sga_max_size parameter, but this will require you to shutdown and restart the database instance. Finally, be aware that if you set the sga_max_size parameter on most platforms the result will be that Oracle will acquire memory equivalent to sga_max_size from the operating system at database startup. Thus, even though your total SGA may only have 300MB allocated, if sga_max_size is set to 500MB, then 500MB will be acquired by Oracle from free memory. Thus, be cautious setting sga_max_size so that you don't take memory away from user sessions, applications and that you don't cause swapping to occur.

There are some more features of Oracle 9i as follows:

- **Multiple Database Block Size Support**

- **Cursor Sharing in Oracle9i**

- **Self Tuning PGA**

- **Online Table Redefinition**

- **Miscellaneous Administrative Features**

- **New Partitioning Options and Features**

- **Extraction of Object Metadata**

- **Automatic Segment Space Management**

- **Skip Scanning of Indexes**

- **Bitmap Join Indexes**

- **Mapping tables and Bitmap Indexes on Index-Organized Tables**

- **External Tables**

- **View Constraints**

- **Multi-Table Insert Statements**

- **Associative Arrays**

- **Oracle CASE Statements and Expressions**

- **Oracle Merge Statements**

- **Support for ANSI/ISO SQL 1999 Compliance**

- **Looking at Cached Execution Plans**

- **Generate an Explain Plan Using DBMS_XPLAN**

- **Column Defaults**

- **New Date and Time Datatypes, Functions and functionality**

- **Better Support for LOB's**

- **PL/SQL Native Compilation**

- **Fine Grained Auditing**

- **Fast Start Time-Based Recovery**

- **Flashback Query**

- **RMAN New Features**

- **Log Miner New Features**

- **Oracle9i Data Guard**

<u>User Departments</u>

Departments using Oracle 10g:

1. Directorate of Accounts & Treasury

2. Chief Electrical Inspector

3. CMO (Department of Science and Technology)

4. IWDMS – Integrated Workflow and Documentation Management System (DST)

5. VAT (Commissionerate of Sales Tax)

Departments using Oracle 9i:

1. General Administration Department

2. Legal Department

eGovernance News

Gujarat at Conflux, 2005

Conflux 2005 was a three day conference and exhibition organized by Centre for Science Development and Media Studies (CSDMS) in collaboration with Government of National Capital Territory of Delhi. The objective of the event was to showcase e-Government developments in India and the Asia Pacific and learn from the successful practices in the region. The conference program served as a platform to bring experts from the various countries, key government representatives, industry and academia together to discuss the issues and priorities on the subject. The participants were able to demonstrate their initiatives, take feedback from the community and learn about the processes, technologies and solutions which can address their concerns. The three key stakeholders in e-Government program implementation-the government, private and the NGO sector shared their successes, failures and opportunities during the conference.

Conflux 2005 was designed to help attendees address these challenges and provides practical, actionable knowledge through sharing of better learning practices, presentation on e-Government case studies from various Indian states and also from other Asian countries.

On Day II (October 18, 2005), there were two presentations done by Gujarat as follows:

1) Shri J.N.Singh, Secretary (Department of Science & Technology), Govt. Of Gujarat made a presentation on State e- Governance Plans (under NeGP) in the presence and interacting with the following persons.

State e-Governance Plans

- **(Chair) J. Satyanarayana**, CEO, National Institute of Smart Government, Hyderabad
- **(Co-Chair) S P S Grover**, Senior Director, Oracle
- **J. N. Singh** , Secretary-DST, Gujarat
- **S N Tripathy**, Secretary-IT, Orissa
- **Dr. V Prithvi Ra**j, Director-IT, Govt. of Pondicherry
- **Narsing Rao**,, Secretary-IT & C Govt. of AP
- **Ram Sewak Sharma,** Secretary-IT, Govt. of Jharkhand
- **G Sethuraman,** IBM Consulting Services

2) Neeta Shah, Director (e-Governance), Gujarat Informatics Limited, made presentation on Village Information System (VIS) Project, which is part of the ICTD Initiative of UNDP/ NISG in the presence and interacting with following persons:

UNDP-ICTD Projects

- **(Chair) Pradeep Sharma**, UNDP, India

- **(Co-Chair) J. Satyanarayana**, CEO, NISG, Hyderabad

- **Neeta Shah,** Director (e-Governance), Gujarat

- **Ranjit Kr Maiti**, Joint Secretary, Panchayat and Rural Development Department, Govt. of West Bengal

- **Reshma Anand**, Tarahaat, Development Alternatives

- **Manoj Solanki**, Kutch Nav Nirman Abhiyan

- **P Ram Gopal**, Byrraju Foundation

The Web-Enabled Government Program Advisory Board of eminent e-Government experts and senior central government officers guides and supports the development of the Conflux 2005 conference program to ensure a relevant, first quality program that meets the capacity building needs of public sector participants. The Program Advisory Board members fulfilled this role by participating in periodic meetings, making recommendations about the program theme, session topics and speakers, and identifying organizations that would benefit from conference participation. The event program was designed to help public sector managers' plan, implement and monitor e-Government projects.

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Conflux 2005

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