Database Administration at CMS

DATABASE ADMINISTRATOR ROLES AND RESPONSIBILITIES

GENERAL ORGANIZATIONAL RESPONSIBILITIES

This section will explain the roles and responsibilities of the Database Administrator (DBA). There are two levels of DBA's and they will be referenced in this section: Central DBA and Local DBA. Central Level Central DBA will refer to CMS staff in the Division of Data Services (DDMSS), which is in the Enterprise Database Group (EDG). DDMSS will be totally responsible for all administrative functions as defined in this document. The Central staff's responsibilities encompass all platforms. The Central DBA will have final approval for all database objects running on all database servers. Each Central DBA will have a backup to assure coverage and continuity of task assignments. As will be discussed in detail, the Central DBA will be responsible for administration of all activities in the production environment as it pertains to databases on each database server. These activities include:

- Develop and enforce CMS database standards, guidelines and operational policies and procedures
- Review physical structures
- Review performance, maintenance and utilities associated with each structure (i.e., REORGS, LOAD, UNLOADS)
- Review necessary storage media (DASD and Tape)
- Review SQL performance and Tuning
- Reviewing application's access to the database structures
- Review backup & recovery strategies
- Review, where required, the purge/archive criteria
- Monitoring database/subsystem performance issues
- Review Migration Plans

In addition to the above listed activities, the following activities apply to Oracle databases in development and production environments:

- Assist in developing purge/archive criteria and procedures for historical application data
- Monitor and tune memory usage for Oracle databases
- Implement, maintain, and test backup & recovery strategies
- Create instances and databases with appropriate initialization parameters and database structures (i.e., datafiles, rollback segments, tablespaces, etc.)
- Manage physical database resources
- Implement and review appropriate security guidelines/mechanisms
- Grant authority to Local DBAs as necessary (see Oracle Standards for further clarification on levels of database authority)
- Insure appropriate users/authority are in place
- Review and monitor system and instance resources to insure continuous database operations (i.e., database storage, memory, CPU, network usage, and I/O contention)
- Perform database software maintenance:
- Assist in installation and specify initial installation options
- Develop and test database migration procedures
- Perform database migrations
- Evaluate and test new features/functionality

- Upgrade/migrate databases to current release levels
- Document migration procedures and test results
- Perform database maintenance functions
- Move, rebuild, or change database objects as required in production
- Start and stop database instances and listener
- Develop database administration tools/utilities/operation procedures

The Central DBA will provide guidance to the Local DBA in developing and implementing each of the above activities. The necessary database authorities required to complete these activities would be granted to the Local DBA.

Local Level

The Local DBA will refer to the day-to-day operational support person responsible for activities necessary to implement and maintain the database for a project. The Project Manager, components or divisions will name a team member as the Local DBA. Alternatively, components may contract outside vendors to serve in the role of the Local DBA. If so, contractors are subject to the same requirements placed on CMS personnel serving in the same roles.

The Local DBA will ensure that the Central DBA is informed of new developments within the application. It is extremely important that the individual chosen as Local DBA be well versed in database administration, particularly, for the database platform chosen. The Project Manager will ensure that the Local DBA is highly skilled in Database Administration to perform the role assigned.

RESPONSIBILITIES

Designing & creating relational database objects such as tables, views & indexes; Supporting and maintaining the environment a relational database requires to properly function (i.e., security, recovery, backup & reorganizations) ; Ensuring that relational database access code performs efficiently (i.e., SQL review, database monitoring).

ACTIVITIES

Central DBA

- Developing & maintaining naming standards for database objects such as tablespaces, tables, indexes & views
- Participating in database migration reviews
- Assisting in product installation & reviewing initial installation options; for Oracle, the Central DBA will assist in product installation and specify initial installation options
- Providing functional guidance to the systems programmer & the operator. For Oracle, the Central DBA will provide this functional guidance to the Unix System Administrator.
- Evaluating & testing DBMS related software
- Develop operational procedures
- Supporting, monitoring & tuning the database subsystems & instances; for Oracle this includes starting and stopping the instances, listeners, and intelligent agents
- Participate in selecting database management support tools
- Developing & implementing database administration policies & procedures including subsystem or instance security guidelines

Local DBA

- Providing assistance in the development of the conceptual & logical database design
- Participating in database migration reviews
- Defining & creating the database objects; for Oracle, this is limited to users objects (i.e., tables, views, indexes, etc.)
- Assisting application developers in functional prototyping
- Carrying out application performance tuning and testing
- Developing all necessary/ required database utilities
- Recommending/ developing backup/recovery procedures for application tables/indexes
- Supporting application programmers in the testing of database applications
- Providing technical assistance to other team members
- Providing input to the CMS/Project capacity planning function
- Provide ongoing database support/review in the CMS production environment

PROCEDURES

- This section provides a comprehensive list of procedures/processes during a relational database project at CMS, which should be performed.
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- Project Manager will choose a Local DBA
- A database development form will be completed and submitted to DDS
- DDS will assign a Central DBA
- The Local DBA will work with the Central DBA and Data Administrators to design an efficient and effective relational database structure, with the information supplied by the DAs and capacity numbers.
- Determine which DBMS is most appropriate for the application based on established criteria; determine the database platform based on access, transactions, number of users, etc. The Central DBA with input from the Local DBA is responsible for this determination
- Assure that media disk space has been secured. This is the responsibility of the Central DBA in coordination with the Local DBA and CMS Media Manager. Allow sufficient lead-time for procuring the media necessary for production data Volumes. Contact of both the CMS Media Manager and the Local DBA by the Central DBA early in the planning stages, should determine the amount of lead-Time to allow in the project plan. Request for new media will include the source of funds for the purchase.
- The Central DBA will be responsible for the management of database files on disk.
- The local DBA, with Central DBA advice, will develop the best physical database design to formulate table/indexes definitions through the use of available processes and tools.
- The Local DBA will generate the Data Definition Language (DDL) to create the objects necessary to implement in the relational DBMS using the Data Dictionary. The Data Dictionary will be the source of record for the DDL.
- Ensure Referential Integrity (RI) where applicable. The RI will usually reflect data integrity rules of the data structures inherent to the design. Apply RI rules before data is loaded to ensure the rules are tested during test loads. The Local DBA will be directly involved with the formulation and testing of the RI rules.
- Develop database objects in adherence to Central naming conventions. The Local DBA will be responsible for the naming of database objects according to published database naming conventions. For Oracle databases, the Central DBA

will develop the following database objects according to published database naming conventions: tablespaces, datafiles, rollback segments, archive logs, database names, redo logs, and instance names. All other object names will be the responsibility of the Local DBA, Local DA, and Central DA.

- A database walkthrough will occur at a minimal three times in the life cycle of the project. The intent of the walkthrough is to ensure that database standards are met, performance is maintained and data redundancy is controlled. It is the responsibility of the Project Team to coordinate and schedule all required database walkthroughs in accordance with the published Database Migration Procedures.
- It is the Local DBA responsibility to ensure the Central DBA is notified of any development activities with production implications.
- The Local DBA will work with the Central DBA to determine user access to table, plans, and any other database objects used in the project in accordance with the security guidelines.
- The Local DBA will assist the Application Developers in developing efficient SQL code to access and manipulate database objects as projected in functional requirements.
- For DB2 databases, the Local DBA is responsible for the development of a comprehensive backup and recovery plan to assure total database recovery due to system outages or application program faults. Also the Local DBA will ensure the development of all necessary documentation as a reference for CMS systems operations personnel on these procedures. For Oracle databases, it is the Central DBA's responsibility.
- The Local DBA will notify and coordinate with Central DBA, APCSS, ENDEVOR, Networking, Security and Capacity Planning all migration plans and dates for database and tables database movement to a production mode. Notification of APCSS and ENDEVOR does not apply to Oracle databases.
- The Local DBA will notify the Central DBA and network personnel of migration dates, traffic numbers, type of network loads and peak times associated with tables and databases being moved to a production mode
- The production database objects must have scheduled backup/recovery jobs tested, documented and turned over to operations. Hands-on training provided by the Local DBA. For Oracle databases, the Central DBA will develop, test and schedule production backups. The Central DBA will ensure that recovery strategies for production and development are fully tested.
- The Central DBA, Local DBA and Telecommunications Group will ensure that database communications are configured and tested to accommodate access to all relational databases from source to target.
- The Local DBA will be accountable for databases under their domain and coordinate any activities with the Central DBA.
- Jobs that gather statistics will be developed and scheduled by the Local DBA, under direction of the Central DBA. For Oracle databases, the Central DBA will develop and schedule jobs gathering statistics.
- The Local DBA will determine recovery issues associated with new DBMS releases. For Oracle databases, the Central DBA is responsible for this function.
- The Local DBA will be responsible for creating and coordinating the migration task list for the Validation and Production environments. The Central DBA will be responsible for the review and approval of all migration activities.
- The Local DBA will always be the primary contact for the Production database and any problems/issues, which may arise.