

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT'S OF HUMAN SERVICES, INSURANCE, AND AGING

INFORMATION TECHNOLOGY STANDARD

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| Name Of Standard: DMS 2200 Physical Implementation | Number: STD-DMS002 |
| Domain: Data | Category: DMS 2200 Physical Implementation |
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| Date Revised: 08/03/2016 | Clifton Van Scyoc, Dir of Division of Technical Engineering |

Abstract:

Within the Database Management Section, the Database Integrity Unit is responsible for database security at the database level on the UNISYS 2200 mainframe by registering TIP transactions, batch and adhoc jobs for DMS 2200, utilizing native RDMS 2200 security, and database backups and recovery.

The Database Design Unit is responsible for reviewing and ensuring that all database requests adhere to the Department of Human Services(DHS)/Bureau of Information Systems'(BIS) standards for physical database design, load and operational schema/subschema creation, and production implementation.

General:

This document contains DHS/BIS standards for the physical implementation of a hierarchical database management system (DMS 2200) and relational database management system (RDMS) on a UNISYS 2200 mainframe.

Standard:

Access Control DBP Standards for DMS 2200

NOTE: While the security at the database level for DMS 2200 and RDMS 2200 is internally handled in different manners, all standards, procedures, and practices listed below for DMS220 Batch, TIP, and Adhoc apply to RDMS 2200 programs as well.

In order to control the DMS 2200 (Database Management System) run unit (Batch or TIP) for the Production environment, Access Control Database Procedures (DBP) have been developed and standards for DMS 2200 BATCH, TIP and ADHOC run have been established. All the DBP standards have to be followed; otherwise the run unit will be roll backed with error code 571500 (for IMPART) or 570900 (for OPEN).

Applicable Divisions within the Bureau of Information Systems (BIS)

1. Division of Enterprise Applications (DEA)
2. Division of Infrastructure Management and Operations (DIMO)
3. Division of Technology Engineering (DTE)

Business Partners contracted for mainframe centric Application development and support must also adhere to these standards.

The Program Implementation Form must be completed and submitted to the Quality Assurance Unit.

DBP STANDARDS FOR DMS 2200 TIP TRANSACTIONS

Every DMS 2200 Production TIP Transaction must be registered within the DBP Control TIP Table.

All DMS 2200 TIP Transactions are only allowed to run during prime time, i.e., from 6:00 a.m. to 6:00 p.m. Monday through Friday, unless specifically stated on the Program Implementation Form.

The following groups have their own forms for registering DMS 2200 TIP programs. Please check with the Office of Income Maintenance/BPS/Division of Automation Planning and Support and BIS/DTE/Systems Engineering Section, Mainframe and Performance Monitoring Unit for the appropriate form.

DBP Standards for DMS 2200 Batch Run

- Every DMS 2200 Production Batch Run has to be registered with DBP Control Batch Table with valid production **RUNID**, Account **Number**, and Subschema **Name** and mode of access (update or retrieval). To view the registration procedures see Procedures to Register DMS Production Jobs with DBP Control Batch and TIP Tables below.
- No DMS 2200 Batch Jobs are allowed to do update during prime time, i.e., from 7:00 a.m. to 6:00 p.m.
- All DMS 2200 production programs must be scheduled by the Infrastructure Operations Section, Customer Services Unit.
- **Runid**, Start key and account code must be included within each DMS related Traveler, along with all applicable operation documentation sent to the Scheduling unit.

DBP Standards for DMS 2200 Ad Hoc Run

- Any DMS 2200 Non-regular Production Batch Run has to be registered with DBP Control ADHOC Table by calling Database Management Section at 772-7136 and Infrastructure Operations Section **for clearance**.

In addition to the three standards under the Batch Run, there is a maximum number (7) of program executions set up for ADHOC Run.

Access Control DBP Standards – Registration Procedures

To establish a guideline to register DMS 2200 BATCH, TIP and ADHOC Run with DBP control tables.

Applicable Individuals

1. Application Developers, **both Commonwealth and Business Partner staff**, for the Unisys 2200 Mainframe
2. Division of Infrastructure Management and Operations, Batch Services and Support Section
3. Division of Technology Engineering, All Sections

Procedures to Register DMS 2200 Production Jobs with DBP Control Batch and TIP Tables

Contact the Application Testing Unit, Application Testing Section, Division of Enterprise Applications for procedures to place into Production.

Application Developer Checklist

Application Developers must check their programs to ensure conformity to the following items prior to submitting a program for the review process for production:

1. DMS 2200 Programming Standards
2. Documentation Standards (Open System ACD/Batch Operations Services Request)
3. Clean COBOL Compile (Exceptions Exist)
4. Correct Mapping
5. Technical Bulletin Procedures
6. Reasonable Programming Techniques
7. Removal of Testing/Debugging Methods

Procedures to Register DMS 2200 Adhoc Jobs with DBP Control Tables

- Complete a [Request for Database Access](#) form.
- Instructions for this document which describes the various fields contained in this form are located at [Instructions for Completing a Database Request](#).
- Direct any questions, problems, or aid pertaining to completing the form to the Database Integrity Unit.
- Batch updates are not permitted during prime time (7:00 a.m. to 6:00 p.m.) unless is approved by Director of Division of Infrastructure Management and Operations and the Director of Division of Enterprise Applications.
- If ADHOC program is going to be executed after prime time, scheduled it by "Special Production Rid" instead of "TESTER".
- **NOTE: Adhoc runids are approved for the stated project when submitted and are not permitted to be utilized for other projects or initiatives.**

Procedures to Register DMS 2200 Individual RUNIDS Jobs with DBP Control Tables

- Individual runids associated with an Application Developer can be created to allow for problem investigation and resolution. These runids are assigned to the Application Developer making the request and are not to be share with any others. Violation of this will result in individual accounts being deleted from the MASMDBP batch tables and notification sent to the BIS Chief Security Officer.
- Complete a [Request for Database Access](#) form.
- Instructions for this document which describes the various fields contained in this form are located at [Instructions for Completing a Database Request](#). Direct any questions, problems, or aid pertaining to completing the form to the Database Integrity Unit.
- Batch updates are not permitted during prime time (7:00 a.m. to 6:00 p.m.) unless is approved by Director of Division of Infrastructure Management and Operations and the Director of Division of Enterprise Applications.
- If ADHOC program is going to be executed after prime time, scheduled it by "Special Production Rid" instead of "TESTER".

Emergency Procedures

If DMS 2200 production job encounters any problems related to DBP, such as receiving error code 571500 (for IMPART) or 570900 (for OPEN), contact Stacey Borger at (717) 772-7287 or Jim Shelton at (717) 772-7150.

COMMON MASMDBP ERROR MESSAGES

- **DBP*XXXXXX RUN NOT REGISTERED WITH CONTROL
- **DBP* XXXXXX RUN NOT IN TABLE
- **DBP*XXXXXX ILLEGAL TIME FOR BATCH PROGRAM
- **DBP*XXXXXX RUNNING UNDER WRONG ACCOUNT NUMBER
- **DBP*XXXXXX TRYING TO ACCESS WRONG SUBSCHEMA
- **DBP*XXXXXX YOU ARE OUT OF SCHEDULED TRYS
- **DBP*XXXXXX EXCLUSIVE USE IS NOT TO BE PERMITTED
- **DBP*XXXXXX - ILLEGAL TIME TO RUN

SCHEMA/SUBSCHEMA Creation

DDL and SDDL will be used to create the schema or subschema.

Data Definition Language (DDL)

All schema code will use DDL to define the database, as it exists on mass storage. Refer to the OS 2200 DMS 2200 DDL Administration, Operations and Programming Guide for information regarding using DDL.

Subschema Data Definition Language (SDDL)

All subschema code will use SDDL to define those portions of the database that are available to an application program. Refer to the OS 2200 DMS 2200 SDDL Administration, Operations and Programming Guide for information regarding using SDDL.

Compilation of Schema/Subschema

All schema and subschema compilations will use the standard compile run streams as stated by DBA. Absolute compilations will be placed in files consisting of an environment qualifier, followed by an asterisk (*) and a filename. (Ex. DEVDMS*S17ICPDDL, would be the absolute compile file for the Development S17ICP schema for DDL compiles).

DMS Naming Conventions

Schema Name

The DMS 2200 Schema Name - must be (10) characters. Alpha-numeric codes adhering to the following DMS format:

DMS SCHEMA FORMAT = SNNAAEFFFF

Where: S = designates a hierarchical schema and is a fixed character.

NN = is a sequential number (02-56) value assigned to uniquely identify the database.

AAA = A three alpha character abbreviation for the applications system supported by this database. Examples are: S02CIS for Client Information System, S02PRV for Provider, S03PCH for Paid Claims History, etc.

EEE = Designates the environment in which the schema was tailored to operate. PRD = Production, DEV = Development, TRN = Training, SAT = Systems Acceptance, INT = Integration, DBI = Database Integrity Research and Development

E = Designates the function which the schema was tailored to perform. Where 0 = Operational, L = Load, U = Unload.

Thus S20CISPRDL would be a load schema for the CIS production database and S24LIHDEVO would be an operational schema for LIH in Development environment.

Subschema Name

Must be (12) characters. Alpha-numeric codes adhering to the following criteria format: "All Subschemas No Exceptions."

1. The first 10 characters must match the exact characters as the Schema name to which this Subschema is to apply.
2. The last 2 positions of the 12 characters will be numeric values (01-99) depending upon how many variations of the schema/subschemas are needed. The database administrator's special DMU (Data Management Utility) Subschema will end in MU as the last two characters. (Examples: S20MRGPRDM70 = Subschema number 70 which is part of Production schema S20MRGPRDM; S03PCHDEVO01 = subschema number 01 which is part of Development schema S03PCHDEVO.)

Area Name

The area name is a maximum of 12 characters and must follow the criteria listed below:

1. The first five characters are AXXX - with:
 - a. A = meaning Area, and always required.
 - b. XXX = is a numeric value 076 thru 999, and must be the DMS 2200 Schema's area code value which is unique across all data bases. A list of available area numbers can be found on Host IKE-C in file DPWDMS*AREA-FILE.
 - c. - = dash (-) which separates the descriptive characters to follow.
2. The last seven characters are used to further define the name of the area within the Schema.

Example: A121-RLNODIR, which is area A121, the recipient line number directory within the CIS database.

Page Size

Based on the number of records desired per page, area utilization and the processing environment (transaction or batch, update or retrieval), all page sizing exercises for physical Database designs will be conducted with DB pages of 448, 896, 1,792, 2688, and 3584 words. It is important to keep page sizes as standard as possible to avoid fragmenting the page buffer and therefore degrading DMS 2200 processing in general.

Sizing: The size of page/records storage space for DMS 2200 overhead is computed using the form in section 6.1 "Determining Record Size" in the DMS 2200 Schema Data Definition Language manual.

Number of Pages per Area

The number of pages assigned to a production area is determined by computing the total volume (storage requirements) of the records to be stored within the area and how the records 'fit' on the page size allocated. This computation is based upon the average set size for the associated owners and member records to be stored in the area. Also any extension of storage logic such as multiple area assignments or the strategic use of overflow will be included in these calculations. All non-production environments will contain page allocations based upon a percentage of the production allocation that is based on the application and environment.

Record Name

The record name can be up to a maximum of 30 characters and must follow the criteria listed below:

1. The first five characters are RXXX- with:
 - a. R = meaning Record, and always required.
 - b. XXX = is a numeric value 001 thru 999, and must be the DMS 2200 Schema's record code value which is unique across all data bases. "No two records in a DB structure can use the same code value." For a list of available record numbers, consult file DPWDMS*REC-FILE on Host IKE-C.
2. The last 25 characters are used to further define the name of the record within the Schema.

Example: R15-RCPT-BASIC-DATA-RECORD, which is record number 15, containing recipient basic data.

Record Placement

Determining in which area(s) a record type will be a candidate for storage. This determination is primarily an assessment of record relationships and area grouping strategies. Record placement strategies that require physical pointers to span areas are discouraged due to data recovery considerations.

Determining Location Mode

This determination is a review of the DMR options for placement of a record on the database.

- Direct
- Index Sequential
- Calc
- Via Set

Set Name

The set name is up to a maximum of 30 characters and must follow the criteria listed below:

1. The first five characters are SXXX- with:
 - a. S = meaning Set, and always required.
 - b. XXX = is a numeric value 001 thru 999, and must be the DMS 2200 Schema's set code value which is unique across all data bases. "No two sets in a DB structure can use the same code value. For a list of available set numbers, consult file DPWDMS*SET-FILE on Host IKE-C.
2. The last 25 characters are used to further define the name of the set within the Schema.

Example: S535-CM-CASE-BDGT which is set number 535, for the cash medical budget data to the cash medical case budget set within the CIS database.

Set Linkage

It is a determination of the types and the direction of the physical links that will exist within each set occurrence based on the processing requirements defined for the data contained in the set.

Set Order

This is a determination of the proper order of the pointers of a set to support the most efficient storage and retrieval of records for the processing requirements defined for the data contained in the set.

Physical Files

Physical File Name

A physical file name will consist of a 6-character file qualifier followed by an asterisk (*) and up to a 12-character file name. The following are valid qualifiers that designate what environment each physical file will reside: DEVDMS INTDMS SATDMS DPWDMS TRNDMS

- DEVDMS = Development
- INTDMS = Integration
- SATDMS = Systems Acceptance Testing
- DPWDMS = Production
- TRNDMS = Training

Examples of physical file names are TRNDMS*A580-RCPT-15 (DMS area 580-RCPT-15 within Training environment) and DPWDMS*A562-RCPTSSN (DMS area RCPTSSN within Production environment).

Cataloging a Physical File by Environment

All physical files will be cataloged according to the environment in which they will exist. (See above list for valid file qualifiers). When a physical file size for Production is determined, the Database Design group will communicate with the original requestor, who in turn would forward physical file requirements to Infrastructure Operations Section in order to request mass storage. When mass storage is available, the DB Integrity Section will physically catalog the file on ADC-A. Assignments to be made with MIN and MAX track assignments the same.

Backup and Recovery

Contingency planning for recovery from hardware/software failures is a responsibility of the Database Integrity Unit within the Database Management Section. Coordination of procedures will take place with Division of Enterprise Applications.

Schemas and Production Implementation

Write General Testing Schema

Once the Database Design Unit has defined all database, area, record, set parameters in the development steps, the task of writing the DDL and SDDL to create/alter the Schema and Subschema code must be completed.

All Schema's must be coded as a production operational Schema. Only one copy of the schema source code is maintained. To produce a database Schema other than production, the production DDL will be processed to change the source syntax.

Changes to the Schema Definition can be:

1. Schema name changes
2. Area name and code changes
3. Recovery Look changes
4. Area page volume allocation changes
5. Schema definition/access definition changes such as duplicate allowed or not allowed, changes to set order, etc.
6. Only the original production elements Schema and Subschema are maintained within the Database Management Section since all secondary databases are built from the original element section.

Design Load Schema

There are three limitations on the initial database loads:

1. Pages must be pre-initialized using the DMU.
2. After-Looks must not be specific for any area.
3. Quick-Before-Looks must not be specified for any area without explicit approval of the DBA.

In developing a load strategy, several factors must be considered and a load Schema must be developed.

The load Schema must reflect the same physical structure reflected by the Production Schema.

Allow optimization of high volume load processing by eliminating some features from the load schema which can be more efficiently performed by the load program. Duplicate checking and elimination of set orders other than NEXT or LAST are examples of LOAD strategies that relieve the DMR (Database Management Routine) of potentially high overhead situations during load processing.

A functional description of the load program(s) must be written to describe how to:

1. Edit and validate input data.
2. Assure that each owner within a set occurrence is loaded before any of the member record occurrence.
3. Properly group occurrences of any record type whose location mode is VLA SET.
4. Minimize DMR overhead for sorting during the final load program.

For a detailed discussion on load strategies, refer to "Database Loading Techniques" Appendix 3.1 of DMS System Design, Development and Implementation Procedures.

Preparatory programs (Purification/Conversion) must validate and edit data (including checking for duplicates) and order the input data so that the load programs perform only load functions.

Implementation for Production Database

During the final phase of system development there is a critical need to insure all individual users and operational support personnel are informed and aware of the planned implementation.

Advanced documented implementation plan will be prepared and distributed to all areas well in advance. Explanation of their involvement, requirements, and supportive responsibilities will be outlined. An implementation meeting must be held where questions and problems can be addressed and resolved.

System Development/User Interface Standards for Data

Database Conversion and Load Strategy

The database conversion and load strategy will be a joint effort with specific responsibilities established concerning it. The application data or converted load data will be purified and sequenced by the application developer when given to the database analyst.

- Application software development to ensure the purity of the data to be loaded into the database is the responsibility of the various application development groups.
- Software development to format the data for the database load process is the responsibility of the Database Management Section.

Database Integrity

After loading the database, the development team will verify the correctness and the logical integrity of the data.

- Verification procedures will be jointly established. Verification will include correctness of field positioning, data format, data content, load, densities and any other specific load strategies which will be employed. It will also include confirmation of set linkages. Any verification process should also include transaction executions.
- If reload is required another cycle of verification will be required.

Special User Interface

If it is determined that existing database interfaces are inadequate for the application, a joint team under the control of the Database Management Section will be established to investigate further requirements.

- The Database Management Section may implement the proposed interface design or recommend an alternate. These interfaces could be special I/O routines, transaction interface, schema structural changes, or other customized interfaces. The Database Management Section attempts to construct the new interface not only to benefit the individual user group but also to have minimum impact on other users or on general applications for all users of that database system.

Database Protection

With the database loaded and necessary interfaces created, the database will require measures to protect its integrity. This is a continuing process that begins as soon as the data is open to the users. This means that backup and recovery consideration must have been built into the schema to support this protection.

- Establishment of schema recovery is established by the database design analyst.
- Database backup strategy for recovery is established by the database analyst and merged into the DMS operational consideration for all database(s). The application system development group remains responsible for program recovery.

- The system development group is responsible for establishing recovery dealing with corrupt or invalid updating of data by application programs.
- It is the responsibility of the Database Management Section to provide for database integrity using database recovery techniques.

The user is responsible for creating, implementing, and maintaining the data verification procedures unique to his application.

Performance Monitoring

In conjunction with the continuing effort to verify the data integrity of the database:

- The user is responsible for application monitoring of his database system.
- It is the responsibility of the Database Management Section to monitor the performance of the data management system environment and the physical condition of the various databases.

Reorganization

There can be many reasons why a database will eventually require reorganization. Some of the most common are data oriented and, in most cases, result from the inefficient use of storage space over time. The processes of adding, modifying, and deleting data will cause various situations of lengthy set linkages, saturation of prime storage, duplication of storage keys, etc., which result in the use of overflow storage. Data reorganization is the process geared toward relieving these conditions. It consists of an off-load and reload of the data in its existing format. Other reasons for reorganization processing revolve around alterations to the database structure and are a result of any modifications to database components. Changes in record sizes, area sizes, set linkages etc. all require off-loading the data in its existing format followed by a reload of the data in a revised format.

- The Database Management Section will determine the strategies and processes used in the reorganization effort. If, after a reorganization process has been successfully executed, it is found that reorganization is needed periodically to ensure timely execution, responsibility for accomplishing this task can be transferred to the unit within the Division of Enterprise Applications responsible for the application. Periodic reorganization of data is usually scheduled to follow any purge processing contained in the application logic.
- The Database Management Section is responsible for performing all reorganization tasks that are structure oriented.

Application Programs

The Database Design Unit is responsible for assisting users in acquiring a complete understanding of their applications with respect to DMS 2200. It is also necessary to insure that applications programs are written correctly and efficiently in Unisys DMS 2200 DML.

- It is the duty of the database design analyst to establish and maintain all applicable environments (DEV, SAT, TRN, etc.) for each application assigned.
- The Database Management Section enforces standardization of database usage, Schemas, Subschema, and maintenance of the data dictionary. It is the responsibility of the database design analyst to ensure compliance to standards for each application assigned.
- The DBA allocates physical storage space for database files and additional storage as necessary.

General User

The general user of an application system is any individual or a group who uses the database as a resource.

Effective database administration will divide user groups with regard to responsibility, i.e. users responsible for data maintenance and users using the database as an information retrieval tool only. As the database becomes more and more integrated over time, this distinction will become more pronounced.

Communication with DMS 2200 about Problem Areas

It is important for the database user to communicate any problems and needs to the Database Management Section. As the design proceeds, the user must provide insight as needed by the BIS/DMS/Database Design Unit to carry out their tasks. After the database is operational, the user must continue to work with the Database Management Section to bring about changes and service, which will make the database a viable problem-solving tool.

Summary

Database Administration standards at the Department of Human Services are designed to promote the controlled use of database technology through a team approach for design, implementation, and management of the DMS 2200 environment.

Exemptions from this Standard:

There will be no exemptions to this standard.

Refresh Schedule:

All standards and referenced documentation identified in this standard will be subject to review and possible revision annually or upon request by the DHS Information Technology Standards Team.

Standard Revision Log:

| Change Date | Version | Change Description | Author and Organization |
|-------------|---------|-----------------------|---|
| 08/14/2007 | 2.0 | Reviewed and updated. | P. Gillingham |
| 08/03/2016 | 3.0 | Reviewed and updated. | Database Integrity and Design, Patty Gillingham |