

IBM DB2 Control Center for VM & VSE 7.1

New 7.1 Features to Simplify:
Database Administration,
Application Development,
and 24X7 Operations

"Doing More in Less Time"



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Gaithersburg, Maryland
May, 2000

Agenda

- ▶ Control Center for VM & VSE Overview
- ▶ Announcing Control Center 7.1
 - What is new for 7.1. -- A brief overview.
- ▶ Discussion of selected new functions
 - New tools to aid database application development and optimization.
 - Discussion and ideas for of integrating Control Center functions into the application development process.
 - New feature to aid in 24X7 operations.
 - Discussion of other "Doing More in Less Time" Control Center features.
- ▶ Call for new requirements
- ▶ Summary



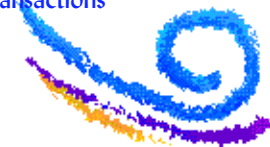
What is Control Center?

- ▶ An optional feature of IBM's DB2 Server for VSE & VM
- ▶ Original product called IBM SQL Master
- ▶ Available since 1990
 - Control Center for VSE introduced in 1996
 - Became program feature of DB2 in 1997, renamed DB2 Control Center for VM & VSE
- ▶ A suite of DBA tools to
 - Simplify Administration
 - Automate Maintenance
 - Increase Availability
 - Improve Database Performance
 - Developed by DBAs for DBAs



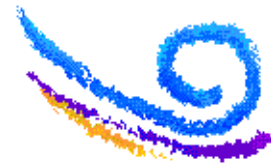
Our Production VM Environment

- ▶ Control Center Development group is part of, and supports our company's Information Systems group.
- ▶ Production Databases
 - 23 DB2 VM Databases (3.5-6.1) under 2 primary Control Center machines & 20 batch machines.
 - Major Node consolidation in 2nd quarter 2000.
 - Planned transition to high density drives with robot tape loaders.
- ▶ Largest VM DB2 6.1 Database, Contracts Management, Budget & Planning
 - DB2 Connect & DRDA
 - 12 tape archive (3.4 to 3.5 archive execution reduced from 5 to 3 hours)
- ▶ Accounting & Personnel Databases refreshed from MVS host daily, weekly and monthly
 - Implemented VMDSS, CPU overhead reduced by 97%.
- ▶ Production Environment
 - Busy batch environment (7:00 p.m. to 5:00 a.m.) Read only & update transactions
 - QMF, RXXSQL, REXX with CMS Pipes, PL I, Cold Fusion & Visual Basic.
 - Multi-million record databases
 - Weekly & Daily Archives (Logmode 'L'), recoveries, less than 2/year



Our Control Center Development Environment

- ▶ Control Center Test & Development Environment
 - 15 Databases under 4 primary Control Center, 4 Support machines & 4 Data Restore service machines (3.5 - 6.1)
 - VMTAPE with high density drives and robot loaders, DYNAMT, and CMS tape handling
 - VSE Control Center system running under ESA 2.3 and 2.4 Transaction Server.



Notes - What is Control Center....

Control Center, officially named, IBM DB2 Control Center for VSE & VM, is an optional feature of IBM's DB2 Server for VSE & VM. Its predecessor product, IBM SQL Master, has been available since June 1990.

Developed and heavily used by IBM internal DBAs, the product has grown in size and functionality managing objects from dbspaces down to packages. By customer request, in February 1996, a VSE version was made available. In May, 1997, SQL Master received a new name, a new version, and joined the DB2 family of products. The most current level of Control Center is version 7.1, announced in April 2000 for General Availability for September 2000.

What Control Center offers is a suite of DBA tools to ease and simplify the administration of DB2 databases for VM/ESA and VSE/ESA hosts. On either platform, customers have a wide variety of tools and utilities that automate maintenance, increase availability and improve the overall performance of DB2 databases.

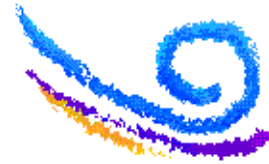
Today's presentation will focus on the 7.1 new tools and enhancements as well as overview general product capabilities.

Prerequisites for both the VSE & VM products can be found at the end of this presentation.



Control Center for VSE - General Tools

- ▶ Operator Commands
- ▶ Monitors
- ▶ Dbspace and Table Reorganization
- ▶ Automated Maintenance
- ▶ Packages Maintenance
- ▶ Group Authorization
- ▶ Job Scheduling



Notes - Control Center for VSE - General Tools

From the Control Center for VSE menu, database operator commands can be issued against one or more DB2 databases. Using the database switching capability, enabled with SQL/DS 3.5, operator commands can be executed on different servers. This operator command interface eliminates the need for the DBA to invoke ISQL or to issue database commands from the VSE operator console. Monitors were added with Control Center Version 5.1. With this capability, operator commands can be issued at predefined times and days, and for specific intervals. Results are captured and stored in tables where the DBA can watch for problematic conditions or trends that might require intervention. Additionally warning notification is available where when a threshold is met, a VSE message will be issued to the operator console advising the DBA of a potential situation.

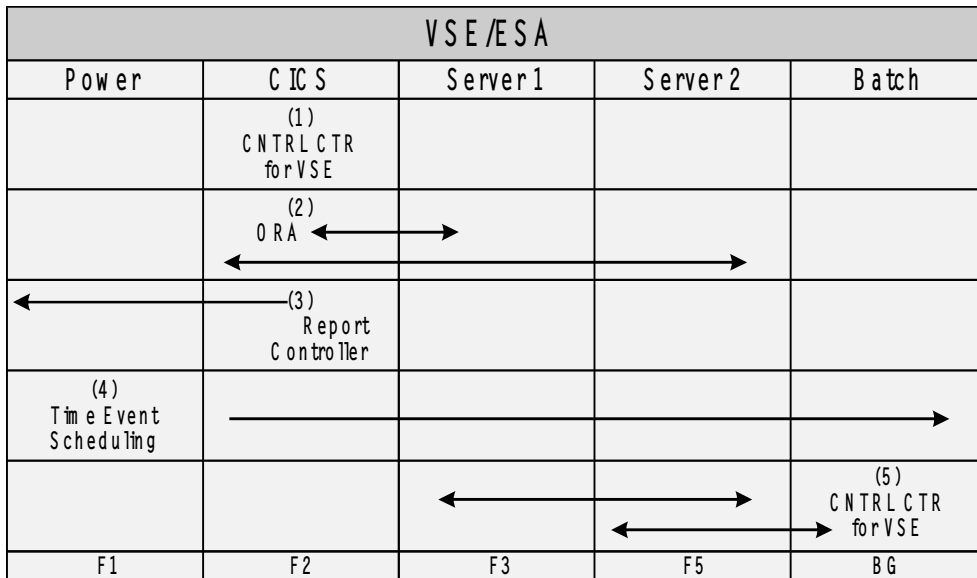
Reorganization tools are available at the dbspace and table level. DDL capture, unloads, reloads, and migration activities can be performed with the reorganization tools. Dbspace reorganization allows object attribute modification (i.e., page size, storpool location, lock level, etc.). Dependent packages can be rebound with the job or deferred for later execution. The automated maintenance tool helps the DBA tune DBSPACES by keeping track of the update statistics and reorganization activities and by executing these functions where and when necessary. Reorganized dbspaces and updated statistics mean better performing applications and less wait time for query execution.

Packages can be unloaded from one server and reloaded to another. Useful in tuning applications, options include viewing package SQL statement and preprocess options. Parameters also include rebinding dependent packages (invalid only or all).

The group authorization tool simplifies the administration of authorities on tables, views and packages. One grant or revoke is issued at the group level versus multiple grants or revokes. Reports are also available that list users or objects within groups as well as authorities.

Based upon the nature of the tool, output from jobs can be unloaded to tape or disk. Jobs can also be scheduled or executed immediately through the VSE/POWER queue. The CICS Report Controller interface lets you manage POWER queue jobs. Using this tool, you can release, delete, browse and change queue entries.

Control Center for VSE Architecture



Control Center for VM - General Tools

- ▶ Archive & Recovery
- ▶ System Administration
- ▶ Operator Commands
- ▶ Monitors
- ▶ Reorganization of dbspaces, tables & indexes
- ▶ Automated analysis and Maintenance
- ▶ Package Maintenance
- ▶ Group Authorization
- ▶ Job Scheduling

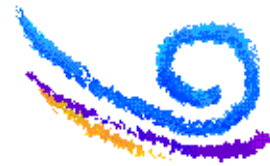
Notes - Control Center for VM - General Tools

The Control Center family of tools provide generic functionality across both the VSE & VM platforms to help manage and automate the maintenance of DB2 Server databases.

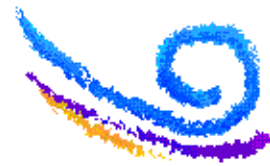
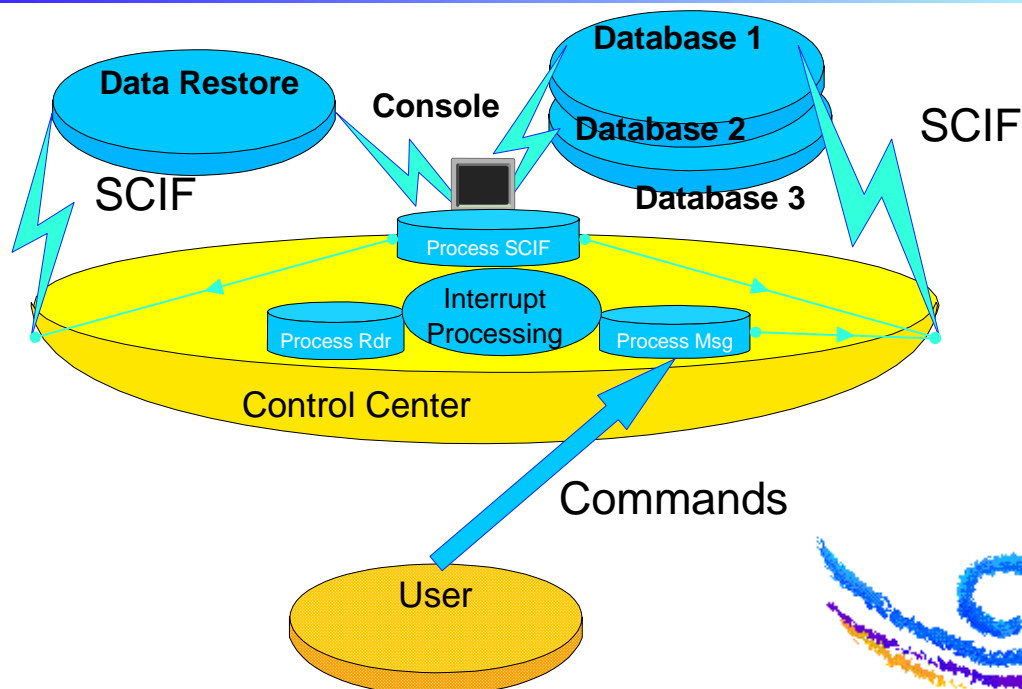
Architectural differences on the VM/ESA host provide an operator interface using SCIF (single console interface facility). Unlike VSE/ESA, with SCIF, operator commands can be issued directly on the database console without the need for an agent connection.

Control Center for VM also provides complete archive and recovery support, using the conventional database methods (log archive, archive, and user archive) as well as interfaces to the Data Restore feature, including incremental backups.

The more mature of the two products, Control Center for VM offers DBAs a wide selection of tools for specific database needs. Several of these tools will be described further in this presentation. As VSE customer requirements are heard, we will try to address those needs on a priority basis. Your input and satisfaction are very important to us. We encourage all of our customers to use the IBM Toronto DB2 WEB page, or connect us directly for new user or product requirements.

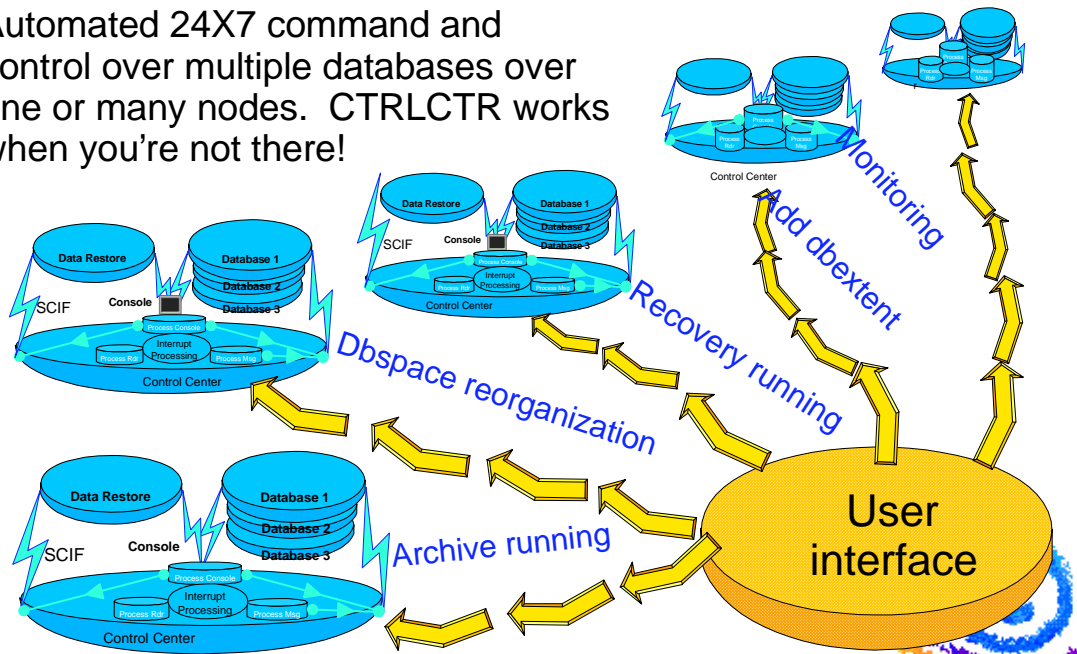


CTRLCTR Architecture with Data Restore & DB/2

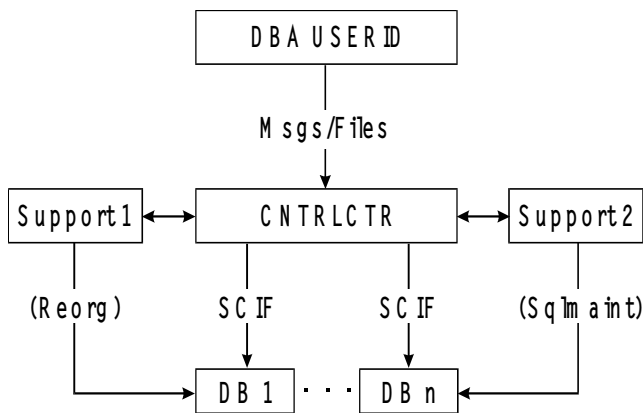


Manage All databases across the enterprise from your DBA userid

Automated 24X7 command and control over multiple databases over one or many nodes. CTRLCTR works when you're not there!



Control Center for VM Support Machine Architecture



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Support machines run off the same code disk as service machines.

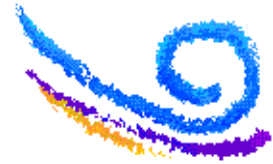
Use support machines to run or schedule reorganizations and other applications.



Control Center for VSE - 6.1 & 7.1

New Functions/Enhancements

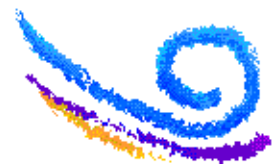
- ▶ 7.1
 - Compatibility with DB2 Server for VSE 7.1.
 - Web Control Center Stored Procedure Support
 - Installation in CICS 2.3 or 2.4 TS
- ▶ 6.1
 - Table Utility Tool
 - Table Create Tool
 - QMF Invocation
 - Independent Library Location
 - RDO Installation



Control Center for VM - 7.1

New Functions/Enhancements

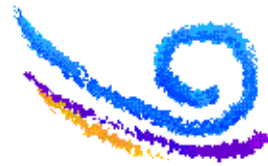
- ▶ Compatibility with DB2 Server for VM 7.1, including all initialization parameters and operator commands.
- ▶ New DB2 Query Management Facility (QMF) support features.
 - List, count or view QMF objects (QUERIES, PROCS and FORMS).
Transfer ownership of QMF objects.
 - EXPLAIN QMF queries.
 - Schedule QMF PROCS to execute
- ▶ New Package statement Explain Tool for the Search & List Package Tool.
- ▶ New Table Create Tool.
 - Create new table or import table DDL from existing table.



Control Center for VM - 7.1

New Functions/Enhancements *(continued)*

- ▶ New online archive support
 - Filedef/Labeldef automatically changed while the database is running after online database (ARIARCH) archives.
 - New QUERY FILEDEF and QUERY LABELDEF commands.
- ▶ Tape management Enhancements
 - Enhanced tape hopper support
 - High density tape drive support
- ▶ New & improved Database Status menu options
- ▶ UDB Web Control Center stored procedure support
- ▶ Synonym List added to Object Search & List tool
- ▶ Command interface for Referential Integrity Report generator.



Control Center Continues to Expand Functions and Usability

- ▶ **12/98 Control Center 6.1 - VM**
 - QMF invocation
 - Data Restore Incremental Backup
 - SFS support
 - Dynam-T support
 - Drop table
 - Referential Integrity mapping tool
 - High density tape drive support (PTF)
 - New Search & List features
- ▶ **Control Center 6.1 -- VSE**
 - QMF invocation
 - Table list, reorganization, DDL capture, data unload/reload and update statistics.
 - Table create
 - RDO installation
 - Independent Library location
- ▶ **05/97 Control Center 5.1 - VM**
 - Name changed to Control Center.
 - Data Restore support: Backup, Restore, Unload, Reload, Applylog, Listlog, & Translate.
 - Group Authorization tool
 - New Search List features
 - Enhanced HOLIDAYS file options (PTF)
 - Add Data Restore Showdbs (PTF)
 - Enhanced DB extent map report (PTF)
- ▶ **Control Center 5.1 -- VSE**
 - Group Authorization tool
 - Database Monitors



Control Center VM & VSE

7.1 Prerequisites

- ▶ At minimum, all you need is a DB2 database, the ESA operating system, and Control Center.
- ▶ **Control Center for VM**
 - VM/ESA 2.3 or higher
 - Compatible with VM/ESA 2.2
 - DB2 for VM 7.1
 - Compatible with DB2 6.1
- ▶ **Control Center for VSE**
 - VSE/ESA 2.4 or higher
 - Compatible with VSE/ESA 2.3
 - DB2 for VSE 7.1
 - Compatible with DB2 for VSE 6.1



Control Center For VM QMF Tools

Extending Your QMF Power
A Partner in Database Application Development

QMF Tools

Expanding Your QMF Capabilities

- ▶ QMF Tools extends your QMF investment.
- ▶ Provides access to QMF product from Control Center.
- ▶ List, or Count your QMF Queries, Procs and Forms.
 - Display Queries and Procs.
 - Run EXPLAIN on your queries.
 - Schedule QMF Procs to run when you are not there.
 - Transfer ownership or erase your QMF objects.
- ▶ Create report of QMF objects.



List or Count QMF Objects

```
dd/mm/yyyy          Control Center          hh:mm:ss
*----- LIST QMF OBJECTS -----*
| Option ==>>          CTRLID: MSTRV |
| Database => SQLDBA    NODE: VMSYSTEM |
|
| ENTER C (Count) or L (List) Option above and one of the choices below:
| CHOICE 1
| OWNER ==> _____ OBJECT ==> _____
|
| Use a specific OWNER name, the SQL wildcard (%) or ALL for OWNER.
| For OBJECT use ALL, QUERY, PROC, FORM, a specific name, or SQL wildcard.
|
| CHOICE 2
| OWNER ==> _____ OBJECT ==> _____
| OWNER ==> _____
| OWNER ==> _____
|
| Enter up to 3 specific OWNER names.
| For OBJECT use ALL, QUERY, PROC, FORM, a specific name, or SQL wildcard.
|-----SQMOLIST-----*
PF: | Help 3 End 4 Exit 5 Main Menu
```

You Can:
Search by
Single or multiple
owners.
Search by
object type.

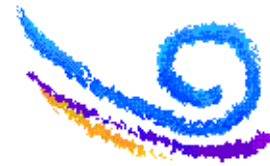


Manage Your Queries, Forms & Procs

```
dd/mm/yyyy          Control Center          hh:mm:ss
----- LIST QMF QUERIES, PROCS, FORMS -----*
| Option ==>          CTRLID: MSTRV1
| Database => SQLDBA   NODE: VMSYSTEM1
|-----|
| SEL OWNER  TYPE  NAME                CREATED  MODIFIED  LAST USED
|-----|-----|-----|-----|-----|-----|
| ___ MYTEST  QUERY D_COST_Q          2000-03-10 2000-03-10 2000-03-13
| ___ MYTEST2 QUERY D_SYSTEM_DBS_Q     2000-03-10 2000-03-10 2000-03-13
| ___          FORM  D_SYSDSPACE_F      2000-03-10 2000-03-10 2000-03-10
| ___ DEVIDID1 QUERY SYSOPTIONS_QUER    2 000-03-07 2000-03-07 2000-03-14
| ___          SYSOPTIONS_QUERY_2      2000-03-03 2000-03-03 2000-03-14
| ___          FORM  MY_FORM_NEWTEST_1   2000-03-09 2000-03-09 2000-03-14
| ___          MY_FORM_NEWTEST_2       2000-03-14 2000-03-14 2000-03-14
| ___          PROC  SYSOPTIONS_QUERY18  2000-03-14 2000-03-14 2000-03-14
| ___          SYSOPTIONS_QUE16       2000-03-14 2000-03-14 2000-03-14
| SELECT: D (Display) E (Erase) N (New Owner) S (Schedule) X (eXplain)
| PROC PARM=>
|-----|
|                                     Page 2 of 3
|-----|-----|-----|-----|-----|-----|
|-----SQMOLST2-----*
PF: 1 Help  3 End  4 Exit  5 Main Menu  6 Remarks
   7 Bkwd  8 Fwd  9 Refresh
```

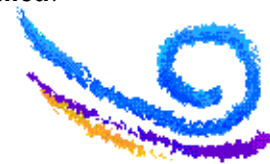
You Can:

- View Queries
- View Procs
- Run Procs
- Run EXPLAIN
- Erase objects



Using the QMF Object Display

- ▶ The display lists the OWNER, type, object name and the CREATED, MODIFIED, and LAST_USED timestamps from OBJECT_DIRECTORY table.
- ▶ **Display Object** -- Displays the QUERY or PROC (but not the FORM) in a CMS file (QMFLIST OUTPUT) . The file can be renamed and saved.
- ▶ **Erase Object** -- Deletes the object from the QMF tables, OBJECT_DIRECTORY, OBJECT_REMARKS and OBJECT_DATA.
- ▶ **New Owner** -- Changes the object's owner in the QMF tables.
- ▶ **Schedule Proc** -- Schedule a PROC to run through Control Center scheduling facility. If symbolic parameters are required, up to 60 characters of substitution values can be entered in the PROC PARM field.
- ▶ **Explain QUERY** -- Passes the query to the DB2 Explain facility and presents the results. You must already have your EXPLAIN tables installed.



Explain Your Queries

```

dd/mm/yyyy          Control Center          hh:mm:ss
*----- QMFLIST - EXPLAIN QUERY -----*
| Option ==>                               CTRLID: MSTRV1
| Database => SQLDBA                         NODE: VMSYSTEM1
|
| EXPLAIN =====> X ALL
|                   _ COST
|                   _ PLAN
|                   _ REFERENCE
|                   _ STRUCTURE
|
| SET QUERYNO => 1 _____ VIEW RESULTS => 1 (1=YES,0=NO)
|
| FOR          D1234567.D_PLAN_COST_Q1
|
| NOTE: Place an 'X' in the appropriate selection fields. Enter a query
|       number so the results can be extracted for viewing.
|       Press ENTER to submit the EXPLAIN statement.
|-----SQMEXPLN-----*
PF: 1 Help  3 Quit  4 Exit  5 Main Menu
    
```

You Can:

- Chose any or all Explain options.
- Set your query number.
- Run Explain.
- View the report.



Sample Explain Report

```

1          CONTROL CENTER QMF EXPLAIN REPORT
          EXPLAIN RESULTS FOR QUERYNO: 12345
-----
QUERY NAME: M760595.ACTNO
DATABASE  : SQLDBA
DATE     : dd/mm/yyyy hh:mm:ss

          PLAN TABLE
          -----
TIMESTAMP : 2000-04-12-09.15.57.104211
QUERYNO   : 12345
QUERY NAME: M760595.ACTNO

QUERY BLOCKNO: 1      RINO: 0

  PLANNO  METHOD  CREATOR  TABLE  TABNO
-----
      1      0  SQLDBA  ACTIVITY  1

  ACESSTYPE  MATCHCOLS  ACREATOR  ACCESSNAME  INDEXONLY
-----
      I          1  SQLDBA  PKEYCLZRSQDUDPHX  W

  SORT
  NEW  UNIQ  JOIN  ORDERBY  GROUPBY  SORT  COMP  UNIQ  JOIN  ORDERBY  GROUPBY
-----
      N    N    N    N          N    N    N    N    N          N

RINO: Value set to 0 for the user's original statement and
      incremented by 1 for each internally-generated statement
      that is processed for referential integrity or cascade
      delete. RINO is intended to distinguish among queries
      and internally-generated queries.

(Report example truncated )
    
```

- ▶ Formatted output for each Explain option.
- ▶ All Explain parameters defined.
- ▶ Same report as Package Explain Tool.



Control Center For VM Package Explain Tool

Object Search & List Integrated Tools Enhancements

A Partner in Database Application Development

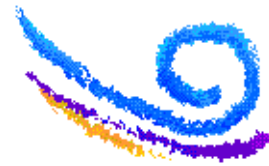
Control Center for VM What are the Object Search & List Tools?

- ▶ The Search & List Tools are a set of integrated applications that search the system catalog tables and display important information about your objects.
 - Dbspaces, Tables, Packages, Indexes, Views, Columns
- ▶ Start from Dbspace, Table or Package List OR "drill-down" until you find the object you need. This is a great way to find indexes when you are not sure of their name.
- ▶ Once you find the object you need, you can choose from a selection of information about the object or perform maintenance.
 - Reorganize dbspaces, tables or indexes. Manage packages. Report referential integrity relationships. Acquire dbspaces. View or add table remarks.
- ▶ New for Control Center for VM 7.1:
 - Listing table synonyms
 - Running EXPLAIN against Package statement (queries).



Search & List Package Tool Taking Control of Your Packages

- ▶ Use the Package Search & List tool to list your application's packages.
 - Select 'SL' (Search & List) from the main menu. Press PF11 key for Package Search. Type in the package name and creator or use wild cards to broaden your search.
- ▶ When you find your package, you can select from a list of functions to perform -- including
 - View Package: Creates detailed report with creation info, prep options and lists all the SQL statements contained in the package.
 - Package Explain: Choose SQL statements from a package to run DB2 EXPLAIN against.



Use Database Search & List Package Tool To Find and Manage Your Packages

```

dd/mm/yyyy          Control Center          hh:mm:ss
-----
*----- PACKAGE List Utility -----*
Database => SQLDBA      Table =>
-----
SEL CREATOR  PACKAGE NAME  SPNO  VALID  TIMESTAMP
-----
- Q          DSQ9SV      2     Y     09/26/97.16:36:41
- Q          DSQ9TSQL     2     Y     09/24/97.10:47:01
- Q          DSQ9UPRF     2     Y     09/24/97.11:14:52
* SQLDBA    ARIDSQSQL     2     Y     04/23/98.12:23:16
- SQLDBA    ARIFCRD     2     Y     04/23/98.12:28:02
- SQLDBA    ARIISQSQL     2     Y     04/28/98.17:49:46
- SQLDBA    ARIS7VE      2     Y     03/24/00.09:45:40
- SQLDBA    CALLCOB1     2     Y     04/30/99.11:57:45
- SQLDBA    CALLDBSU     2     Y     06/30/99.15:23:40
- SQLDBA    CALLPCOB     2     Y     05/18/99.14:23:56
Select:  D = Drop Package  R = Rebind Package  X = eXplain
         U = Unload        L = reLoad          V = View Package
-----
Page 3      of 6
-----*-----SQMPLIST-----*
PF:  1 HELP      3 QUIT      4 EXIT      5 MAIN MENU
     7 Bkwd      8 Fwd
  
```

- ▶ View
- ▶ Explain
- ▶ Drop
- ▶ Rebind
- ▶ Unload
- ▶ Reload



View Your Package Report

```
Package: SQLDBA.ARIDSQ
Database: SQLDBA

Package create release: 6.1
Last prepped in release: 6.1
Character Set: INTERNATIONAL
Sections: 35

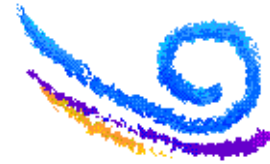
Preprocessing Characteristics:
-----
Package built without Extended Dynamic
Database DBCS option OFF at package creation
Block option: BLOCK
Package is NOT modifiable
Describe option: OFF

Options Specified at Prep time:
-----
BLOCK
ISOLation(USER)

DEFAULT Options at Prep time:
-----
RElease(COMMIT), EXPLAIN(NO), KEEP, REPLACE, NOEXIST
NOCHECK, TIME(default), DATE(default), APOST
PREPname=ARIDSQ
LABEL(default=spaces)
CHARSUB(Default), CTOKEN(NO)

Static SQL Statements in package:
-----
SELECT USER INTO :H FROM SYSTEM.SYSCATALOG WHERE TNAME='SYSCATALOG'
AND CREATOR='SYSTEM'
```

- ▶ Package Report Includes
- ▶ DB2 Release Created and Last Prepped
- ▶ Preprocessing Characteristics
- ▶ Prep Options
- ▶ Default Prep Options
- ▶ Static SQL Statements



Selecting Your Package Query

```
dd/mm/yyyy          Control Center          hh:mm:ss
*----- Package SQL Statements -----*
Database => SQLDBA          CTRLID: MSTRV1
Package => "SQLDBA"."ARIDSQ"      NODE: VMSYSMT1

S TEXT
-----
X SELECT USER INTO :H FROM SYSTEM.SYSCATALOG WHERE TNAME='SYSCATALOG'
AND CREATOR='SYSTEM'

- SELECT CURRENT DATE,CURRENT TIME,CURRENT TIMESTAMP, VALUE,
LENGTH(CHAR(CURRENT DATE)), LENGTH(CHAR(CURRENT TIME)) INTO :H,:H,:H,:H
,:H,:H FROM SYSTEM.SYSOPTIONS WHERE SQLOPTION = 'RELEASE'

- SELECT DBSPACENO INTO :H FROM SYSTEM.SYSDBSPACES WHERE DBSPACENAME=:H
AND OWNER=:H

Select (X) for the statement to be EXPLAINED.

Page 1 of 5
-----SQMPSTMT-----
PF: 1 Help 3 QUIT 4 EXIT 5 MAIN MENU 7 Bkwd 8 Fwd
```

- ▶ Select option 'X' from the Package List
- ▶ Select the statement to be EXPLAINED.



The Explain Package Statement Menu

```
dd/mm/yyyy          Control Center          hh:mm:ss
*----- EXPLAIN PACKAGE STATEMENT -----*
Option ==>>
Database ==> SQLDBA                                CTRLID: MSTRV1
                                                    NODE:  VMSYSMT1

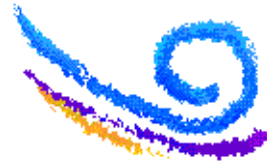
EXPLAIN ==>>>  X  ALL
                -  COST
                -  PLAN
                -  REFERENCE
                -  STRUCTURE

SET QUERYNO => _____          VIEW RESULTS => 1 (1=YES,0=NO)

FOR          SELECT USER INTO :H FROM SYSTEM.SYSCATALOG WHERE TNAME=
            'SYSCATALOG' AND CREATOR='SYSTEM'

NOTE: Place an 'X' in the appropriate selection fields.  Enter a query
      number so the results can be extracted for viewing.
      Press ENTER to submit the EXPLAIN statement.

*-----SQMEXPLN-----*
PF:  1 Help    3 Quit    4 Exit    5 Main Menu
```



Executing the Package Explain

- ▶ The Explain Package Statement Menu options follows the syntax of the EXPLAIN statement. After filling in the menu, press ENTER to execute the EXPLAIN.
 - The EXPLAIN tables for the USERID must already exist to complete the operation.
- ▶ **EXPLAIN Type:** Choose an EXPLAIN type: 'ALL', 'COST', 'PLAN', 'REFERENCE' or 'STRUCTURE'
- ▶ **SET QUERYNO** -- An integer number for the SET QUERYNO field so the results can be identified and extracted for viewing.
- ▶ **View Results** -- Type '1' to view the results of the EXPLAIN run immediately. Type '0' to view the report later.
 - The report file is kept on your A-disk with the FILENAME of "QUERYNO" and FILETYPE of "Qnnnnnnn", where n is the first 7 digits of the number entered in the SET QUERYNO field.
- ▶ **FOR Field** -- The first 110 bytes of the SQL statement are displayed in this field.



Control Center For VM & VSE Table Create Tools

Doing More in Less Time
Your Partner in Database Management

Table Create Function for VM & VSE

- ▶ Provides full screen interface for defining a DB2 table.
- ▶ Option to add 53 bytes of table remarks.
- ▶ Option to GRANT SELECT TO PUBLIC on the table.
- ▶ Option to 'DRAW TABLE' (import) DDL from existing table.
 - VM Only
- ▶ Option to activate DATA CAPTURE field.
- ▶ HELP file illustrates column definition syntax.
- ▶ **Invocation**
 - VM: SQM option 'U' (Database Utilities), 'TC' (Table Create).
Fastpath: SQM =U.TC
 - VSE: SQM option 10 (Table Utility), 4 (Create Table)



VM Table Create Menu

```
***** SQLTABCR TABLE CREATE UTILITY *****
Database ==> SQLDBA
CREATOR ==>
OWNER ==>
DRAW TABLE ==>
TABLE NAME ==>
DBSPACE NAME ==>

Mod Colno Column Name Column Type Column Length Nulls (1/0)
-----
1
2
3
4
5
6
7
8
9
10
GRANT SELECT TO PUBLIC ==> 0 (1=YES,0=NO) DATA CAPTURE => NONE
COMMENT ON TABLE ==>

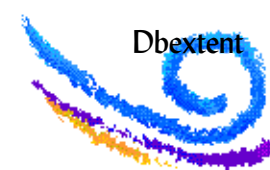
Page 1 of 1
PF: 1 Help 3 QUIT 7 Bkwd 8 Fwd 9 DRAW Table 10 PROCESS Definition
ENTER PROCESS Current Screen 11 CLEAR Definition 12 COLUMN Help
```

You Can:
Draw table.
Modify, Add & Delete Columns.
Grant SELECT to PUBLIC.
Activate Data Capture.
Create Remarks.



Table Create Quick Tips Doing More in Less Time!

- ▶ **Table Remarks** -- Don't forget to add the remarks to describe the new table. Remarks will help you later to remember what the table was for. In VM, if you need to add or change the table remark, you can use the Search & List tools to find the table, and add or change the remark.
- ▶ **Don't forget the indexes** -- When performance is a problem, many times it is because the indexes were not created or were dropped.
- ▶ **"Doing More in Less Time"**
 - Use Table Create to generate quick prototype tables for users or applications. Use Group Authorization tool to add user and table to authorization groups.
 - Use Table or dbspace reorganization tools to copy existing tables and data to test tables. In VM, use Table Reorganization, option 4, to redefine the table, but keep the data.
 - In VM, use Search & List to find free dbspaces and Add tool to add new extents.



Control Center for VM Tools for Database App Development

- ▶ **Prepare your database objects for tuning.**
 - Use Table Create to create new test tables or table or dbspace reorg to migrate or copy existing tables and data for testing.
 - Schedule dbspace, table and index reorganization functions to optimize your tables and indexes overnight.
 - Use Package Rebind Function to re-prepare packages.
 - Use Referential Integrity function to report and verify table relationships.
- ▶ **Tune your packages and queries**
 - Use QMF and Package Tools to view and EXPLAIN queries.
 - Use QMF Tools to test run your QMF PROCES overnight.



Control Center for VM Tools for Database App Deployment

- ▶ **Deploy your application**
 - Use table or dbspace functions to migrate tables.
 - Use Search List functions to verify tables, indexes and referential integrity.
 - Use QMF Tools to transfer QMF objects to production owners.
- ▶ **Protect your application environment**
 - Archive the database!!!
 - Use dbspace and index analysis tools to automate optimization



Control Center For VM

24 X 7 Online Archive Support

Automatic Online Filedef & Labeldef Change

Helping You With 24 X 7 Availability
Doing More in Less Time

Why 24 X 7 Online Archive Support?

- ▶ Online archive support has been on the "wish List" for a long time.
- ▶ Previously, Filedef & Labeldef (CMS) commands could only be issued when the database was down.
- ▶ If performing a reorganization of a large dbspace in logmode 'A':
 - Multiple implicit online archive could occur. The second archive:
 - Could write over the first archive.
 - Could fail because the tape mounted would not match the Labeldef. If the archive fails, the reorganization could fail.
- ▶ `SQLEND ARCHIVES` affect availability for 24X7 users and critical enterprise applications:
 - Banks, Police call centers, overnight delivery companies



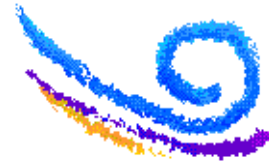
Notes: Filedefs & Labeldefs Before 7.1

CP commands can always be executed while a database or code is running. CP commands are necessary to issue tape mount commands and detach tape drives on the database console. Without CP commands, Control Center for VM could not perform tape management and would not be able to manage archives and recoveries as it does now.

An integral part of the archive process is the execution of CMS FILEDEF and LABELDEF commands necessary to define the archive output media and recovery output and input media to the database. Previously, CMS FILEDEF and LABELDEF commands could only be executed while the database is down. Control Center executes the necessary FILEDEF and LABELDEF commands on the database in the DBSTART EXEC just prior to invoking the database's SQLSTART EXEC. Being able to execute CMS FILEDEF and LABELDEF commands while the database is running has been a long time requirement of users who rely upon online archives.

Previously, an archive executed while the database is running (implicit or explicit online archive) would require that the database be brought down in order that the ARCHIVE (ARIARCH) FILEDEF and LABELDEF be updated with the new valid or disk file name for the next archive. If the database is archived again before the FILEDEF is changed, the previous archive may be overwritten or the archive may fail because the tape mounted does not match the existing Labeldef.

Control Center support of online Filedefs will allow successive online archives to occur without overwriting the previous archive.



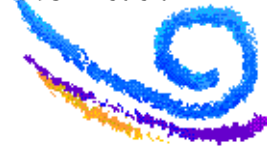
Control Center for VM Online Archive Support Features

- ▶ Automatically performed immediately after a logmode 'A' or 'L' online archive completes:
 - FILEDEF or LABELDEF commands will only be executed to change the valid or disk file information of the FILEDEF or LABELDEF for ARIARCH. Other FILEDEF or LABELDEF parameters will remain the same.
- ▶ New Commands to Query Filedef, Labeldefs and FDEFLOG
 - Type: SQM dbmach QUERY FILEDEF
 - Type: SQM dbmach QUERY LABELDEF (see sample)
 - Type: SQM dbmach QUERY FDEFLOG (see sample)
- ▶ Use the commands to verify Filedef/Labeldef changes.
 - The ARCHLOG file also indicates the beginning and end of the CHANGE.



Usage Considerations

- ▶ Available only for Control Center and DB2 for VM, 7.1 or greater.
- ▶ Online Filedef/Labeldef change is not necessary for archive operations that bring the database down. It will not be used for:
 - SQLEND archives (any logmode).
 - User archives (any logmode). User archives are SQLEND archives.
 - Logmode 'Y' archives. Control Center facilitates archives from logmode 'Y' by implementing a logmode change to 'A' which brings the database down.
- ▶ Log archive tapes/files (ARILARC) are not affected. Currently, Control Center does not LABELDEF log archives tapes in order that successive implicit online log archives may occur without changing the LABELDEF for the tapes.
- ▶ Trace (ARITRAC) Filedefs are not changed. Changing ARITRAC Filedefs while the database is tracing would cause errors. ARITRAC is currently reset in DBSTART.



Reviewing the FDEFLOG file

```
Userid: MSTRV1                               Date:
2000-03-10                                   Time: 13.27.58
At Node: VMSYSTEM1
Request: CHANGE ARCHIVE ( SQMA292I for database SQLDBA
PARMS  ==> ARCHIVE Series: 100  Media: TAPE
Executed ==> LABELDEF ARIARCH VOLID ? ( CHANGE
DMSLBD441R Enter VOLID information:
VOLID: VB3767 Entered.
DMSLBD441R Enter VOLID info
VOLID: VB3768 Entered.
DMSLBD441R Enter VOLID information:
VOLID: BLANK Entered to complete processing.
==> SQMDFDEF SQLDBA COMPLETED. RC=0
```

You Can:
Verify the
parameters.

Verify the
command
executed

Verify the
tapes used.

Command: SQM dbmach QUERY FDEFLOG



Reviewing the FDEFLOG file

```
Userid: DBA1                      Date: dd/mm/yyyy
At Node: VMSYSTEM1                Time: hh:mm:ss

Request: FDEFSQL Q LABELDEF for database SQLDBA at VMSYSTEM1

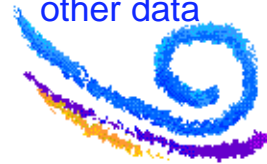
DDNAME  VOLID  FSEQ VOLSEQ GENN GENV CRDTE  EXDTE SEC  FID
ARIARCH                                SQLDBA.ARCH
VOLIDS:
VB3767  VB3768 ←
DDNAME  VOLID  FSEQ VOLSEQ GENN GENV CRDTE  EXDTE SEC  FID
ARITRAC SCRATCH SQLDBA.TRAC ←
                                000284
```

You Can:
Verify the
ARIARCH
Labeldef

Verify the
ARITRAC
Labeldef

Verify the
data set
name &
other data

Command: SQM dbmach QUERY LABELDEF
Command: SQM dbmach QUERY FILEDEF



Confirmation in the ARCHLOG file

```
ARI2054I Database manager has taken a FULL archive.
ARI0292I Archive is completed.
FULL ARCHIVE completed, (FULL) series 100 volid VB3767 @03-15-00
...
SQMDFDEF REQUESTED LABELDEF ARIARCH VOLID ? ( CHANGE
SQMDFDEF CHANGE COMPLETED ARCHIVE SQMA292I 200 VB3773
@2000031500...
```

You Can:

Verify the
CHANGE
start and
end in the
ARCHLOG
file



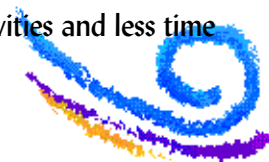
Using Control Center VM to Improve 24X7 Operations: Quick Tips

- ▶ The goal for working in 24X7 shop is to maximize maintenance impact and minimize the maintenance window.
- ▶ Change dbspace analysis criteria to prevent SHOW DBSPACE.
 - The dbspace analysis tool (SQLMAINT) has the option to use catalog table values from SYSDBSACES instead of a SHOW DBSPACE to analyze dbspaces.
 - This can reduce processing time and prevent dbspace locking.
 - From the SQLMAINT menu (SQM =U.M), select PF8 (Criteria)
 - Input 'N' (No) for the "USE CRITERIA 3 thru 6 (Y or N)" option
- ▶ Try using Data Restore SHOWDBS feature
 - Generates "Show Dbspace" information on ALL dbspaces without using the database. You can not indicate only one dbspace.
 - Reads the databases disks directly to retrieve same information as SHOW DBSPACE. Database can be up or down.
 - Generally much faster than SHOW DBSPACE
 - Use SQM =DR.D to get to SHOWDBS menu.



Using Control Center VM to Improve 24X7 Operations: More Quick Tips

- ▶ Use index analysis and reorganization tool (SQM =U.RI) to get quick performance improvement without performing dbspace reorganization.
- ▶ Switch to higher tape densities and/or high density tape drives
 - If you have a tape management system, like VMTAPE, that uses the DMSTVI tape exit all you have to do is change the density in the database PARMS file.
 - If you do not have a tape management system (CMS tape handling only) or your tape manager does not use DMSTVI, then try:
 - Setting the default on your tape drive to the highest density and leave the density field blank in the database PARMS file. The Filedef will not include the density but the tape should be written using the default density.
 - Switching from 38K to EXF density reduced the number of tapes we use by 4-to-1.
 - Quicker archives means more time for other maintenance activities and less time watching tapes being ATTACHED.



Control Center Development & Support Team

Team

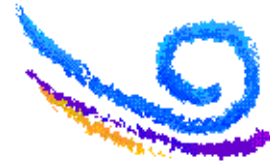
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Web Page

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What are YOUR Requirements for Future Control Center Development?

- ▶ 1
- ▶ 2
- ▶ 3
- ▶ 4
- ▶ 5
- ▶ 6
- ▶ 7
- ▶ 8



Summary - Control Center for VM & VSE

- ▶ Grown in function since 1990
 - Created by DBAs, for DBAs.
 - Added Control Center for VSE in 1996
 - Became a feature of DB2 in 1997
 - Continued commitment to expanding functions to meet the needs of the DBA.
- ▶ Control Center helps DBAs
 - Simplifies administration
 - Increases database availability
 - Improves performance of DB2 servers

