

Oracle® CODASYL DBMS for OpenVMS

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Oracle® CODASYL DBMS for OpenVMS

Release Notes

Release 7.2.4.1 for OpenVMS Alpha and
HP OpenVMS Industry Standard 64 for Integrity Servers

APRIL 2010

Oracle CODASYL DBMS Release Notes, Release 7.2.4.1 for OpenVMS Alpha and OpenVMS I64

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Preface

Purpose of This Manual

This manual contains release notes for Oracle CODASYL DBMS release 7.2.4.1. The notes describe changed and enhanced features, upgrade and compatibility information, new and existing software problems and restrictions, and software and documentation corrections.

Intended Audience

This manual is intended for use by all Oracle CODASYL DBMS users. Read this manual before you install, upgrade, or use Oracle CODASYL DBMS release 7.2.4.1.

Document Structure

This manual consists of the following chapters:

<u>Chapter 1</u>	Describes how to install Oracle CODASYL DBMS release 7.2.4.1.
<u>Chapter 2</u>	Describes new and changed features in Oracle CODASYL DBMS release 7.2.4.1.
<u>Chapter 3</u>	Describes problems fixed in Oracle CODASYL DBMS release 7.2.4.1.
<u>Chapter 4</u>	Describes problems, restrictions, and workarounds known to exist in Oracle CODASYL DBMS release 7.2.4.1.
<u>Chapter 5</u>	Describes new features and fixed problems in previous releases.

Conventions

Oracle CODASYL DBMS is often referred to as DBMS in this manual.

HP OpenVMS Industry Standard 64 for Integrity Servers is often referred to as OpenVMS I64.

OpenVMS refers to both OpenVMS Alpha and OpenVMS I64.

Chapter 1

Installing Oracle CODASYL DBMS

All Oracle CODASYL DBMS release 7.2.4.1 kits are full kits. There is no requirement to install any prior release of Oracle CODASYL DBMS prior to installing this release.

1.1 Oracle CODASYL DBMS on OpenVMS I64

In addition to the HP OpenVMS Alpha platform, Oracle CODASYL DBMS is available on the HP OpenVMS Industry Standard 64 for Integrity Servers platform. In general, the Oracle CODASYL DBMS functionality is comparable between the two platforms.

This release provides a full set of Oracle CODASYL DBMS functionality for both platforms, including local and remote database access, as well as native DML and DDL operations. This means that users running on OpenVMS I64 can create Oracle CODASYL DBMS databases, compile, link, and run their database applications natively.

Because the Oracle CODASYL DBMS database format is the same across all supported platforms, you can, for example, back up an Oracle CODASYL DBMS database on an Alpha system, then restore it on an I64 system (the reverse is also true). If necessary, implicit forward conversions are performed to bring the database version to the currently installed level.

With remote access, you can bind to an Oracle CODASYL DBMS database on an Alpha system from an I64 system, or vice versa, as long as the appropriate Oracle CODASYL DBMS software is available on both platforms.

Additionally, if your environment consists of Alpha and I64 systems in a mixed cluster environment, you can access an Oracle CODASYL DBMS release 7.2.4.1 database from either system, or both systems concurrently.

1.2 Using Databases from Releases Earlier Than V7.0

You cannot convert or restore databases from versions earlier than 7.0 directly. The DBO CONVERT command for Oracle CODASYL DBMS 7.2.4.1 supports conversions from V7.0 and V7.1 only.

If you have a V3.3 through V6.1 database, you must convert it to at least V7.0 and then convert it to 7.2.4.1 in two steps. For example, if you have a V4.2 database, install the latest update to DBMS 7.1, convert the database to that version, install DBMS 7.2.4.1 then convert the V7.1 database to 7.2.4.1.

If you attempt to convert or restore a database version prior V7.0 directly to 7.2.4.1, Oracle DBO generates an error.

1.3 Requirements

This version of Oracle CODASYL DBMS supports OpenVMS Alpha 8.3–x and OpenVMS I64 8.3–x.

One of the following conditions must be met in order to install this software:

- OpenVMS Alpha version 8.2 or later
- OpenVMS I64 version 8.2 or later.

1.4 Installation of Oracle CODASYL DBMS Software

Please refer to the *CODASYL DBMS 7.2 Installation Guide* for detailed Oracle CODASYL DBMS installation instructions. Oracle strongly recommends that you read the installation guide before attempting an installation.

To extract either the PostScript (PS) or text (TXT) version of the installation guide from the kit, use one of the following commands:

For OpenVMS Alpha:

```
$ BACKUP <device>:DBM07241A072.A/SAVE/SEL=DBM072_INSTALL_GDE.PS  
$ BACKUP <device>:DBM07241A072.A/SAVE/SEL=DBM072_INSTALL_GDE.TXT
```

For OpenVMS I64:

```
$ BACKUP <device>:DBM07241I072.A/SAVE/SEL=DBM072_INSTALL_GDE.PS  
$ BACKUP <device>:DBM07241I072.A/SAVE/SEL=DBM072_INSTALL_GDE.TXT
```

The release 7.2 installation guide is available on MetaLink and OTN in Adobe Acrobat PDF format.

1.5 Documentation in Adobe Acrobat Format

You can view the documentation in Adobe Acrobat format using the Acrobat Reader, which allows anyone to view, navigate, and print documents in the Adobe Portable Document Format (PDF). For information about obtaining a free copy of Acrobat Reader and for information on supported platforms, see the Adobe Web site at:

<http://www.adobe.com>

The Oracle CODASYL DBMS and Hot Standby documentation in Adobe Acrobat format is available on MetaLink and OTN.

Chapter 2

Enhancements Provided

This chapter describes new and changed features in Oracle CODASYL DBMS release 7.2.4.1.

2.1 New Verb Statistics Option for DBM\$BIND_DEBUG_FLAGS

For this release, the DBMS DBM\$BIND_DEBUG_FLAGS mechanism has been enhanced to enable the display of the following classes of Data Manipulation Language (DML) Verb statistics:

- Elapsed time Statistics
- Database I/O Statistics
- Locking Statistics

These new options provide statistics on a per-verb basis.

The I/O and Locking statistics are collected by the DBMS Statistics engine (RTPMS), so local (process) statistics must be enabled. As with other DBMS DEBUG flag options, you can direct the output to a file (say, "MYDATA.OUT") by:

```
$ DEFINE DBM$BIND_DEBUG_FLAGS_OUTPUT "MYDATA.OUT"
```

To display any per-verb statistic, you must first define the DBM\$BIND_DEBUG_FLAGS to include "VS" (for: [V]erb and [S]tatic). Another logical, DBM\$BIND_DEBUG_STAT_FLAGS, has been added to control which particular statistics you wish to display.

2.1.1 Elaped Time Statistics

Elapsed timer statistics are derived from a call to LIB\$SHOW_TIMER. To enable this statistic display, define the DBM\$BIND_DEBUG_STAT_FLAGS to "E". The output will be similar to:

```
-----  
READY CONCURRENT UPDATE  
-----  
ELAPSED:      0 00:00:00.06  CPU: 0:00:00.04  BUFIO: 20  DIRIO: 31  FAULTS: 15
```

2.1.2 Database I/O Statistics

Statistics on the following I/O types can be displayed by defining the DBM\$BIND_DEBUG_STAT_FLAG logical to the value in the corresponding parentheses:

- ASYNCH PIO STATS ("A")
- IO STALL STATS ("I")
- AIJ IO STATS ("J")
- INDEX IO STATS ("X")
- SUMMARY IO STATS ("S")

For example, to show the SUMMARY IO STATS, define the DBM\$BIND_DEBUG_STAT_FLAGS to be "S" and the output will be similar to:

```
-----  
STORE VENDOR_REC  
-----
```

```
IO STALL STATS:  data read time=1 root read time=0 data write time=1
root write time=0 data extend time=0 RUJ read time=0 AIJ read time=0
RUJ write time=1 AIJ write time=0 RUJ extend time=0 AIJ extend time=0
-----
```

NOTE: In this release, only one IO type can be shown at a time. If you define the logical to be "AS", only the SUMMARY IO stats will be displayed and the ASYNCH PIO stats will be ignored.

2.1.3 Locking Statistics

Statistics on the following locks types can be displayed by defining the DBM\$BIND_DEBUG_STAT_FLAG logical to the value in the corresponding parentheses:

- AREA LOCK STATS ("B")
- FREEZE LOCK STATS ("F")
- PAGE LOCK STATS ("P")
- QUIET LOCK STATS ("Q")
- RECORD LOCK STATS ("R")
- SNAPSHOT LOCK STATS ("C")
- SUMMARY LOCK STATS ("L")

Display fields for any of these lock types will be the same. For example, by defining DBM\$BIND_DEBUG_STAT_FLAGS to be "L", the following will be displayed:

```
-----
READY CONCURRENT UPDATE WAIT 5
-----
SUMMARY LOCK STATS:  locks requested=59 locks promoted=41 (rqsts not queued)=0
(proms not queued)=0 (rqsts stalled)=0 (proms stalled)=0 (rqst deadlocks)=0
(prom deadlocks)=0 locks demoted=4 locks released=0 blocking ASTs=1
stall time x1000=0
-----
```

NOTE: In this release, only one lock type can be shown at a time. If you define the logical to be "LF", only the FREEZE LOCK stats will be displayed and the SUMMARY LOCK stats will be ignored.

2.2 New DBO /SHOW STATISTICS /WRITE_REPORT_DELAY=n Feature

Bug 3199615

Previously, it was not possible to use the DBO /SHOW STATISTICS to write a report file in non-interactive mode.

This problem has been corrected. The /WRITE_REPORT_DELAY=n qualifier specifies that statistics are to be collected for "n" seconds (default of 60 seconds) and then a report file written and then the RMU /SHOW STATISTICS utility will exit. /WRITE_REPORT_DELAY implies /NOINTERACTIVE.

Chapter 3

Problems Corrected

This chapter describes software errors corrected in Oracle CODASYL DBMS release 7.2.4.1.

3.1 Bugchecks at DIOFETCH\$FETCH_SNAP_SEG or DIOCCH\$FETCH_SNAP_SEG

In some cases when using read-only transactions along with read-write transactions that request exclusive access to a record, the read-only transaction may bugcheck with a "footprint" simimilar to the following:

```
***** Exception at 0000000001948194 : DBMSHR72\DIOFETCH$FETCH_SNAP_SEG
+ 000003C4
%COSI-F-BUGCHECK, internal consistency failure
Saved PC = 00000000019488B4 : DBMSHR72\DIOFETCH$FETCH_VISIBLE_SEG + 00000684
Saved PC = 00000000019492FC : DBMSHR72\DIOFETCH$FETCH_ONE_LINE + 000008AC
Saved PC = 0000000001949CCC : DBMSHR72\DIOFETCH$SCAN_ONE_PAGE + 000002AC
```

This problem would only occur on databases with a transaction sequence number larger than 2,147,483,647. The problem has been corrected. The invalid access by the read-only transaction is correctly detected and the expected error is generated:

```
%DBM-F-LOCK_CONFLICT, request failed due to locked resource
-DBM-F-CANTSNAP, can't ready storage area $1$DGA1:[DB]FOO.DBS;1 for snapshots
```

3.2 DBO/RECOVER/ORDER_AIJ_FILES fails with RMS-E-FNF when processing one AIJ file.

If there is only one After Image Journal (AIJ) file and you try to recover the database using the /ORDER_AIJ_FILES qualifier, it fails to find the AIJ file.

This issue has been fixed in DBMS V7.2.4.1.

The workaround would be to not use the qualifier when recovering a single journal file.

Chapter 4

Known Problems and Restrictions

This chapter describes problems and restrictions relating to Oracle COADASYL DBMS release 7.2.4.1 and includes workarounds where appropriate.

4.1 Ensure No Processes Have DBMSHR Image Activated

The Oracle CODASYL DBMS installation procedure checks to make sure that the DBMS Monitor (DBMMON) process is not running. However, it is also important to make sure that there are no processes on the cluster that have images activated with a prior version DBMSHR image. Such processes may not be currently attached to a database but may do so in the future and could cause problems by using an older DBMSHR image with a later DBMS installation.

The following command procedure can be used on each cluster node that shares the system disk to determine if there are any processes that have activated the DBMSHR72.EXE image. This procedure should be executed by a privileged account after MONSTOP72.COM has been run. Any processes that have DBMSHR72.EXE activated at this point should be terminated prior to starting the DBMS installation procedure.

```
$ DBM$TMP = "SYS$SCRATCH:'F$UNIQUE()' .TMP
$ DEFINE /NOLOG /USER DBM$TMP 'DBM$TMP
$ ANALYZE /SYSTEM
    SET OUTPUT DBM$TMP
    SHOW PROCESS /CHANNELS ALL
    EXIT
$ SEARCH /OUTPUT='DBM$TMP' 'DBM$TMP';-1 DBMSHR72.EXE,"PID:"
$ SEARCH 'DBM$TMP' DBMSHR72.EXE /WINDOW=(1,0)
$ DELETE /NOLOG 'DBM$TMP';*{text}
```

In the following example, the process 2729F16D named "FOO\$SERVER" has the image DBMSHR72.EXE activated even after RMONSTOP72.COM has been executed and this process should be terminated prior to starting the DBM installation procedure:

```
$ @SYS$STARTUP:RMONSTOP72.COM
.
.
.
$ @FIND_DBMSHR72_PROC.COM

OpenVMS system analyzer

Process index: 016D   Name: FOO$SERVER   Extended PID: 2729F16D
0240 7FEF4460 8384F300 $1$DGA2:[VMS$COMMON.SYSLIB]DBMSHR72.EXE;722
$
```

4.2 Syntax for Prestart Transaction Timeout

The ability to define a timeout value for a prestarted transaction has been available on Oracle CODASYL DBMS since version V7.1, however the usage was never documented.

To define a timeout value for a prestarted transaction, enter the syntax:

```
$ DBO/MODIFY/TRANSACTION=PRESTART=(TIMEOUT=nnn) <database name>
```

where, 'nnn' is a value (range 0:3600) in seconds. This value represents the number of seconds to wait before aborting the prestarted transaction. Timing out the prestarted transaction may prevent snapshot file growth in environments where servers stay attached to the database with long periods of inactivity.

Additional functionality added to an update of V7.1 included an enhancement to force a process to obtain a new transaction sequence number (TSN) if the same TSN has been reused throughout the duration of the prestarted transaction timeout interval. This provides the ability for processes that constantly reuse TSNs to periodically obtain a new TSN, thus preventing excessive snapshot growth.

4.3 Patch Required When Using VMS V8.3 or V8.2–1 on Itanium

During qualification testing, a possible problem related to OpenVMS image activation on some Itanium systems was discovered. This problem could in some cases result in unexpected messages similar to the following:

```
%LIB-E-ACTIMAGE, error activating image  
-SYSTEM-F-NOPRIV, insufficient privilege or object protection violation
```

To avoid this problem, Oracle recommends that customers install one of the following architecture-specific patch kits (or subsequent replacement if superseded) for Itanium systems: VMS821I_SYS-V0400 (I64) VMS83I_SYS-V0200 (I64)

4.4 /LOCK_TIMEOUT Documentation Clarification

The /LOCK_TIMEOUT qualifier can be used on a number of DBO commands to specify how long an operation should wait for locks to be granted before timing out. These locks could be either the QUIET POINT lock or any other lock required for online operations.

Some Oracle CODASYL DBMS documentation suggests that there is a default value for this qualifier. However, this is not true.

If you specify the /LOCK_TIMEOUT qualifier, you must specify the number of seconds to wait:

```
$ DBO/BACKUP/AFTER/LOCK_TIMEOUT=5 . . .
```

will cause DBO to wait 5 seconds before returning a time out message.

4.5 Unexpected RCS termination

It has been observed in internal testing of Oracle Codasyl DBMS V7.2.2.0 that if the Record Cache Server (the RCS), terminates in an uncontrolled fashion this may under some conditions cause corruption of the database and/or the After Image Journal file.

When the RCS terminates the database is shut down and a message like the following is written to the monitor log:

```
6-DEC-2007 15:04:17.02 - Received Record Cache Server image termination from 22ED5144:1
- database name "device:[directory]database.R00;1" [device] (1200,487,0)
- abnormal Record Cache Server termination detected
- starting delete-process shutdown of database:
  - %DBM-F-RCSABORTED, record cache server process terminated abnormally
- sending process deletion to process 22ED10F9
- sending process deletion to process 22ECED59
- sending process deletion to process 22EC0158
- sending process deletion to process 22EB9543 (AIJ Log server)
- database shutdown waiting for active users to terminate
```

A future attempt to roll forward the AIJ following a restore of a database backup might fail with a bugcheck dump if this problem has happened.

The only currently known situation where this problem has been observed is if the logical name `DBM$BIND_RCS_VALIDATE_SECS` is defined to some value and the logical name `DBM$BIND_RCS_LOG_FILE` at the same time is undefined or defined incorrectly.

To prevent this problem, Oracle recommends any customer using the Row Cache feature either avoid defining the logical name `DBM$BIND_RCS_VALIDATE_SECS`, or if this logical name needs to be defined, makes sure that `DBM$BIND_RCS_LOG_FILE` is correctly defined (i.e. defined with the `/SYSTEM` and `/EXECUTIVE` qualifiers and pointing to a valid file name in an existing directory on a cluster accessible device with sufficient free space). This recommendation applies to all versions of Oracle Codasyl DBMS.

4.6 Slight Relaxation Of VMS\$MEM_RESIDENT_USER Requirement

Bug 5859487

Previously, the VMS\$MEM_RESIDENT_USER identifier was required to open a database that had any row cache configured for resident memory even if no caches were enabled for the database.

This restriction has been relaxed. If the database is not enabled for row caches, the VMS\$MEM_RESIDENT_USER identifier is not required even if caches are defined for resident memory.

4.7 Patch Required When Using VMS V8.3 and Dedicated CPU Lock Manager

During qualification testing of Oracle CODASYL DBMS Release 7.2.1 on OpenVMS V8` systems, a problem with the use of Extended Lock Value Blocks and the OpenVMS Dedicated CPU Lock Manager feature was discovered.

To avoid this problem, Oracle strongly recommends that customers wishing to use DBMS and the OpenVMS Dedicated CPU Lock Manager feature with OpenVMS V8.3 install one of the following architecture-specific patch kit (or subsequent replacement if superseded) prior to using Oracle CODASYL DBMS Release 7.2.1, or later, on OpenVMS V8.3 systems:

- VMS83I_SYS-V0200 (I64)
- VMS83A_SYS-V0100 (Alpha)

4.8 VMS\$MEM_RESIDENT_USER Rights Identifier Required

Oracle CODASYL DBMS release 7.1 introduced additional privilege enforcement for the database or row cache qualifiers MEMORY_MAPPING=SYSTEM and LARGE_MEMORY. If a database utilizes any of these features then the user account that opens the database must be granted the VMS\$MEM_RESIDENT_USER rights identifier. Also, any process attempting to change these attributes, to convert, or restore a database with these attributes enabled must also hold the right.

Oracle recommends that the DBO/OPEN command be used when utilizing these features.

4.9 Features Not Yet Available for OpenVMS I64

The following features or capabilities or components are not currently available to run or are known to not run reliably on OpenVMS I64 with this Oracle CODASYL DBMS release.

- Oracle CODASYL DBMS ADA precompiler
- PL/I compiler and Oracle CODASYL DBMS PL/I precompiler

4.10 Oracle CODASYL DBMS and IEEE Floating Point Support

Currently, Oracle CODASYL DBMS does not support floating point IEEE formats for either OpenVMS Alpha or OpenVMS I64. Because of the default float point behavior on OpenVMS IA64, if your Oracle CODASYL DBMS metadata contains floating point data items, you must compile your OpenVMS I64 applications with the `FLOAT=G_FLOAT` compiler switch.

Note

This restriction should not impact the storing or fetching float point items with the DBQ utility.

Oracle will look into lifting or easing this restriction for a future release.

For more information about IEEE floating point and OpenVMS I64, please refer to [Section 4.13](#) in this document.

4.11 Expect Additional Memory Consumption

Due to the increased sizes of image files (especially on Integrity servers) and more aggressive buffering and caching schemes and larger I/O size defaults, you should expect to allocate additional page file quota, working set sizes and buffered I/O byte limit quota when using Oracle CODASYL DBMS release 7.2. In particular, when running on Integrity servers, a page file quota of perhaps three times larger may be required for some applications.

4.12 ILINK-E-INVORINI Error on I64

When linking an application with multiple modules, the following error message may be returned:

```
%ILINK-E-INVORINI, incompatible multiple initializations for overlaid section
  section: DBM$UWA_B
  module: M1
  file: DKA0:[BLD]M1.OBJ;1
  module: M2
  file: DKA0:[BLD]SYS.OLB;1
```

On I64 systems, you cannot have a program section that attempts to be initialized a subsequent time where the non-zero portions of the initializations do not match. This is a difference from OpenVMS Alpha and VAX systems where the linker permitted such initializations.

This can be seen when linking multiple FORTRAN DML modules, where some modules use the default (non-stream) UWA, and another uses a "naked" invoke, which only contributes an abbreviated contribution to the DBM\$UWA_B psect.

For example, A.FOR contains:

```
PROGRAM AFOR
  INVOKE (SUBSCHEMA = FORTRAN_SUBSCHEMA,
1      SCHEMA = PARTS,
2      DATABASE = PARTS)
  CALL BSUB()
  END
```

B.FOR contains:

```
SUBROUTINE BSUB
  INVOKE
  RETURN
  END
```

On VAX or ALPHA, the above code will link and run correctly, However, on I64, the linker will generate the following:

```
%ILINK-E-INVORINI, incompatible multiple initializations for overlaid section
  section: DBM$UWA_B
  module: AFOR
  file: A.OBJ
  module: BSUB
  file: B.OBJ
```

4.13 Default Floating Point Format

The Itanium architecture has a 64-bit model and basic system functions similar to the Alpha chip. However, there are some implementation differences between the two platforms that might affect user-written applications.

One of the differences is the availability of hardware-supported floating-point formats. The Itanium architecture implements floating-point arithmetic in hardware using the IEEE floating-point formats, including IEEE single and IEEE double. The Alpha architecture supports both IEEE and VAX floating-point formats in hardware, and OpenVMS compilers generate code using the VAX formats by default, with options (on Alpha) to use IEEE formats. Irrespective of whether it was originally written for VAX or Alpha, an OpenVMS application that uses the default VAX floating-point formats needs to produce equivalent behavior on the Itanium architecture using IEEE formats at the lowest level.

- On OpenVMS VAX and OpenVMS Alpha, VAX float is the default. VAX format data is assumed and VAX floating instructions are used.
- On OpenVMS Alpha, you can specify the compiler option `/FLOAT=IEEE`. In this case, IEEE format data is assumed and IEEE floating instructions are used.
- On OpenVMS I64, IEEE float is the default. IEEE format data is assumed and IEEE floating instructions are used.
- On OpenVMS I64, you can specify the compiler option `/FLOAT=D_FLOAT` or `/FLOAT=G_FLOAT`.

When you compile an OpenVMS application that specifies an option to use VAX floating-point on the Itanium architecture, the compiler automatically generates code for converting floating-point formats. Whenever the application performs a sequence of arithmetic operations, this code does the following:

1. Converts VAX floating-point formats to either IEEE single or IEEE double floating-point formats.
2. Performs arithmetic operations in IEEE floating-point arithmetic.
3. Converts the resulting data from IEEE formats back to VAX formats.

Note that where no arithmetic operations are performed (VAX float fetches followed by stores), conversions will not occur. The code handles such situations as moves. VAX floating-point formats have the same number of bits and precision as their equivalent IEEE floating-point formats. For most applications, the conversion process will be transparent. In a few cases, arithmetic calculations might have different results because of the following differences between VAX and IEEE formats:

- Values of numbers represented
- Rounding rules
- Exception behavior

For more information, Oracle recommends reviewing the white paper "OpenVMS floating-point arithmetic on the Intel Itanium architecture" available from HP.

4.14 SYSTEM-F-INSFMEM Fatal Error With SHARED SYSTEM MEMORY or LARGE MEMORY Enabled in Galaxy Environment

When GALAXY support is enabled in an OpenVMS Galaxy environment, a *%SYSTEM-F-INSFMEM, insufficient dynamic memory error* message may be returned when mapping row caches or opening the database. One source of this problem specific to a Galaxy configuration is running out of Galaxy Shared Memory regions. For Galaxy systems, GLX_SHM_REG is the number of shared memory region structures configured into the Galaxy Management Database (GMDB).

While the default value of 64 regions (for OpenVMS versions through at least V7.3-1) might be adequate for some installations, sites using a larger number of databases or row caches when the SHARED MEMORY IS SYSTEM or LARGE MEMORY IS ENABLED features are enabled may find the default insufficient.

If a *%SYSTEM-F-INSFMEM, insufficient dynamic memory* error is returned when mapping record caches or opening databases, Oracle Corporation recommends that you increase the GLX_SHM_REG parameter by two times the sum of the number of row caches and number of databases that might be accessed in the Galaxy at one time. As the Galaxy shared memory region structures are not very large, setting this parameter to a higher than required value does not consume a significant amount of physical memory. It also may avoid a later reboot of the Galaxy environment. This parameter must be set on all nodes in the Galaxy.

Galaxy Reboot Required

Changing the GLX_SHM_REG system parameter requires that the OpenVMS Galaxy environment be booted from scratch. That is, all nodes in the Galaxy must be shut down and then the Galaxy reformed by starting each instance.

To enable Galaxy support, issue the command:

```
$ DBO/SET GALAXY/ENABLED <db>
```

To enable SYSTEM SHARED MEMORY, issue to command;

```
$ DBO/MODIFY/MEMORY_MAPPING=SYSTEM <db>
```

To enable LARGE MEMORY for record cache, issue the command:

```
$ DBO/CACHE/MODIFY/LARGE_MEMORY <db> <cache>
```

4.15 Oracle CODASYL DBMS and OpenVMS ODS-5 Volumes

The OpenVMS Version 7.2 release introduced an Extended File Specifications feature, which consists of two major components:

- A new, optional, volume structure, ODS-5, which provides support for file names that are longer and have a greater range of legal characters than in previous versions of OpenVMS.
- Support for "deep" directory trees.

ODS-5 was introduced primarily to provide enhanced file sharing capabilities for users of Advanced Server for OpenVMS 7.2 (formerly known as PATHWORKS for OpenVMS), as well as DCOM and JAVA applications.

In some cases, Oracle CODASYL DBMS performs its own file and directory name parsing and explicitly requires ODS-2 (the traditional OpenVMS volume structure) file and directory name conventions to be followed. Because of this knowledge, Oracle does not support any Oracle CODASYL DBMS database file components (including root files, storage area files, after-image journal files, record cache backing store files, database backup files, after-image journal backup files, and so forth) that utilize any non-ODS-2 file naming features. For this reason, Oracle recommends that Oracle CODASYL DBMS database components not be located on ODS-5 volumes.

Oracle CODASYL DBMS does support database file components on ODS-5 volumes provided that all of these files and directories strictly follow the ODS-2 file and directory name conventions. In particular, all file names must be specified entirely in uppercase and special characters in file or directory names are forbidden.

4.16 Carryover Locks and NOWAIT Transaction Clarification

In NOWAIT transactions, the BLAST (Blocking AST) mechanism cannot be used. For the blocking user to receive the BLAST signal, the requesting user must request the locked resource with WAIT (which a NOWAIT transaction does not do).

Oracle CODASYL DBMS defines a resource called NOWAIT, which is used to indicate that a NOWAIT transaction has been started. When a NOWAIT transaction starts, the user requests the NOWAIT resource. All other database users hold a lock on the NOWAIT resource so that when the NOWAIT transaction starts, all other users are notified with a NOWAIT BLAST.

The BLAST causes blocking users to release any carryover locks. There can be a delay before the transactions with carryover locks detect the presence of the NOWAIT transaction and release their carryover locks. You can detect this condition by examining the stall messages. If the "Waiting for NOWAIT signal (CW)" stall message appears frequently, the application is probably experiencing a decrease in performance, and you should consider disabling the carryover lock behavior.

4.17 Both Application and Oracle CODASYL DBMS Using SYS\$HIBER

In application processes that use Oracle CODASYL DBMS and the \$HIBER system service (possibly by RTL routines such as LIB\$WAIT), it is important that the application ensures that the event being waited for has actually occurred. Oracle CODASYL DBMS uses \$HIBER/\$WAKE sequences for interprocess communications particularly when the ALS (AIJ log server) feature is enabled.

The Oracle CODASYL DBMS use of the \$WAKE system service can interfere with other users of \$HIBER (such as the routine LIB\$WAIT) that do not check for event completion, possibly causing a \$HIBER to be unexpectedly resumed without waiting at all.

To avoid these situations, consider altering the application to use a code sequence that avoids continuing without a check for the operation (such as a delay or a timer firing) being complete.

The following pseudo-code shows one example of how a flag can be used to indicate that a timed-wait has completed correctly. The wait does not complete until the timer has actually fired and set TIMER_FLAG to TRUE. This code relies on ASTs being enabled.

```
ROUTINE TIMER_WAIT:
BEGIN
! Clear the timer flag
TIMER_FLAG = FALSE

! Schedule an AST for sometime in the future
STAT = SYS$SETIMR (TIMADR = DELTATIME, ASTRTN = TIMER_AST)
IF STAT <> SS$_NORMAL
THEN BEGIN
LIB$SIGNAL (STAT)
END

! Hibernate. When the $HIBER completes, check to make
! sure that TIMER_FLAG is set indicating that the wait
! has finished.
WHILE TIMER_FLAG = FALSE
DO BEGIN
SYS$HIBER()
END
END

ROUTINE TIMER_AST:
BEGIN
! Set the flag indicating that the timer has expired
TIMER_FLAG = TRUE

! Wake the main-line code
STAT = SYS$WAKE ( )
IF STAT <> SS$_NORMAL
THEN BEGIN
LIB$SIGNAL (STAT)
END
END
```

In OpenVMS V7.2, the LIB\$WAIT routine has been enhanced through the FLAGS argument (with the LIB\$_NOWAKE flag set) to allow an alternate wait scheme (using the \$\$SYNCH system service) that can

avoid potential problems with multiple code sequences using the \$HIBER system service.

4.18 Row Cache Not Allowed While Hot Standby Replication is Active

The row cache feature may not be enabled on a Hot Standby database while replication is active. The Hot Standby feature will not start if row cache is enabled.

A new command qualifier, `/CACHE=NOENABLED`, has been added to the `DBO/OPEN` command. To open the Hot Standby database prior to starting replication, use the `/CACHE=NOENABLED` qualifier on the `DBO/OPEN` command.

4.19 Exclusive Access Transactions May Deadlock with RCS Process

If a record is frequently accessed by long running transactions that request read/write access, reserving the record for exclusive update, and if the record has one or more indexes, you may experience deadlocks between the user process and the row cache server (RCS) process.

There are at least three suggested workarounds to this problem:

1. Reserve the record for CONCURRENT UPDATE.
 2. Close the database and disable row cache for the duration of the exclusive transaction
 3. Change the checkpoint interval for the RCS process to a time longer than the time required to complete the batch job and then trigger a checkpoint just before the batch job starts. Set the interval back to a smaller interval after the checkpoint completes.
-

Chapter 5

New Features and Corrections in Previous Releases

5.1 New Features for Release 7.2.4.0

This section contains new features and technical changes for Oracle CODASYL DBMS release 7.2.4.0.

5.1.1 DBO /SHOW VERSION Displays System Architecture and Version

The DBO /SHOW VERSION command has been enhanced to include information about the system architecture and OpenVMS version as shown in the following example:

```
$ DBO /SHOW VERSION
Executing DBO for Oracle CODASYL DBMS V7.2-40 on OpenVMS IA64 V8.3-1H1
$
```

5.1.2 DBO /SHOW STATISTICS "Checkpoint Statistics" new counters

Previously, on the "Checkpoint Statistics" screen of the "DBO /SHOW STATISTICS" utility, two of the possible checkpoint conditions were not being captured for display. The new conditions displayed are:

- "clear" indicates that a process's checkpoint information is to be cleared in the root file
- "initial" indicates that a process has performed its initial checkpoint to establish a checkpoint starting location

Aggregate Total

Because some of the checkpoint conditions can occur in combination, the sum total of all of the possible checkpoint types may exceed the aggregate total "checkpoints" value displayed.

5.1.3 Performance Enhancements With Internal Lock Data Structures

In order to help performance for certain classes of applications that lock a large number of records within a transaction, several optimizations have been implemented:

- An internal hash table, used to access a list of record locks owned by a database user, has been increased in size to help speed access to entries within the table
- An internal data structure, used in conjunction with the hash table, is now allocated in larger segments to reduce the number of memory allocations

5.1.4

DBO/DUMP/BACKUP/MULTITHREAD/OPTIONS=ROOT/HEADER displays the header information only

A new feature has been added to the DBO/DUMP/BACKUP/MULTITHREAD/OPTIONS=ROOT command to process only the header information when /HEADER_ONLY qualifier is used.

In prior releases of Oracle CODASYL DBMS, the user had to wait until the entire backup file (.DBF) was processed. If the backup file was stored on tape and spanned multiple tapes then all the tapes had to be mounted and processed. When using /HEADER_ONLY, DBO now ceases processing of the backup file once the header has been displayed.

```
$ DBO/DUMP/BACKUP/OPTIONS=ROOT/HEADER PARTS.DBF
*-----
* Oracle CODASYL DBMS V7.2-40                               14-APR-2009 11:20:27.04
*
* Dump of Database Backup Header
*   Backup filename: PARTS.DBF
*   Backup file database version: 7.2
*
*-----
```

Database Parameters:

```
Root filename is "PARTS$DIR:PARTS.R00;1"
Created at 5-NOV-1987 09:34:21.63
Oracle CODASYL DBMS structure level is 72.1
Maximum user count is 10
Maximum node count is 16
Database open mode is AUTOMATIC
Database close mode is AUTOMATIC
Database will be mapped in process space
Prestarted transactions are enabled
Snapshot mode is NON-DEFERRED
Statistics are enabled
Operator notification is disabled
Row Caches...
- Active row cache count is 0
- Reserved row cache count is 1
- Checkpoint information
  No time interval is specified
  Default source is updated rows
  Default backing file directory is database directory
  RUJ Global Buffers are enabled
- WARNING: Maximum node count is 16 instead of 1
- WARNING: Fast commit is disabled
Buffers...
- Default user buffer count is 10
- Default recovery buffer count is 10
- Global buffers are disabled
  Global buffer count is 50
  Maximum global buffer count per user is 5
  Large memory is disabled
- Buffer size is 10 blocks
  Maximum pages per buffer is 5
- Asynchronous pre-fetch is enabled
  Maximum pre-fetch depth is 8 buffers
- Detected asynchronous pre-fetch is enabled
  Maximum pre-fetch depth is 4 buffers
```

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```
    Pre-fetch threshold is 4 buffers
- Asynchronous batch-write is enabled
    Clean buffer count is 5
    Maximum batch size is 10 buffers
- Optimized page transfer is disabled
Locking...
- Adjustable record locking is enabled
    Fanout factor 1 is 10 (10 pages)
    Fanout factor 2 is 10 (100 pages)
    Fanout factor 3 is 10 (1000 pages)
- Carry-over lock optimization is enabled
- Lock tree partitioning is disabled
RUJ Journaling...
- No default recovery-unit journal directory
AIJ Journaling...
- After-image journaling is enabled
- Database is configured for 1 journal
- Reserved journal count is 1
- Available journal count is 1
- LogMiner is disabled
- Journal is automatically extended when full
- Exclusive database access required to reserve additional journals
- Journal "DBM$JOURNAL" is current
- All journals are accessible
- Shutdown time is 60 minutes
    Shutdown is immediate because only 1 journal is active
- Backup operation is manual
- Default backup filename edits are not used
- Log server startup is MANUAL
- Journal overwrite is disabled
- AIJ cache on "electronic disk" is disabled
- Default journal allocation is 512 blocks
- Default journal extension is 512 blocks
- Default journal initialization is 512 blocks
- Current roll-forward sequence number is 1
- Current backup sequence number is 1
- Database backup AIJ sequence number is 1
- Next journal to be backed up is "DBM$JOURNAL"
    Backup sequence number is 1
- AIJ Journal "DBM$JOURNAL"
    Filename is "PARTS$DIR:PARTS.AIJ;1"
    Default AIJ filename is "SYS$DISK:[]PARTS.AIJ"
    Journal is current
    Journal was activated 13-AUG-1997 17:54:49.06
    Backup sequence number is 1
    Journal has been modified with transaction data
    Allocation is defaulted to 512 blocks
    Extension is defaulted to 512 blocks
    Initialization is defaulted to 512 blocks
    Journal has never been backed up
    Last Commit TSN is 0:1
Fast Commit...
- Fast commit is disabled
- No checkpointing AIJ interval is specified
- No checkpointing time interval is specified
- No checkpointing transaction interval is specified
- Commit to AIJ optimization is disabled
- Transaction interval is 256
Hot Standby...
- WARNING: Fast commit is disabled
- WARNING: Log server startup is MANUAL
- Informational: Operator notification is disabled
```

- Database is not currently being replicated
- Security Auditing...
 - Security auditing is disabled
 - Security alarm is disabled
 - No audit journal filename is specified
 - No alarm name is specified
 - Synchronous audit record flushing is disabled
 - Audit every access
- Database Backup...
 - Fast incremental backup is enabled
 - Full database backup has not yet been performed
 - Full database restore has not yet been performed
- Derived Data...
 - Global section size
 - With global buffers disabled is 982246 bytes (1MB)
 - With global buffers enabled is 1259199 bytes (2MB)
 - With Large memory global buffers enabled...
 - Database TROOT section is 1003199 bytes (1MB)
 - Large memory global buffers section is 256000 bytes (1MB)
 - Row Cache RUJ buffers section size is 2626560 bytes (3MB)

5.1.5 AIJ Extend Additional Information In Operator Notification New Feature

Bug 8286207

In order to help understand the impact of AIJ extension operations on the system, a new optional feature can be used to display additional OPCOM messages and perform validation (read checking of initialized data) during AIJ extend operations.

If the logical name DBM\$BIND_AIJ_EXTEND_ADDITIONAL_INFO is defined to a value of "1" (Oracle recommends that this logical be defined system-wide if you intend to take advantage of this feature), and if the database is configured to send operator notifications, additional OPCOM messages will be generated during an AIJ extend operation. This optional feature also includes a validation of the initialization pattern written to the AIJ file. If an invalid pattern is detected, the process performing the extension will bugcheck.

The following example shows the format of the additional messages that indicate the old and new physical EOF locations, the number of blocks of the AIJ file being initialized, the number of IO operations required for the initialization and the ID of the process performing the extension and initialization.

```

%%%%%%%%%% OPCOM 25-MAR-2009 02:31:45.95 %%%%%%%%%%%
Message from user SUPERDOME on BRDBRY
Oracle CODASYL V7.2-40 Event Notification for Database
$1$DGA301:[SUPERDOME.V72]FOO.ROO;3
  
```

```

AIJ journal 512 block extension in progress (new size is 95552 blocks)
  
```

```

%%%%%%%%%% OPCOM 25-MAR-2009 02:31:45.95 %%%%%%%%%%%
Message from user SUPERDOME on BRDBRY
Oracle CODASYL DBMS V7.2-40 Event Notification for Database
$1$DGA301:[SUPERDOME.V72]FOO.ROO;3
  
```

```

AIJ new PEOF = 95616, old PEOF = 95040, init count = 576, PID = 0000049E
  
```

```

%%%%%%%%%% OPCOM 25-MAR-2009 02:31:45.95 %%%%%%%%%%%
  
```

```
Message from user SUPERDOME on BRDBRY  
Oracle CODASYL DBMS V7.2-40 Event Notification for Database  
$1$DGA301:[SUPERDOME.V72]FOO.R00;3
```

```
AIJ initialize IO count = 3, validating VBN 95041 to 95616, PID = 0000049E
```

5.1.6 Hot Standby LRS Database Prefetch Count Limit

Previously, the LRS process would set its APF (asynchronous prefetch) depth to half of its buffer count. For large numbers of buffers, this depth could result in a significant number of outstanding database prefetch IO requests. In some cases, this could result in possible quota exhaustion or storage controller saturation.

This problem has been addressed by providing addition control of the LRS process APF depth along with a lower default limit.

The logical name (must be defined system-wide prior to the startup of an LRS process) `DBM$BIND_LRS_MAX_APF_DEPTH` can be used to limit the maximum number of default LRS APF IO depth. If not specified, the default value is 500 and the minimum value is 2 and the maximum value is 524288. If the database specifies a higher APF depth value, that value will be utilized.

5.2 Corrections in Release 7.2.4.0

This section describes software errors corrected in Oracle CODASYL DBMS release 7.2.4.0.

5.2.1 Bugcheck With SYSTEM-F-ROPRAND in KODTXN\$POST_TSNBLK_UPDATE

Bug 7193991, 8796832

It is possible for a process to bugcheck due to a corrupt internal queue header with a reserved operand fault in the routine KODTXN\$POST_TSNBLK_UPDATE. Correcting the memory corruption requires closing and re-opening the database. This problem will generally present with an bugcheck exception "footprint" similar to the following:

```
**** Exception at 0000000815C89D2 : DBMSHR72\KODTXN$POST_TSNBLK_UPDATE
+ 000000D2
%SYSTEM-F-ROPRAND, reserved operand fault at PC=0000000815C89D2, PS=00000009
Saved PC = 0000000815C3EF0 : DBMSHR72\KOD$START + 00000D40
```

Analysis of the bugcheck dump file will often indicate that at least one of the "TUPB_RELQHD" queue headers will contain an entry containing "00000000:00000001" as in the following example where entry 13 has been corrupted:

```
TUPB_RELQHD_VEC[1.] @04910A00 = 00000000:00000000 (04910A00:04910A00)
TUPB_RELQHD_VEC[2.] @04910A08 = 00000000:00000000 (04910A08:04910A08)
TUPB_RELQHD_VEC[3.] @04910A10 = 00000000:00000000 (04910A10:04910A10)
TUPB_RELQHD_VEC[4.] @04910A18 = 00000000:00000000 (04910A18:04910A18)
TUPB_RELQHD_VEC[5.] @04910A20 = 00000000:00000000 (04910A20:04910A20)
TUPB_RELQHD_VEC[6.] @04910A28 = 00000000:00000000 (04910A28:04910A28)
TUPB_RELQHD_VEC[7.] @04910A30 = 00000000:00000000 (04910A30:04910A30)
TUPB_RELQHD_VEC[8.] @04910A38 = 00000000:00000000 (04910A38:04910A38)
TUPB_RELQHD_VEC[9.] @04910A40 = 00000000:00000000 (04910A40:04910A40)
TUPB_RELQHD_VEC[10.] @04910A48 = 00000000:00000000 (04910A48:04910A48)
TUPB_RELQHD_VEC[11.] @04910A50 = 00000000:00000000 (04910A50:04910A50)
TUPB_RELQHD_VEC[12.] @04910A58 = 00000000:00000000 (04910A58:04910A58)
TUPB_RELQHD_VEC[13.] @04910A60 = 00000000:00000001 (04910A60:04910A61)
```

The cause of the problem was related to an incorrect synchronization between processes manipulating a relative memory queue within the database global section. This (or related) problem may impact all DBMS databases that perform transactions by more than one database user.

The possibility of corruption increases with higher transaction rates and when there are more database users performing transactions. Generally, databases configured for less than 168 users will not see this problem and databases with fewer than 168 simultaneous will not see this problem.

This problem has been corrected. The shared memory access to "TUPB_RELQHD" queue headers is now correctly synchronized. Oracle recommends that all DBMS installations upgrade to at least Oracle CODASYL DBMS Release 7.2.4.0 to implement the correction to this problem.

5.2.2 Incorrect Messages From DBO /MONITOR START When DBM\$MON_USERNAME Specifies Non-existent Account

Bug 8420114

In prior releases, when the logical name DBM\$MON_USERNAME is defined to specify a non-existent username, the DBO /MONITOR START command would return incorrect or misleading messages. The following example shows such output:

```
$ DBO /MONITOR START
%DBO-F-CANTCREMON, unable to start database monitor process
%F
%?-RESULTOVF
%F-CTRLERR
%I-POWERFAIL
-PLI
%NOMSG, Message number 0053474E
%BADPARAM
%NORMAL
Message number 00081C48
-INPSMB
-JBC, normal successful completion
-TRACE, Message number 0009A930
%F-NOMSG, Message number 4F525024
```

As a workaround, either do not define DBM\$MON_USERNAME or make sure that it specifies a valid username.

This problem has been corrected. If you specify an invalid value for DBM\$MON_USERNAME, you will get a correctly formatted error message:

```
$ DBO/MON START
%DBO-F-CANTCREMON, unable to start database monitor process
-DBO-F-NOSUCHUSER, unknown user "PAUL"
```

5.2.3 Incorrect LOCK_TIMEOUT value with DBO/BACKUP/MULTI/ONLINE/LOCK_TIMEOUT

In prior releases of Oracle CODASYL DBMS if both DBO/BACKUP/AFTER_IMAGE and DBO/BACKUP/MULTITHREAD specify LOCK_TIMEOUT then it appears that subsequent timeouts are increased. For example, if /LOCK_TIMEOUT=60 is specified on an after image backup it stalls for approximately this time. If the database backup also has a 60 wait time then this appears to double and it waits for 2 minutes.

This problem has now been corrected.

5.2.4 VMS\$BUFFER_OBJECT_USER Not Always Checked

Bug 8464087

In some cases, the OpenVMS rights identifier VMS\$BUFFER_OBJECT_USER was not being required for database buffer object use. This could allow users to utilize the buffer objects feature even though they did not have the identifier granted.

This problem has been corrected. Users attempting to utilize buffer object features now must always have the VMS\$BUFFER_OBJECT_USER rights identifier granted.

It is possible that applications that worked previously when using the buffer objects feature with processes that did not have the VMS\$BUFFER_OBJECT_USER rights identifier granted may now correctly fail with messages similar to the following:

```
-DBM-F-SYS_REQUEST, error from system services request
-DBM-F-CANTCREBOB, error creating Buffer Object
-SYSTEM-E-NOBUFOBJID, requires rights identifier VMS$BUFFER_OBJECT_USER
```

These messages indicate that the process must be granted the VMS\$BUFFER_OBJECT_USER rights identifier before attempting to use the buffer objects feature. In many cases, granting the identifier to the user account and then logging in again will resolve the issue.

5.2.5 Potential INVEXCEPTN System Crash Using LARGE MEMORY IS ENABLED or MEMORY MAPPING IS SYSTEM on Itanium

Bug 8541571

When closing a database when using the MEMORY MAPPING IS SYSTEM or LARGE MEMORY IS ENABLED feature on some Itanium systems, it was possible for Oracle CODASYL DBMS to cause an OpenVMS system crash with a bugcheck type of "INVEXCEPTN, Exception while above ASTDEL". The INVEXCEPTN can be triggered by an invalid access to the OpenVMS PTE database.

The following OpenVMS crash "footprint" is a result of this problem:

```
Bugcheck Type:      INVEXCEPTN, Exception while above ASTDEL
Node:              RDBI64      (Cluster)
CPU Type:         HP rx8640   (1.60GHz/12.0MB)
VMS Version:      V8.3-1H1
Current Process:   DBMS_MONITOR72
Current Image:     $1$DGA4000:[SYS2.SYSCOMMON.][SYSEXEC]DBMMON72.EXE;3
Failing PC:       00000000.0057DDD0      DEALLOC_PHY_BUFFER_C+001C0
Failing PS:       00000000.00000803
Module:           DBMPRV72
Offset:           000A7DD0
```

This problem only effects those Itanium systems with physical memory accessible to the system of PFNs greater than 268,435,455 (Hex 0FFFFFFF). The SDA command CLUE CONFIG can be used to display the system memory configuration.

The workaround to this problem, for such systems with PFNs greater than 268,435,455, is to discontinue use of the LARGE MEMORY IS ENABLED and MEMORY MAPPING IS SYSTEM features, if enabled, by using one, or both, of the following commands:

- DBO/MODIFY ../GLOBAL_BUFFERS=(NOLARGE_MEMORY)
- DBO/MODIFY ../MEMORY_MAPPING=(PROCESS,RESIDENT)

This problem has been corrected. The DBMS VLM feature correctly processes 64-bit PFN values when closing databases using MEMORY MAPPING IS SYSTEM or LARGE MEMORY IS ENABLED feature on some Itanium systems.

5.2.6 Incremental Backup With Row Cache

Bug 8363084

Previously, it was possible for incremental database backups to not correctly save all modified database records since the last full backup when the row cache feature was in use. When modified rows were copied from cache back to the database, the "MAX_SNAP_TSN" field on the database page was not correctly maintained. This field is used by the incremental database backup feature as an indication of when rows on the page may have been modified and if it is out of date, the incremental backup may not consider the page content as a candidate to be saved.

As a possible workaround for this problem, perform full database backups rather than incremental database backups when using the row cache feature.

This problem has been corrected. The "MAX_SNAP_TSN" field on the database page is now maintained correctly when modified rows are copied from cache back to the database. c

5.2.7 Use of external Media Manager or Tape Librarian causes a hang or an ACCVIO

It is possible for a DBO multithreaded BACKUP or RESTORE command to fail with an ACCVIO or hang, especially when using a media manager or tape librarian. This problem could occur if the per thread stack became exhausted, causing a stack overflow or underflow.

To help detect this problem, a no-access virtual memory page has been added to either side of a per thread stack. This will cause an ACCVIO if a thread tries to use stack space beyond the stack limits.

If such a problem is detected, you can add extra stack space by defining the DBM\$BIND_LIBRARIAN_ADDITIONAL_STACK logical. For example:

```
$ DEFINE DBM$BIND_LIBRARIAN_ADDITIONAL_STACK 10240
```

will add another 10KB stack space per DBO thread.

This logical can be used on DBO/MULTITHREAD /BACKUP and /RESTORE commands even if no media manager or tape librarian is being used.

5.2.8 DBO/BACKUP/MULTITHREAD sometimes dismounts the last volume in a multi-tape drive case

When running a DBO multithreaded backup using multiple tape drives, the last volume was sometimes erroneously dismounted.

In a multi-tape drive case, all volumes except the last one are considered continuation volumes and cannot be appended to. Hence these volumes can be dismounted at the end of the backup. However, the last volume can still be appended to and therefore should not be dismounted.

The problem was caused by a false setting of a last volume flag. This has now been corrected with this version.

5.2.9 DBO-W-AIJBCKFAIL – DBO/RECOVER reports incomplete AIJ backup

When attempting to recover an after-image journal file, backed up with the /FORMAT=NEW_TAPE qualifier, you may encounter the following warning at the end of the recovery:

```
$ DBO /RECOVER /NOLOG PARTS.AIJBCK /FORMAT=NEW_TAPE
...
%DBO-W-AIJBCKFAIL, the AIJ backup that created the AIJ file did not complete
%DBO-I-AIJALLDONE, after-image journal roll-forward operations completed
%DBO-I-AIJFNLSEQ, to start another AIJ file recovery, the sequence number needed will be 0
```

This can happen when the DBO/BACKUP/AFTER_JOURNAL command would exactly fill an internal buffer when saving the last AIJ record. A block counter was not correctly incremented and the final AIJ_END record was tagged with a duplicate block number. The problem remains undetected during the save operation. All AIJ records are restored during a recover operations – only the reported next sequence number is incorrect which may prevent a further recovery operation.

This has been corrected.

5.2.10 Potential System Crash Using LARGE MEMORY IS ENABLED or MEMORY MAPPING IS SYSTEM on Itanium

When using the MEMORY MAPPING IS SYSTEM or LARGE MEMORY IS ENABLED feature on some Itanium systems, it was possible for Oracle CODASYL DBMS to cause an OpenVMS system crash with a bugcheck type of "MACHINECHK, Machine check while in kernel mode". The MACHINECHK can be triggered by an invalid PFN (page frame number) value being loaded into a PTE (page table entry).

This problem only effects those Itanium systems with physical memory accessible to the system of PFNs greater than 268,435,455 (Hex 0FFFFFFF). The SDA command CLUE CONFIG can be used to display the system memory configuration.

The workaround to this problem, for such systems with PFNs greater than 268,435,455, is to discontinue use of the LARGE MEMORY IS ENABLED and MEMORY MAPPING IS SYSTEM features, if enabled, by using one, or both, of the following commands:

- DBO/MODIFY/GLOBAL BUFFERS=(NOLARGE_MEMORY)
- DBO/MODIFY/MEMORY_MAPPING=(PROCESS,RESIDENT)

This problem has been corrected. The DBMS VLM feature now correctly processes 40-bit PFN values.

5.2.11 Default Behavior Change, New Syntax for DBO/RECOVER/CONFIRM

The default behavior for confirming DBO/RECOVER operations that require users intervention has been changed. Typically, intervention is required if a missing or out-of-sequence after-image journal (AIJ) file is encountered. The default could be changed by specifying the /NOCONFIRM on the command line, in which case, processing would continue.

The old behavior for batch mode operations was /NOCONFIRM and an exception would be raised if you attempt to specify /CONFIRM. This assumed that the user did not want to terminate the recovery and would continue applying journals, even if a missing AIJ sequence was detected. Skipping the recovery of a AIJ file could result in loss of data or invalid indexes. It was possible that these errors could go undetected until a full verify operation was performed.

Starting with this release, the default qualifiers for interactive recoveries continues to be /CONFIRM, which prompts the user to see if he wants to continue, and /NOCONFIRM for batch mode. However, the behavior of the /NOCONFIRM qualifier has changed. Now, DBO/RECOVER/NOCONFIRM, in either interactive or batch mode, will cause the recovery to terminate at the point where an out of sequence AIJ file is detected.

Two new keywords have been added to /CONFIRM to provide compatibility with the previous behavior.

```
/CONFIRM=CONTINUE
```

Do not prompt the user; if a sequence gap is detected on the next AIJ file to be rolled forward, ignore the missing AIJ file and continue rolling forward.

```
/CONFIRM=ABORT
```

Do not prompt the user; if a sequence gap is detected on the next AIJ roll forward, terminate the recovery at this point.

Effectively, /NOCONFIRM has the same meaning as /CONFIRM=ABORT.

The following example shows the new "/CONFIRM=CONTINUE" syntax used to allow DBO/RECOVER to continue rolling forward if a sequence gap is detected:

```
DBO/RECOVER/CONFIRM=CONTINUE/LOG/ROOT=USER$TEST:FOO FAIJBCK1,FAIJBCK2,FAIJBCK4
%DBO-I-LOGRECDDB, recovering database file DEVICE:[DIRECTORY]FOO.ROO;1
...
%DBO-I-LOGOPNAIJ, opened journal file DEVICE:[DIRECTORY]FAIJBCK4.AIJ;1
  at 25-FEB-2009 17:26:04.00
%DBO-W-AIJSEQAFT, incorrect AIJ file sequence 8 when 7 was expected
%DBO-I-AIJONEDONE, AIJ file sequence 8 roll-forward operations completed
%DBO-I-LOGRECOVR, 1 transaction committed
%DBO-I-LOGRECOVR, 0 transactions rolled back
%DBO-I-LOGRECOVR, 0 transactions ignored
%DBO-I-AIJNOACTIVE, there are no active transactions
%DBO-I-AIJSUCCESS, database recovery completed successfully
```

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```
%DBO-I-AIJNXTSEQ, to continue this AIJ file recovery, the sequence number
needed will be 9
%DBO-I-AIJALLDONE, after-image journal roll-forward operations completed
%DBO-I-LOGSUMMARY, total 3 transactions committed
%DBO-I-LOGSUMMARY, total 0 transactions rolled back
%DBO-I-LOGSUMMARY, total 0 transactions ignored
%DBO-I-AIJSUCCES, database recovery completed successfully
%DBO-I-AIJFNLSEQ, to start another AIJ file recovery, the sequence number
needed will be 9
%DBO-I-AIJNOENABLED, after-image journaling has not yet been enabled
```

The following example shows the new `"/CONFIRM=ABORT"` syntax used so that `DBO/RECOVER` will not continue rolling forward if a sequence gap is detected.

```
DBO/RECOVER/CONFIRM=ABORT/LOG/ROOT=USER$TEST:FOO FAIJBCK1,FAIJBCK2,FAIJBCK4
%DBO-I-LOGRECDB, recovering database file DEVICE:[DIRECTORY]FOO.R00;1
...
%DBO-I-LOGOPNAIJ, opened journal file DEVICE:[DIRECTORY]FAIJBCK4.AIJ;1
at 25-FEB-2009 17:27:42.29
%DBO-W-AIJSEQAFT, incorrect AIJ file sequence 8 when 7 was expected
%DBO-E-AIJRECESQ, AIJ roll-forward operations terminated due to sequence error
%DBO-I-AIJALLDONE, after-image journal roll-forward operations completed
%DBO-I-LOGSUMMARY, total 2 transactions committed
%DBO-I-LOGSUMMARY, total 0 transactions rolled back
%DBO-I-LOGSUMMARY, total 0 transactions ignored
%DBO-I-AIJFNLSEQ, to start another AIJ file recovery, the sequence number
needed will be 7
%DBO-I-AIJNOENABLED, after-image journaling has not yet been enabled
```

5.2.12 Can't Disable After-Image Journaling when Fast-Commit is Enabled

BUG 8286207

In certain circumstances, attempts to disable after-image journaling (AIJ) in Oracle CODASYL DBMS would fail with the following error message when the Fast-Commit feature was enabled:

```
$ DBO/MODIFY/JOURNAL_OPTIONS=(NOENABLE) PARTS
%DBO-F-MUSTRECDB, database must be closed or recovered
```

When Fast-Commit is enabled, certain checks must be executed to ensure that committed transactions are synchronized between the database and AIJ file before journaling could be disabled.

If the database was closed cleanly (no users remaining), then after-image journaling can be disabled. However, if the database was closed abnormally while users were still attached, a check is made to see determine if any of those users had an active checkpoint. If so, journaling could not be disabled.

It was recently discovered that this second level check was not being performed correctly and would report that an abnormally-terminated user had an active checkpoint when they, in fact, did not.

This problem has now been fixed.

5.2.13 DBO/SHOW STATISTICS Row Cache Overview Invalid Percentage

BUG 8366854

The DBO/SHOW STATISTICS "Row Cache Overview" was not correctly processing all quadword statistics values. This could lead to integer truncation which would lead to invalid results when calculating percentages prior to display.

This problem has been corrected.

5.2.14 Application hangs using ABS

Using automatic AIJ backups (ABS) the application could hang while waiting for the next AIJ to become available. A dump of the database shows inaccessible AIJ files.

```
$ DBO/DUMP db
...
- 1 journal is inaccessible
  AIJ backup not possible
...
  File is inaccessible
    journal has been made inaccessible by system
    journal is not empty
...
```

The database dump may also show other symptoms of failed or stalled AIJ backups.

This issue has been fixed in this release.

5.2.15 Failed DBO /MOVE or /COPY deletes wrong files

A failed DBO /MOVE or /COPY operation could delete the wrong version of a created database file at the target location. This can happen, for example, if during the operation a target device becomes full.

For this to happen, there have to be other files in the target location with the exact same filenames as the current database.

This was caused in the cleanup code after a failure using no file version number to find the correct file for deletion.

This issue has been fixed in this release.

5.2.16 Memory Leak On Systems With RAD Support Enabled

Bug 8410893

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When running on an Alpha system with RAD support enabled, a memory leak was possible during database unbind/bind sequences. The size of the leak would be related to the size of the per-RAD database statistics global section.

As a possible workaround, the system parameter RAD_SUPPORT can be set to zero.

This problem has been corrected.

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