

Oracle® CODASYL DBMS for OpenVMS

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Oracle® CODASYL DBMS for OpenVMS

Release Notes

Release 7.2.5.0 for OpenVMS Alpha and
HP OpenVMS Industry Standard 64 for Integrity Servers

JUNE 2011

Oracle CODASYL DBMS Release Notes, Release 7.2.5.0 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 7.2.5.0. 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 7.2.5.0.

Document Structure

This manual consists of the following chapters:

<u>Chapter 1</u>	Describes how to install Oracle CODASYL DBMS release 7.2.5.0.
<u>Chapter 2</u>	Describes new and changed features in Oracle CODASYL DBMS release 7.2.5.0.
<u>Chapter 3</u>	Describes problems fixed in Oracle CODASYL DBMS release 7.2.5.0.

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 7.2.5.0 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 7.2.5.0 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 7.2.5.0 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 7.2.5.0 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 7.2.5.0 then convert the V7.1 database to 7.2.5.0.

If you attempt to convert or restore a database version prior V7.0 directly to 7.2.5.0, Oracle DBO generates an error.

1.3 Requirements

This version of Oracle CODASYL DBMS supports OpenVMS Alpha 8.4-x and OpenVMS I64 8.4-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 8.2-1 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>:DBM07250A072.A/SAVE/SEL=DBM072_INSTALL_GDE.PS
$ BACKUP <device>:DBM07250A072.A/SAVE/SEL=DBM072_INSTALL_GDE.TXT
```

For OpenVMS I64:

```
$ BACKUP <device>:DBM07250I072.A/SAVE/SEL=DBM072_INSTALL_GDE.PS
$ BACKUP <device>:DBM07250I072.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 7.2.5.0.

2.1 Monitor Memory Management Enhancements

Previously, the Oracle Codasyl DBMS Monitor (DBMMON) process would map each database global (TROOT) section into P0 virtual address space. This could, in some cases, consume a significant portion of the 1GB available space and could also result in the virtual address space becoming sufficiently fragmented such that the monitor would be unable to open a database.

As a possible workaround the monitor process can be restarted.

With this release, the impact of this virtual memory fragmentation has been somewhat reduced. The DBMMON process now maps database global sections that use `PROCESS` or `RESIDENT SHARED MEMORY=PROCESS` in to 64-bit P2 virtual address space. In addition, on OpenVMS Integrity Server systems, the executable code of the DBMMON process is mapped in to 64-bit P2 virtual address space further reducing the amount of P0 virtual address space consumed.

To specify `PROCESS` or `RESIDENT` shared memory, use the `DBO/MODIFY` command:

```
$DBO/MODIFY/MEMORY_MAPPING=( PROCESS, [RESIDENT] ) db-name.roo
```

2.2 Server Process Name Format Changed

When starting server processes (such as database recovery processes), previous releases of Oracle CODASYL DBMS would always start creating processes with a name starting with a number one (such as DBM_RB72_1). In some cases, when starting a large number of processes or when multiple databases are opened on a system, duplicate names would be created and processes would have to be re-started with a different process name. This results in additional system resources being consumed.

This problem has been reduced in Oracle CODASYL DBMS Version 7.2.5.0. Server processes are now created with much more unique names.

2.3 Temporary File Names

Oracle Codasyl DBMS generates random file names for various temporary functions (such as AIJ recovery work files). In rare cases, the file names would not be unique in a cluster and could potentially cause a conflict.

This problem has been corrected. Oracle Codasyl DBMS now generates file names that are unique within a cluster.

2.4 DBO /SHOW STATISTICS /ROWS= and /COLUMNS= Feature

Previously, it was not possible to use DBO /SHOW STATISTICS and specify the number of display rows and columns. The values would default to the user's display or, in the case of non-interactive mode, 132 columns and 66 rows.

This problem has been corrected. DBO /SHOW STATISTICS includes the new qualifiers /ROWS=n and /COLUMNS=n to allow the user to specify the desired number of display rows and columns. The existing minimum and maximum limits apply as enforced by the SMG run time library or the DBO /SHOW STATISTICS utility.

2.5 Use of RMS MBC larger than 127

This release of Oracle Codasyl DBMS takes advantage of OpenVMS enhancements permitting values of the RMS Multi Block Count (MBC) parameter to be up to 255 blocks (the prior limit was 127 blocks). With this change, some disk-based file read and write operations performed by Oracle Codasyl DBMS may require half of the IO resources as compared with prior releases by allowing RMS to do larger IO transfers.

Oracle Codasyl DBMS now anticipates that OpenVMS patch(es) have been installed that support using a RMS Multi Block Count (MBC) parameter larger than 127 blocks. Oracle Codasyl DBMS will first attempt to use a larger value and if a RMS\$_MBC error is returned from the SYS\$CONNECT call, a second attempt is made with a RMS Multi Block Count (MBC) parameter of less than 128.

In order to receive the IO performance improvements available when accessing sequential files when using a RMS Multi Block Count (MBC) parameter larger than 127 blocks, the following patches (or their subsequent replacements) are required to be installed:

- VMS831H1I_SYS-V1200 or later
- VMS83I_SYS-V1500 or later
- VMS83A_SYS-V1800 or later
- VMS84I_UPDATE-V0400 or later
- VMS84A_UPDATE-V0400 or later

Oracle recommends installing OpenVMS patches that permit values of the RMS Multi Block Count (MBC) parameter to be up to 255 blocks for best performance and functionality.

2.6 Additional Database Storage Area Checks

In rare cases, generally involving concealed logical names or in a cluster environment, it was possible to construct cases where two physical databases could access the same storage area file in an uncoordinated fashion. This access could lead to data corruption.

The steps required for this type of uncoordinated access would include a database restore or copy likely in a cluster environment. Because the databases shared the same original creation time stamp, so too would the storage areas and DBMS would not detect that the storage areas were for physically separate databases.

This problem has been corrected. Oracle Codasyl DBMS now stores a time stamp of the physical database creation (via copy, restore or create) in the database root file and each storage area file. Each new access to a storage area compares the time stamp of the database root file and the storage area file to further ensure that they are part of the same physical database. If a mismatch is detected, the message INVDBSFIL—"inconsistent storage area file" is signaled.

If necessary, the storage area file can be re-synchronized with the root with the following DBO/ALTER command:

```
DBALTER> UPDATE FILE storage-area-name [SNAP] DBPRO
```

2.7 Average Transaction Duration Display Precision Increased

As systems and applications become faster, it is more common for transaction durations of less than .0000 seconds to be performed. Currently, it is not possible to accurately determine, with the DBO /SHOW STATISTICS utility, the average duration of such rapid transactions.

This condition has been addressed. The average transaction duration value on the "Transaction Duration" display of the DBO /SHOW STATISTICS utility has been increased in precision from 4 to 6 fractional digits and the output display slightly modified to fit to a 80 column display as in the following example.

```
Node: RDBTUK (1/1/1) Oracle Codasyl DBMS V7.2-50 Perf. Monitor 29-SEP-2010 23:10:29.65
Rate: 3.00 Seconds      Transaction Duration (Total)      Elapsed: 00:00:26.77
Page: 1 of 1           DISK$TUKWILA7:[DB.V72]FOO.ROO;1      Mode: Online
```

```
-----
Total transaction count:          771
Seconds Tx.Count:   % #Complete:  % #Incomplete:  %
0-< 1:             773 100%       773 100%         0 0% <-avg=0.000192 95%=0.0
1-< 2:              0 0%          0 0%             0 0%
2-< 3:              0 0%          0 0%             0 0%
3-< 4:              0 0%          0 0%             0 0%
4-< 5:              0 0%          0 0%             0 0%
5-< 6:              0 0%          0 0%             0 0%
6-< 7:              0 0%          0 0%             0 0%
7-< 8:              0 0%          0 0%             0 0%
8-< 9:              0 0%          0 0%             0 0%
9-<10:             0 0%          0 0%             0 0%
10+++:            0 0%          0 0%             0 0%
```

2.8 DBMS Monitor Log File Write Rate Reduced

The Oracle Codasyl DBMS Monitor process (DBMMON) previously would write to the monitor log file using an IO size of either 127 or 124 disk blocks and would perform a RMS "flush" operation one per minute.

With this release of Oracle Codasyl DBMS, the Monitor process now anticipates that OpenVMS patch(es) have been installed that support using a RMS Multi Block Count (MBC) parameter larger than 127 blocks. The Oracle Codasyl DBMS Monitor process will first attempt to use a larger value and if a RMS\$_MBC error is returned from the SYS\$CONNECT call to the lof file, a second attempt is made with a RMS Multi Block Count (MBC) parameter of less than 128.

In addition the Oracle Codasyl DBMS Monitor process reduces the frequency of monitor log file "flush" operations to once every ten minutes.

For some sites with significant monitor log file write activity, these changes should serve to reduce physical IO.

2.9 Memory Layout Change For Global Section

In order to help prevent cases where shared memory is unexpectedly overwritten, the internal layout of data structures has been altered and additional "guard" pages have been added within DBMS' memory management subsystem. These changes are intended to help detect and prevent unexpected memory write access to the database global section.

2.10 DBO /BACKUP/MULTITHREAD Performance Improvements

DBO /BACKUP/MULTITHREAD performance has been improved by streamlining code sequences and reducing redundant data copies in memory. In some cases, reductions of up to 10% of CPU time have been realized.

2.11 New /PAGE_PAD_LEN Qualifier

BUG 652074

In Oracle CODASYL DBMS release version 7.2.3.1, a new qualifier, /PAGE_PAD_LEN, was added to DBO/CREATE and DBO/MODIFY to allow modification of a storage area's PAGE PADDING LENGTH (PPL).

Due to an inadvertent omission, the description of this new qualifier had been left out of release notes prior to this release.

The PPL is an area reserved for Oracle CODASYL DBMS page management and would not typically be used to store user data. In prior versions, the size of this area was fixed at 10% of the database page size for that storage area.

In certain database designs, the fixed PPL resulted in much unused space on the data page and limited DBA's ability to set thresholds properly. With this new qualifier, this restriction has been lifted.

Note

Oracle CODASYL DBMS suggests that the default for this parameter not be changed, unless warranted after a thorough design review

If you specify the /PAGE_PAG_LEN qualifier, you must provide a value (between 0 and the storage area page size) which will be the number of bytes to be set aside for the PPL in lieu of the default. The qualifier is positional; it can be used either globally or locally on selected areas.

```
$ DBO/MOD/PAGE_PAD_LEN=25 PARTS/LOG
%DBO-I-LOGMODROO, modifying root file D:PARTS.R00;2
%DBO-I-LOGMODSTO, modifying storage area MAKE
%DBO-I-LOGMODVAL,    modified page pad len to 25
%DBO-I-LOGMODSTO, modifying storage area BUY
%DBO-I-LOGMODVAL,    modified page pad len to 25
%DBO-I-LOGMODSTO, modifying storage area MARKET
%DBO-I-LOGMODVAL,    modified page pad len to 25
%DBO-I-LOGMODSTO, modifying storage area PERSONNEL
%DBO-I-LOGMODVAL,    modified page pad len to 25
$
$ DBO/MOD PARTS MAKE/PAGE_PAG_LEN=45/LOG
%DBO-I-LOGMODROO, modifying root file D:PARTS.R00;2
%DBO-I-LOGMODSTO, modifying storage area MAKE
%DBO-I-LOGMODVAL,    modified page pad len to 45
$
$ PIPE DBO/DUMP/HEADER/OPT=DEBUG PARTS|-
SEARCH SYS$PIPE: PAG_PAD_LEN, PAG_DBID
PAG_DBID = 1.  PAG_LEN = 1024.  PAG_PAD_LEN = 45.
PAG_DBID = 2.  PAG_LEN = 1024.  PAG_PAD_LEN = 25.
PAG_DBID = 3.  PAG_LEN = 1024.  PAG_PAD_LEN = 25.
PAG_DBID = 4.  PAG_LEN = 1024.  PAG_PAD_LEN = 25.
```

2.12 DBO/BACKUP/MULTITHREAD/AFTER INVALID OPEN RECORD WITH EMERGENCY AIJ FILES

If DBO/BACKUP/MULTITHREAD/AFTER was being executed to back up fixed AIJ files at a time when there was an extremely heavy load on an Oracle Codasyl DBMS database which caused the existing AIJ files to fill up so that additional emergency fixed AIJ files had to be created and frequent switching between AIJ files was taking place, an invalid OPEN record with an invalid sequence number of "-1" and other incorrect fields could be created in the backup AIJ file for one of the non emergency AIJ files that was backed up. If the backed up AIJ file was used later for an DBO/RECOVER of the database the invalid sequence number would cause the recovery to fail. Note that the invalid OPEN record was created in the backed up AIJ file, not in the live fixed AIJ files.

This problem is fixed in the first Oracle Codasyl DBMS V7.2-4 and all later V7.2-4 releases but was not documented in previous V7.2-4 release notes. It happened because a flag in the database root for each AIJ file which indicates that the AIJ file is currently being backed up was being cleared too soon. This flag is checked by the AIJ server code when switching between files and for other operations. If the fixed AIJ files were being heavily used during the backup this set up a small time window when the sequence number of the OPEN record of the AIJ file currently being backed up could be reset to -1, to indicate that the AIJ file was not being currently used, just before DBO/BACKUP/MULTITHREAD/AFTER read the AIJ file OPEN record and copied it to the backup AIJ file.

The following shows an example of the invalid open record when the AIJ backup file created by the DBO/BACKUP/MULTITHREAD/AFTER command was dumped.

```
$ DBO/BACKUP/MULTITHREAD/AFTER_JOURNAL/NOLOG/NOQUIET PARTS.ROO PARTSAIJBCK
$ DBO/DUMP/AFTER/NODATA/OUT=DUMP.LIS PARTSAIJBCK
$ TYPE DUMP.LIS
```

```
60494/131589      TYPE=0, LENGTH=510, TAD=19-JUL-2010 14:35:51.53,
CSM=00
```

```
Database DEVICE:[DIRECTORY]PARTS.ROO;1
Database timestamp is 19-JUL-2010 11:02:31.47
Facility is "DBMAIJ ", Version is 721.0
Database version is 72.1
AIJ Sequence Number is -1
Last Commit TSN is 0:0
Synchronization TSN is 0:0
Journal created on VMS platform
Type is Normal (unoptimized)
Open mode is Initial
Journal was backed up on 19-JUL-2010 14:35:49.15
Backup type is No-Quiet-Point
I/O format is Block
```

This problem has been corrected in Oracle CODASYL DBMS release 7.2.5.0.

2.13 New Encryption Message Added

Starting in version V7.2.0.2, Oracle Codasyl DBMS allows users to create encrypted database and After Image Journal (AIJ) backups by specifying the /ENCRYPT qualifier on the DBO/BACKUP/MULTITHREAD and DBO/BACKUP/AFTER_JOURNAL, respectively. The qualifier takes one parameter: either a value or a key name as the encryption key.

The same encryption key must be specified when the database is restored or recovered by the DBO/RESTORE/MULTI/ENCRYPT and DBO/RECOVER/ENCRYPT commands.

Starting in this release, a new informational message has been added to those backup command to remind the user that the same key used to encrypt must be used to decrypt on the restore and recover commands. For example,

```
$ DBO/BACKUP/MULTITHREAD/NOLOG database_file backup_file -  
  /ENCRYPT=(VALUE=key_name,ALGORITHM=algorithm_name)  
%DBO-I-ENCRYPTUSED, Encryption key required when future restore performed.  
  
$ DBO/BACKUP/MULTITHREAD/AFTER_JOURNAL/FORMAT=NEW_TAPE -  
  database_file backup_file -  
  /ENCRYPT=(VALUE=key_name,ALGORITHM=algorithm_name)/NOLOG  
%DBO-I-ENCRYPTUSED, Encryption key required when future restore performed.
```

Chapter 3

Problems Corrected

This chapter describes software errors corrected in Oracle CODASYL DBMS release 7.2.5.0.

3.1 Unexpected SYSTEM-F-VA_NOTPAGALGN Error With Global Buffers and Reserved Memory Registry

Bug 8204438

In some cases with the following conditions:

- database global buffers are enabled,
- global sections created RESIDENT,
- global sections allocated via the OpenVMS Reserved Memory Registry

a failure, SYSTEM-F-VA_NOTPAGALGN, may occur while attempting to manually open the database:

```
$ DBO/OPEN FOO/GLOBAL_BUFFERS=BUFFERS=1231
%DBM-F-CANTOPENDB, database could not be opened as requested
-DBM-F-CANTCREGBL, error creating and mapping database global section
-SYSTEM-F-VA_NOTPAGALGN, specified virtual address is not CPU-specific
page aligned
```

This problem has been corrected. As a workaround if this problem is encountered, the memory reservation for the database global section can be removed as in the following example:

```
$ MCR SYSMAN RESERVED_MEMORY FREE DBM72N$1$DGA2422960004000000000000
%SMI-S-RMRFREPAG, pages successfully freed from reservation
$ DBO/OPEN FOO/GLOBAL_BUFFERS=BUFFERS=1231
```

3.2 Bugcheck At RUJUTL\$ROLLBACK_LOOP

Bug 9856675

In very rare cases, it is possible for a rollback operation (either explicit or implicit) to fail with a bugcheck due to entries being unable to be "undone" on a database page due to an unexpected lack of "locked" space. The sequence of events is complex and requires a specific ordering of operations and accumulation of locked and free space on a database page among several processes.

The bugcheck "footprint" will be similar to the following:

```
Exception occurred at DBMSHP72\RUJUTL$ROLLBACK_LOOP + 000010A1
Called from DBMHRP72\RUJ$ROLLBACK + 000000F0
Called from DBMHRP72\KOD$ROLLBACK + 000007A0
```

Analysis of the bugcheck dump will indicate one or more entries on the "FBIJBL" queue similar to the following:

```
FBIJBL @1C3109C0:          QUE = 16E5B0F8:16E5B0F8
+-----+
| This JFA 0              Record sequence number 640      |
| Prior JFA 94096        Previous TSN was 0:3390022611    |
| Modified segment 11:11828:16 with length of 64 bytes    |
+-----+
```

The cause of the problem was related to an incorrect synchronization between processes manipulating the locked and free space while adding lines to the page.

This problem has been corrected. Oracle recommends that all Oracle CODASYL DBMS installations upgrade to at least Release 7.2.5 to impliment the correction.

3.3 Stall Statistics (Aggregate Count) In DBO /SHOW STATISTICS Inaccurate

Bug 10016136

In previous versions of Oracle Codasyl DBMS, the values on the "Stall Statistics (Aggregate Count)" display were incorrectly scaled and were displayed as inaccurate values.

This problem has been corrected. The correct scaling factor is now used.

3.4 DBO /RECOVER /ORDER_AIJ May Remove Required Journal Files

Bug 10020166

In certain cases, it was possible for the /ORDER_AIJ qualifier on the DBO/RECOVER command to reject (or "prune") required journals from the input journal list. This would most likely happen when all the following occurred:

- Performed an DBO /RECOVER using After-Image Journal (AIJ) backups;
- Recovered only a subset of the required journals;
- The last journal applied had unresolved or incomplete transactions;

For example, suppose a database needed to be recovered, starting at AIJ VNO 10 using the following AIJ backup journal files:

```
J1.AIJ (aij quiet_point backup) : OPEN_VNO=10, QUIET_VNO=10
J2.AIJ (aij noquiet_point backup) : OPEN_VNO=11, QUIET_VNO=10
J3.AIJ (aij noquiet_point backup) : OPEN_VNO=12, QUIET_VNO=11
J4.AIJ (aij quiet_point backup) : OPEN_VNO=13, QUIET_VNO=13
```

STEP 1) The DBA issues:

```
$ DBO/RECOVER/ORDER_AIJ/ROOT=PARTS J1,J2,
```

Journals J1.AIJ (OPEN_VNO=10) and J2.AIJ (OPEN_VNO=11) are applied and the database root is updated to show that RCVR_VNO 12 is the next journal to be applied. However, J2 had potentially unresolved transactions since it was not closed at a quiet_point.

STEP 2) The DBA next issues:

```
$ DBO/RECOVER/ORDER_AIJ/ROOT=PARTS J3,J4
```

Since J3 (OPEN_VNO=12, QUIET_VNO=11) does not start at a quiet_point, recovery terminates with an error:

```
DBO-F-AIJNORCVR, recovery must start with journal sequence 11
```

STEP 3) The DBA next issues:

```
$ DBO/RECOVER/ORDER_AIJ/ROOT=PARTS J1,J2,J3,J4
```

Normally, this would have been the optimal command for the recovery in this case but since the root had been previously updated to show that VNO 12 is required to start recovery, /ORDER_AIJ would prune J1 and J2 and only attempt to recover journals J3 and J4, which would result in the same error as in STEP 2 above.

The workaround would be to not use /ORDER_AIJ when recovering with such a strategy.

This problem has been fixed in the Oracle Codasyl DBMS Release 7.2.5. Now when the DBA attempts STEP 1, the root's OPEN_VNO will not be updated past the last known QUIET_POINT (VNO 10, in this case).

Note

When using AIJ backups for recovery, DBO/RECOVER must begin with a QUIET_POINT backup (either implicit or explicit). However, Oracle recommends that recovery terminate with an AIJ backup that was closed at a QUIET_POINT (i.e. the next journal backed up was created by a QUIET_POINT backup).

3.5 DBMS Monitor Bugcheck at MON\$LOCK_MPLL + 00000264

Bug 10142076

A problem was introduced in Oracle Codasyl DBMS Release 7.2.4.0 that could corrupt one of the DBMS monitor's in-memory data structures causing the monitor to terminate with a bugcheck at MON\$LOCK_MPLL + 00000264.

The problem does not lead to any data corruption and the monitor can be restarted normally.

This problem has been corrected in Oracle Codasyl DBMS Release 7.2.5.

3.6 DBR Bugchecks within RUJUTL\$BIJBL_GET_FORWARD

In prior versions of Oracle Codasyl DBMS, in rare cases (likely involving a "verb" rollback), it was possible for a later process failure to result in a database recovery process (DBR) failure with a "footprint" similar to the following:

```
***** Exception at 000000000018E658 : DBMDBR72\RUJUTL$BIJBL_GET_FORWARD + 000000F8
%COSI-F-BUGCHECK, internal consistency failure
Saved PC = 0000000000194FA4 : DBMDBR72\RUJUTL$RECOVER_RUJ + 00000964
Saved PC = 0000000000078F08 : DBMDBR72\DBR$RECOVER_USER + 00000A78
Saved PC = 0000000000078164 : DBMDBR72\DBR$RECOVER + 000004C4
Saved PC = 000000000006E9B4 : DBMDBR72\DBR$MAIN + 00001514
```

This particular problem was caused by an incorrect pointer within the RUJ file being used by the recovery process. Upon database re-open, the DBR would succeed.

This problem has now been corrected.

3.7 DBO Online Backup May Store TSNs of Zero

When an online DBO Backup operation captures data from a live page that requires searching a snapshot chain to retrieve visible row content, the TSN values written to the backup output would incorrectly be stored as zeros.

In certain cases, a database restored from such a backup may contain incorrect record content and may lead to verification or runtime errors.

This problem has been corrected. Correct TSN values are now written to the backup output.

3.8 Unexpected ACCVIO when using DBO/SHOW STATISTICS

Bug 11871974

In prior releases of Oracle Codasyl DBMS it was possible to receive a ACCVIO as DBO Show Statistics was returning to DCL. This problem was mostly likely due to an error freeing virtual memory used during the session. The ACCVIO causes a bugcheck dump to be generated with a footprint similar to the following.

- Itanium OpenVMS 8.3-1H1
- Oracle Codasyl DBMS Server 7.2.4.1.0
- Got a DBOBUGCHK.DMP
- SYSTEM-F-ACCVIO, access violation, virtual address=FFFFFFFF816F4040
- Exception occurred at DBO72\COSI_MEM_FREE_VMLIST + 00000132
- Called from DBO72\KUT\$DISPLAY + 00004DB0
- Called from DBO72\DBO\$DISPLAY + 000044E0
- Called from DBO72\DBO\$SHOW + 000014D0

This problem has been corrected in Oracle Codasyl DBMS Release 7.2.5.0.

3.9 DBR Bugcheck at RUJUTL\$ROLLBACK_LOOP + 00000760

BUG 10296522

Under certain circumstances, it may be possible for a Database Recovery Process (DBR) to fail while trying to recover a user process, even when there is nothing to recover. This failure would generate a DBMDBRBUG.DMP file and cause the database to shutdown. Once the shutdown occurs, a subsequent recovery operation will be successful and the database will again be accessible.

For this problem to occur, Row Cache must be enabled, and an DBO/BACKUP/AFTER must occur between the time that a user process commits one transaction and starts another transaction, which then fails before doing any database updates.

The DBR fails because of a missing checkpoint record.

This problem has been fixed in this release of Oracle CODASYL DBMS.

3.10 %DCL-W-ACTIMAGE error Running Multiversion DBMDEMO

BUG 10247226

If you attempted to run the multiversion version DBMDEMO application (example: @SYS\$COMMON:[SYSTEM.DBM72]DBMDEMO.COM) without properly setting the multiversion DBMS environment (using, @SYS\$LIBRARY:DBMSETVER.COM 72), you may experience errors similar to:

```
%DCL-W-ACTIMAGE, error activating image SYS$SYSTEM:DBQ
-CLI-E-IMAGEFNF, image file not found
$1$DGA4:[SYS2.SYSCOMMON.][SYSEXE]DBQ.EXE;
```

If you don't explicit set the DBMS runtime environment, DBMS attempts to use standard (ie, non-varianted) DBMS images. The ACTIMAGE would occur if there was no standard version available. Also, if there was a standard version, then the DBMDEMO would be run against that DBMS version and not the one that you expected.

The workaround is to explicit set the proper enviroment prior to running the demo.

Starting with this release, Oracle CODASYL DBMS will detect which version of DBMS you want to use to run the DBMDEMO procedures and set the runtime environment accordingly.

3.11 Updated support for SECURVIO error message

BUG 10250864

In previous versions of Oracle CODASYL DBMS, the explanation text associated with the SECURVIO error only mentioned a SECURITY_SECHEMA access restriction as a probable cause. However, this error could also occur while attempting to execute a secured DBO command without the required command authorization.

Starting with this release, the standard and variant versions of SYS\$HELP:DBM\$MSG.DOC file has been updated to better describe the SECVURVIO error message:

SECURVIO, security violation, operation denied

Explanation: 1) Attempted operation violated the security schema to which you are mapped; or 2) you couldn't bind to a security schema; or 3) if this failure results from a DBO operation, you don't have necessary permissions to execute the particular command.

User Action: Have the DBA review your security settings using the DBO/GRANT and/or DBO/PERMIT commands.

3.12 No Separate License Required to Run HOT STANDBY

BUG 11843812

In previous versions of Oracle CODASYL DBMS, the kitinstal.com use to display the following message:

```
*****  
  
HOT STANDBY (aka AIJ Log Shipping or ALS) is a separately  
licensed component of Oracle CODASYL DBMS  
  
If you have obtained the proper license, you can install  
this software  
  
*****
```

and then prompt to see if you wished to install the files required to run HOT STANDBY (HS).

A special license is no longer required to run HS. Starting with this current release, kitinstal.com will no longer prompt as to whether you want to install the associated files and will just install them automatically. This new message will be displayed:

```
*****  
  
Oracle CODASYL DBMS HOT STANDBY is no longer a separately  
licensed product.  
  
The associated software will automatically be installed.  
  
*****
```

Chapter 4

New Features and Corrections in Previous Releases

4.1 New Features for Release 7.2.4.1

This section contains new features and technical changes for Oracle CODASYL DBMS release 7.2.4.1.

4.1.1 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]tatistic). Another logical, DBM\$BIND_DEBUG_STAT_FLAGS, has been added to control which particular statistics you wish to display.

4.1.1.1 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
```

4.1.1.2 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.

4.1.1.3 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.

4.1.2 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.

4.2 Corrections in Release 7.2.4.1

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

4.2.1 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" similar 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
```

4.2.2 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.

4.3 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.

4.3.1 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
$
```

4.3.2 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.

4.3.3 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

4.3.4

DBO/DUMP/BACKUP/MULTITHREAD/OPTIONS=ROOT/HEADER_

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.ROO;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
  Pre-fetch threshold is 4 buffers
```

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- 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)

```

4.3.5 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.ROO;3
```

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

4.3.6 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.

4.4 Corrections in Release 7.2.4.0

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

4.4.1 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.

4.4.2 Incorrect Messages From DBO /MONITOR START

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"
```

4.4.3 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.

4.4.4 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.

4.4.5 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.][SYSEXE]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.

4.4.6 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

4.4.7 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.

4.4.8 DBO/BACKUP/MULTITHREAD 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.

4.4.9 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.

4.4.10 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 tape 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.

4.4.11 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-LOGRECDB, 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-AIJSUCCEP, database recovery completed successfully
%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-AIJSUCCE, 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
```

4.4.12 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.

4.4.13 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.

4.4.14 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.

4.4.15 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.

4.4.16 Memory Leak On Systems With RAD Support Enabled

Bug 8410893

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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