**How to Identify ORA-00060 Deadlock Types Using Deadlock Graphs in Trace (Doc ID 1507093.1)**

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| **In this Document**   |  |  | | --- | --- | |  | [Goal](https://support.oracle.com/epmos/faces/DocumentDisplay?_afrLoop=525525214176544&id=1507093.1&_adf.ctrl-state=bf2iquj02_300 \\l GOAL) |  |  |  | | --- | --- | |  | [Deadlock Graph Interpretation](https://support.oracle.com/epmos/faces/DocumentDisplay?_afrLoop=525525214176544&id=1507093.1&_adf.ctrl-state=bf2iquj02_300 \\l aref_section11) |  |  |  | | --- | --- | |  | [Ask Questions, Get Help, And Share Your Experiences With This Article](https://support.oracle.com/epmos/faces/DocumentDisplay?_afrLoop=525525214176544&id=1507093.1&_adf.ctrl-state=bf2iquj02_300 \\l aref_section12) |  |  |  | | --- | --- | |  | [Solution](https://support.oracle.com/epmos/faces/DocumentDisplay?_afrLoop=525525214176544&id=1507093.1&_adf.ctrl-state=bf2iquj02_300 \\l FIX) |  |  |  | | --- | --- | |  | [Discuss ORA-00060 Deadlocks](https://support.oracle.com/epmos/faces/DocumentDisplay?_afrLoop=525525214176544&id=1507093.1&_adf.ctrl-state=bf2iquj02_300 \\l aref_section21) |  |  |  | | --- | --- | |  | [References](https://support.oracle.com/epmos/faces/DocumentDisplay?_afrLoop=525525214176544&id=1507093.1&_adf.ctrl-state=bf2iquj02_300 \\l REF) |   IMG_256  **APPLIES TO:**  Oracle Database - Enterprise Edition - Version 9.0.1.0 and later  Information in this document applies to any platform.  **GOAL**  When Oracle detects a deadlock, the current SQL in the session detecting the deadlock is cancelled and 'statement-level rollback' is performed so as to free up resources and not block all activity. The session that detected the deadlock is still 'alive' and the rest of the transaction is still active. If you repeat the last (cancelled) operation in the session, then you will get the deadlock again.  When such a deadlock is detected a trace file is produced containing a "Deadlock Graph" (along with other useful information). By examination of numerous Service Requests, we have seen that the most common types of deadlock can be identified by a "signature" deadlock graph that can be used to identify the "type" of deadlock being encountered. This article presents examples of each type so that investigation and resolution can continue along the right track.  The aim of this document is to show how to use a "Deadlock Graph" produced by and ORA-00060 error to identify the base problem.  **NOTE:** Some deadlock traces **DO NOT** contain a "Deadlock Graph"  section because the deadlock is such that it would be inappropriate or irrelevant. In these cases then the recommended action is to collect some extra diagnostic information and then create a Service Request with Support as outlined in the following document:  [Document 1552194.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1552194.1) ORA-00060 Deadlock Graph Not Matching any Examples: Suggested Next Steps  If you are not already using it, you can use the Troubleshooting Assistant to help you diagnose common ORA-00060 Deadlock issues:  [Document 60.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=60.1) Troubleshooting Assistant: Oracle Database ORA-00060 Errors on Single Instance (Non-RAC) Diagnosing Using Deadlock Graphs in ORA-00060 Trace Files  **Deadlock Graph Interpretation**  A typical deadlock graph might look like this:    IMG_257  In order to differentiate different types, we have taken the Lock Type and the mode held/waited for by the holder and waiter and used this to create a signature for each type. For example, the previous graph shows the following characteristics:   * >1 row in the Deadlock Graph * All Lock Types are TX * The lock modes for the Holders and the Waiters are all X (eXclusive, mode 6)   By focusing on these particular characteristics in the graph:    IMG_258  will give us the following type (which is typically an application deadlock):  TX X X  TX X X  Note that the most relevant parts of the "Key Signature" for deadlock type recognition are the **lock Type** and the **Mode** it is requesting. The main types are highlighted in the table below  The most common types are:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **"Key Signature"** | **Lock Type** | **Requested  Lock Mode** | **Deadlock Graph** | **Likely  Deadlock Type** | **Comments** | | Type TX Lock Requesting Mode X (6) | TX | X(6) | **TX** X **X TX** X **X** | [Application](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1552120.1 \\o ORA-00060 Deadlock Graph with >1 Row of \\TX X X\\: Application Deadlock) | TX Lock Held in Mode X (6) Requesting Mode X (6) | | Type TM Lock Requesting Mode SSX (5) | TM | SSX (5) | **TM** SX **SSX** SX **SSX TM** SX **SSX** SX **SSX** | [Missing Index on Foreign Key (FK) Constraint](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1552169.1 \\o ORA-00060 Deadlock Graph with >1 Row, at Least 1 Row is Type \\TM\\ with Waiter Waiting for Mode \\SSX\\ Typical Graph Row: \\TM SX SSX SX SSX\\) | TM  Lock Held in Mode SX (3) Held SSX (5) Requested | | Type TX Lock Requesting Mode S(4) | TX | S(4) | **TX** X **S TX** X **S** | [Insufficient Interested Transaction List (ITL) Provision](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1552191.1 \\l ITL \\o ORA-00060 Deadlock Graph with >1 Row, at Least 1 Row is \\TX X S\\ and None of the Involved Objects are Bitmap Indexes) **OR [Bitmap Index](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1552175.1 \\o ORA-00060 Deadlock Graph with >1 Row, at Least 1 Row is \\TX X S\\ and at Least 1 Involved Object is a Bitmap Index) OR [PK/UK Index](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1552191.1 \\l PKUKINDEX \\o ORA-00060 Deadlock Graph with >1 Row, at Least 1 Row is \\TX X S\\ and None of the Involved Objects are Bitmap Indexes)** | TX Lock Held in Mode X (6) Requesting Mode S (4)  ITL, Bitmap Index and PK/UK Index Signatures are the Same. Further Investigation will be required to identify absolute cause | | Type TX Lock Requesting Mode X (6)  Single Row in Deadlock Graph | TX | X(6) | **TX** X **X Single Row in Deadlock Graph** | [Self Deadlock](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1552123.1 \\o ORA-00060 Deadlock Graph with ONLY 1 Row of \\TX X X\\, No Autonomous Transactions: Single-Resource \\SELF Deadlock\\) OR [Autonomous Transaction Self Deadlock](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1552173.1 \\o ORA-00060 Deadlock Graph with ONLY 1 Row of) | This looks the same as a standard application deadlock except that there is only a single row in the deadlock graph. | | Type UL Lock in Deadlock Graph | UL | ANY | **UL ? ?  ?** | [Application Deadlock Featuring User Defined Locks](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=2063394.1 \\o ORA-00060 Deadlock Graph with at least 1 Row of Featuring a \\UL .. ..\\ Lock: Application Deadlock Involving a User Defined Lock \\t _blank) | This is very similar to the standard application deadlock except that it features User Defined Locks |     **Note:** this table is not exhaustive and outlines the most common issues. There are some rare conditions where deadlocks can be achieved that are not mentioned. For cases that do not match those above, the recommended action is to collect some extra diagnostic information and then create a Service Request with Support as outlined in the following document:  [Document 1552194.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1552194.1) ORA-00060 Deadlock Graph Not Matching any Examples: Suggested Next Steps  For information on how to identify and diagnose the various different types of ORA-00060 Deadlock Types that you may encounter, please refer to the following document:  [Document 1559695.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1559695.1) How to Diagnose Different ORA-00060 Deadlock Types Using Deadlock Graphs in Trace  Note: these are the most common types and causes. There are rare cases where similar symptoms can be found with different causes. If there is any doubt about the identification of a particular non-application deadlock type or if different graphs are seen, then file a Service Request with Oracle Support   For Reference, the Oracle lock modes are :   0 - none  1 - null (NULL)  2 - Row Share, also called a subshare table lock  (SS)  3 - Row eXclusive Table Lock, also called a subexclusive table lock (SX)  4 - Share Table Lock (S)  5 - Share Row-eXclusive, also called a share-subexclusive table lock (SSX)  6 - EXclusive (X)  Note: Often you will see a combination of an application deadlock "Signature" plus one of the others as opposed to a "classic" repeating signature. For example you may see something like:  Deadlock graph:                       ---------Blocker(s)--------  ---------Waiter(s)---------  Resource Name          process session holds waits  process session holds waits  TM-XXXXXXXX-00000000　      11     333    SX             22      44    SX   SSX  TX-XXXXXXXX-XXXXXXXX　      22      44     X             11     333           X  Which is a combination of the "Application deadlock" and "Missing Index on Foreign Key (FK) Constraint" deadlock. In these cases, it is advisable to resolve the non-"TX X X" symptoms first since it is more likely that the less common FK/ITL/Bitmap signature is the base cause as opposed to an application deadlock.    Please Note that the trace contains various associated pieces of information that may or may not have any relevance to the issue dependent on the type of deadlock. For example, in the "Rows Waited on:" Section, the "dictionary objn" value can be used to identify related objects in certain cases, but in other cases may point at totally unrelated information. If the information is useable, it is noted in the relevant section, otherwise, do not rely upon it.  There is more about lock modes and locking in the following:  **Oracle® Database Concepts  12*c*** **Release 1 (12.1)  E17633-20  Chapter 9 Data Concurrency and Consistency  Section: Lock Modes [http://docs.oracle.com/cd/E16655\_01/server.121/e17633/consist.htm#CNCPT020](http://docs.oracle.com/cd/E16655_01/server.121/e17633/consist.htm /l CNCPT020 /o Lock Modes)**  **Ask Questions, Get Help, And Share Your Experiences With This Article**  **Would you like to explore this topic further with other Oracle Customers, Oracle Employees, and Industry Experts?  [Click here](https://community.oracle.com/thread/3297263 /o Discussion Thread: Troubleshooting ORA-00060 Deadlock Detected [Document IDs 62365.1, 1507093.1 & 1559695.1] /t _blank)** to join the discussion where you can ask questions, get help from others, and share your experiences with this specific article.  Discover discussions about other articles and helpful subjects by clicking [here](https://community.oracle.com/community/support/oracle_database/database_tuning /o My Oracle Support Community - Database Tuning /t _blank) to access the main *My Oracle Support Community* page for Database Tuning.  **SOLUTION**  For information on how to identify and diagnose the various different types of ORA-00060 Deadlock Types that you may encounter, please refer to the following document:  [Document 1559695.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1559695.1) How to Diagnose Different ORA-00060 Deadlock Types Using Deadlock Graphs in Trace |

## **REFERENCES**

[NOTE:1559695.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1559695.1) - How to Diagnose Different ORA-00060 Deadlock Types Using Deadlock Graphs in Trace  
[NOTE:1019527.6](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1019527.6) - Script to Check for Foreign Key Locking Issues for a Specific User  
[NOTE:1039297.6](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=1039297.6) - Script: To list Foreign Key Constraints  
[NOTE:15476.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=15476.1) - FAQ: Detecting and Resolving Locking Conflicts and Ora-00060 errors  
[NOTE:33453.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=33453.1) - Locking and Referential Integrity  
[NOTE:62354.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=62354.1) - Waits for 'Enq: TX - ...' Type Events - Transaction (TX) Lock Example Scenarios  
[NOTE:18251.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=18251.1) - OERR: ORA-60 "deadlock detected while waiting for resource"

[NOTE:60.1](https://support.oracle.com/epmos/faces/DocumentDisplay?parent=DOCUMENT&sourceId=1507093.1&id=60.1) - Troubleshooting ORA-00060 Deadlock Detected Errors