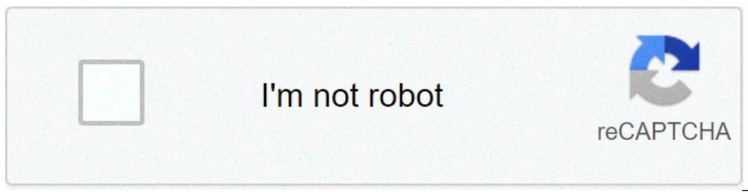

Continue

Oracle sequence cache size

Sequence cache and RAC The sequence database object requires special attention for applications running on Oracle RAC. It is common for an Oracle sequence to be a point of contention when deploying the application to Oracle RAC. Most applications create a sequence similar to the following example. SQL> create sequence 2 emp_pk_id_seq 3 start with 1000 4 increment at 1 5 nocache; Sequence created. It has become the standard practice for many sequences to have the Nocache policy. The main reason for specifying nocache is that the next sequence value is not lost if the instance terminates unusually. By default, if both cache and nocache are omitted, 20 sequence values are cached in memory. The next example creates a sequence with the default cache value and selects the first two values. SQL> Create Sequence 2 cache_example_sequence 3 start with 1 4 steps of 1; Sequence created. SQL> select 2 cache_example_sequence.nextval 3 from 4 Dual; NEXTVAL ---------- 1 SQL> select 2 cache_example_sequence.nextval 3 from 4 dual; NEXTVAL ---------- 2 The database exits unusually, and after startup, the next value of the sequence is selected. SQL> select 2 cache_example_sequence.nextval 3 from 4 Dual; NEXTVAL ---------- 21 It is important to note that there is now a gap in the values generated by this sequence. The sequence generated values of 1, 2, and 21. The first twenty values were in the cache, but only the first two were actually used. If the instance terminated unusually, sequence values 3 through 20 were lost. For sequences used to generate primary key values, the gap in the ID values is inconsistent because most end users do not notice the gap. Sequence gaps are most noticeable for entities such as invoices or check numbers. Accountants determine whether an check still needs to clear the bank by gaps in the check number sequence. If you're not dealing with accountants, almost every other occurrence of missing numbers in a sequence is irrelevant. But people tend to like order and gaps in numbers mean disorder, chaos. It often takes training to educate users that gaps in sequences are really meaningless. It is easier for the database designer to use nocache so that no sequence values are missing than to take the time to teach users that sequence gaps are perfectly acceptable. There are other reasons to ensure that there are no gaps in the sequence numbers, but most are not objective business requirements for convenience. Over time, the database designer simply began to nocache without a second to use. For many, nocache is now a simple habit. that the with nocache sequences in Oracle RAC, the sequence is a global database object. Each node in the cluster can generate the next value. In a database where the sequence is often used by many sessions, the sequence can become a bottleneck. While one session generates the next value of the sequence, other sessions must wait and coordinate through the cluster connection to access the resource. In a single-instance database, all coordination is done locally, entirely in memory. In an Oracle RAC database, processes on different nodes need to talk to each other over the private network, which can really slow down the process. To show the effects of Nocache on sequences in Oracle RAC, we have two sessions, each of which will be selected from the same sequence in a loop over and over again. The sequence is changed to use nocache. SQL> modify sequence 2 cache_example_sequence 3 nocache; Sequence changed. Next, an anonymous PL/SQL block runs simultaneously in two sessions, one session attached to instance orcl1, and the other session attached to instance orcl2. SQL> set timing for SQL> declare 2 curr_val number; 3 cnt number; 4 start 5 cnt := 0; 6 while cnt <= 100000 7 loop 8 select cache_example_sequence.nextval 9 in curr_val 10 of 11 dual; 12 cnt := cnt + 1; 13 Final loop; 14 End; 15/ PL/SQL procedure completed successfully. Elapsed: 00:19:59.61 The elapsed runtime of 19:59.61 is from the session on the orcl1 instance. The code that was executed on the orcl2 instance that completed in 20:43.22. Each session took about 20 minutes to collect 100,000 sequence values when running at the same time. Next, the sequence is modified to cache 20 values. The instances are jumped to prevent memory invoices in the instances from distorting the results. SQL> Modify Sequence 2 cache_example_sequence 3 Cache 20; Sequence changed. The same anonymous PL/SQL block runs simultaneously in both instances. SQL> set timing for SQL> declare 2 curr_val number; 3 cnt number; 4 start 5 cnt := 0; 6 while cnt <= 100000 7 loop 8 select cache_example_sequence.nextval 9 in curr_val 10 of 11 dual; 12 cnt := cnt + 1; 13 Final loop; 14 End; 15/ PL/SQL procedure completed successfully. Elapsed: 00:00:41.19 The first session was completed in 00:41.19 and the second session in 00:49.18. A simple, small change in the cache value of the sequence (the ?cache 20?setting) reduced the runtime of this sample program to 20 up to less than 1 minute! To further illustrate the effect of the cache value of the sequence, the sequence is modified with larger cache sizes, and the same PL/SQL block runs simultaneously in two instances. If the cache value was increased to 100, the PL/SQL block was completed in 00:10.98 for the first session and 00:11.57 for the second session, now about 10 seconds. If the cache value of the sequence is increased to 1000, the runtimes of the PL/SQL block were 00:01.06 and 00:02.62, each less than 3 seconds. The following table summarizes the results. Cache Value Node 1 Session Runtime Node 2 Session Runtime None 19:59.61 20:43.22 20 00:41,19 00:49,18 100 00:10,9 8 00:11.57 1000 00:01.06 00:02.62 Table 3.1 Sequence Runtimes with Caching It should be clear from these results the effect of the cache value of the sequence. These results were obtained on a two-node RAC database running on a laptop, definitely not in the production hardware. The results are most likely different depending on the system configuration. Regardless of the resources available to the RAC cluster, this simple test can be used to illustrate the effects of cache values on a sequence. Some readers might think? When will I ever encode a loop that does nothing but select the next value of the sequence?? That is a fair question. The above simple example is only used to demonstrate sequence conflicts. In this example, only two concurrent sessions were performed on two Oracle RAC nodes. In practice, there can be more than 100 simultaneous sessions on three or four nodes. Sequence conflicts may well exist and may have a performance that is not so different from this simple example. While a real application never codeby selecting the next value of the sequence in a loop like this example, except as an academic exercise, an application would encode a statement similar to the following. insert in destination_table select my_sequence.next_val, column from source_table; In the case of the example insert statement above, the next value of the sequence is generated for each row of the result set that is not as different from a loop as it is used in this example. Insert 100,000 rows into a table that fills a column from a sequence database object, and we used the sequence effectively, similar to our example. Alternatively, there may be a trigger in the target table that generates the next value of the sequence for each row that is inserted into that table, with a similar effect. Using nocache for a sequence in an Oracle may result in poor application performance. It is best to set a high cache value. Most sequences benefit from a cache value of 100 or higher. The greater the conflict for this resource, the higher the cache value should be, of course. It is not uncommon to display a cache value of 1,000 for a sequence in an Oracle RAC database. that the Query can be used to determine which sequences nocache specified. select sequence_owner, sequence_name, dba_sequences where cache_size = 0; All sequences owned by application users should be checked to ensure that the cache value does not cause an application bottleneck. Note that we never try to modify sequences that are part of the Oracle Data Dictionary. Examining the wait events for a session can identify a conflict for sequence objects. When querying v-session_wait, all events that our session has been waiting for are displayed. It is often useful to see the top 5 waiting events. The following script shows the five most important wait events for one of the sessions involved in the sequence example. < current_session_top5_waits.sql SQL> select 2 * 3 of 4 (choose 2 event, 3 total_waits, 4 time_waited 5 of 6 v-session_event 7, where 8 sid=SYS_CONTEXT('USERENV','SID') 9 Order by 10 time_waited desc) 11 where 12 rownum <= 5; EVENT TOTAL_WAITS TIME_WAITED ---------- ---------- ---------- Row Cache Lock 94154 40306 gc cr block lost 393 17826 gc current block lost 371 17462 gc cr block busy 37397 6731 gc current block 2-way 93214 5587 Four of the top 5 waiting events for this session all start with ?gc?. The previous chapter covered some of these global cache wait events described above. The rest of these cache fusion latency will be covered in a later chapter. The top wait event is the row cache lock out event. How does this wait event prove that there is a conflict for a sequence database object? To know securely, the specific parameter values of the Row Cache Lock Wait event for this session must be examined. While the session was running and conflicts occur, the specific wait event of that session was captured. < current_session_wait.sql SQL> 2 event, 3 p1, 4 p2, 5 p3 6 from 7 v-session_wait 8 select, where 9 sid=SYS_CONTEXT('USERENV','SID'); EVENT P1 P2 P3 ---------- ---------- ---------- ---------- ---------- row cache

lock 13 0 5 The output above displays the row cache lock wait event in the session. Note that the P1 value is 13. When you examine the v-rowcache view, the data dictionary is displayed. Type involved. For the row cache lock wait event, the P1 value links to the cache column of the v-rowcache view SQL> select 2 parameters, 3 gets, 4 getmisses 5 of 6 v-rowcache 7, where 8 cache-=13; PARAMETER GETS GETMISSES ---------- ---------- ---------- dc_sequences 64740 64283 The above output shows that the session has conflicts for the dc_sequences object type. Also note that the number of misdemeanors is very high compared to the number of gets. However, the metric displayed in this query can have a low ratio to errors compared to total fetches, and the application can still have sequence conflicts. The v-rowcache metric displayed applies to all sequence database objects, including objects that have little or no conflict. In the end, the above showed that our session experienced a bottleneck, a wait, for something in the row cache, which subsequently confirmed that this was the part of the line cache that deals with sequences. What needs to be answered is the order involved in the bottleneck. To answer this question, you would have to look at the code that is running for this session. If access to the code is not available, you can always start an SQL trace in the session to determine the order. It should be noted that some versions of Oracle RAC that conflict with sequences may not manifest as the row cache lock-out event shown in this chapter. These examples were run on Oracle 11.2.0.4 and Oracle 12.1.0.1 and achieved similar results. Some versions may show the enq: SQ - conflict waiting event, which is a fancy way to display Sequence (SQ) Enqueues (Lock) conflicts. Learn Rac Tuning Internals! This is an excerpt from the groundbreaking book Oracle RAC Performance Tuning, a book that offers real-world advice on how to solve the most difficult RAC performance and tuning problems. Buy it for 30% discount directly from the publisher. Publisher.

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