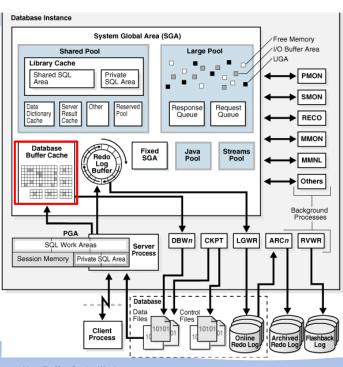
How Buffer Cache Works

Arup Nanda Proligence

Oracle Instance



Source: Oracle Database Documentation Concepts Guide

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How Buffer Cache Works

Agenda

- Difference between block and buffer
- How many buffers are created
- There is just one copy of the buffer in the cache, right?
- · What is the "state" of a buffer
- What are hash buckets (chains)
- · What is a cache buffer chain latch
- How many latches are there
- How do you increase the performance of the buffer cache



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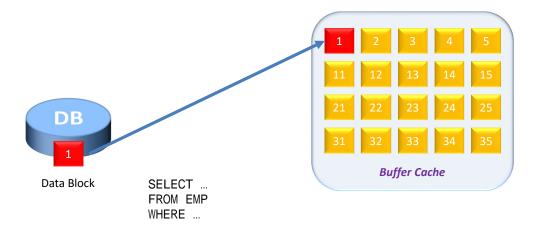
Buffer Operation



SELECT ... FROM EMP WHERE ...



Buffer Operation

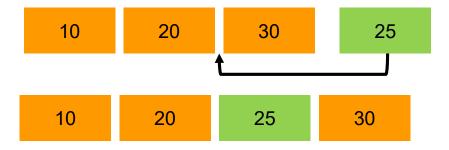


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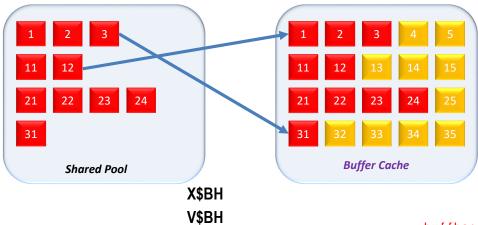
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Buffer Insertion



Buffer Header

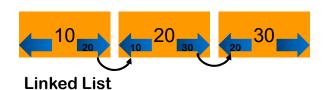


buffhan.sql

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Buffer Header Management



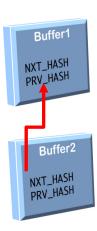


10 20 25 30 25 30

When a new buffer comes in, only the pointers are updated

Linked List





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Test for Buffer Header

bh7.sql

Where did I Park My Car?

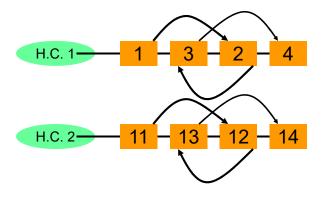


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Hash Chain



Data Block Address

• Get the relative file# and block#

```
select col1,
  dbms_rowid.rowid_relative_fno(rowid) rfile#,
  dbms_rowid.rowid_block_number(rowid) block#
from latchtest;
```

 Get the DBA select dbms_utility.make_data_block_address (file#,block#) from dual;

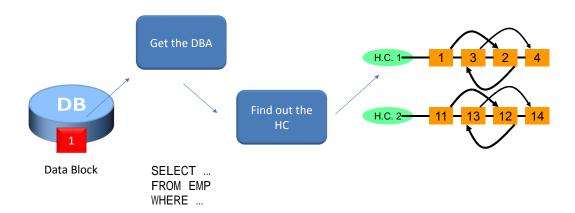
get dba.sql

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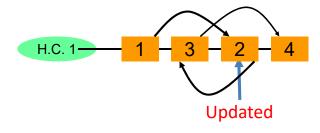
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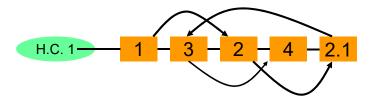
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Chain Placement



Buffer Clones





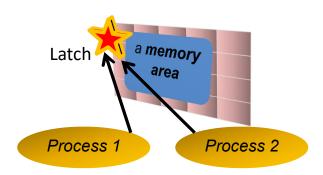
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Buffer States

- What was the intention of the session when it brought the block to the buffer cache?
- If it was to merely read:
 - The state is CR Consistent Read
- If it was to modify:
 - The state is CURRENT
- The column STATE
 - 1 current
 - 3 CR

Latches



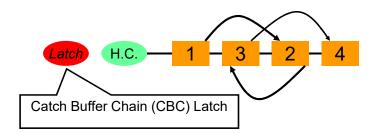
- Process 1 and 2 will try to get the "latch", a area in memory that does not have any required data.
- Whoever gets the latch now gets to access the memory area exclusively
- When done, the process releases the latch

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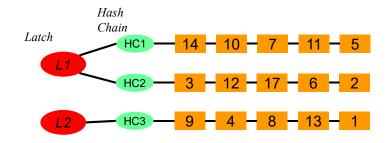
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CBC Latch



Latches and Hash Chains



No. of hash buckets = _db_block_hash_buckets No. of latches = _db_block_hash_latches

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How to get the Hash Chain

- Dump the Buffer Cache
 - S: L; 1!a%ebu< se #=+"%
 - S:L; 1!a%ebu< %u#+ buffe!s >
 - S:L; 1!a%ebu< !acef"le_na#e
 - C?@APP@AR/P@VART/AL@%''a<@!%b#s@a|7BB@a|7BB@ !ace@a|7BB_
 1!a_774B. !c</pre>
- Check the tracefile for the following: CHAAN?

Here is the snapshot from the trace

```
CHAAN? 7(4(((B LOC? (*((((3FFC85B>E6>5 HEAD?
E(*3ffa>cfC>cc5&(*3ffa>efCc8c5F
6H $(*3ffa>cfC>c75) f"leG? 4 !%ba? (*((c(%fB8 $4H837B8) class? 7(ba? (*3ffa>c9>B((()
se ? C +11!? 4 bsI? 57CB bs"? (sfl<? B +- c? (&( %b-!"%? (1bJ? 7(94> 1bJn? 7(94> sn? E(H7F afn? 4 h"n ? f hash? E(*3ffa>cfc7CB5&(*3ffC85B>eb>5F l!u?
E(*3ffa>cfC>e85&(*3ffa>cfC>bC5F

Buffer address from X$BH
```

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And, latches?

```
The column HLADDR selec hla%%!
f!1# *2bh
he!e %ba!f"l . Kf"le_n1 an% %babl0 . Kbl1c0_n1
```

This is a hexadecimal number

Howe many buffers for a latch?

```
• This
selec
              F"leG&
    %ba!f"l
    %bab10
              6 | 1 c 0 G &
    1bJ
              Da a ObJG&
    na#e
              ObJec Na#e&
              Sub ObJ&
    subna#e
     ch
               1uch_c1un &
    %ec1%e$s a e&7&'cu!!en '&4&'CR'&s a e)
              s a e
f!1# *2bh b& 1bJ2 1
an% 1.%a a1bJG . b.1bJ
```

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Identifying Buffer Latches

- Demo
 - Find out the rows and blocks fblk.sql
 - Find out the data object id dobjid.sql
 - Find out the data block address get_dba.sql
 - Find out the child latch address hladdr1.sql
 - Find out the objects protected by a latch latchobjs.sql
 - Find out the total buffers per latch clatchcount.sql

Summary

- Buffers are placeholders in memory
- · Empty when the instance comes up
- Server process brings a data block from database to occupy a buffer
- There is no "database" of which block is in which buffer.
- A process has to scan the buffers to find what it needs
- · The buffers are spread over several hash chains to help in searching
- A data block address (DBA) is fixed for the block
- · DBA determines which chain the block may be found
- A latch prevents multiple processes from walking the chain

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Thank You!

Blog: arup.blogspot.com
Tweeter: @ArupNanda
Facebook.com/ArupKNanda
Google Plus: +ArupNanda

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