Why is my Oracle10g Database SLOWER than my Oracle9i Database?

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Author/Speaker/Oracle Expert

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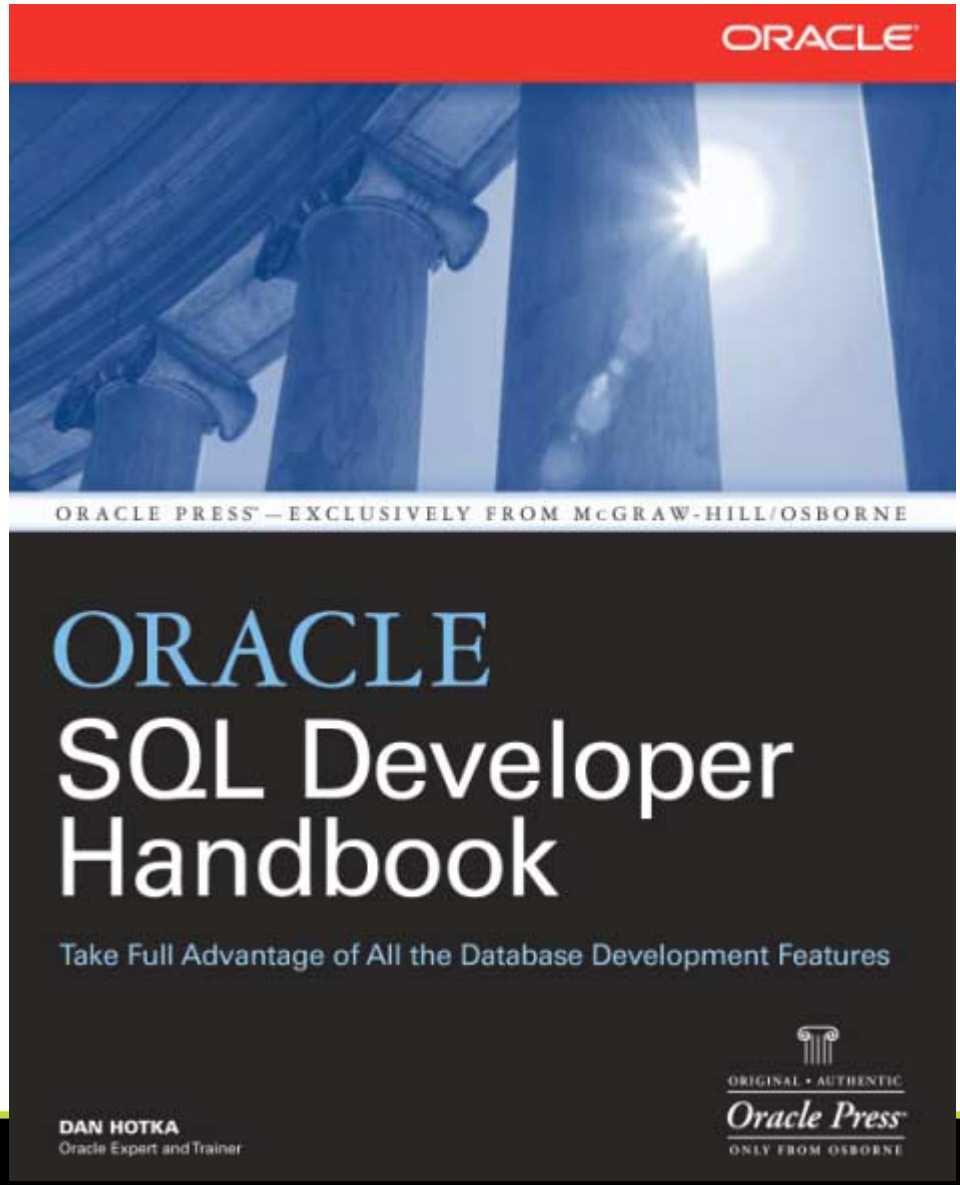

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Agenda

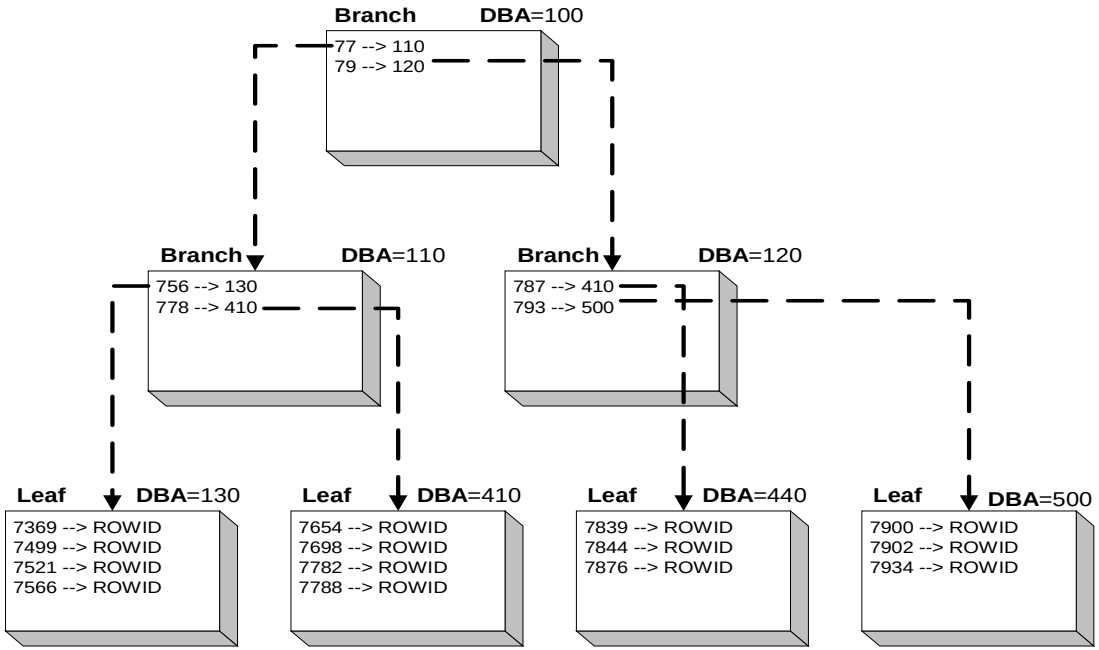
- Index Monitoring
  - Introduced in Oracle9i
- Things I've Heard…
- Index Clustering Factor
  - Relationship between index and table data blocks
- Oracle10g New Tablespace Features
  - Automatic Space Management
- Case Study

Indexes

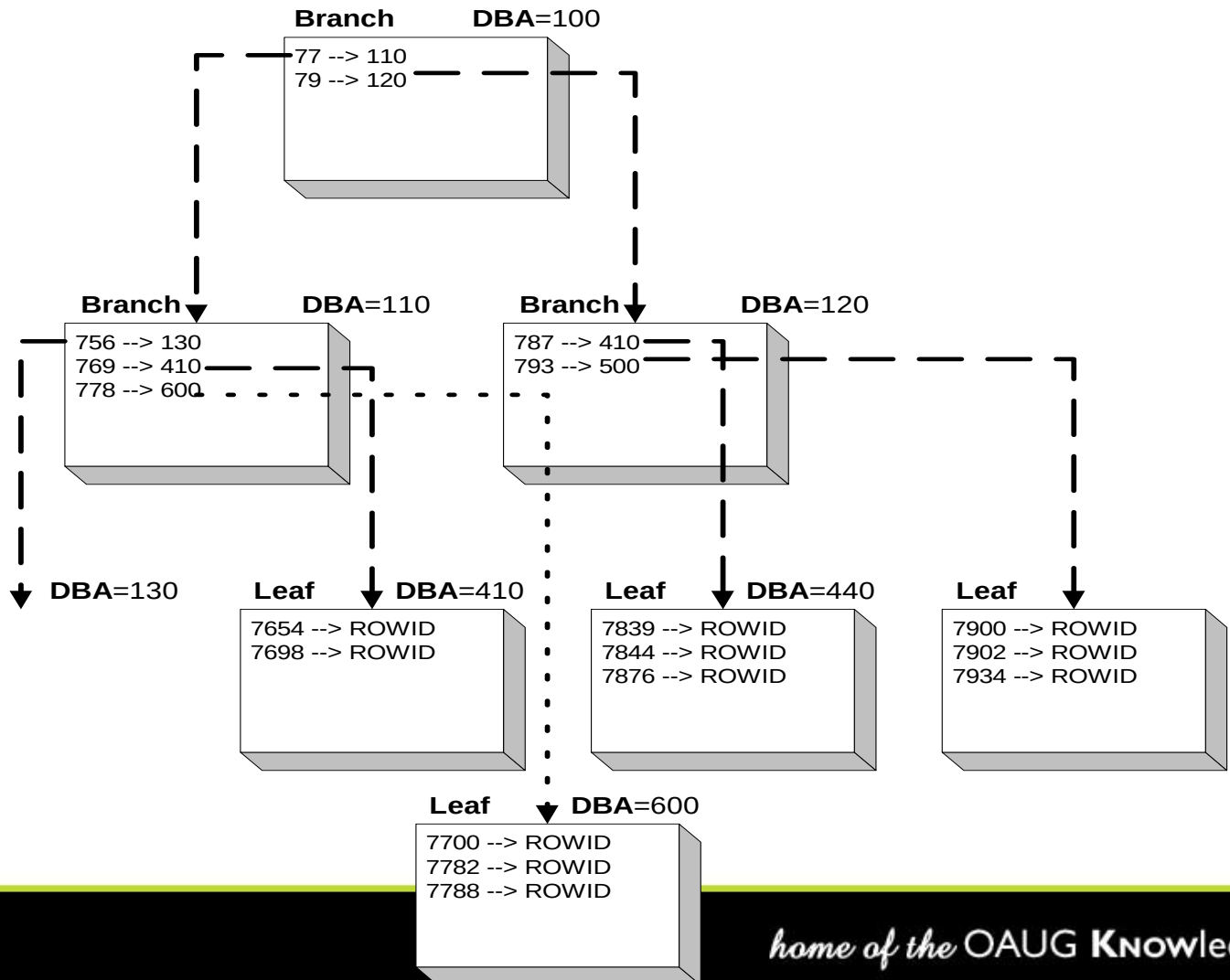
Indexes

- Indexes:
  - Fast path to rows
  - Insures uniqueness
  - Oracle can use them when processing an Order By
  - NOT always the fastest method
  - Not used with any Oracle function
  - Coding style definitely affects Index usage

B*Tree Index Structure



B*Tree Index Split

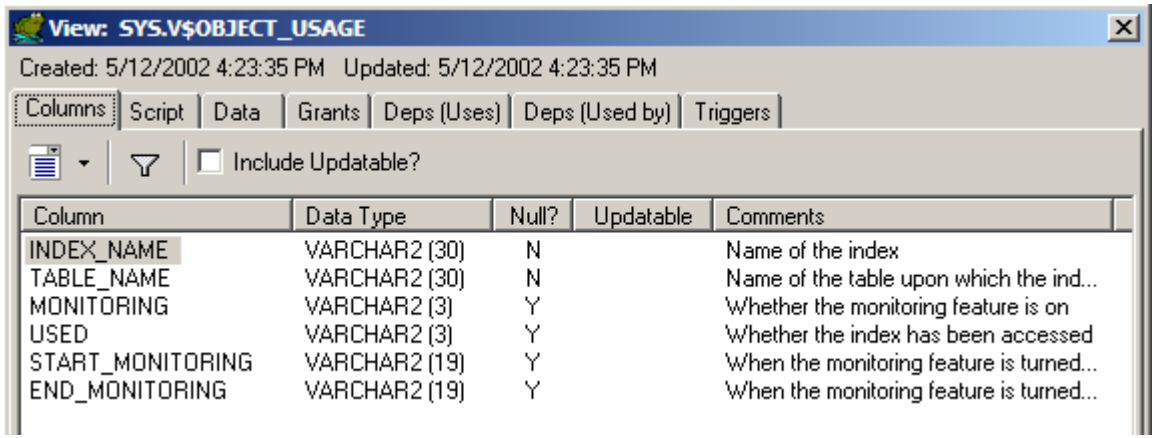


B*Tree Index

- Reorganize Indexes
  - Fills leaf blocks to PCTFREE
  - Performance of fast full scans and range scans increases

Index Monitoring

- Oracle9+ can monitor Index Usage
  - SQL> alter index <index name> MONITORING USAGE
  - SQL> alter index <index name> NOMONITORING USAGE



Index Monitoring

```
set headings off

spool index_monitoring.sql


select 'alter index ' || index_name || ' monitoring usage;'
from user_indexes;

spool off

start index_monitoring


select count(*) from v$object_usage where used = 'YES';

select count(*) from v$object_usage where used is null;

select count(*) from v$object_usage;

select count(*) from user_tables;
```

Index Monitoring

- Ask me for this script:
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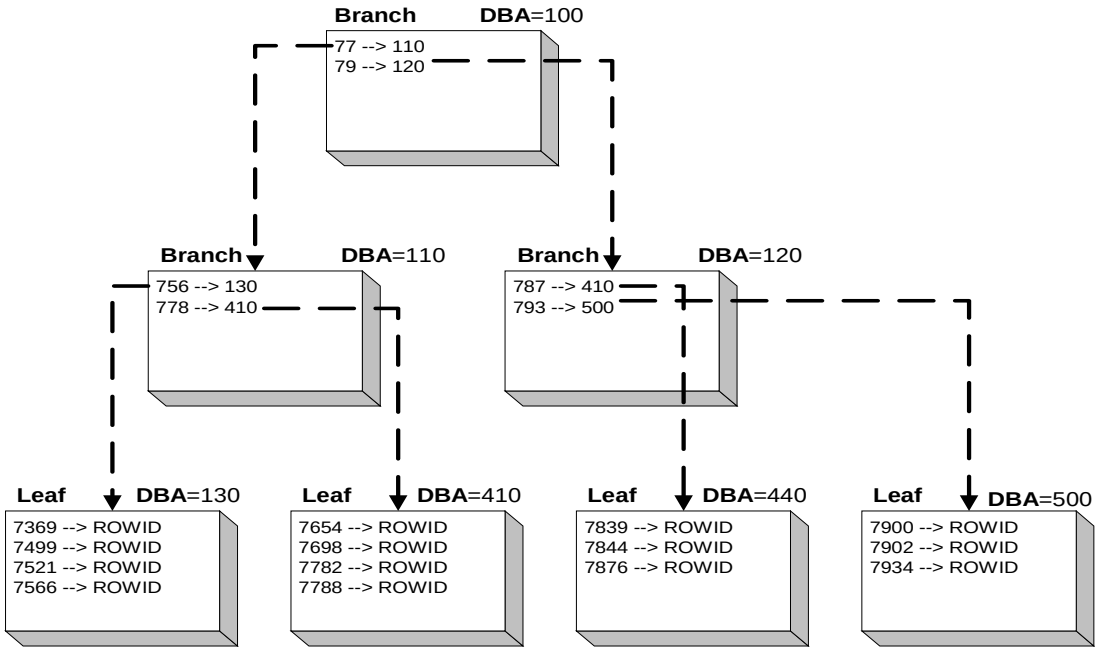
Things I've Heard

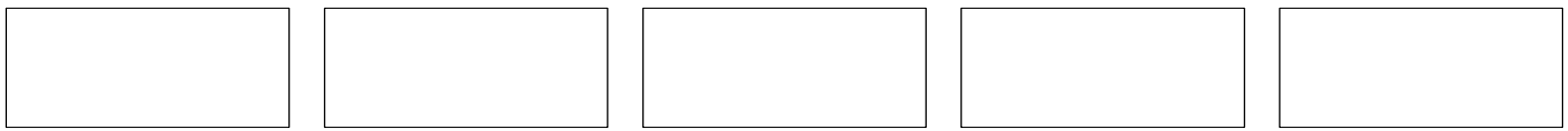
- Things I've Heard…
  - SQL with Histograms not working correctly
  - SQL with Different Explain Plans for no apparent reason
  - Try COMPATIBLE setting
    - Set to 9.2.0.0.0
    - ALTER SESSION SET COMPATIBLE = 9.2.0.0.0
    - INIT.ora sessing

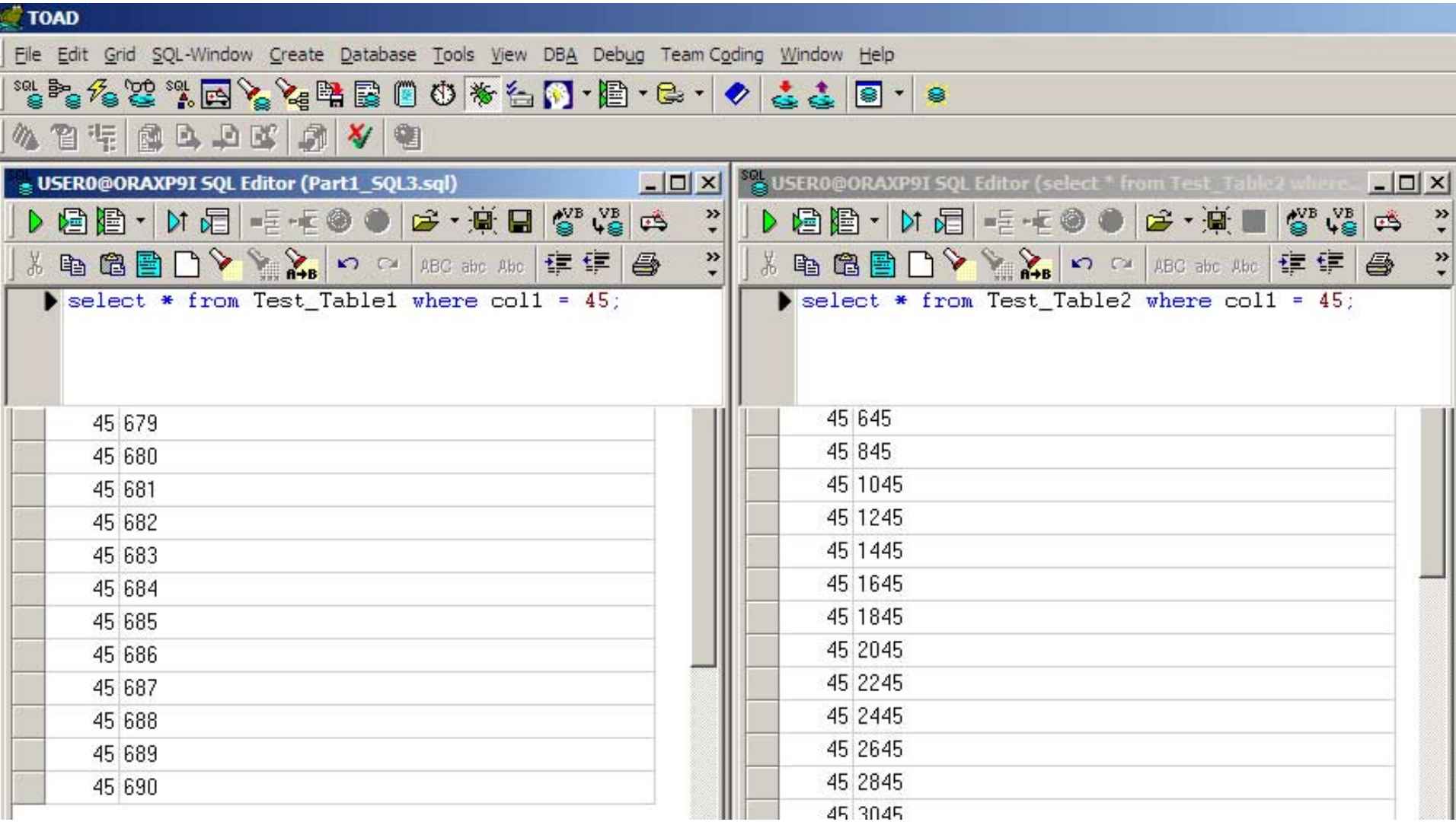
Index Clustering Factor

- The relationship of how many data blocks each leaf block points to
- Collected by CBO
- Lower the clustering factor – more the data is in order by indexed column
- Design indexes/data order around most-used queries/most important queries

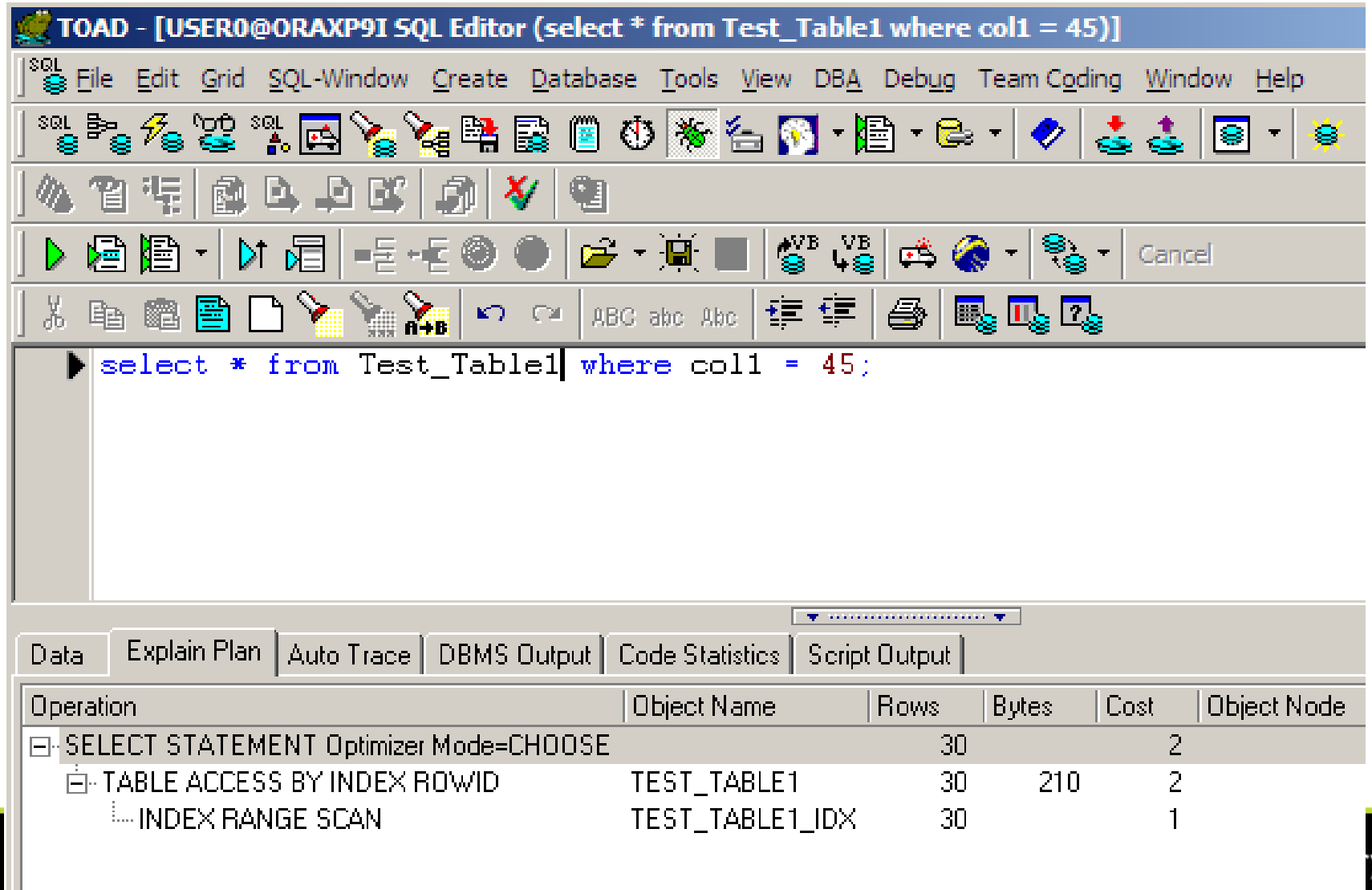
Index Clustering Factor






TOAD
File Edit Grid SQL-Window Create Database Tools View DBA Debug Team Coding Window Help
USER0@ORAXP9I SQL Editor (Part1_SQL3.sql)
select * from Test_Table1 where col1 = 45;
45 679
45 680
45 681
45 682
45 683
45 684
45 685
45 686
45 687
45 688
45 689
45 690
USER0@ORAXP9I SQL Editor (select * from Test_Table2 where...
select * from Test_Table2 where col1 = 45;
45 645
45 845
45 1045
45 1245
45 1445
45 1645
45 1845
45 2045
45 2245
45 2445
45 2645
45 2845
45 3045

Index Clustering Factor



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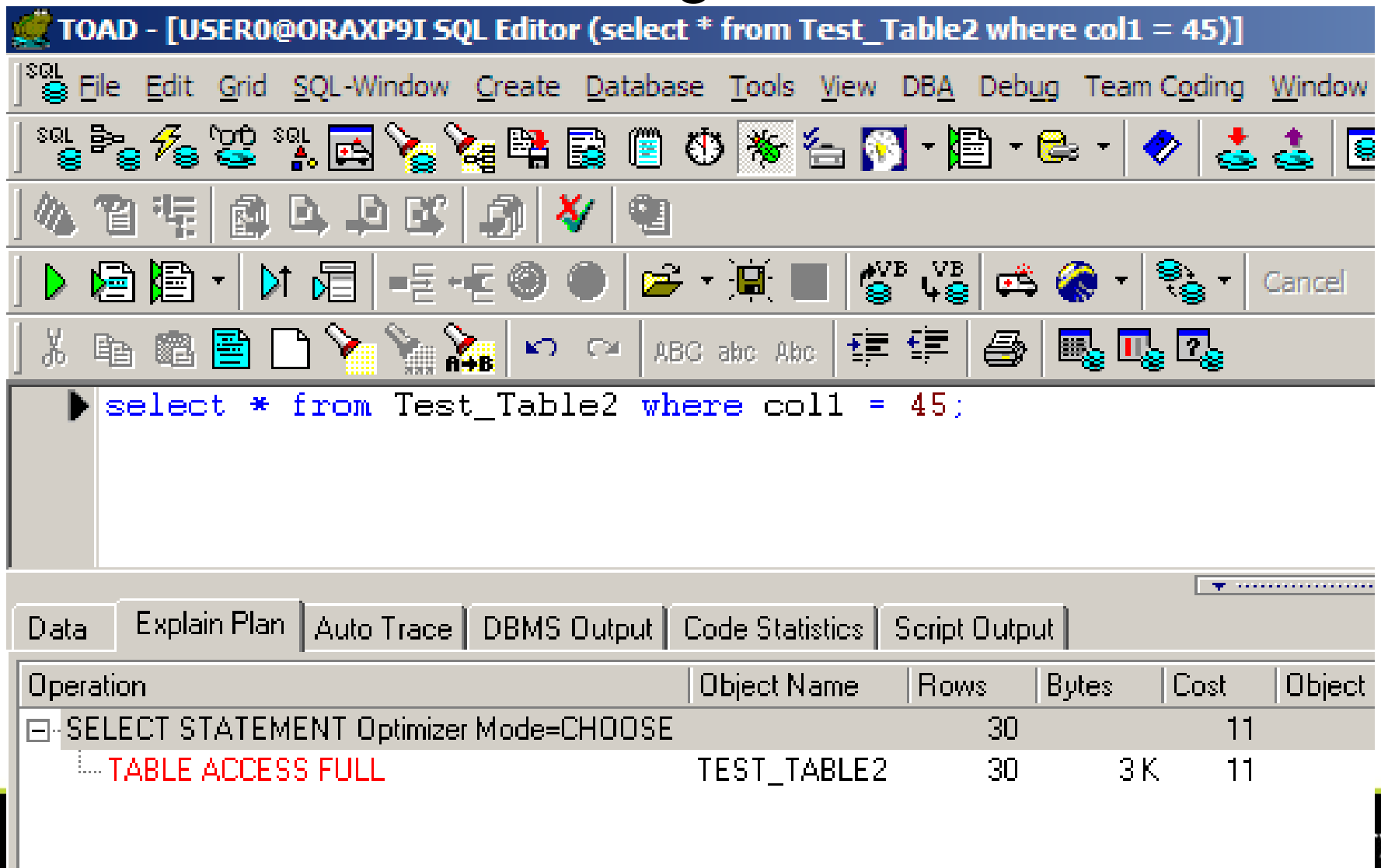

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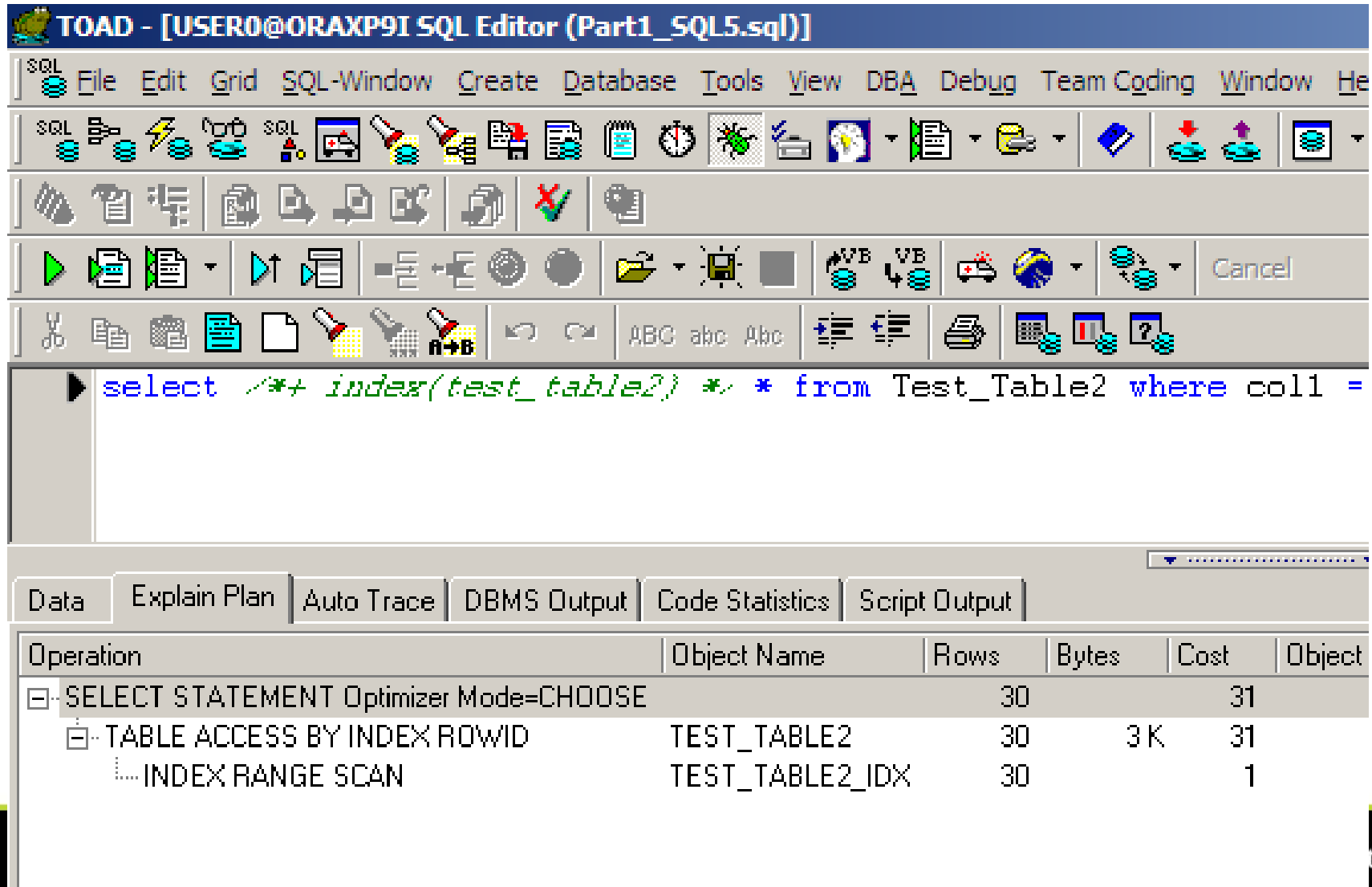

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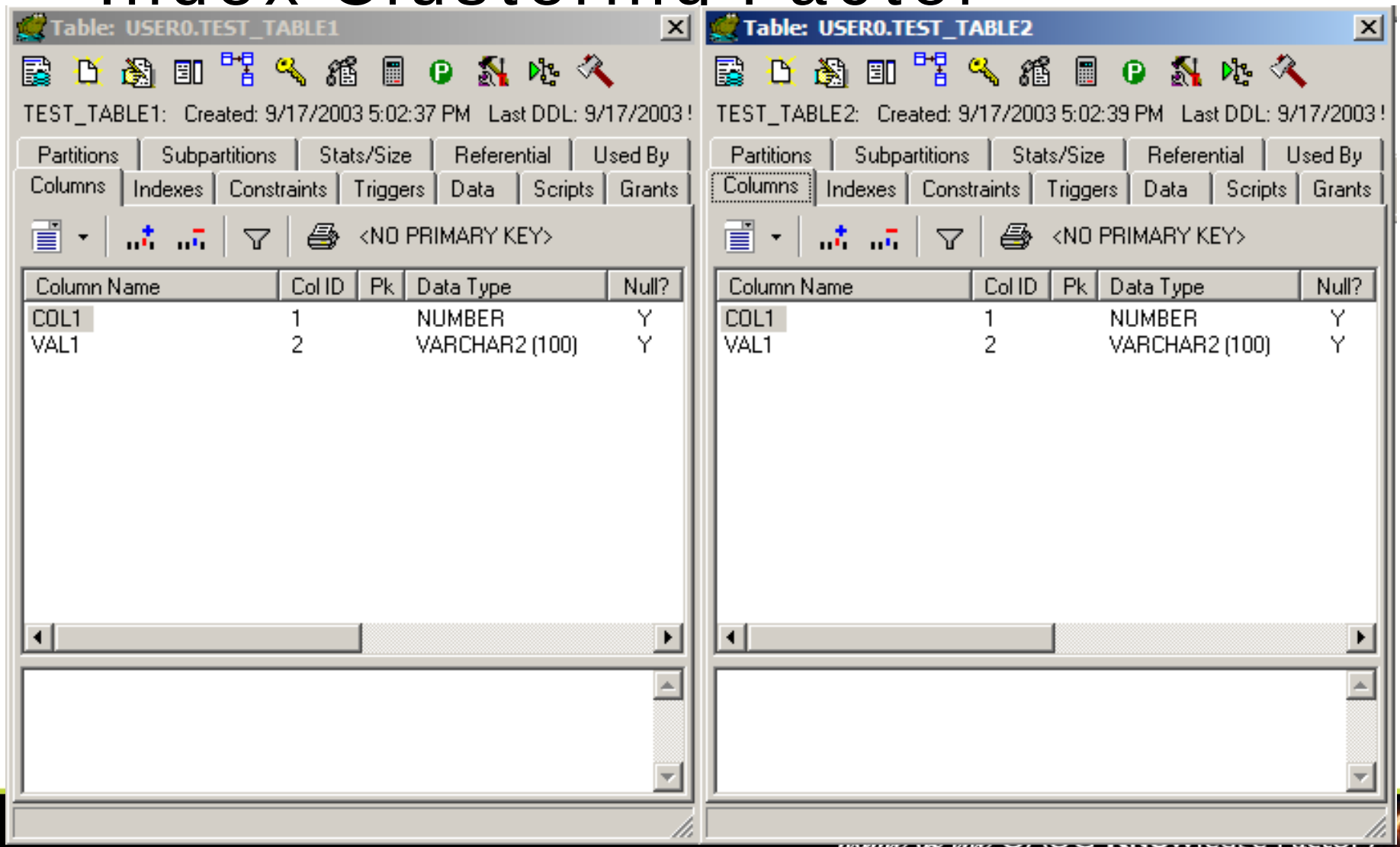

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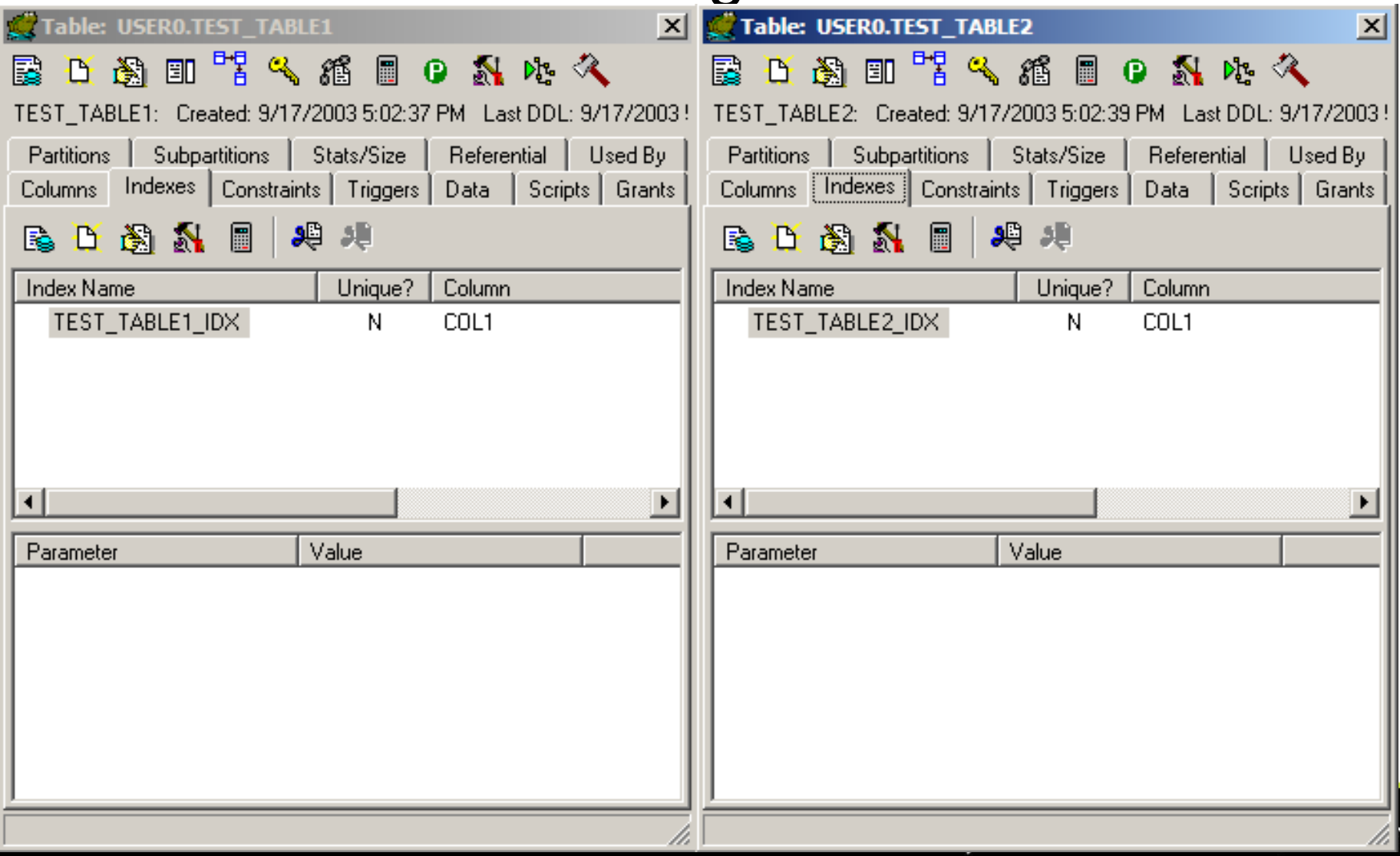
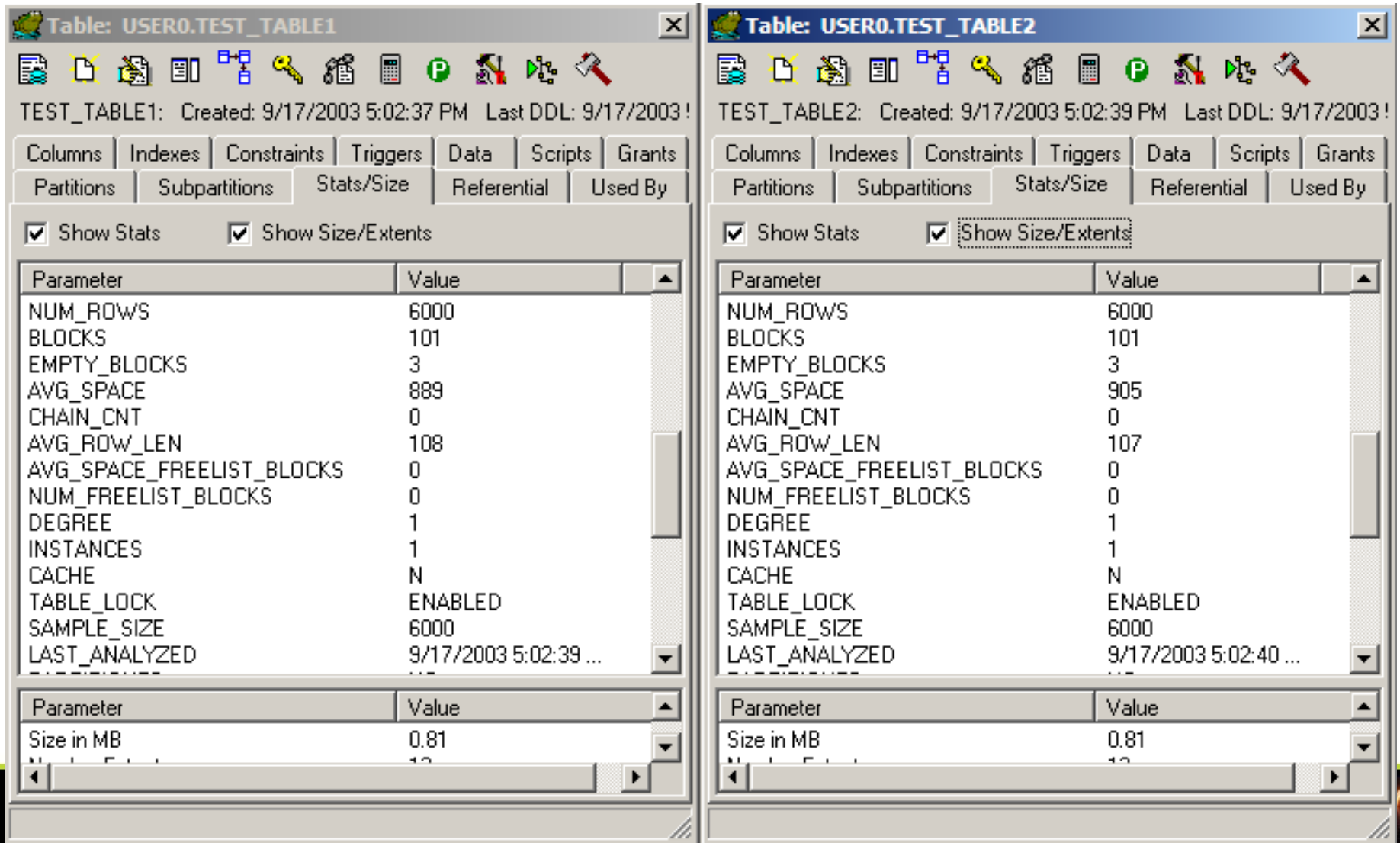


Index Clustering Factor



Index_Info.sql

```
SELECT i.table_name, i.index_name, t.num_rows, t.blocks, i.avg_data_blocks_per_key,
i.avg_leaf_blocks_per_key,i.clustering_factor, o.created
from user_indexes i, user_objects o, user_tables t
where i.index_name = o.object_name
  and i.table_name = t.table_name;
```

Data | Explain Plan | Auto Trace | DBMS Output | Code Statistics | Script Output

TABLE_NAME	INDEX_NAME	NUM_ROWS	BLOCKS	AVG_DATA...	AVG_LEAF...	CLUSTERING_...
A	A_STATUS_IDX	1000	8	3	3	3
B	B_STATUS_IDX	100	4	1	1	1
C	C_B_ID_IDX	1000	8	3	1	300
DEPT_CHAR	DEPT_CHAR_PRIMARY_					
DEPT	DEPT_PRIMARY_KEY					
MASTER	MASTER_LASTNAME					
B	PK_B_ID	100	4	1	1	1
TEAMS	TEAMS_PK					
TEST_TABLE1	TEST_TABLE1_IDX	6000	101	1	1	92
TEST_TABLE2	TEST_TABLE2_IDX	6000	101	30	1	6000
TOAD_PLAN_TABLE	TPTBL_IDX					

Index Info

- Ask me for this script:
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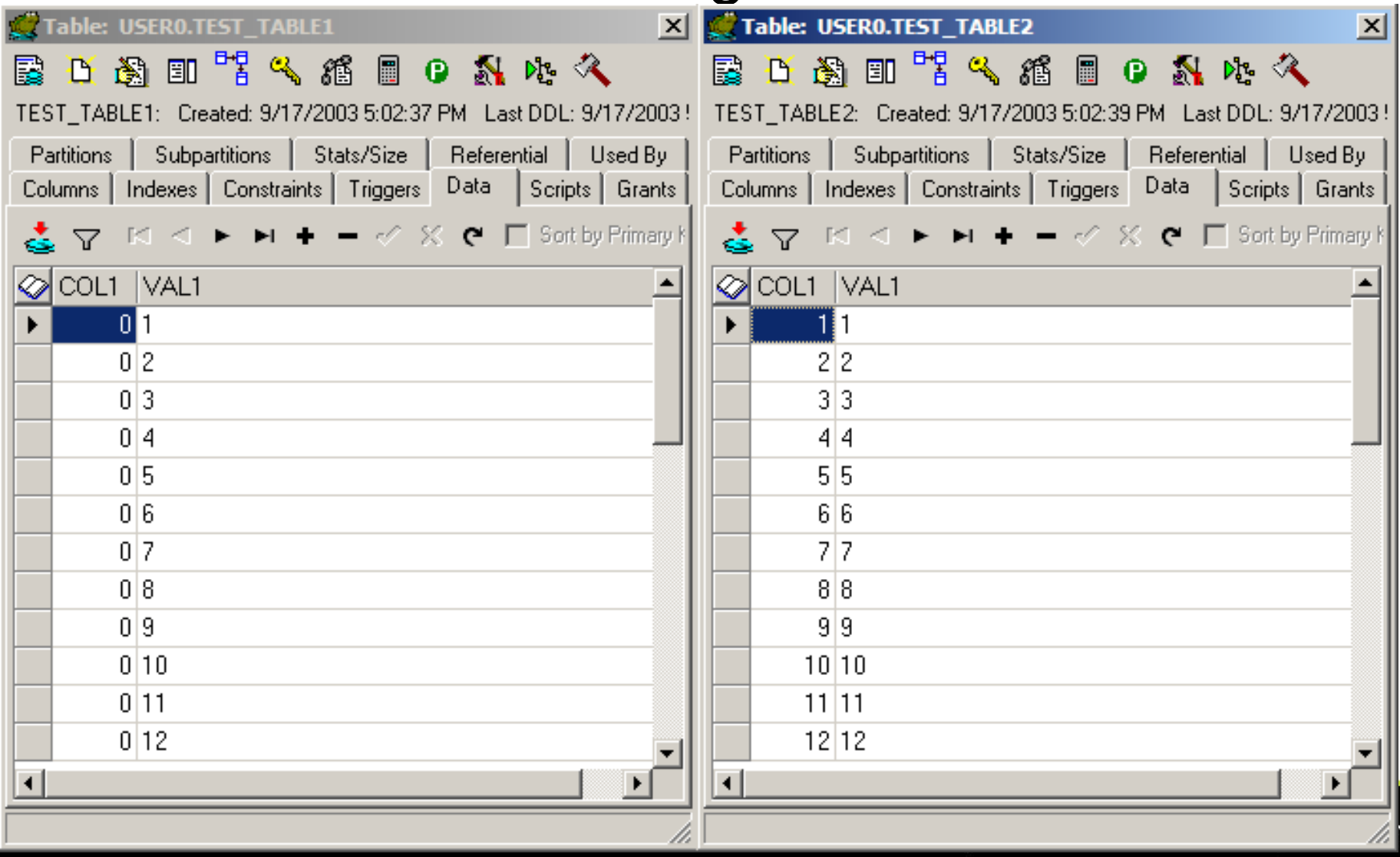
Index Clustering Factor



Automatic Space Storage Management

- Replaces Free lists and free list groups
- Ignores PCTUSED
- Uses a bitmap in the segment header to track available space
  - Holds less extent pointers (chains more quickly)

Automatic Space Storage Management

- Only available with Locally-Managed TS
  - Oracle9v2+
  - AUTO – uses Automatic Space Storage Mngt
  - Manual – uses freelists (existing technology)

```
CREATE TABLESPACE my_tablespace DATAFILE '/oracle/data/myts01.dbf'
SIZE 500M
EXTENT MANAGEMENT LOCAL
SEGMENT SPACE MANAGEMENT AUTO;
```

Automatic Space Storage Management

- Different Segment Header Info
  - No changes in Cache Layer, Map Header
  - Extent Table holds these limits:
    - 2K – 151 Extents (down from 121…)
    - 8K – 307 Extents (down from 496)
    - Etc
  - Low/High Water Marks
    - Low HWM – all blocks below are formatted
    - High HWM – all blocks above are unformatted
    - Between: Oracle checks block status bitmap flag

Automatic Space Storage Management

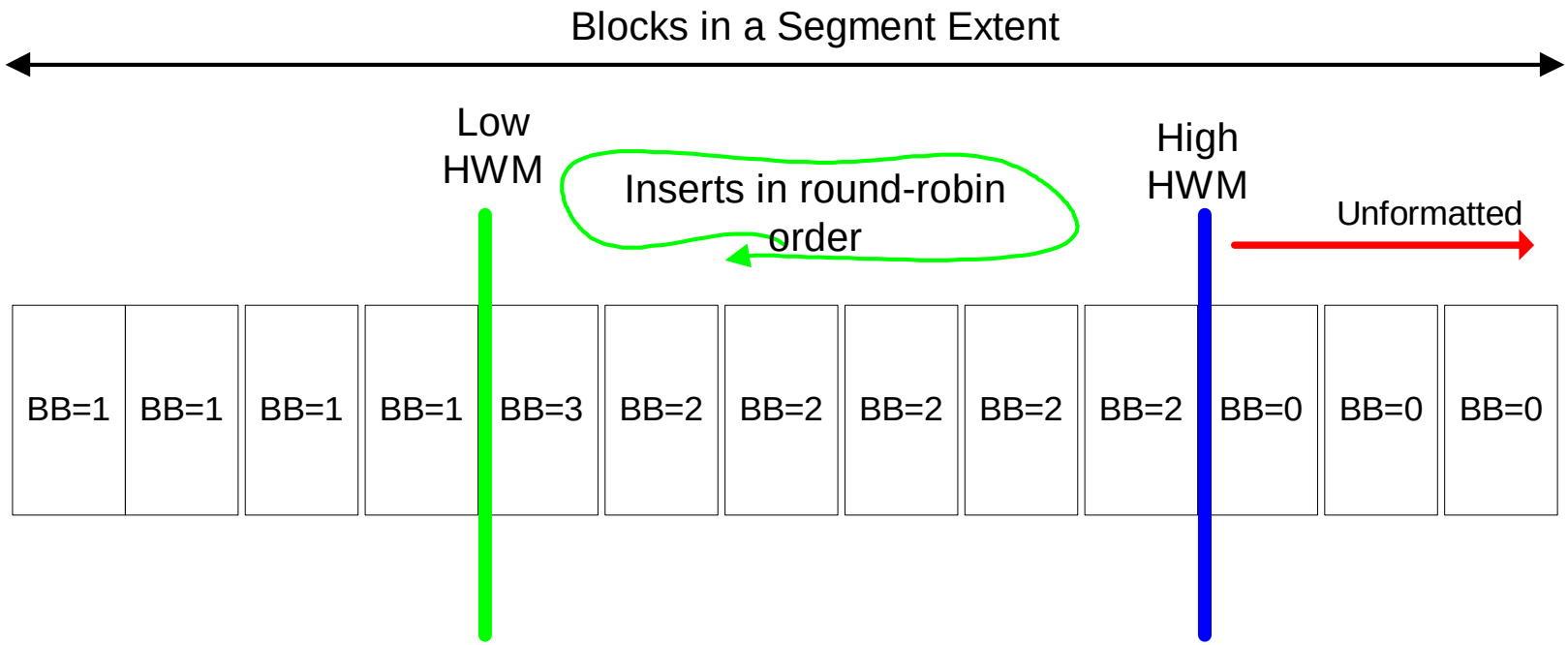
- Bitmap Blocks
  - Stored in separate blocks as part of the segment header
  - Tracks PCTFREE and formatted/unformatted blocks
  - Tracks total free space in the block (not just what is available for inserts)

Automatic Space Storage Management

- 1 nibble (bit) per data block in the segment
  - 0 = unformatted
  - 1 = Full (met PCTFREE)
  - 2 = 0 – 25% free
  - 3 = 25 – 50% free
  - 4 = 50 – 75% free
  - 5 = 75 – 100% free
- Updated as blocks cross thresholds

Automatic Space Storage Management

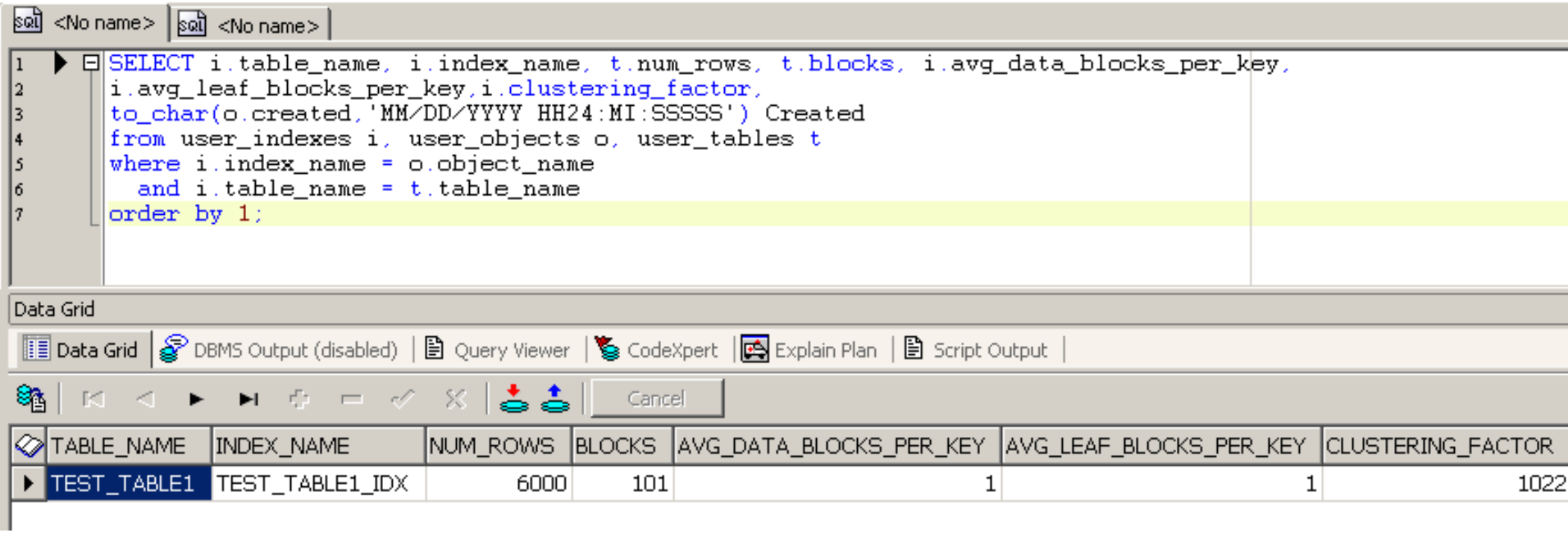
- How it works:



Automatic Space Storage Management

- What it is good for:
  - Apps with lots of concurrent inserts
  - RAC (intended use)
  - Other 10g features
- What it is NOT good for:
  - Space not well used
  - Space can be come lost
    - Needs DBA Attention/monitoring
    - FIX_SEGMENT_STATUS
  - Redo generation is high
  - Can give indexes a high clustering factor!

Index_Info.sql



<No name> <No name>

```
1  SELECT i.table_name, i.index_name, t.num_rows, t.blocks, i.avg_data_blocks_per_key,
2  i.avg_leaf_blocks_per_key,i.clustering_factor,
3  to_char(o.created,'MM/DD/YYYY HH24:MI:SSSSS') Created
4  from user_indexes i, user_objects o, user_tables t
5  where i.index_name = o.object_name
6    and i.table_name = t.table_name
7  order by 1;
```

Data Grid

Data Grid | DBMS Output (disabled) | Query Viewer | CodeXpert | Explain Plan | Script Output

Cancel

TABLE_NAME	INDEX_NAME	NUM_ROWS	BLOCKS	AVG_DATA_BLOCKS_PER_KEY	AVG_LEAF_BLOCKS_PER_KEY	CLUSTERING_FACTOR
TEST_TABLE1	TEST_TABLE1_IDX	6000	101	1	1	1022

Case Study

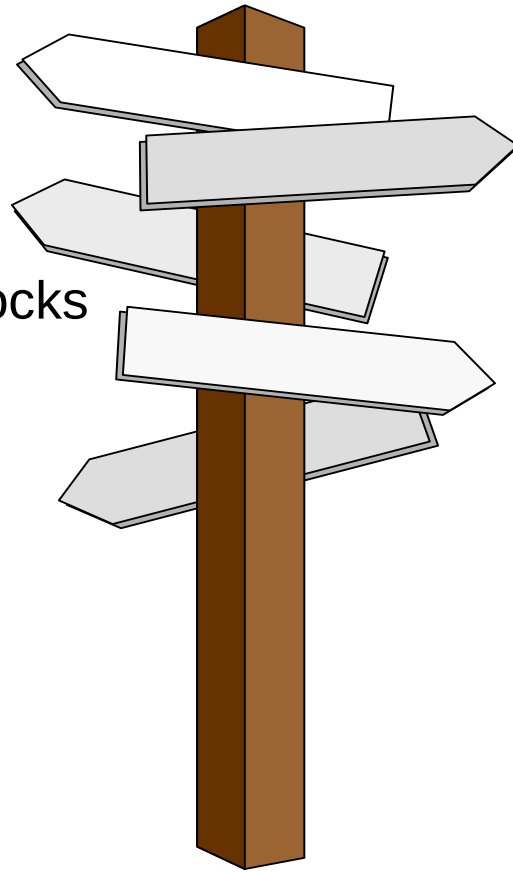
- Large ERP Application
  - 4 CPU IBM P Series
  - 12GB Memory
    - SGA set at 3GB
    - Shared Pool 300MB
  - AIX 5.2 64bit OS
  - Major performance problems when migrating their ERP from 9.2.0.5 to 10.2.0.2
    - JD Edwards One World – No changes/upgrades – just rehosting

Case Study

- Large ERP Application
  - Metalink & 2 Consultants of little help
  - Weeks worth of stats pack reports
    - I/O and explain plans the same
  - Histograms changed
  - “No one could tell me anything…”

Case Study

- Solution
  - Upped the memory
    - Added 12DB Memory
    - SGA to 10GB
    - Shared Pool to 1.8GB
  - Adding 4 more CPUs solved the problem
    - It appears our machine could not handle the same I/O as it did with Oracle9i
  - Oracle finally said – after the problem was solved - that the 10g kernal code had grown enough that our 4 CPU system could not handle it

What have we learned?

- Index Monitoring
  - Introduced in Oracle9i
- Index Clustering Factor
  - Relationship between index and table data blocks
- Things I've Heard…
- Oracle10g New Tablespace Features
  - Automatic Space Management
- Case Study
  - ERP Application
- Lets do the book draw!!!