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#C14LV

Should You Drop Indexes on Exadata?

Session 316

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Longtime Oracle DBA

(and now DMA)



REMINDER

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Should I Drop Indexes on
Fxadata?



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Quotes

“ You don't need
indexes on Exadata.

” “ Drop all the indexes
and reclaim space.

“ *Why*? Because
there is a storage
index.”

Should I Drop Indexes on
Exadata?



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3 Questions for “Best Practices”

1. Why it is better than the rest?
2. What happens if it is *not* followed?
3. When are they *not* applicable?

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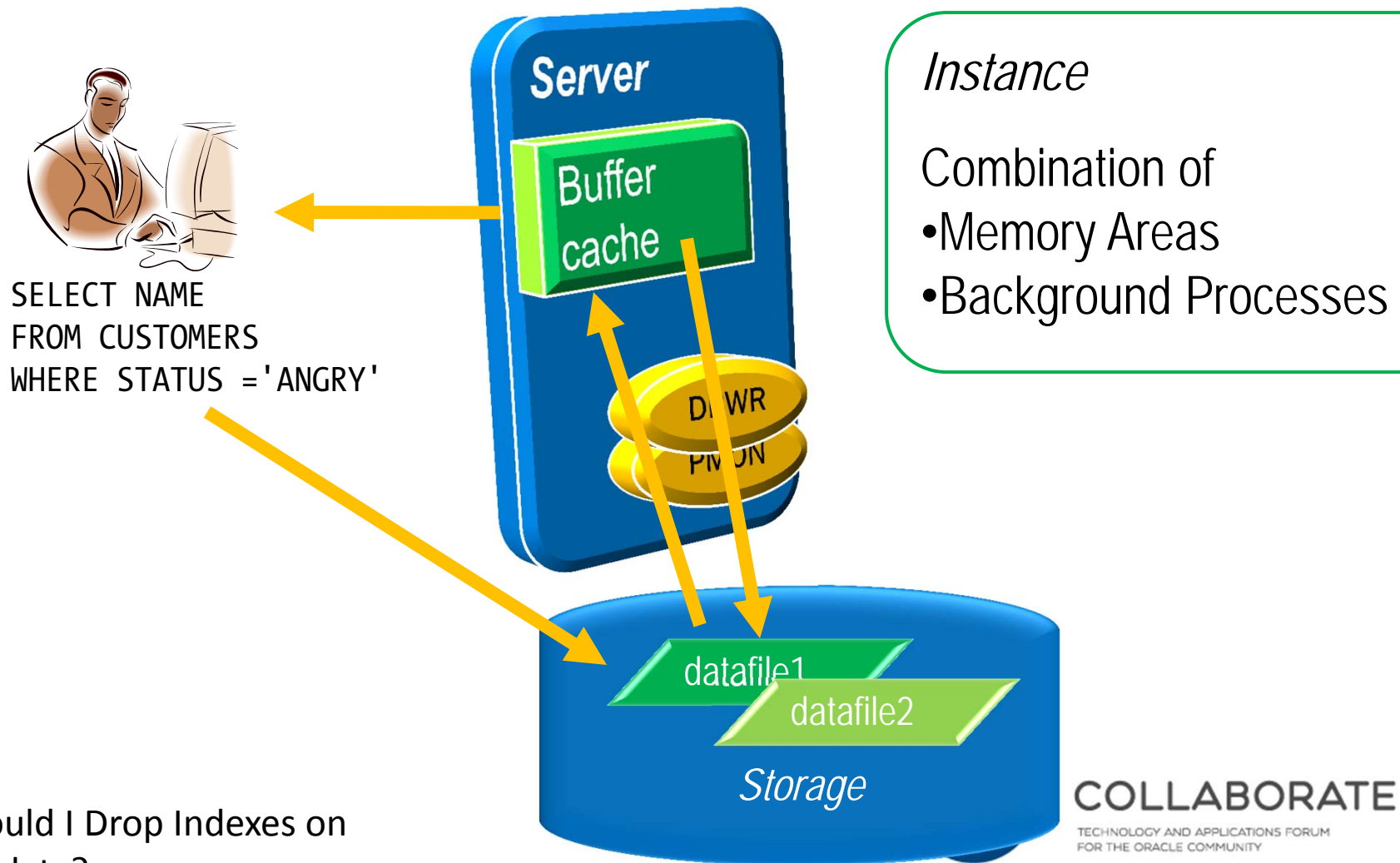
Storage Index

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Exadata?

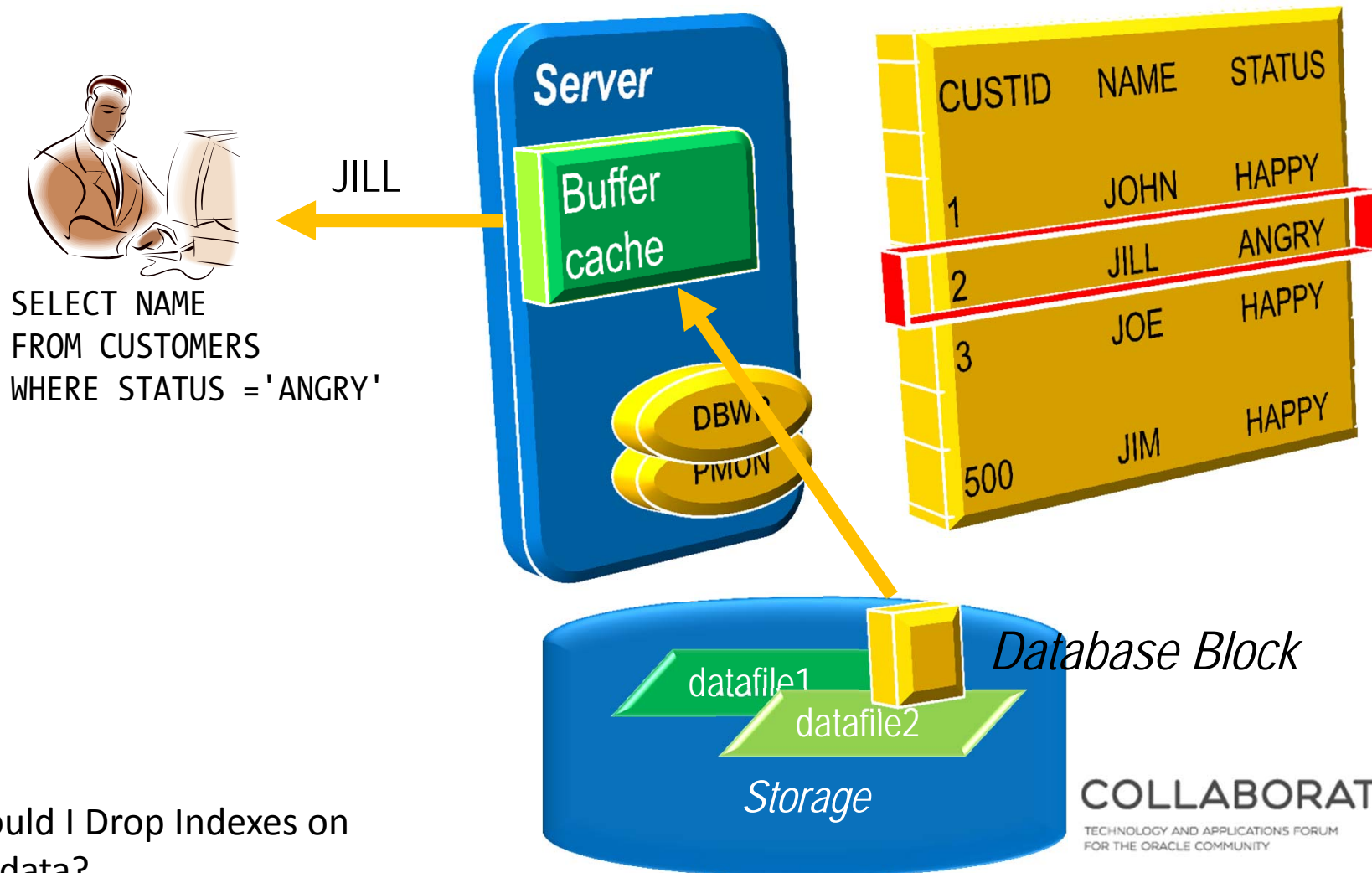


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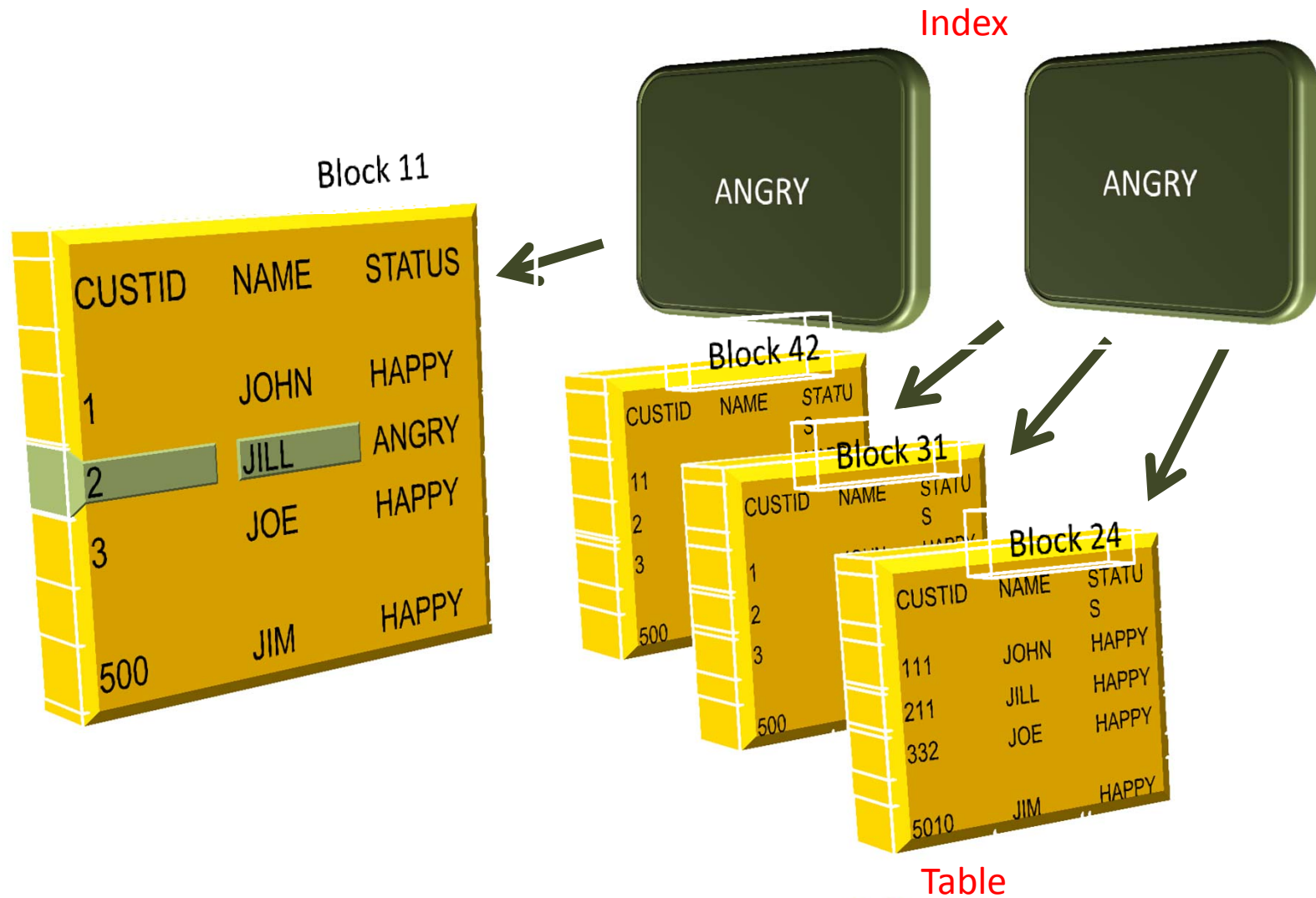
Instances and Databases



Query Processing



Should I Drop Indexes on Exadata?



Should I Drop Indexes on
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Components for Performance

CPU

Memory

Network

I/O Controller

Disk

Less I/O = better
performance

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The Solution

- A typical query may:
 - Select 10% of the entire storage
 - Use only 1% of the data it gets
- To gain performance, the DB needs to shed weight
- It has to get less from the storage
 - Filtering at the storage level
 - The storage must be cognizant of the data

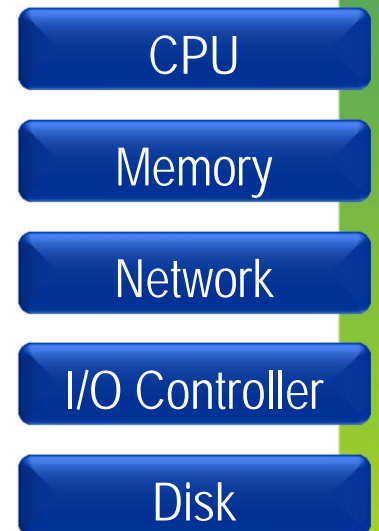
```
SELECT NAME  
FROM CUSTOMERS  
WHERE STATUS = 'ANGRY'
```

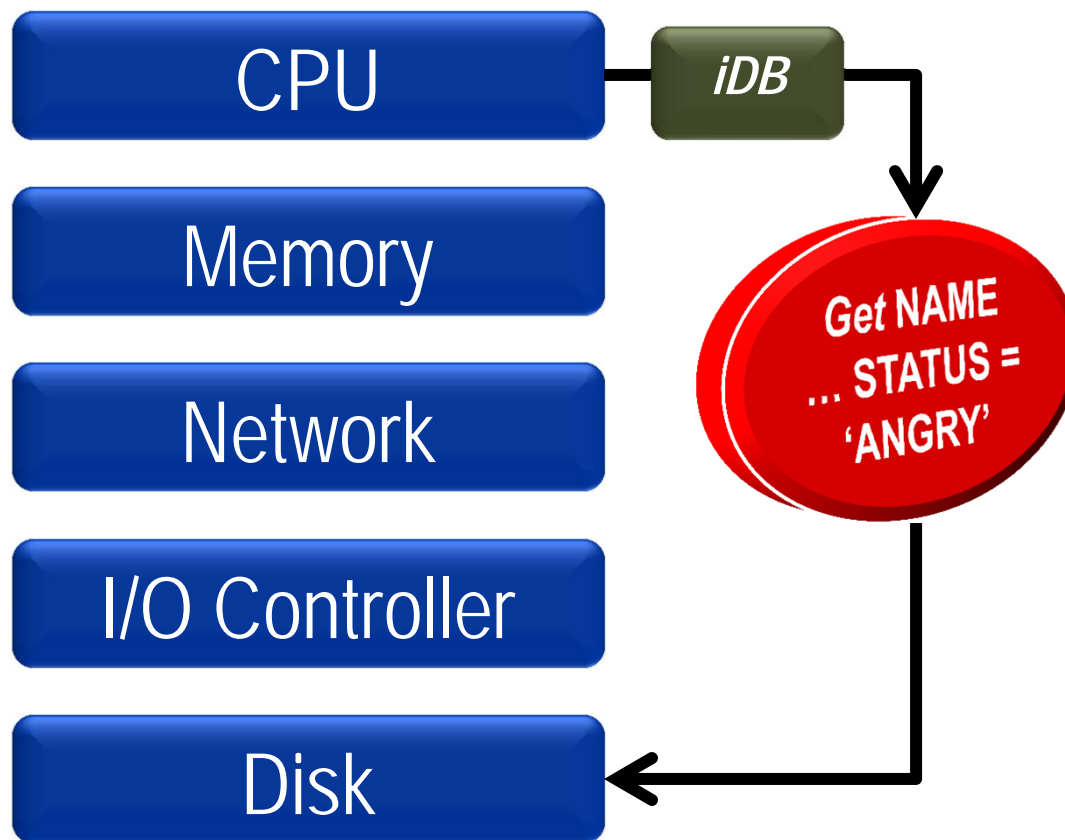


*Filtering
should be
Applied Here*



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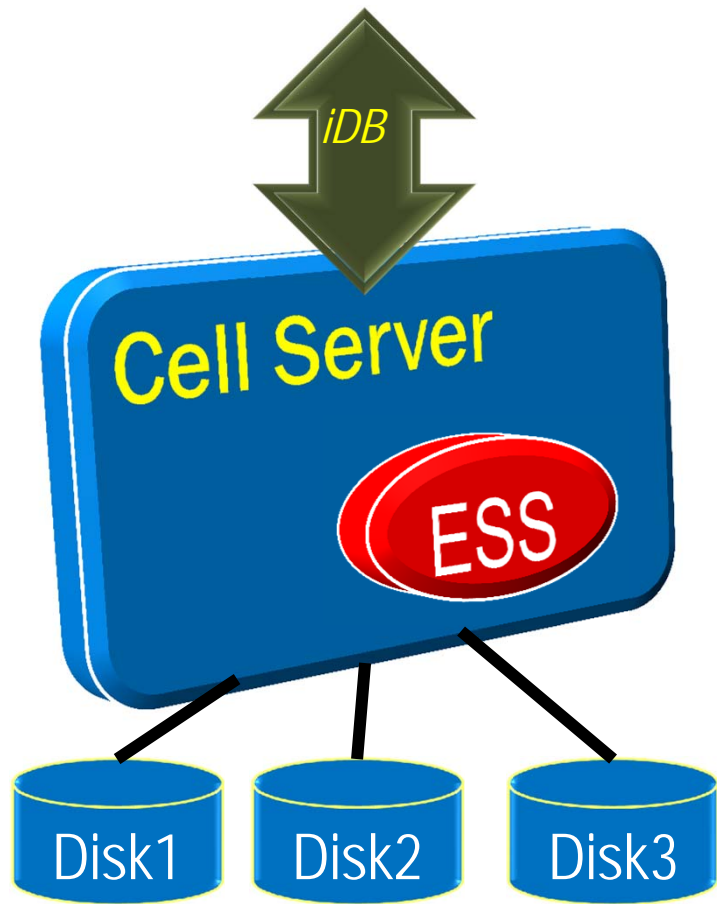




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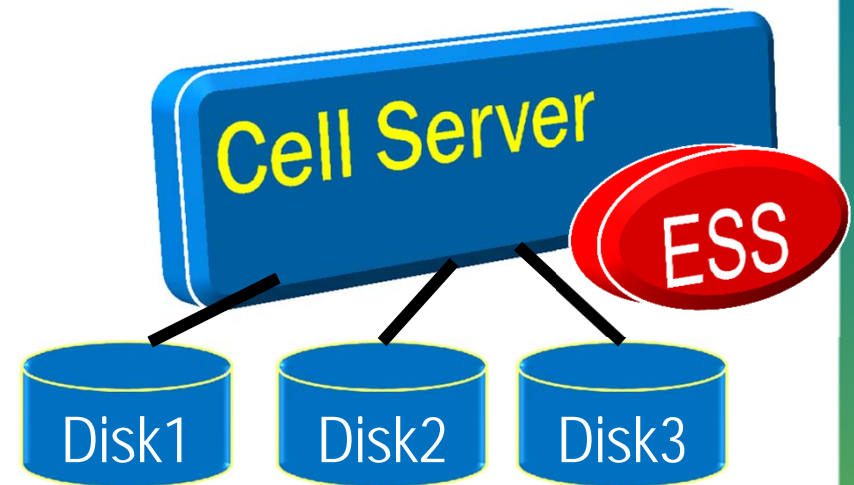
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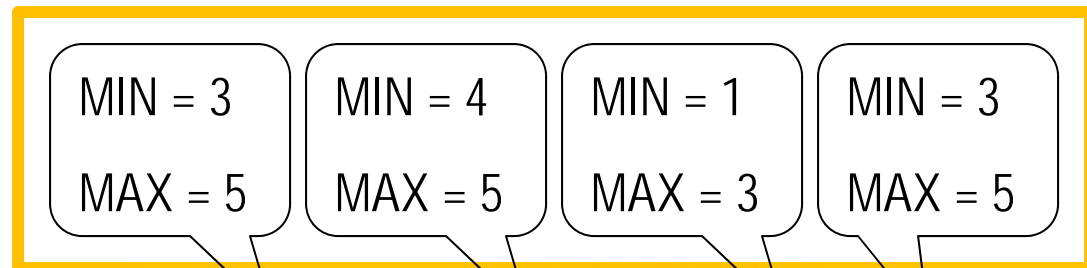
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SELECT ...
FROM TABLE
WHERE COL1 = 2



Storage Index

Should I Drop In
Exadata?



Storage Indexes

- Do not point to the database blocks
- Merely stores for a Storage “Unit”
 - Max/Min Values
 - Whether nulls are present
 - For some columns
- Is on Memory of Cells; not disk
 - Disappears when the cell is down

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Checking Storage Index Use

```
select name, value/1024/1024 as stat_value
from v$mystat s, v$statname n
where s.statistic# = n.statistic#
and n.name in (
    'cell physical I/O bytes saved by storage index',
    'cell physical I/O interconnect bytes returned by
    smart scan')
```

Output

| STAT_NAME | STAT_VALUE |
|------------|------------|
| ----- | ----- |
| SI Savings | 5120.45 |
| Smart Scan | 1034.00 |

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Offloading and Smart Scan

Offloading

Processing to storage cells

Smart Scan

Reduction in I/O

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Offloading

- Column Projection
`select cust_id, sale_amt
from sales`
- Predicate Filtering
`where status = 'ANGRY'`
- Function Offloading
`select min(sale_amt)`
- Virtual Columns

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Smart Scan Benefits

- Less I/O means
 - Faster disk access time
 - Less data from storage to DB
 - Less buffers
 - Less CPU
 - Less data between compute nodes

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Why Not?

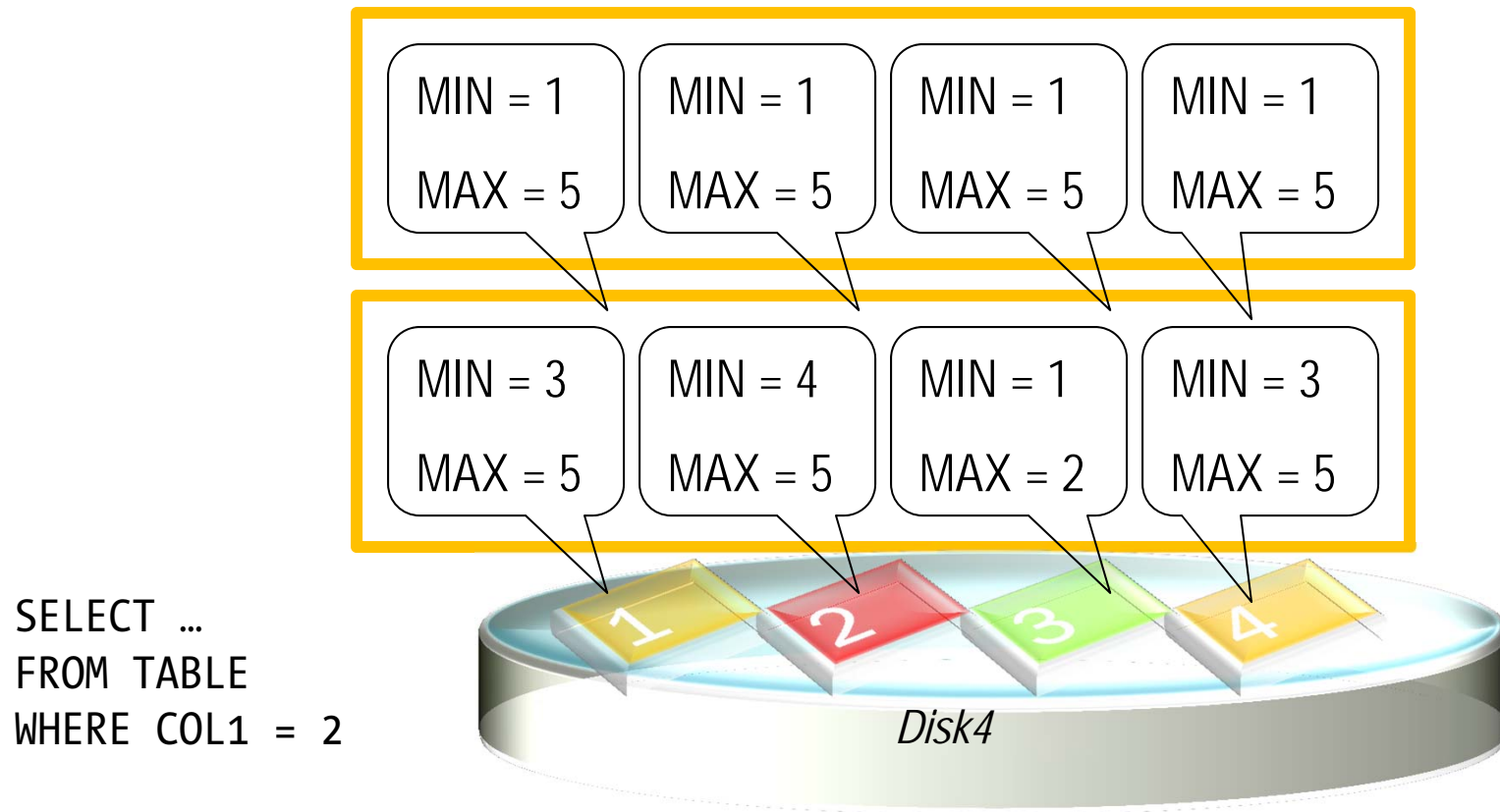
- Pre-requisite for Smart Scan
 - Direct Path
 - Full Table or Full Index Scan
 - > 0 Predicates
 - Simple Comparison Operators
- Other Reasons
 - Cell is not offload capable
 - The diskgroup attribute cell.smart_scan_capable set to FALSE;
 - Not on clustered tables, IOTs, etc.

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Impact of Data Distribution

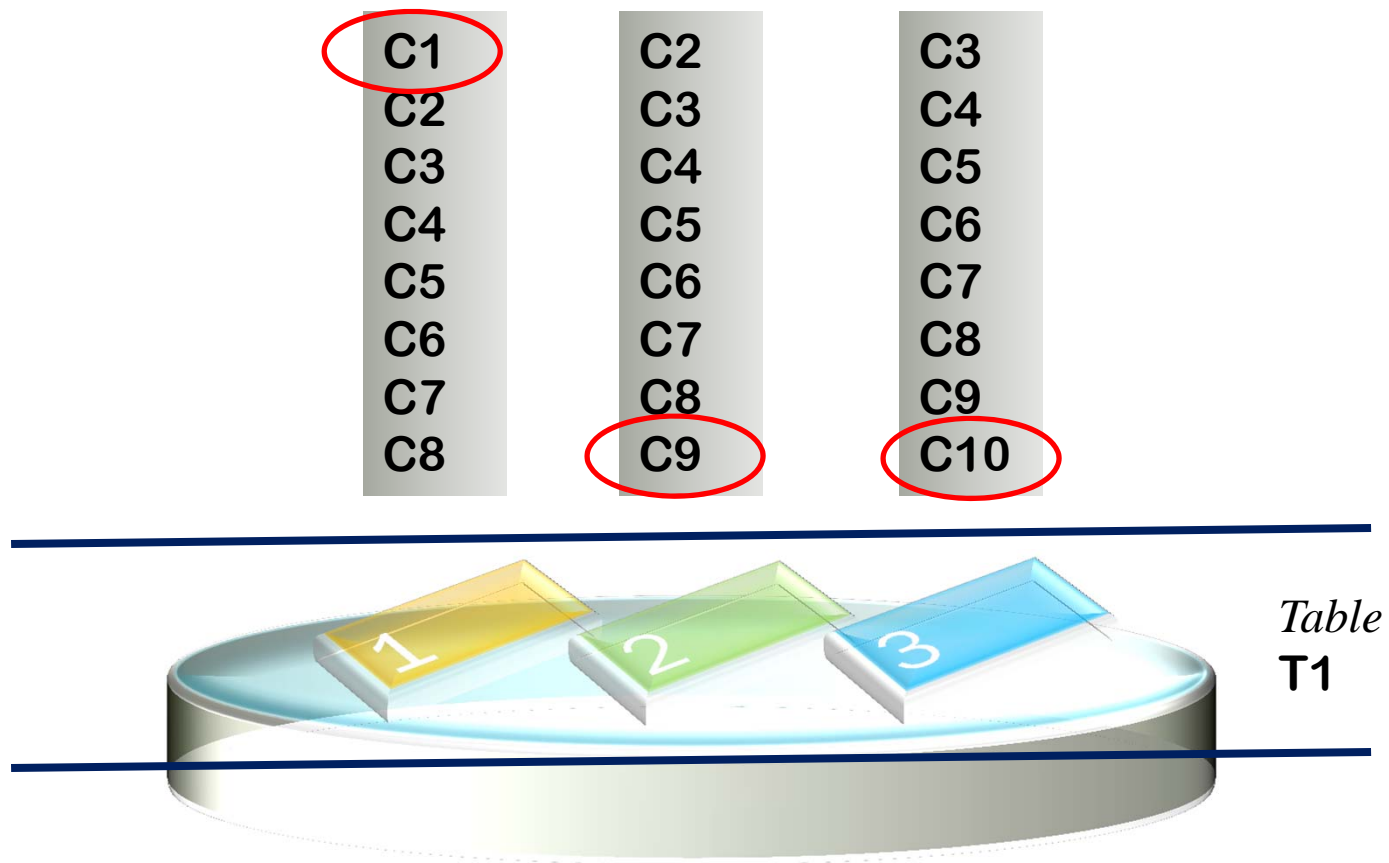


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8 Columns



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No Predicate

- Aggregations
select sum(sale_amt)
from sales
- Sorting
select ...
from sales
order by sale_amt;

Index on
SALE_AMT

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Factdata?



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Function Based Indexes

- Traditional Indexes can't work
select ...
from sales
where to_char(sale_dt,'YY') = '13'
- Function Based Indexes help
- SI indexes will not be useful

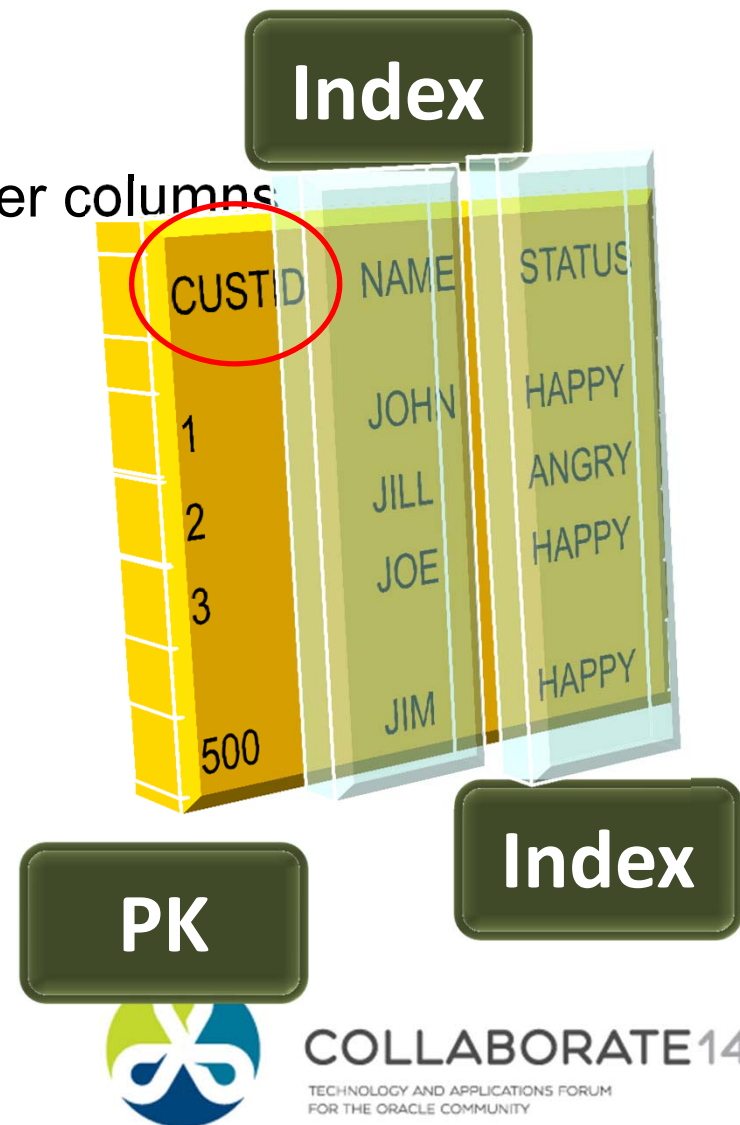
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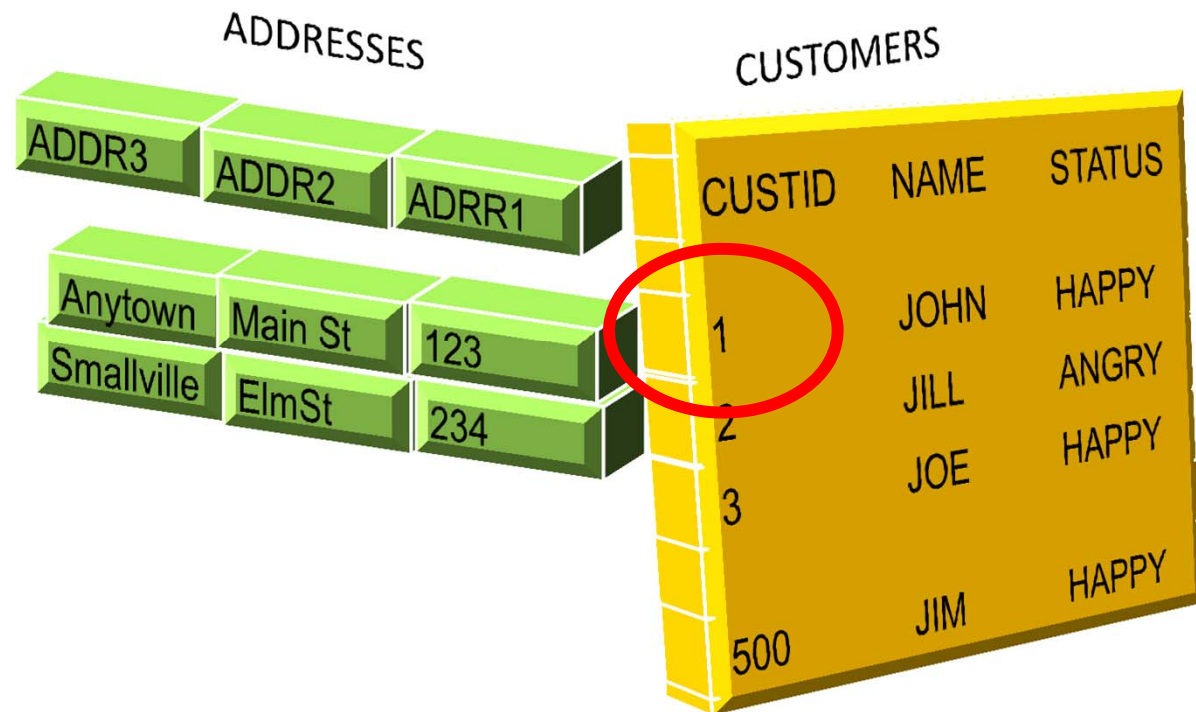
IOTs

- Index Organized Tables
- PK-based rows
- Secondary Indexes built on the other columns



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Clustered Tables



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Exclusion for SIs

- Not for non-equality

```
select sale_amt  
from sales  
where status != 'SHIPPED'
```
- No Wildcards

```
select sale_amt  
from sales  
where city like 'NEW YORK%'
```

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Virtual Columns

- Example

```
alter table EMP add (  
    tot_sal number(13) generated always as sal+comm)  
)
```

- Implication

- Do not actually exists in the table
- Computed at runtime

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Indexes on Small Tables

- Small table
 - Parameter `_small_table_threshold`
- Indexes still help small tables

<http://richardfoote.wordpress.com/2009/04/16/indexes-on-small-tables-part-i-one-of-the-few/>

 - Less latching

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Summary of SI Limitations

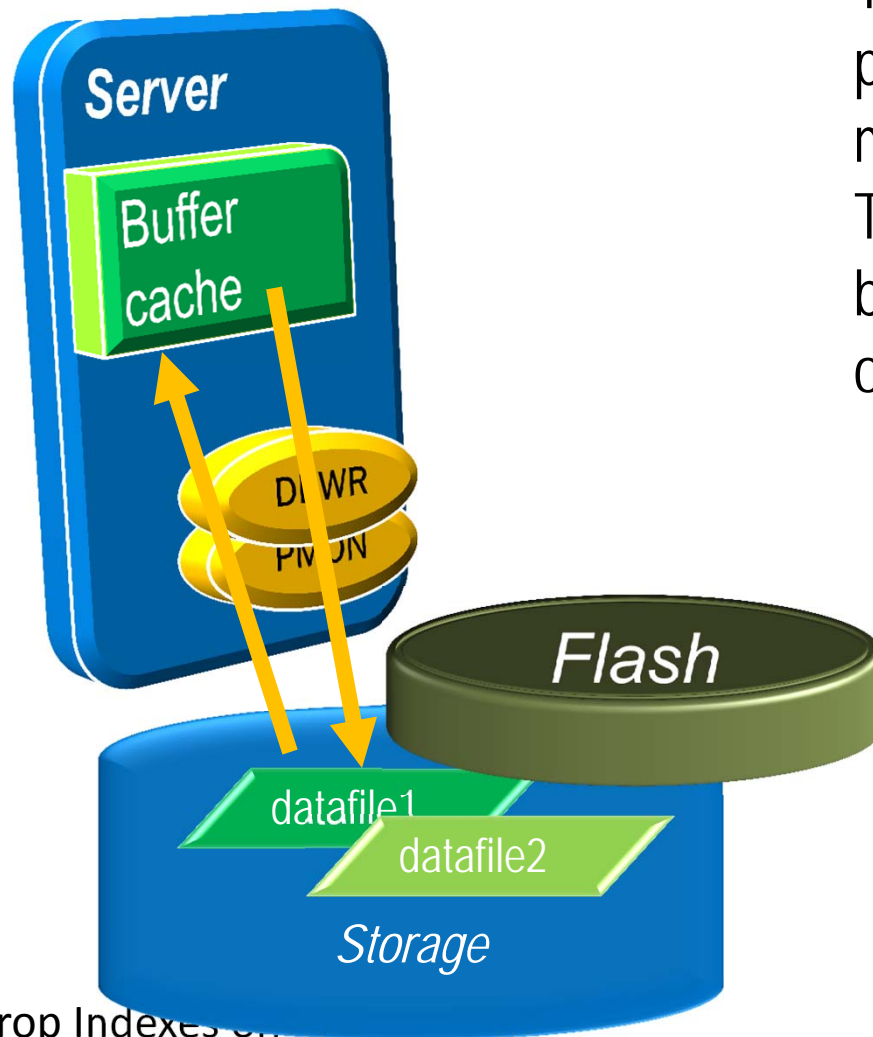
- Direct Path not used
- No Predicate ► No SI
- No Inequality (!=)
- ≤ 8 columns
- No Virtual Columns
- No wildcard match (LIKE '..%')
- No IOT, Clustered Table
- Latching on small tables
- First-timer Penalty
 - Only subsequent queries benefit

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Flash Cache



These are flash cards presented as disks; not memory to the Storage Cells. They are similar to SAN cache; but Oracle controls what goes on there and how long it stays.

```
alter table person  
storage  
(cell_flash_cache  
keep)
```

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Flash Trick for Indexes

- Pin Oft-Used Objects in Flash

```
SQL> alter index in_t2 storage (cell_flash_cache keep);
```

- Check flash

```
CellCLI> list flashcachecontent attributes -  
>         cachedKeepSize, cachedSize, hitCount, -  
>         hoursToExpiration, missCount -  
>         where objectnumber = 382380;
```

- Or, partitions

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Drop the Index?

- Make the indexes invisible
`SQL> alter index i1 invisible;`
 - Maintains the index; but optimizer ignores it
- See the performance impact.
- Selectively see the impact
`SQL> alter session set
optimizer_use_invisible_indexes = true;`
- See the performance impact.

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Disable

- Two parameters
 - Could be session level
- To disable offloading
`cell_offload_processing = false;`
- To disable storage indexes alone
`_kcfis_storageidx_disabled = true;`

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In Conclusion

- Full table scans in Exadata
 - may be faster compared to non-Exadata
 - may not be faster than index scans in Exadata
 - may benefit from Storage Indexes
- Storage Indexes are not same as DB Indexes
- No DB Indexes helps in some cases
 - But not all
- Test by making DB Indexes invisible
- Force FTS in those cases where index hurts

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Thank You!

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