

How to flatten a tree with Materialized Views



Introduction - Me J

Michael A. G. Möller

M² [M-square]

Miracle A/S – Senior Principal Consultant

~8 years in Oracle (Support, Education, Development)

~3 years in Miracle (Support, Education, Consultancy)

Oracle Certified Professional (DBA, 7, 8, 8i, 9i)

Oracle Certified Master

German-Swedish-English-Danish

EMail : Michael.Moeller@MiracleAS.DK



Introduction

The fine print

MIRACLE

UKOUG 2005



MIRACLE

Introduction

The fine print

These descriptions do not reflect the thoughts or opinions of either myself, my company, my friends, or my cat; don't quote me on that; don't quote me on anything; all rights reserved; other copyright laws for specific descriptions apply wherever noted; descriptions are subject to change without notice; details are slightly enlarged to show detail; any resemblance to actual persons, living or dead, is unintentional and purely coincidental; hand wash only, tumble dry on low heat; do not bend, fold, mutilate, or spindle; your mileage may vary; no substitutions allowed; for a limited time only; this information offer is void where prohibited, taxed, or otherwise restricted; information is provided "as is" without any warranties expressed or implied; user assumes full liabilities; not liable for damages due to use or misuse; no shoes, no shirt : no slide; quantities are limited while supplies last; if defects are discovered, do not attempt to fix them yourself, but return to an authorized service center; caveat emptor; read at your own risk; parental advisory - explicit lyrics; text may contain material some readers may find objectionable, parental guidance is advised; keep away from sunlight, pets, and small children; limit one-per-family please; no money down; no purchase necessary; you need not be present to win; some assembly required; batteries are not included; action figures sold separately; no preservatives added; safety goggles may be required during use; sealed for your protection, do not use if the safety seal is broken; call before you dig; for external use only; if a rash, redness, irritation, or swelling develops, discontinue use; use only with proper ventilation; avoid extreme temperatures and store in a cool dry place; keep away from open flames and avoid inhaling fumes; avoid contact with mucous membranes; do not puncture, incinerate, or store above 120 degrees Fahrenheit; do not place near flammable or magnetic source; smoking these slides may be hazardous to your health; the best safeguard, second only to abstinence, is the use of a good slideshow; pixels used in these slides are made from 100% recycled electrons and magnetic particles; no animals were used to test the safety of these descriptions; no salt, MSG, artificial color or flavor added; if ingested, do not induce vomiting, if symptoms persist, consult a consultant; slides are ribbed for your pleasure; slippery when wet; must be 18 to enter; possible penalties for early withdrawal; presentation offer valid only at participating Oracle Interoffice sites; slightly higher west of the Rockies; allow four to six weeks for delivery; disclaimer does not cover hurricane, lightning, tornado, tsunami, volcano, earthquake, flood, and other Acts of God, misuse, neglect, unauthorized repair, damage from improper installation, broken antenna or marred cabinet, incorrect line voltage, missing or altered serial numbers, sonic boom vibrations,

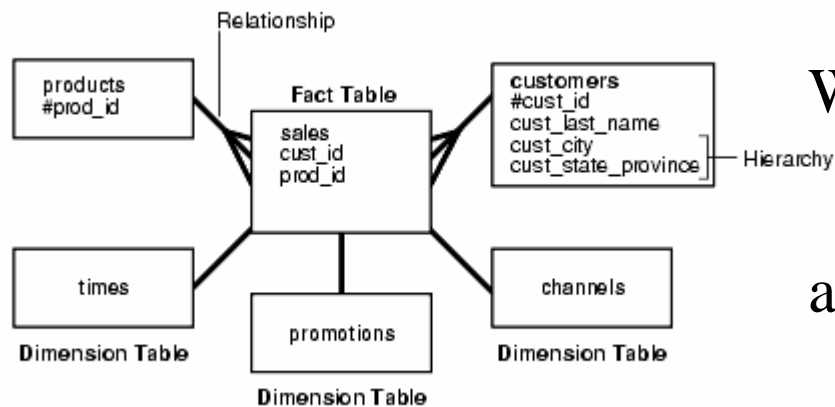
What's the problem?

- Avoiding a complex join between a table and a tree (a table using the Connect By)
 - The tree represents owners of telephones
 - A group of telephone owners have the same employer, who pays the phone
 - A group of companies of the owner belong to the same phone (sub-)supplier
 - The phone calls (CDR) lie in a flat table

What's the difficulty?

- You want to make a number of summaries
 - From different tree levels
 - Different group by
- 9.2 Standard Edition
 - No summary advisor or Dimensions
- Two breaks
 - The tree is balanced
 - The application will do its own “query rewrite”

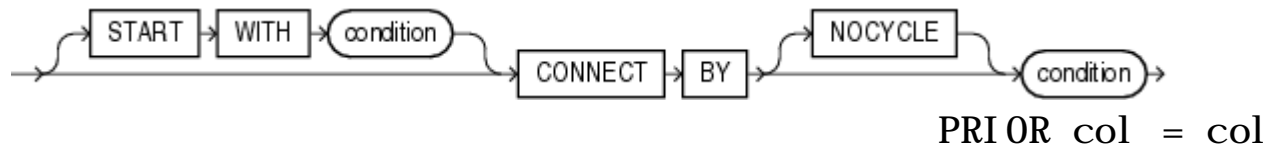
The Fact & Dimension query



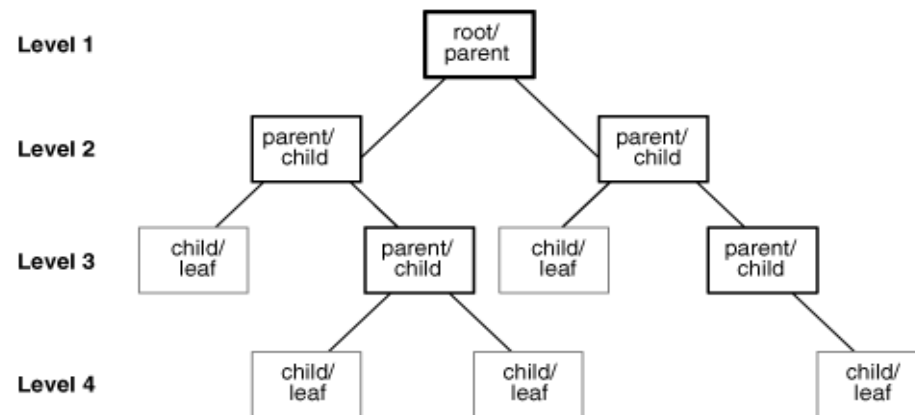
```
SELECT SUM(SALES)
FROM
FACT,PRODUCT
```

```
WHERE
PRODUCT.PROD_ID
= FACT.PROD_ID
and PROD_NAME=
'BANANAS'
```

The Oracle Connect By Tree



- Depth first traversal



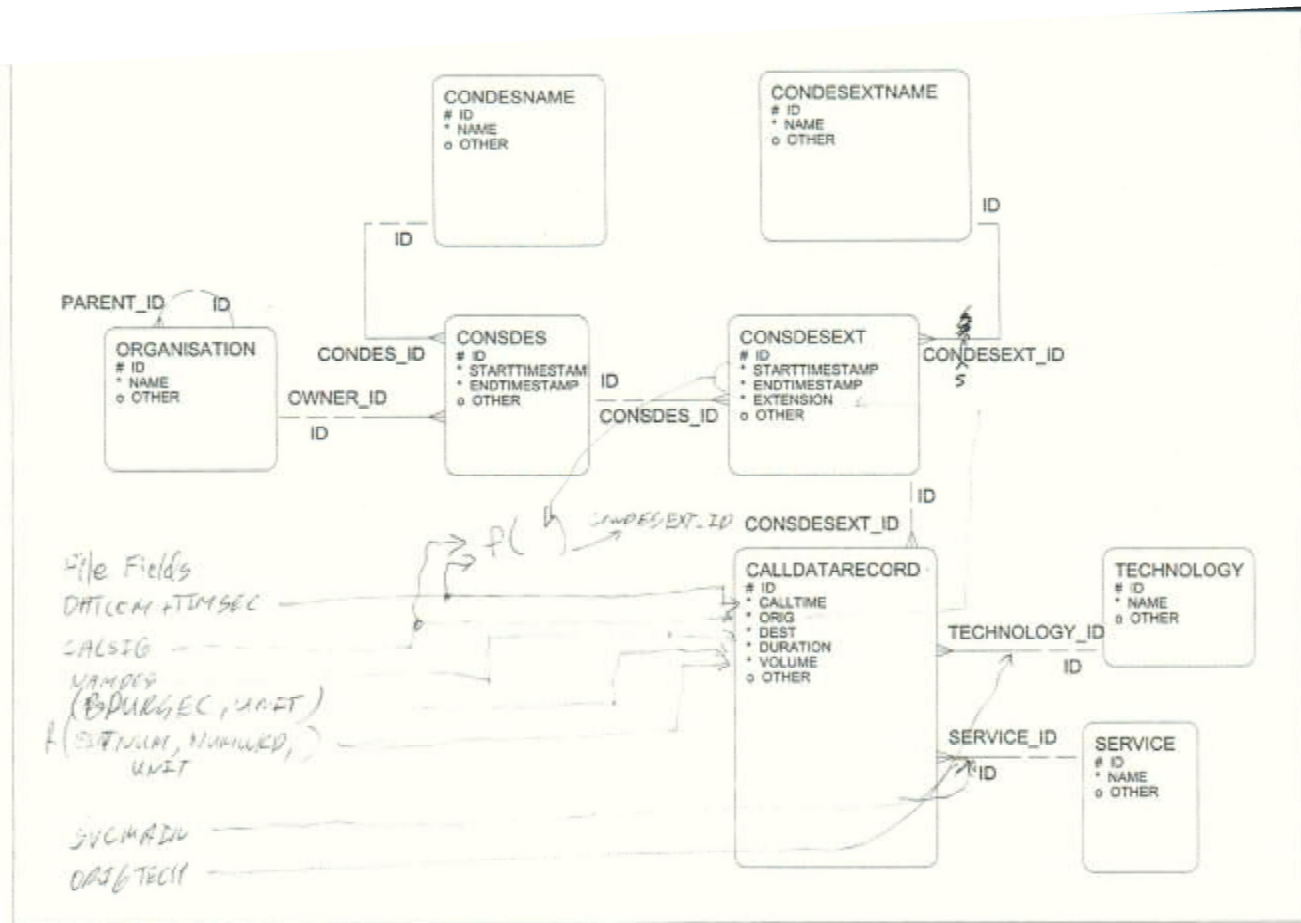
Tree Table

ID	WHAT	PARTOF	ATTR
1	Building		
2	Ground Floor	Building	
3	1st Floor	Building	
4	Reception	Ground Floor	9
5	Kitchen	Ground Floor	8
6	Enterance	Ground Floor	1
7	Attic	Building	5
8	Double Bedroom	1st Floor	3
9	Single Bedroom	1st Floor	6
10	Toilet	1st Floor	0
11	Wardrobe	Double Bedroom	0

ID	WHAT	PARTOF	ATTR	LEVEL
1	Building			1
2	Ground Floor	Building		2
4	Reception	Ground Floor	9	3
5	Kitchen	Ground Floor	8	3
6	Enterance	Ground Floor	1	3
3	1st Floor	Building		2
8	Double Bedroom	1st Floor	3	3
11	Wardrobe	Double Bedroom	0	4
9	Single Bedroom	1st Floor	6	3
10	Toilet	1st Floor	0	3
7	Attic	Building	5	2

Select * From TREE Start with What='Building'
 Connect by PartOf = Prior What ;

The ERD



Basic MV definition

- A view, but with the rows pre-calculated
View ↔ Materialized View
- Manual/Automatic refresh
- Query Rewrite
- Common example(s):
 - Pre calculated aggregate sums
 - A join

The simple minded select

- Select What, Own, P. Gi d, Sum(SeCS)
From Calls C, Phone P,
(Select * From Tree
Start With What='1st Floor'
Connect By Partof=Prior What) T
Where T. Attr=P. Id
and P. Gi d = C. Gi D
Group by What, Own, P. Gi d ;

WHAT	OWN	GiD	SUM(SECS)
Double Bedroom	Plain1	53	1399
Single Bedroom	Plain2	56	913

... and the execution plan

Id	Operation	Name	Rows	Bytes	Cost (%CPU)	Time
0	SELECT STATEMENT		18	576	9 (23)	00:00:01
1	HASH GROUP BY		18	576	9 (23)	00:00:01
* 2	HASH JOIN		18	576	8 (13)	00:00:01
3	NESTED LOOPS		6	150	4 (0)	00:00:01
4	VIEW		11	154	3 (0)	00:00:01
* 5	CONNECT BY WITH FILTERING					
6	TABLE ACCESS BY INDEX ROWID	TREE				
* 7	INDEX UNIQUE SCAN	SYS_C005416	1	11	0 (0)	00:00:01
* 8	HASH JOIN					
9	CONNECT BY PUMP					
10	TABLE ACCESS FULL	TREE	11	275	3 (0)	00:00:01
11	TABLE ACCESS FULL	TREE	11	275	3 (0)	00:00:01
12	TABLE ACCESS BY INDEX ROWID	PHONE	1	11	1 (0)	00:00:01
* 13	INDEX UNIQUE SCAN	SYS_C005418	1		0 (0)	00:00:01
14	TABLE ACCESS FULL	CALLS	19	133	3 (0)	00:00:01

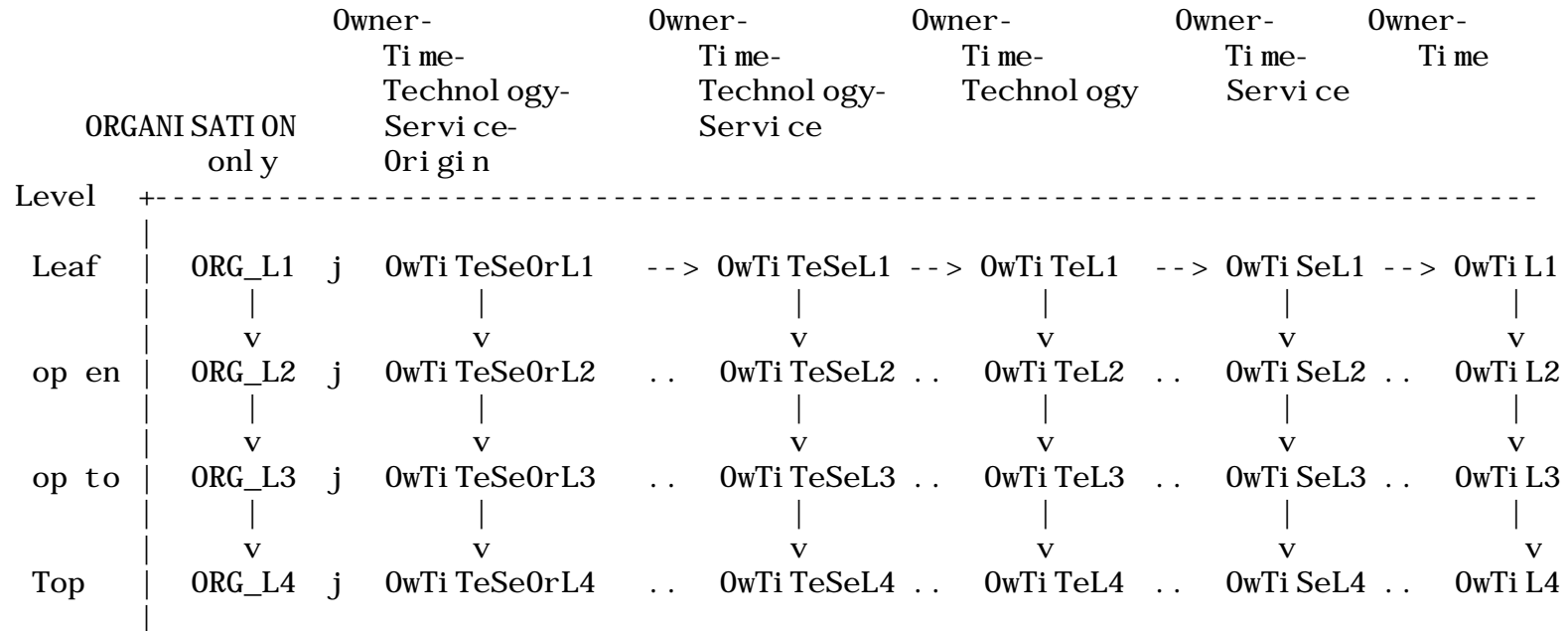
Predicate Information (identified by operation id):

- 2 - access("P"."GID"="C"."GID")
- 5 - filter("WHAT"='1st Floor')
- 7 - access("WHAT"='1st Floor')
- 8 - access("PARTOF"=NULL)
- 13 - access("T"."ATTR"="P"."ID")

Different summaries

- For a given depth of tree ...
 - For a given Group by of the details
- =
- One MV for each combination

Multiple MVs



J - Join

--> - Summary of Summary

MV for tree

- Lowest level (all leafs)
 - Identified leafs by their ATTR being valid
- Level above
 - Avoided Connect By as tree is balanced
 - Identify lower branch rows by simple self join

MV for tree - outline

```
Create Materialized View T1
Build Immediate Using Index as
Select What, part of
From Phone P, Tree T
Where T.Attr=P.Id/*Group by*/ ;
```

```
Create Materialized View T2
Build Immediate Using Index as
Select B.What, Max(B.PartOf) part of
From T1 L, Tree B
Where L.PartOf=B.What
Group by B.What;
```

MV for tree - result

Select * from t1 ;

WHAT	PARTOF
Reception	Ground Floor
Enterance	Ground Floor
Double Bedroom	1st Floor
Single Bedroom	1st Floor

select * from t2 ;

WHAT	PARTOF
1st Floor	Building
Ground Floor	Building

The first summary

(Lets look at the original)

Details, details

- Fast Refresh maintainable
 - MV log on MV
 - Add a PK
- Cascading dependencies
 - Refresh groups
- Avoid some Group by by using max() on fixed value columns

The CT succes story

- Prototype build in 1 week (not just the MV!)
- CT says
 - Met performance expectations
 - Is flexible enough for adaptations



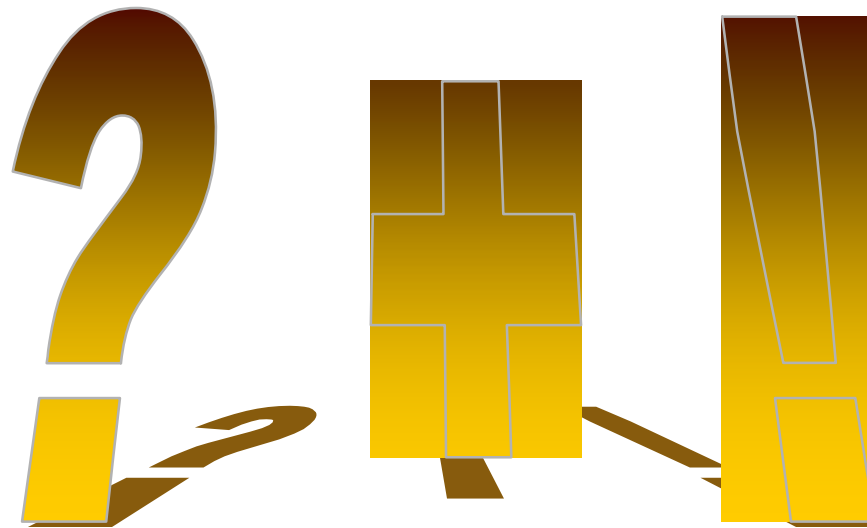
For extra credit ...

MIRACLE

Raising a tree from a flat ground

- Haven't tried this yet
- Taking a flat table indicating owner relationship, and making a tree out of it for traversal

and finally ...



Thank you,

Mi chael . Moel l er@Mi racl eAS. DK