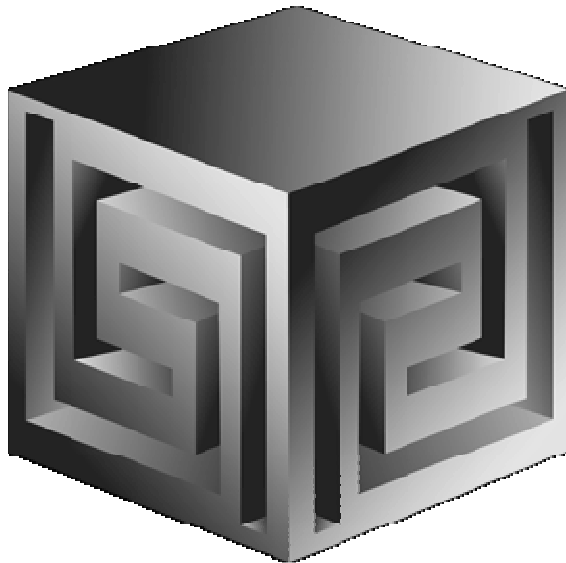


# **Implementing Oracle BI EE on Top of Oracle OLAP Cubes**

**ODTUG 2007**



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**Vlamis Software Solutions, Inc.**

**816-781-2880**

**<http://www.vlamis.com>**

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# **Vlami Software Solutions, Inc.**

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- **Founded in 1992 in Kansas City, Missouri**
- **Oracle Partner and reseller since 1995**
- **Specializes in ORACLE-based:**
  - ☐ **Data Warehousing**
  - ☐ **Business Intelligence**
  - ☐ **Data Transformation (ETL)**
  - ☐ **Web development and portals**
  - ☐ **Express-based applications**
- **Delivers**
  - ☐ **Design and integrate BI and DW solutions**
  - ☐ **Training and mentoring**
- **Expert presenter at major Oracle conferences**



# Who Am I?

---

- **Dan Vlamis, President of Vlamis Software**
  - ☐ **Developer for IRI (former owners of Express)**
  - ☐ **Founded Vlamis Software in 1992**
  - ☐ **Beta tester and early adopter of Oracle OLAP**
  - ☐ **Expert speaker and author**
  - ☐ **“Techie” on OLAP DML**
  - ☐ **Recognized expert in Express and OLAP industry**

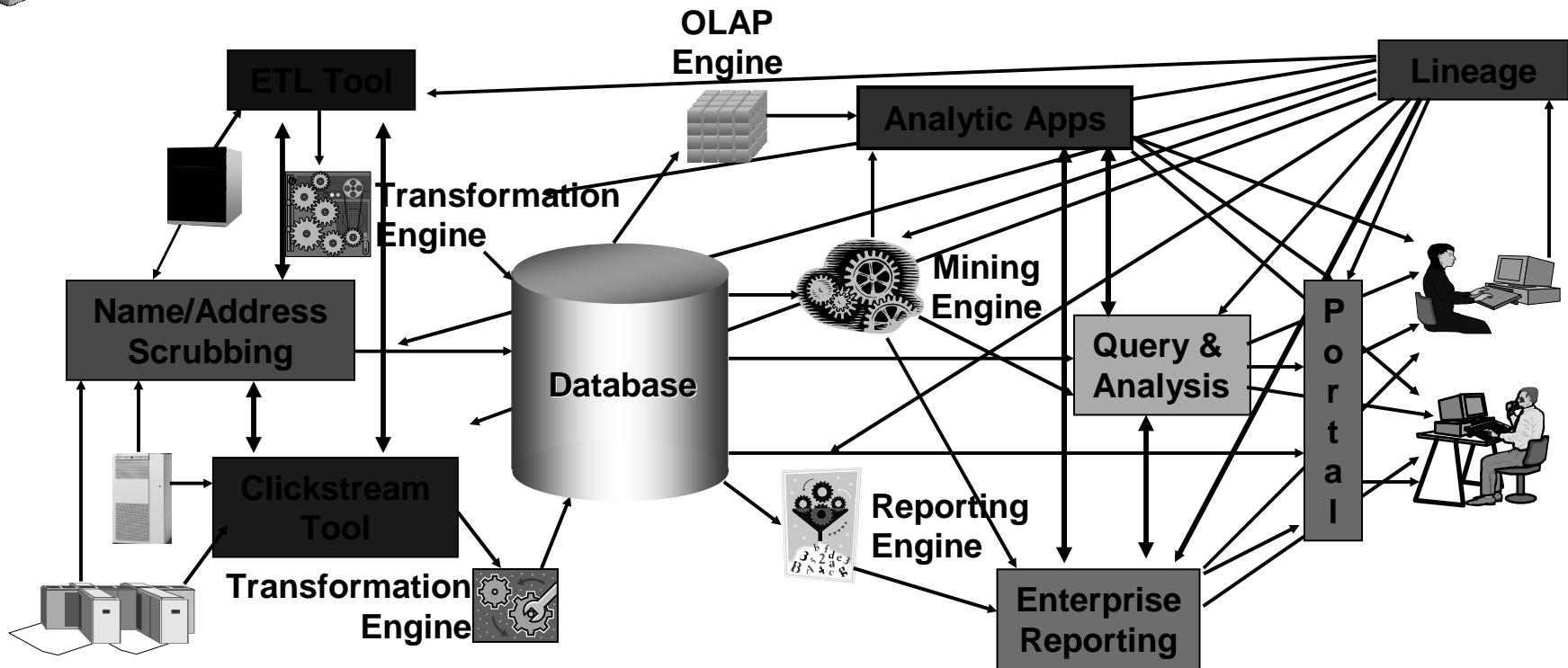


# Agenda

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- **Brief background of BI EE and Oracle OLAP**
- **Demonstration of BI EE on Oracle OLAP**
- **Why Oracle OLAP?**
- **What is Oracle OLAP?**
- **Oracle OLAP storage options**
- **Structure of Analytic Workspace**
- **Building OLAP Cubes**
- **11g OLAP Preview – what changes?**

# Business Intelligence Market Multi-Vendor, Un-integrated



- Protracted and complex implementation
- Escalating maintenance costs
- Software ***and Metadata*** Integration is key!



# Oracle BI Suite Enterprise Edition

## Unified Business Intelligence Infrastructure

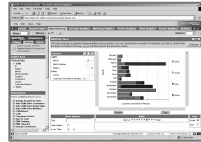
**Interactive  
Dashboards**



**Reporting &  
Publishing**



**Ad-hoc  
Analysis**



**Proactive  
Detection  
and Alerts**



**Disconnected  
Analytics**



**MS Office  
Plug-in**



**Oracle  
BI Server**

**Simplified Business Model and Abstraction Layer**

**Intelligent Caching Services**

**Multidimensional Calculation and Integration Engine**

**Intelligent Request Generation and Optimized Data Access Services**



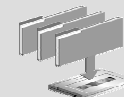
**OLTP & ODS  
Systems**



**Data Warehouse  
Data Mart**



**SAP, Oracle  
PeopleSoft, Siebel,  
Custom Apps**



**Files  
Excel  
XML**

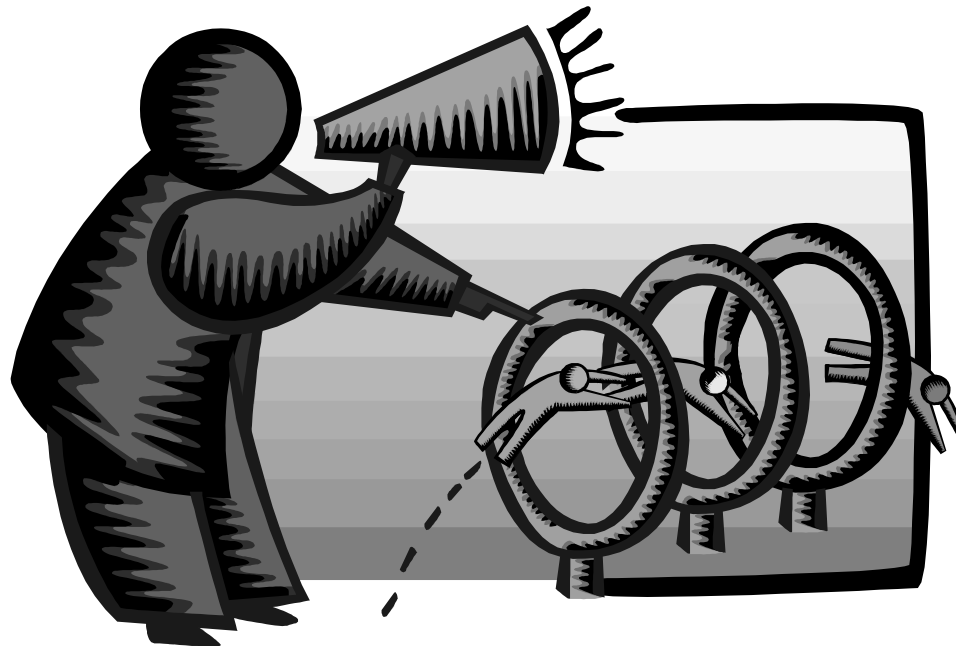


**Business  
Process**



# Demo of BI EE on Oracle OLAP

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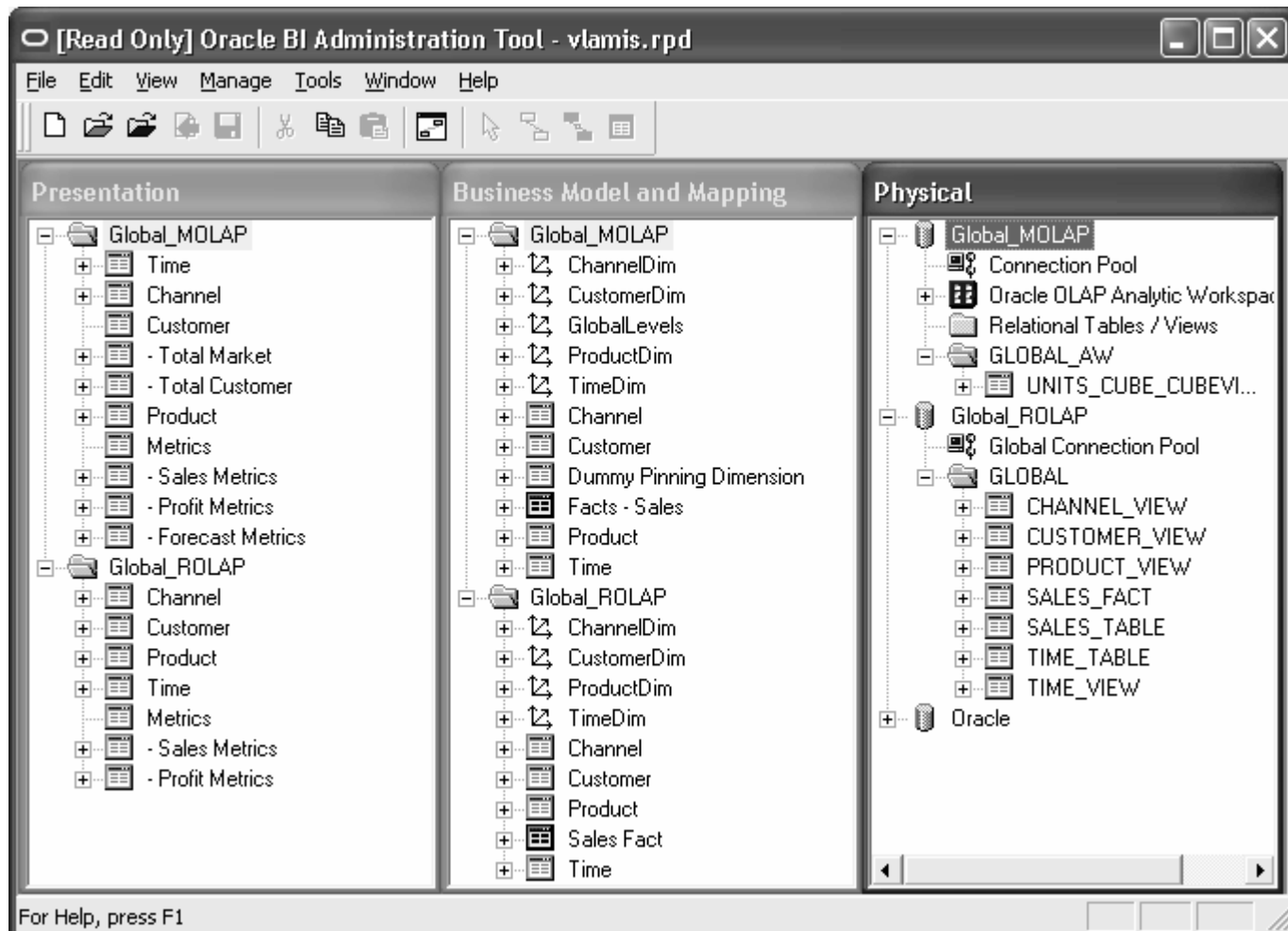




# BI EE Metadata Editor



**Data Flows**



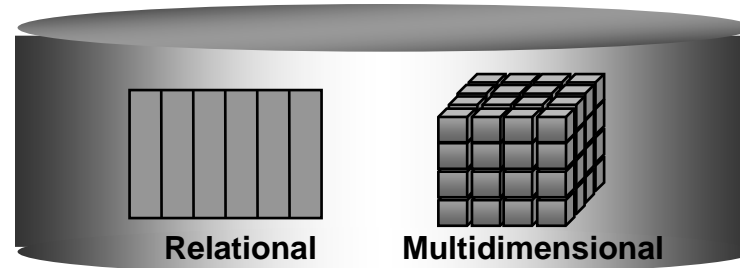




# ROLAP vs. MOLAP

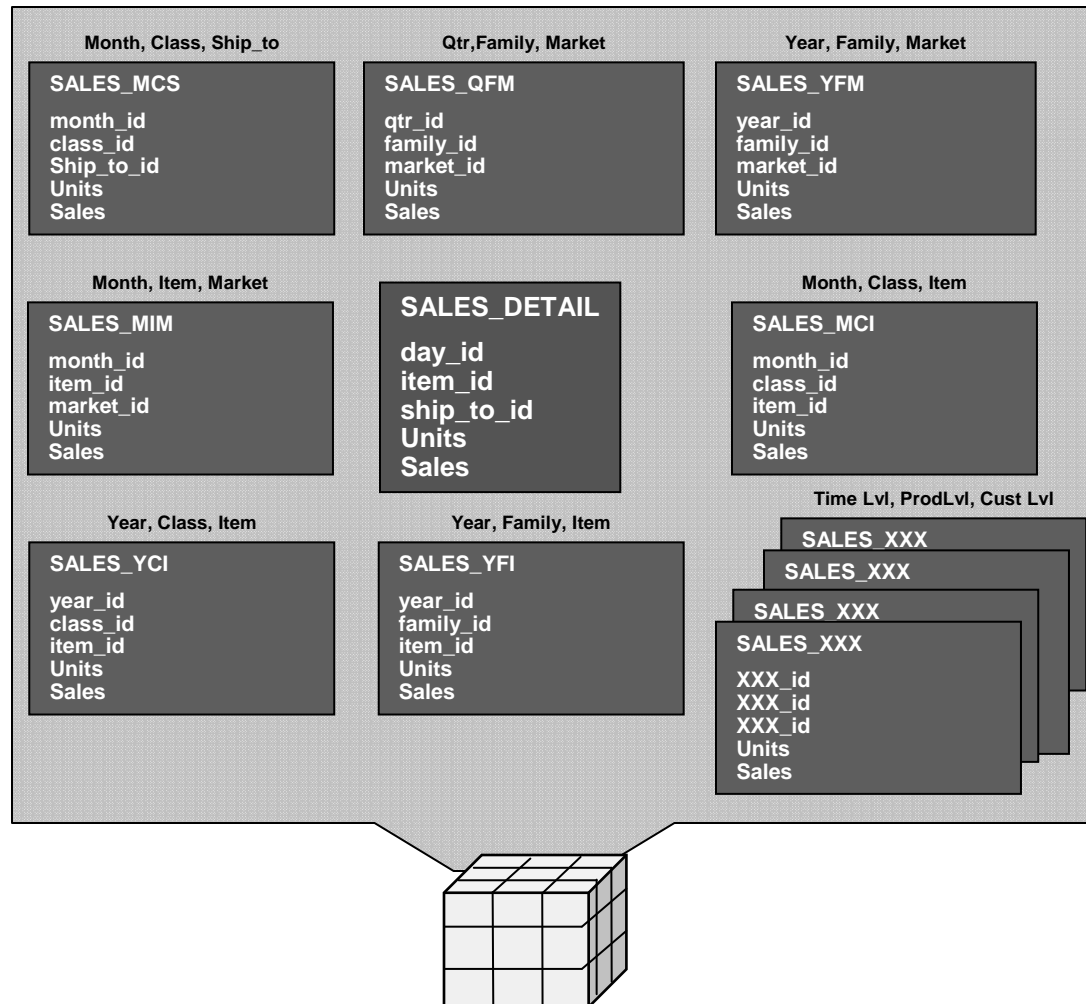
---

- What is ROLAP? (Relational)
- What is MOLAP? (Multidimensional)
- It's all in how the data is stored





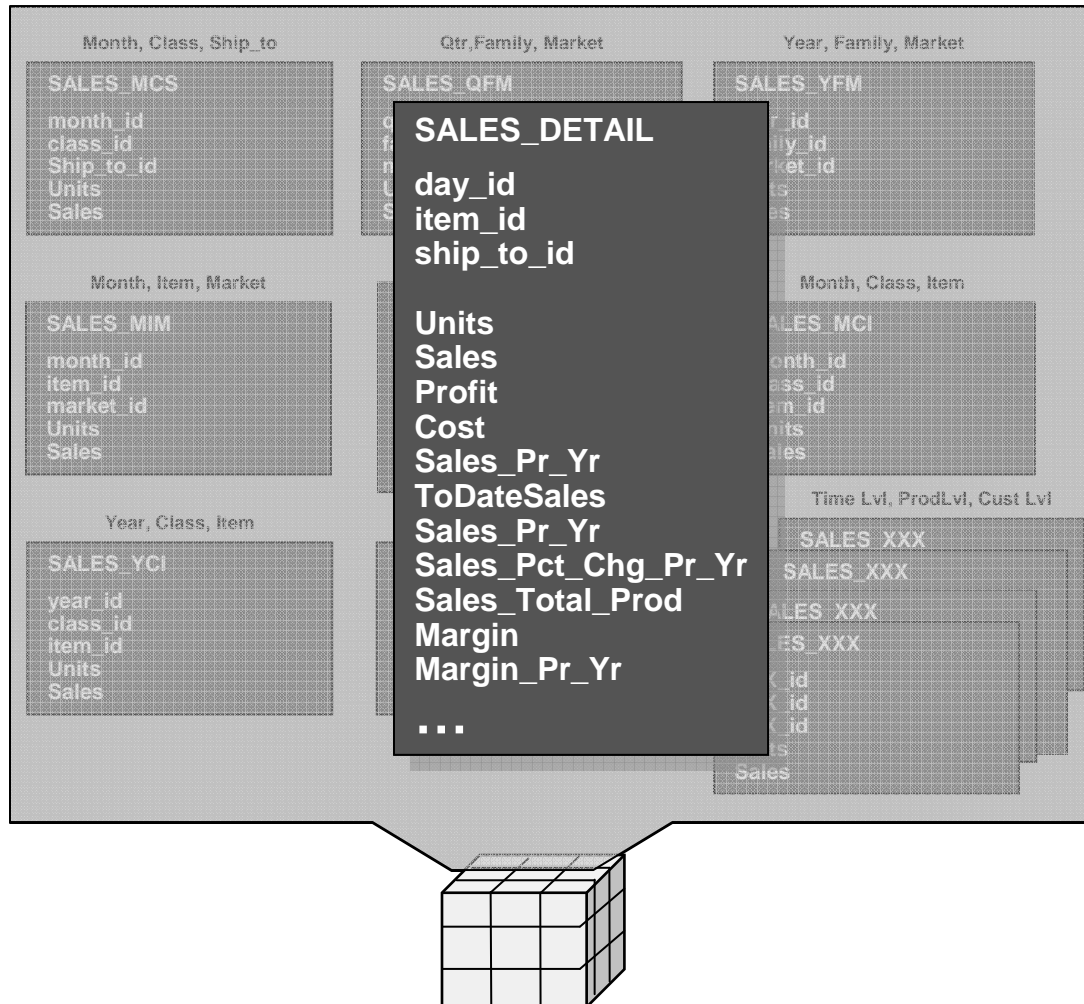
# Classic ROLAP Approach



- Define appropriate summaries based on query patterns
- Each summary is typically defined at a particular grain
  - ☐ Month, Class, Ship\_to
  - ☐ Qtr, Family, Market
  - ☐ Year, Family, Market
  - ☐ etc.

# Summary Strategies

## Classic ROLAP approach



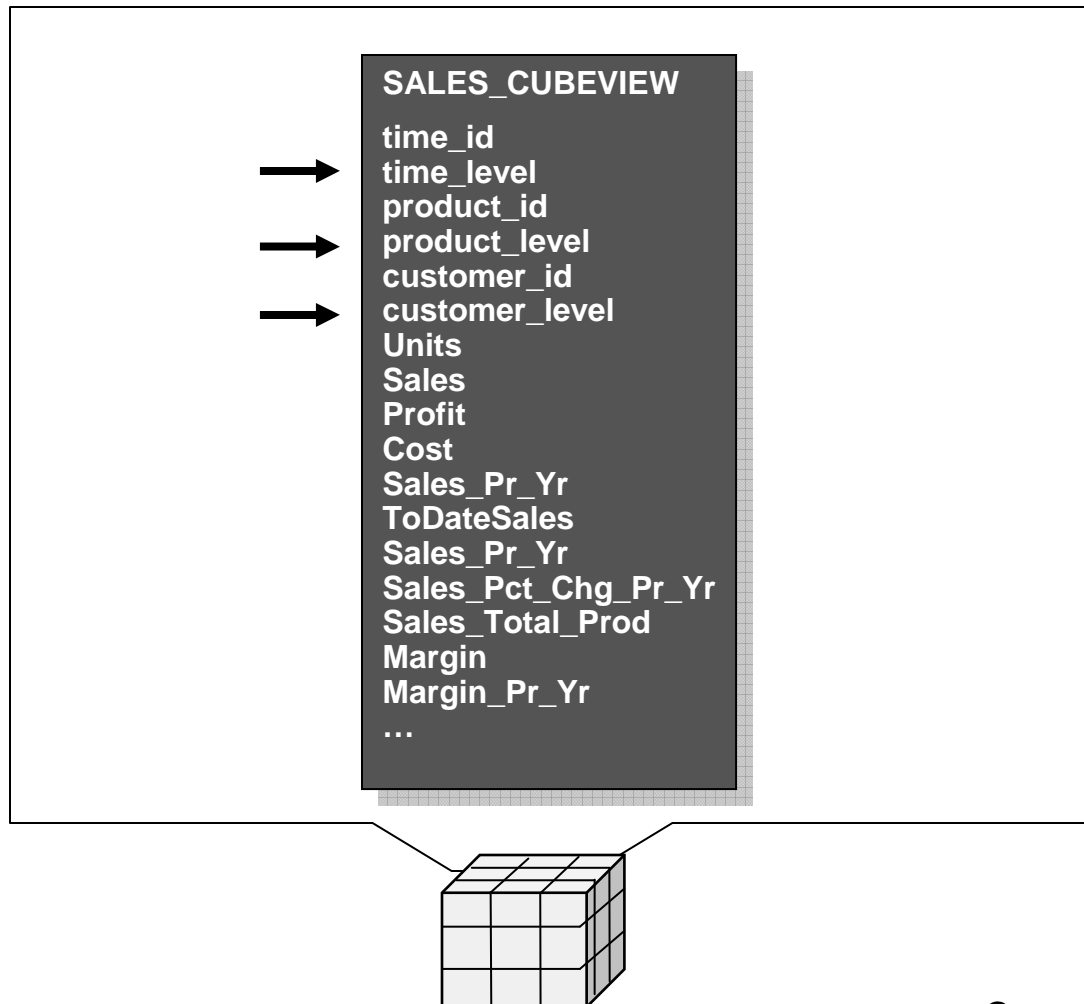
- Most OLAP calculations do not aggregate easily
    - ☐ Percentages
    - ☐ Ratios
    - ☐ Moving Averages
    - ☐ Etc.
  - Aggregation rules may be complex
  - Difficult to handle case where user queries a grain that is not supported by a view
- Summary view required for each grain that will be queried

Is this manageable?



# MOLAP Approach:

## Single embedded total view for aggregations



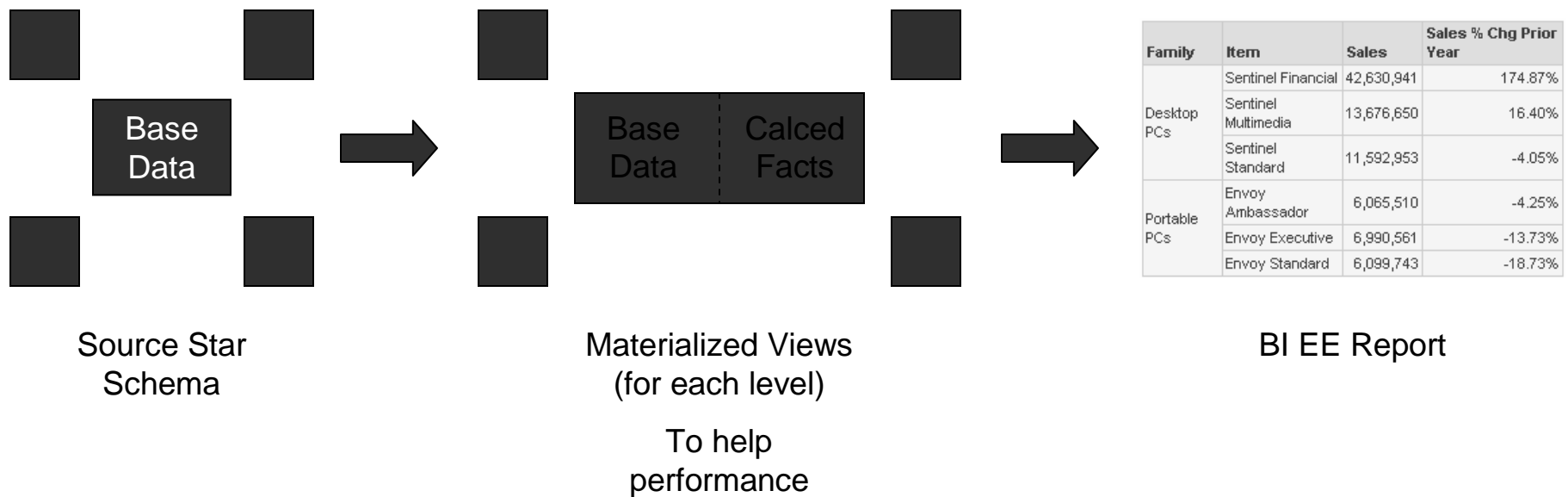
- Single view contains data for *all* summary levels
- Summary level for a row determined by dimension level columns



Simple summary management for ad hoc environments

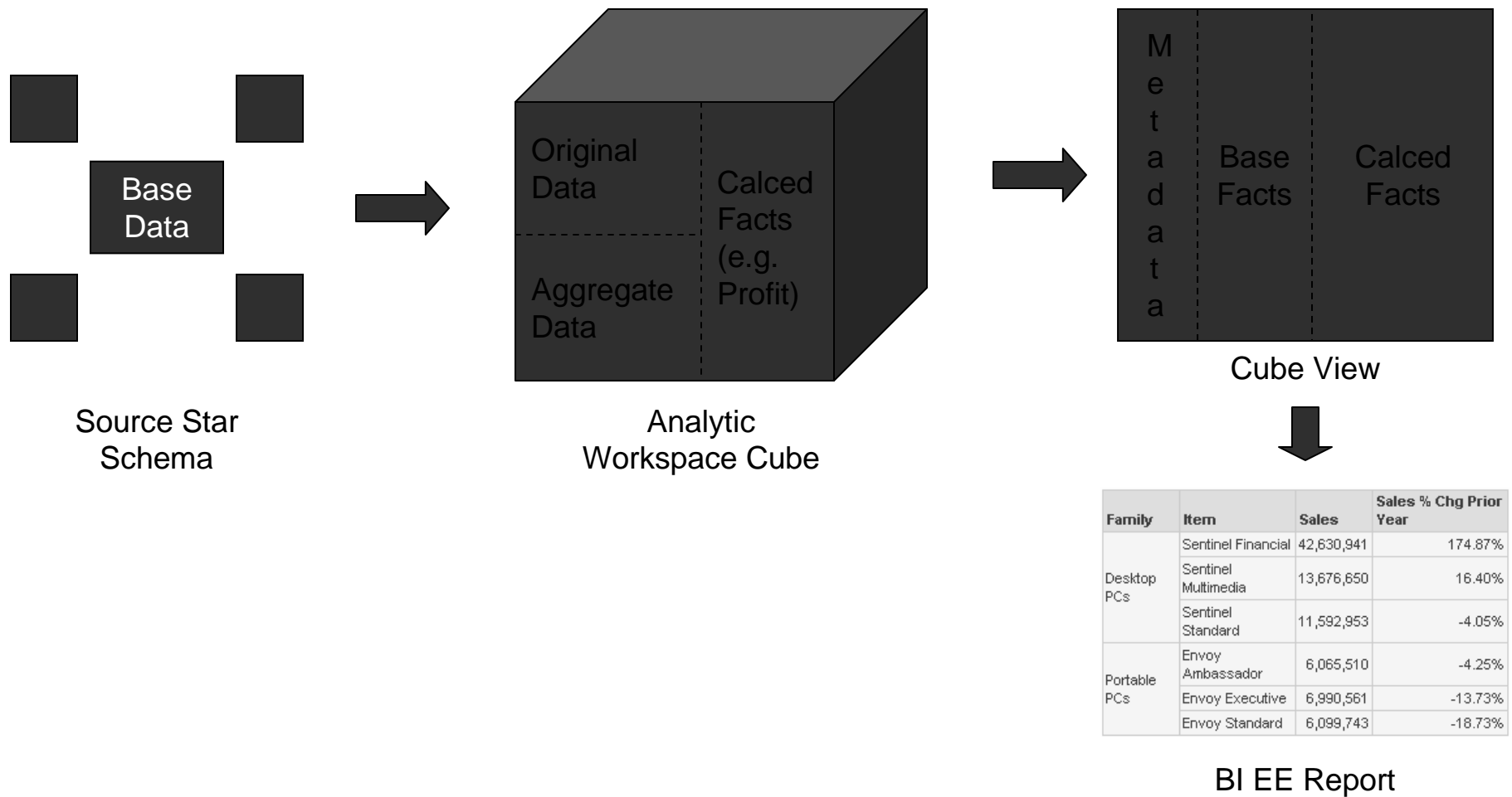


# BI EE on ROLAP



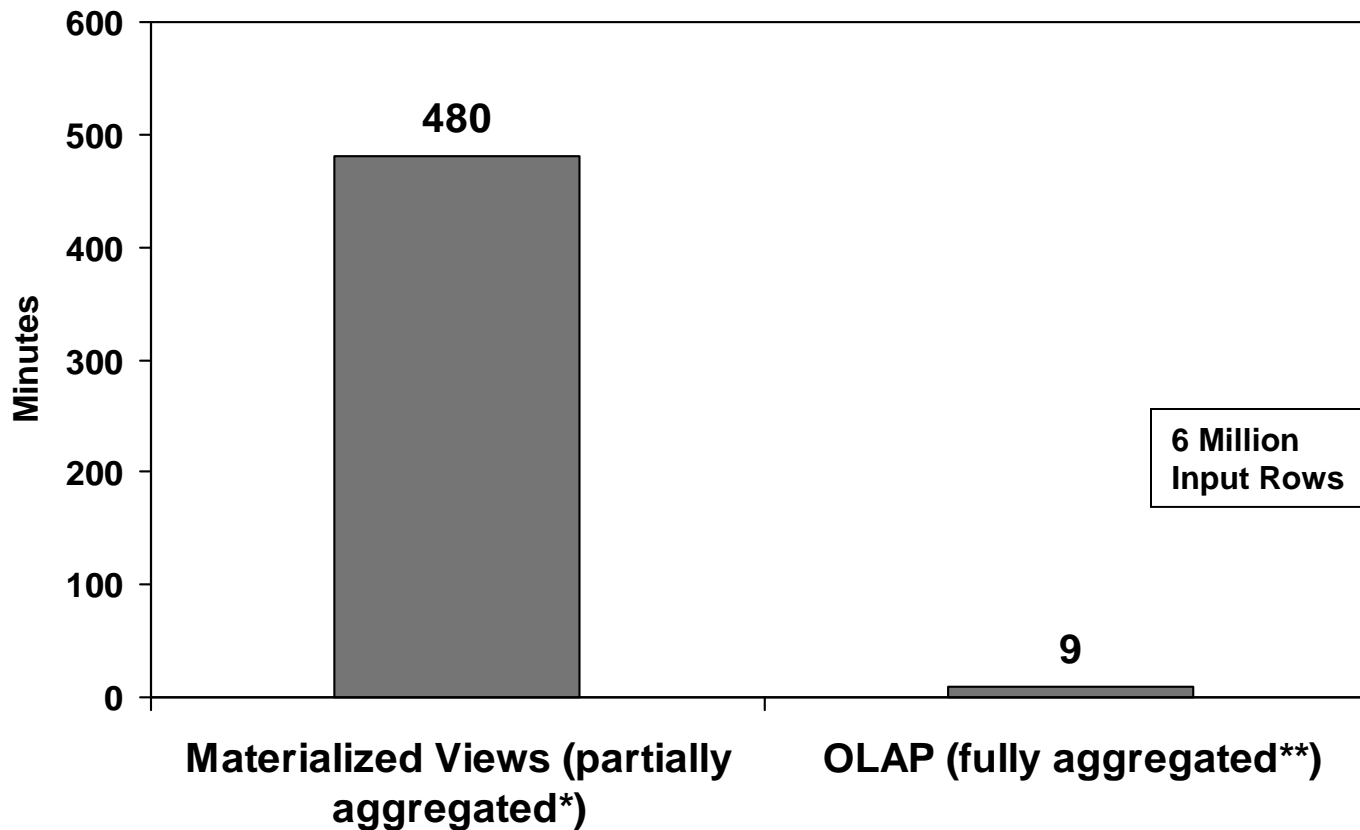


# BI EE on MOLAP



# Oracle Performance Case Study

## Oracle Applications: Finance DBI



\* MV aggregated 1 dimension and 1 measure

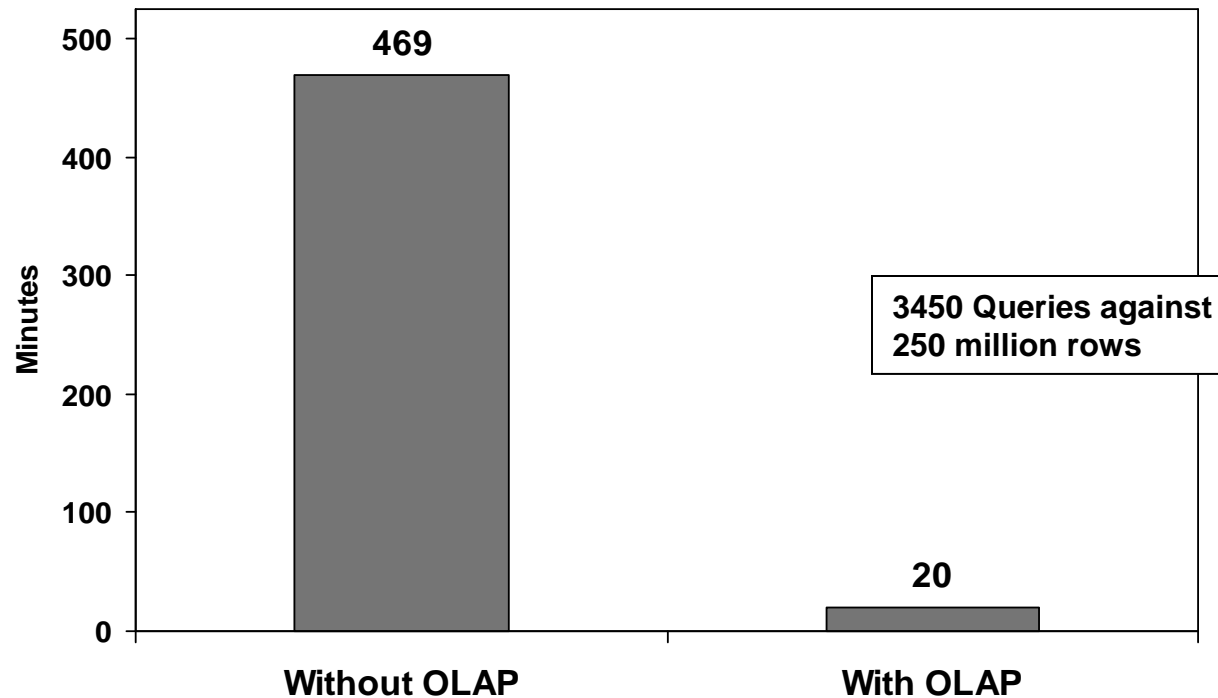
\*\* OLAP aggregated 7 dimensions and 11 measures



# Oracle Performance Case Study

## Ad Hoc Queries Across Summary Levels

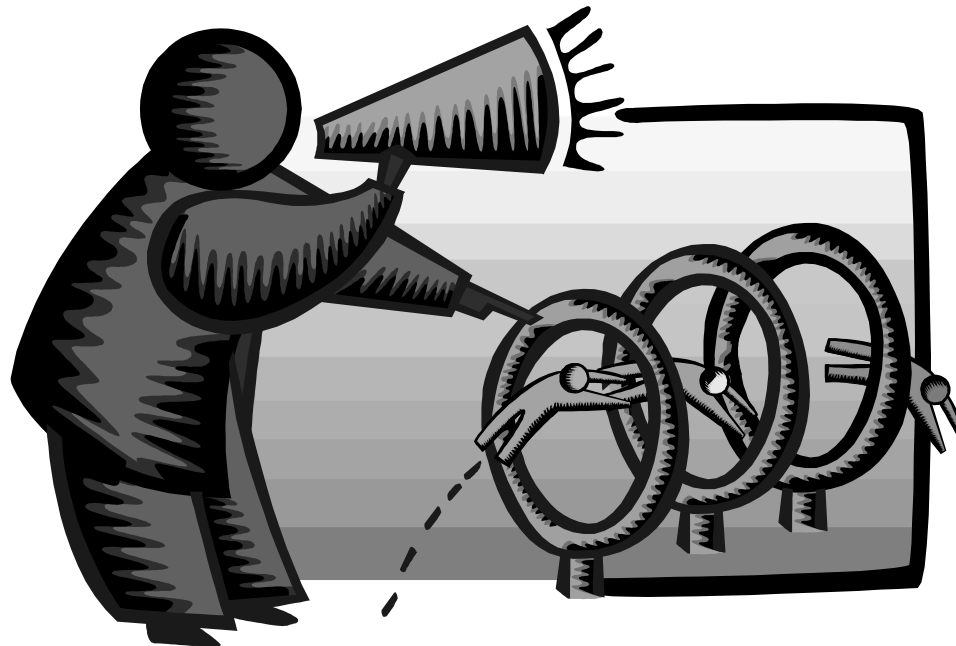
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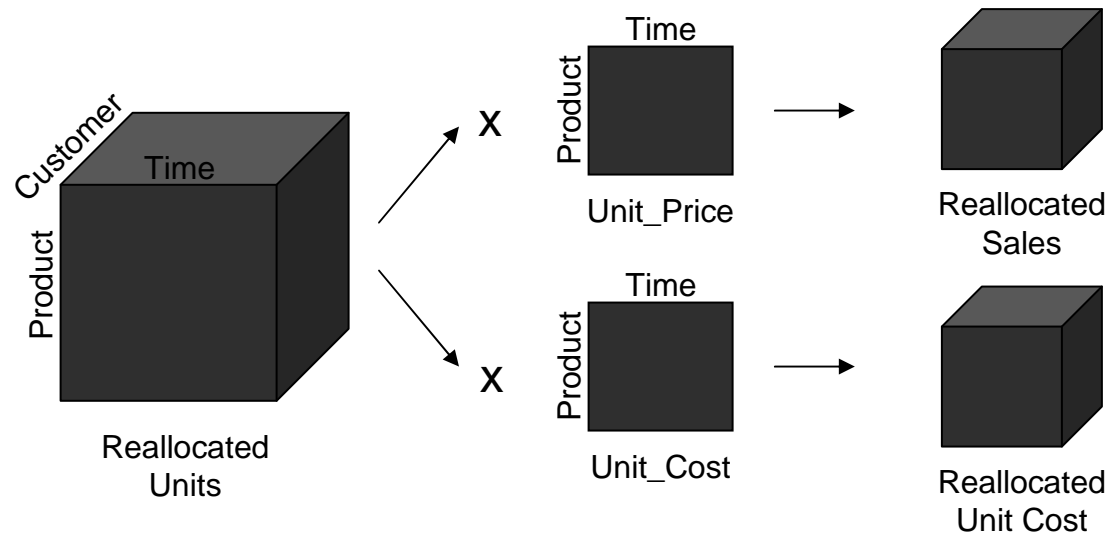
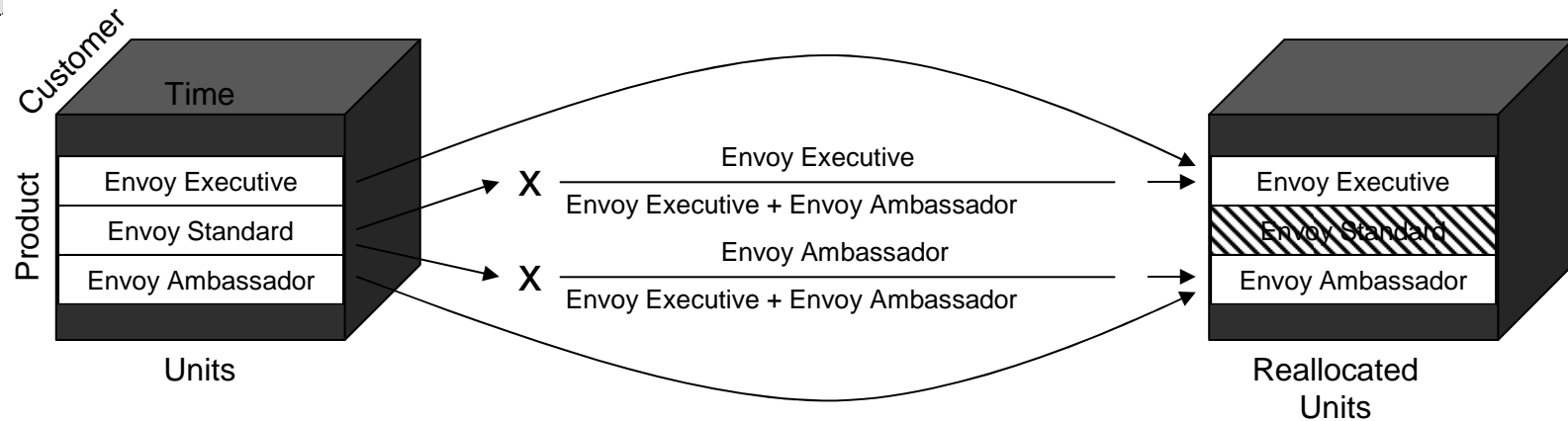
# And Now, Back to Our Demo...

---





# Reallocate Unit Sales





# Further Information

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- Oracle BI Sales
  - ❑ <http://www.oracle.com/bi>
- Oracle BI Technical
  - ❑ <http://www.oracle.com/technology/tech/bi/index.html>
- Oracle BI EE on top of Oracle OLAP
  - ❑ Collaborate 208: Using Oracle BI EE with Oracle OLAP Cubes on [www.vlamis.com/papers.html](http://www.vlamis.com/papers.html)
  - ❑ [http://www.oracle.com/technology/obe/obe\\_bi/bi\\_ee\\_1013/olap/index.html](http://www.oracle.com/technology/obe/obe_bi/bi_ee_1013/olap/index.html)
- VMWare image with Demo environment
  - ❑ [www.bic2q.com](http://www.bic2q.com)
- Oracle OLAP and AWM Sales
  - ❑ [http://www.oracle.com/solutions/business\\_intelligence/olap.html](http://www.oracle.com/solutions/business_intelligence/olap.html)
- Oracle OLAP Technical
  - ❑ <http://www.oracle.com/technology/products/bi/olap/index.html>
- This Demo
  - ❑ <http://www.vlamis.com/demo>



# Definition of OLAP

---

**OLAP stands for On Line Analytical Processing.**  
**That has two immediate consequences: the *on line* part requires the answers of queries to be fast, the *analytical* part is a hint that the queries itself are complex.**

i.e. Complex Questions with FAST ANSWERS!



# **Why a Separate OLAP Tool?**

---

- **Empowers end-users to do own analysis**
- **Frees up IS backlog of report requests**
- **Ease of use**
- **Drill-down**
- **No knowledge of SQL or tables required**
- **Exception Analysis**
- **Variance Analysis**



# **What Does Oracle OLAP Add to a DW?**

---

- **Multidimensional user view of data**
- **Users create own reports**
- **Users create own measures**
- **Easy drill-down, rotate**
- **Iterative discovery process (not just reports)**
- **Ad-hoc analysis**
- **Easy selection of data with business terms**
- **OLAP DML with what-if, forecasting**
- **Platform for extensions**



## **OLAP Option – High-level View**

---

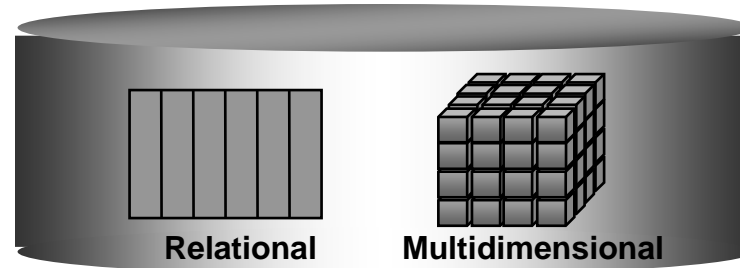
- **Advanced analytics**
- **Integrated in RDBMS**
- **Easy to develop**
- **Easy to use**
- **Facilitate collaboration**
- **Flexible deployment**
- **Scaleable and performant**
- **True Relational – Multidimensional database**



# ROLAP vs. MOLAP

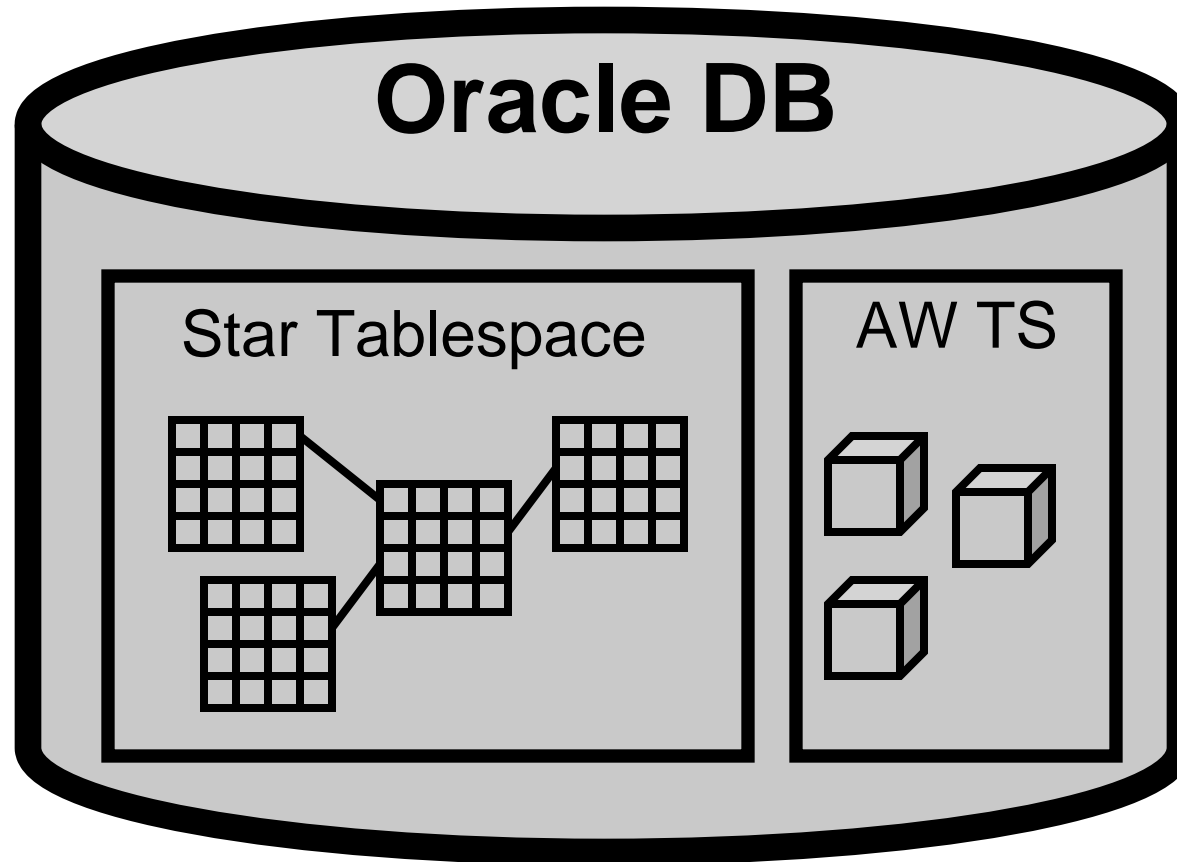
---

- What is ROLAP? (Relational)
- What is MOLAP? (Multidimensional)
- It's all in how the data is stored





# Analytic Workspaces Are Stored in Tablespaces in OLAP





# What is an Analytic Workspace?

Oracle Enterprise Manager Console

File Navigator Object Tools Configuration Help

ORACLE Enterprise Manager

GLOBAL

GLOBAL\_AW

Tables

AW\$GLOBAL

Indexes

Materialized View

Partitions

Triggers

DATE\_TAB

Indexes

Views

Synonyms

Sequences

Clusters

Source Types

User Types

HR

General Constraints Storage Options LOB Storage Statistics

Name: AW\$GLOBAL

Schema: GLOBAL\_AW

Tablespace: GLOBAL\_AW

Table: ☒ Standard ☐ Organized Using Index (IOT)

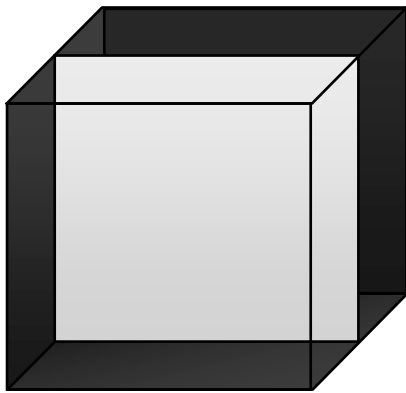
Columns

Name	Datatype	Size	Scale	Nulls?
PS#	NUMBER	10	0	✓
GEN#	NUMBER	10	0	✓
EXTNUM	NUMBER	8	0	✓
AWLOB	BLOB			✓
OBJNAME	VARCHAR2	60		✓
PARTNAME	VARCHAR2	60		✓

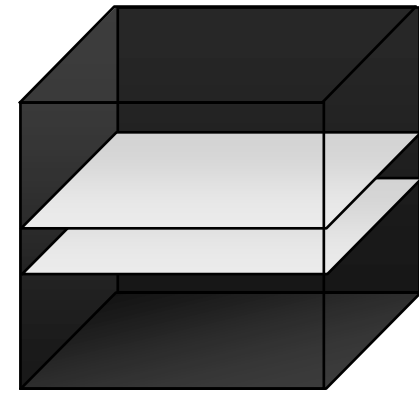
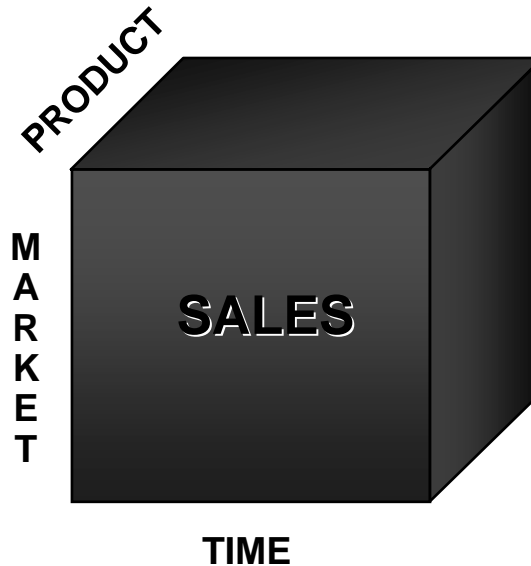


# OLAP AW Stores Data in Cubes

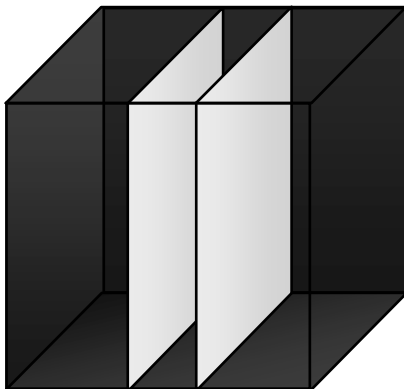
*Fast Flexible Access to Summarized Data*



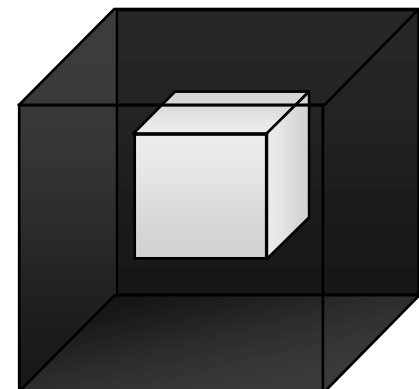
**Product Mgr. View**



**Regional Mgr. View**



**Financial Mgr. View**



**Ad Hoc View**



# **What Are AW Cubes?**

---

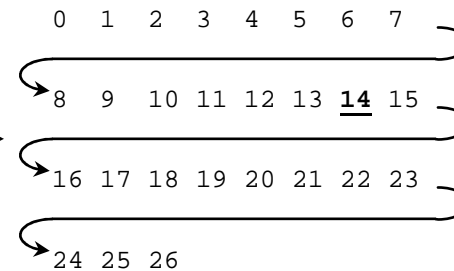
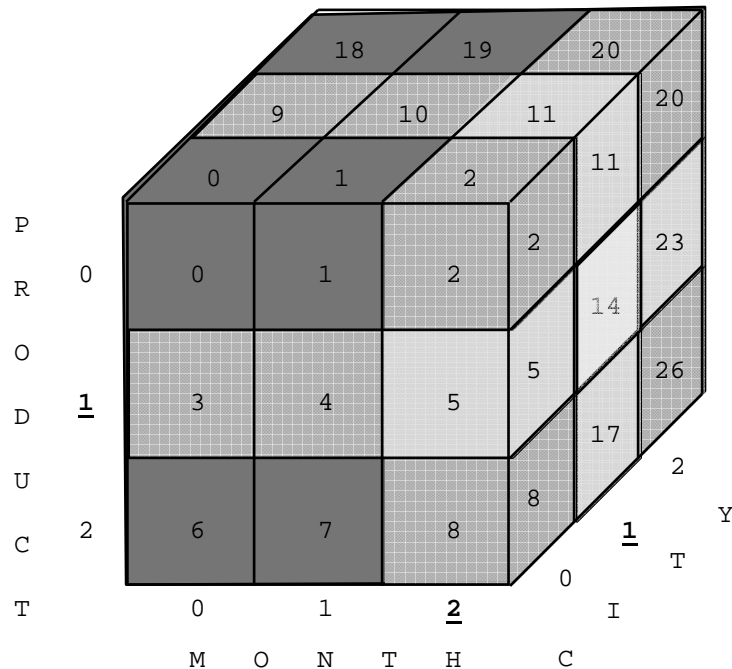
- **Data stored as arrays**
- **Dimension values are internally integers**
- **Offset calculated using simple multiplication**
- **Offset tells exactly where to look for data**
- **Pages and segmentation complicate design**
- **Conjoints and composites handle sparsity**



# Finding data is simple multiplication and addition

Formula for calculating cell offset:

$$\underline{2} + \underline{1} * (\underline{3}) + \underline{1} * (\underline{3} * \underline{3}) = 14$$



Offset 14 \* 8 bytes each = 112.

Fseek to byte 112 to find data.

See <http://www.vlamiis.com> for

"How Does Express Really Work Anyway" for details.



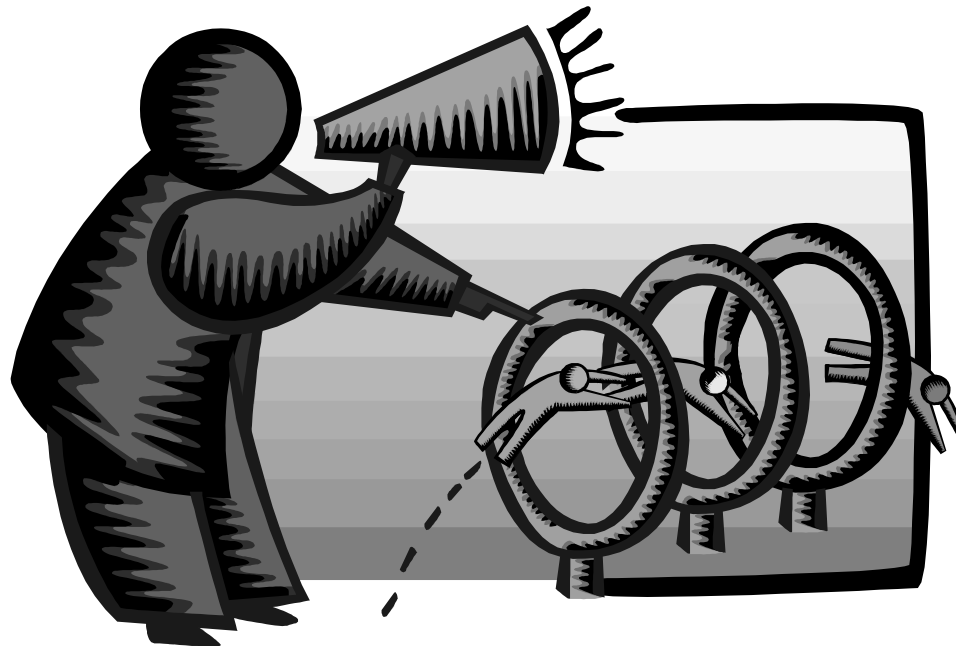
# Cubes Defined

---

- **Definition:**
- **Cubes are collections of measures. They are a logical way to organize data. All measures in a cube share the same dimensionality**
- **Examples:**
  - ❑ **Sales\_Cube (with Units, Dollars, Profit)**
  - ❑ **Finance\_Cube (with Actual, Budget, Variance)**

# Building Cubes in AWM

---





# **AWM Cube Builder Tips**

---

- **Remember to save Everything to XML files**
- **Remember this is Realtime.... So changes are nearly immediate (may need to reload data)**
- **Use “View” to see results in tool – No Need for BI Beans to validate success!**
- **Move Measures to Folders**
- **Can save Calculated Measures to XML – Then you can Edit!**





# Changing Oracle BI Product Line

---

- **Frontends**
  - ☐ Oracle BI EE (Siebel)
  - ☐ Oracle BI SE (Discoverer, BI Beans)
  - ☐ Oracle BI SE One (stripped down Siebel)
- **Backends**
  - ☐ Oracle relational (and Disco Administrator)
  - ☐ Oracle OLAP cubes
  - ☐ Heterogeneous for BI EE (MS, SAP BW, etc.)



# **Editing Oracle BI Metadata**

---

- **Oracle Warehouse Builder (ETL, integrated)**
- **Discoverer Administrator (Discoverer)**
- **Analytic Workspace Manager (AWs)**
- **Oracle BI Administrator (OBI EE)**



# Sneak Peek at BETA OLAP 11g

---

- Oracle 11g is currently in Beta  
(Hope you all went to see it Monday morning!)
- Oracle OLAP has many NEW things Coming!
  - ☐ New CUBE\_TABLE function in SQL
  - ☐ Tight integration with SQL  
(automatically generated views)
  - ☐ Tight integration with data dictionary
  - ☐ New Calc Wizard in AWM!
  - ☐ Easier to use and deploy
  - ☐ Ability to use OLAP for Materialized views  
(get MUCH FASTER response times!)

The following is intended to outline Oracle's general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

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# OLAP 11g Changes

- **New CUBE\_TABLE function simplifies access to AW data (replacing OLAP\_TABLE)**

The screenshot shows the Oracle SQL Developer interface. On the left, the 'Connections' tree is expanded to show the 'stack07 - global - main3' connection, with the 'Views' folder expanded to show the 'CUSTOMER\_SHIPMENTS\_VIEW'. The main window displays the 'Enter SQL Statement:' editor with the following query:

```
SELECT * FROM TABLE(CUBE_TABLE('GLOBAL.CUSTOMER;SHIPMENTS'));
```

Below the editor, the 'Results' tab is selected, showing the execution time of 1.12885725 seconds. The results are displayed in a table with the following columns: REGION, WAREHOUSE, SHIP\_TO, LEVEL\_NAME, and LONG\_DESCRIPTOR. The results are as follows:

	REGION	WAREHOUSE	SHIP_TO	LEVEL_NAME	LONG_DESCRIPTOR
1	(null)	(null)	REGION	Europe	
2	(null)	(null)	REGION	North America	
3	(null)	(null)	REGION	Asia Pacific	
4	20	99	SHIP_TO	UK Env Dept Glasgow	

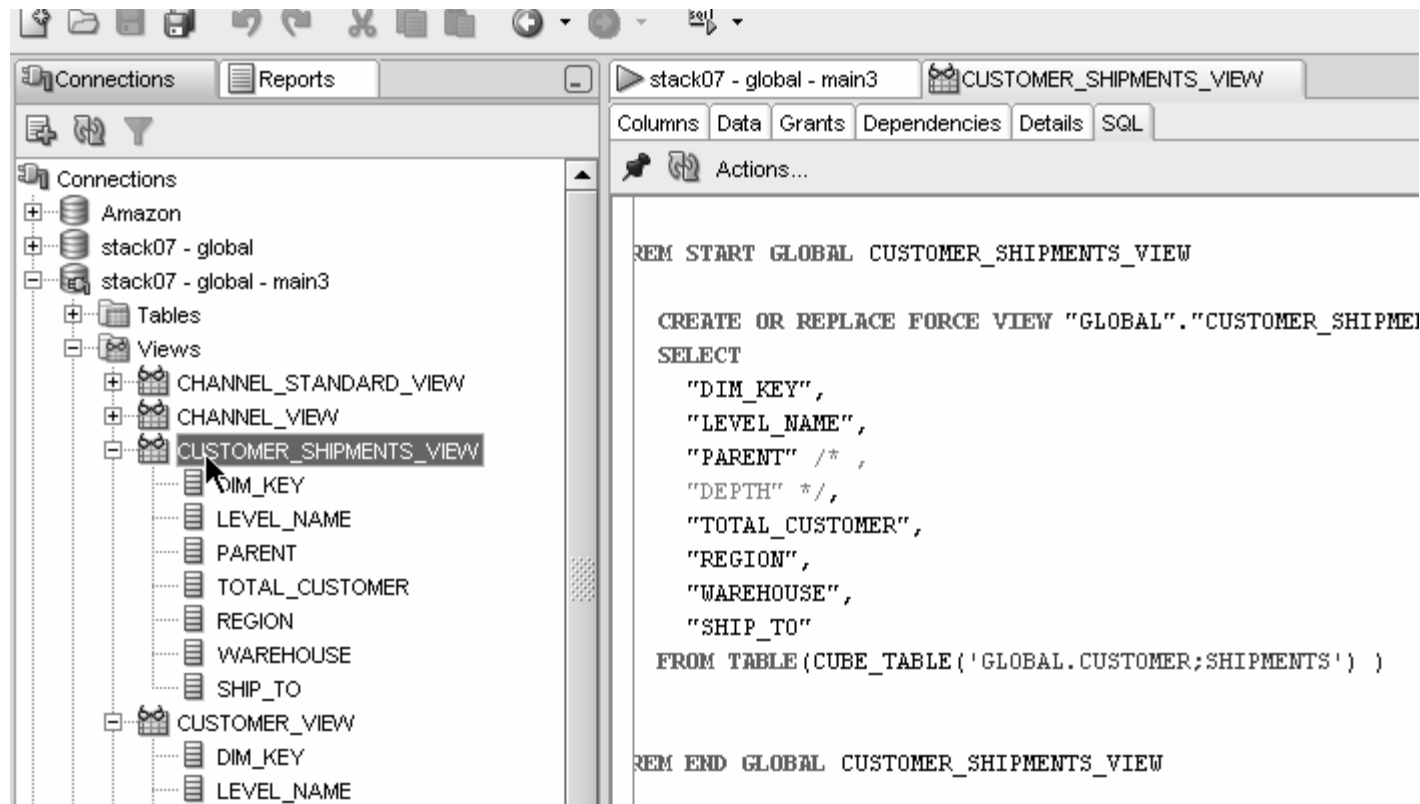
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# OLAP 11g Changes

- Views automatically created for SQL access to AWs – Dimensions and Cubes!



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# OLAP 11g Changes

- Views easily accessed from SQL Developer

The screenshot shows the SQL Developer interface. On the left, the 'Connections' pane shows a tree structure with 'Amazon' > 'stack07 - global' > 'stack07 - global - main3' > 'Views' > 'CUSTOMER\_SHIPMENTS\_VIEW'. The main pane shows the 'Data' tab for this view, displaying a table with 8 columns: DIM\_KEY, LEVEL\_NAME, PARENT, TOTAL\_CUSTOMER, REGION, WAREHOUSE, and SHIP\_TO. The table contains 16 rows of data.

DIM_KEY	LEVEL_NAME	PARENT	TOTAL_CUSTOMER	REGION	WAREHOUSE	SHIP_TO
1 9	REGION	1	1	9	(null)	(null)
2 10	REGION	1	1	10	(null)	(null)
3 8	REGION	1	1	8	(null)	(null)
4 99	SHIP_TO	20	1	9	20	99
5 46	SHIP_TO	21	1	10	21	46
6 89	SHIP_TO	21	1	10	21	89
7 59	SHIP_TO	21	1	10	21	59
8 91	SHIP_TO	20	1	9	20	91
9 90	SHIP_TO	21	1	10	21	90
10 49	SHIP_TO	16	1	9	16	49
11 95	SHIP_TO	21	1	10	21	95
12 72	SHIP_TO	11	1	8	11	72
13 47	SHIP_TO	14	1	9	14	47
14 60	SHIP_TO	18	1	8	18	60
15 74	SHIP_TO	15	1	8	15	74
16 75	SHIP_TO	16	1	9	16	75

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# OLAP 11g Changes

- Automatic views accessible from AWM

The screenshot displays the Oracle OLAP 11g interface. On the left, a tree view shows the hierarchy: **abases** > **stack07 (global)** > **Schemas** > **GLOBAL** > **Analytic Workspaces** > **GLOBAL (attached RW)** > **Dimensions** > **CHANNEL** > **Views**. The **Views** folder is expanded, showing **CHANNEL\_VIEW - [Dimension ET]** and **VIEWNAME - [Hierarchy: STANDARD]**. On the right, the **Specify View Information** dialog box is open, showing the following fields:

- Dimension Name:** CHANNEL
- Hierarchy Name:** STANDARD
- View Name:** (empty text box)

Below the fields is a table with the following data:

Column Name	Data Type	Object Type
DIM_KEY	VARCHAR2	Key
LEVEL_NAME	VARCHAR2	Level Name
PARENT	VARCHAR2	Parent
TOTAL_CHANNEL	VARCHAR2	Hierarchy Level
CHANNEL	VARCHAR2	Hierarchy Level

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# OLAP 11g Changes

- Query Rewrite knows about AWs now

General Translations Implementation Details **Materialized Views** Rules Summarize To Cache

Choose this option to manage refresh of the cube with the Materialized View refresh system

☒ Enable Materialized View Refresh of the cube

Choose how and when to refresh of the cube with the Materialized View refresh system

Refresh Method: Force Refresh Mode: On Demand

Start With:  Modify...

Next Refresh:  Modify...

Constraints: ☒ Trusted ☐ Enforced

☐ Parallel: Degree of Parallelism:

Choose this option to allow queries on the source tables of the cube to be automatically rewritten to use summary data in the cube

☒ Enable the Query Rewrite Materialized View

Materialized View Implementation Details

Refresh Rewrite

☒ Compatibility Check list ☐ Materialized View details

Status	Object	Check
--------	--------	-------

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# OLAP 11g Changes

- Optimizer pushes joins down to AW
- Enables efficient non-OLAP-aware SQL queries

The screenshot displays the Oracle SQL Developer environment. The top pane contains an SQL query:

```
FROM time_view t,  
product_view p,  
customer_view cu,  
channel_view ch,  
units_cube_view f  
WHERE t.dim_key = f.TIME  
AND p.dim_key = f.product  
AND cu.dim_key = f.customer  
AND ch.dim_key = f.channel  
AND t.long_description = '2000'  
AND p.long_description = 'Total Product'  
AND cu.long_description = 'All Customers'
```

The bottom pane shows the 'Explain' tab selected, displaying the execution plan for the query. The plan is as follows:

Operation	Optimizer	Cost	Cardinality	Bytes	Part
SELECT STATEMENT	ALL_ROWS	1028	1	520	
HASH JOIN		1028	1	520	
MERGE JOIN(CARTESIAN)		407	1	380	
MERGE JOIN(CARTESIAN)		305	1	240	
MERGE JOIN(CARTESIAN)		203	1	160	
CUBE SCAN(OUTER) GLOBAL.CHANNEL					
BUFFER(SORT)		102	1	80	
CUBE SCAN(OUTER) GLOBAL.PRODUCT					
BUFFER(SORT)		102	1	80	

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# OLAP 11g Changes

- Views are stored in Oracle Dictionary
- Notice in SYS.USER\_DIMENSION\_VIEWS

The screenshot shows the Oracle SQL Developer interface. On the left, the 'Connections' tree is expanded to 'stack07 - global - main3' > 'Views', listing several views including 'CUSTOMER\_SHIPMENTS\_VIEW'. The main window shows the 'Enter SQL Statement' area with the query: `select * from sys.user_dimension_views;`. Below the query, the 'Results' tab is active, displaying a table with 4 rows and 4 columns: DIMENSION\_NAME, VIEW\_OWNER, VIEW\_NAME, and VIEW\_TYPE.

	DIMENSION_NAME	VIEW_OWNER	VIEW_NAME	VIEW_TYPE
1	TIME	GLOBAL	TIME_VIEW	ET
2	CHANNEL	GLOBAL	CHANNEL_VIEW	ET
3	PRODUCT	GLOBAL	PRODUCT_VIEW	ET
4	CUSTOMER	GLOBAL	CUSTOMER_VIEW	ET

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# OLAP 11g Changes

- **Cost-based presummarization balances aggregation time with performance**

**Create Cube**

General Translations Implementation Details Materialized Views Rules Summarize To Cache

Presummarization  
Select the type of presummarization you wish to use

☐ No presummarization

☒ Cost-based presummarization

Percentage: 0 25 50 75 100 21

☐ Level-Based Presummarization

Choose the regions of the cube to be presummarized and stored in the analytic workspace.

Dimension:

Dimension	Levels
TIME	<input checked="" type="checkbox"/> ALL_TIMES
CUSTOMER	<input checked="" type="checkbox"/> CALENDAR_YEAR
PRODUCT	<input checked="" type="checkbox"/> MONTH
CHANNEL	<input checked="" type="checkbox"/> QUARTER

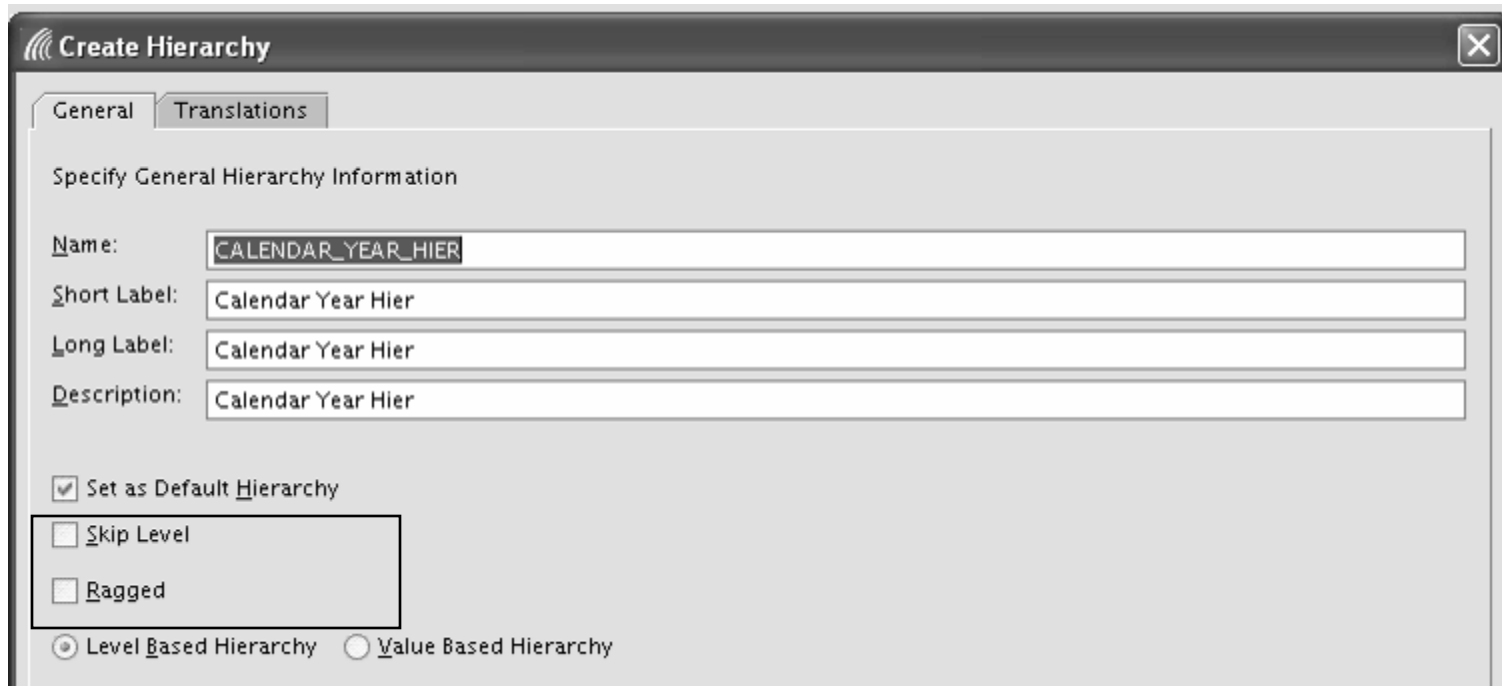
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# OLAP 11g Changes

- Native support for AWs with skip level and ragged hierarchies



The image shows a screenshot of the 'Create Hierarchy' dialog box in Oracle OLAP 11g. The dialog has two tabs: 'General' and 'Translations'. The 'General' tab is selected. The title bar says 'Create Hierarchy' with a close button. The main area is titled 'Specify General Hierarchy Information'. It contains four text input fields: 'Name' (containing 'CALENDAR\_YEAR\_HIER'), 'Short Label' (containing 'Calendar Year Hier'), 'Long Label' (containing 'Calendar Year Hier'), and 'Description' (containing 'Calendar Year Hier'). Below these fields are three checkboxes: 'Set as Default Hierarchy' (checked), 'Skip Level' (unchecked), and 'Ragged' (unchecked). At the bottom, there are two radio buttons: 'Level Based Hierarchy' (selected) and 'Value Based Hierarchy' (unselected).

Create Hierarchy

General Translations

Specify General Hierarchy Information

Name: CALENDAR\_YEAR\_HIER

Short Label: Calendar Year Hier

Long Label: Calendar Year Hier

Description: Calendar Year Hier

☒ Set as Default Hierarchy

☐ Skip Level

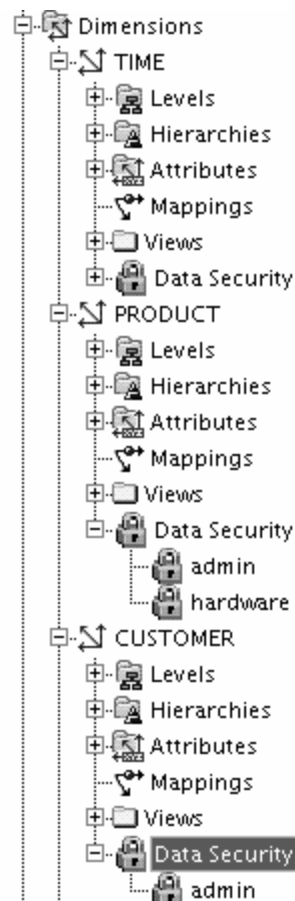
☐ Ragged

☒ Level Based Hierarchy ☐ Value Based Hierarchy



# OLAP 11g Changes

- Create security policies based on hierarchies



The 'Create Data Security Policy' dialog box is shown with the 'Member Selection' tab selected. It displays the 'Available' hierarchy structure and the 'Selected' members. The 'Condition Expression' field is visible at the bottom.

**Available:**

- Hierarchy
  - Descendants of Hardware
  - TOTAL\_CUSTOMER

**Selected:**

- 1. Start with Hardware
- 2. Add Descendants of Hardware

**Condition Expression:**

GLOBAL.PRODUCT.DIM\_KEY IN ('2') OR '2'  
GLOBAL.PRODUCT.PRIMARY LEVEL GLOB

The 'Create Data Security Policy' dialog box is shown with the 'Member Selection' tab selected. It displays the 'Specify Data Security Policy Information' section and the 'Select the access privileges for each user or role below' section.

**Specify Data Security Policy Information**

Data Security Policy Name: north america

Select the access privileges for each user or role below

User or Role	Type	Select	Insert
SCOTT	User	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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# OLAP 11g Changes

- Calc Wizard replaced by powerful "complete the sentence" wizard
- Expression language more SQL-like
- EQs of Calculated Measures in 11g-format AWs "read-only"

Choose a calculation type:

Rank

Calculation:

Rank members of the PRODUCT dimension and PRIMARY hierarchy based on measure UNITS\_CUBE.UNITS (...)

. Calculate rank using RANK method with member's level in order lowest to highest.

member's level  
member's parent  
member's ancestor

Expression:

RANK() OVER HIERARCHY (GLOBAL.PRODUCT.PRIMARY ORDER BY GLOBAL.UNITS\_CUBE.UNITS WITHIN LEVEL)

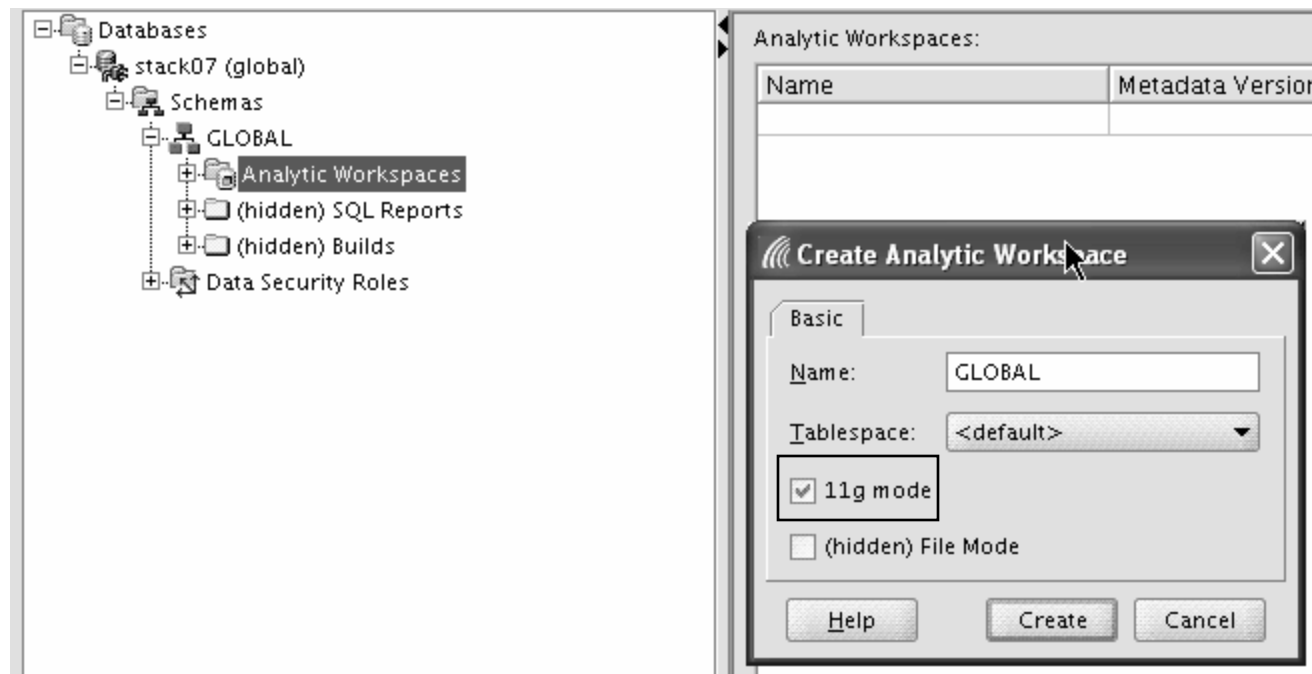
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# OLAP 11g Changes

- Can Create AWs in 11g mode (automatic views)
- If no 11g mode, have same flexibility as 10g

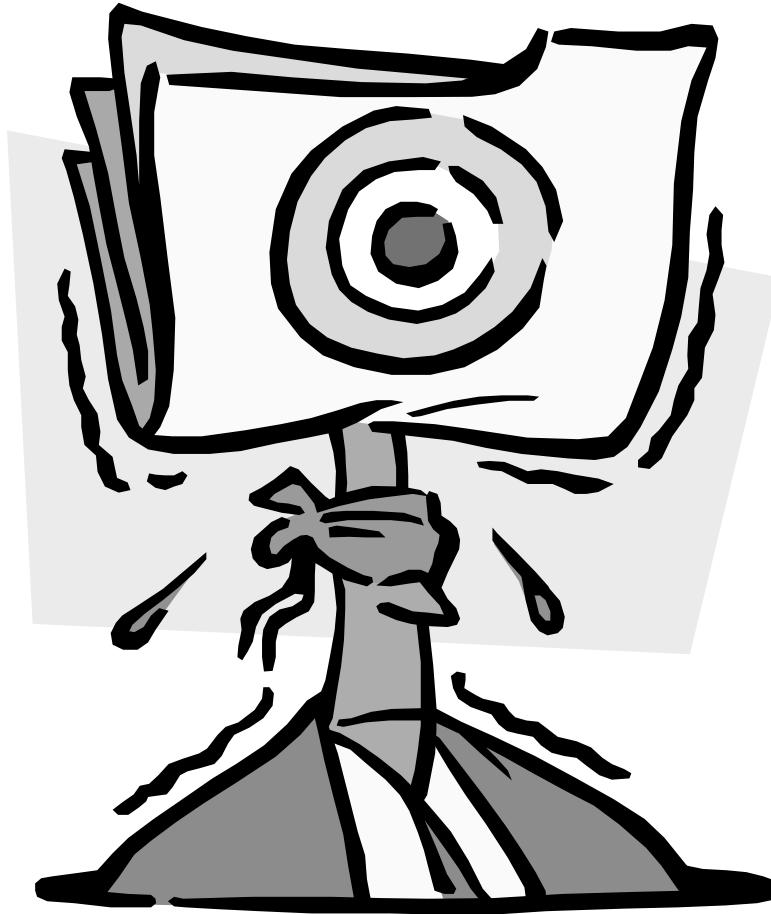


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# QUESTIONS?

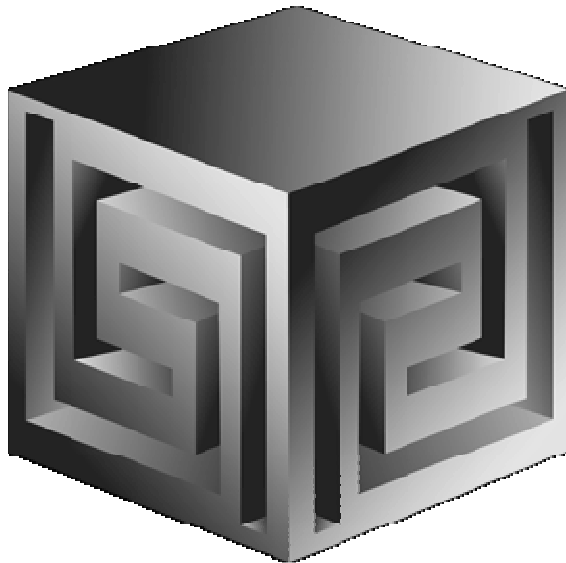
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# **Implementing Oracle BI EE on Top of Oracle OLAP Cubes**

**ODTUG 2007**



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# Oracle BI SE Architecture

