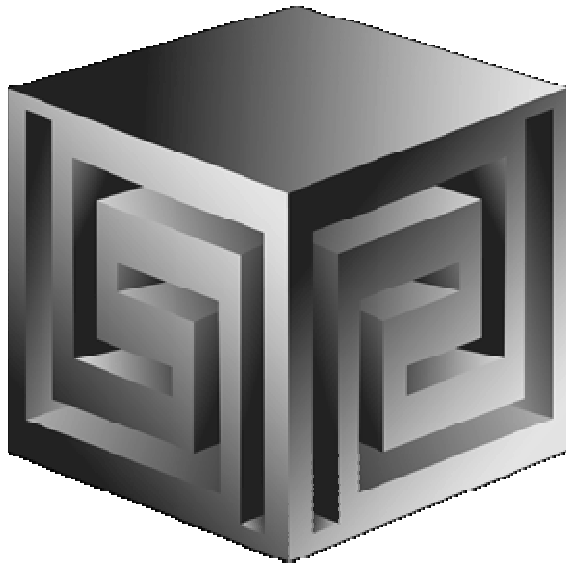


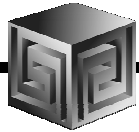
Building Cubes and Analyzing Data using Oracle OLAP 11g

Collaborate '08 Session 219



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Vlami Software Solutions, Inc.

- **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 I Am

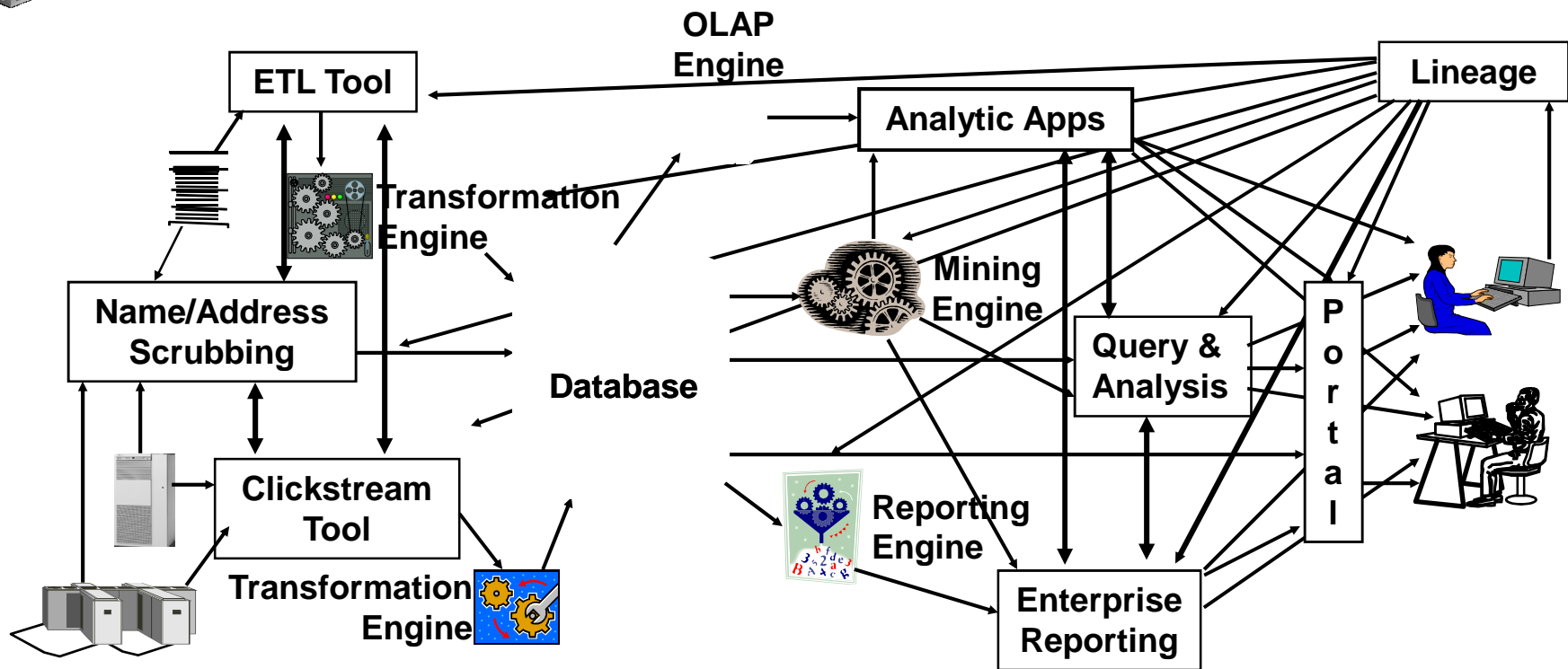
- **Chris Claterbos, Development Manager**
 - ☐ **DBA and applications developer for Oracle products, since 1981.**
 - ☐ **Beta tester and early adopter of - including Oracle 8i, 9i and 10g, JDeveloper and BIBeans, Oracle AS, Portal (formerly WebDB), and Reports.**
 - ☐ **Speaker and author.**
 - ☐ **Previous IOUG Focus Area Manager for Data Warehousing and BI**
 - ☐ **Consulting and Development Manager for Vlamis Software Solutions, Inc.**



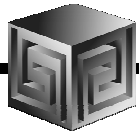
Agenda

- **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?**
- **Hands-on with Oracle OLAP and BI EE**

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

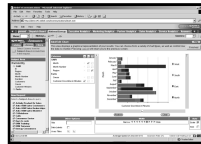
Interactive Dashboards



Reporting & Publishing



Ad-hoc Analysis



Proactive Detection and Alerts



Disconnected Analytics



MS Office Plug-in



Simplified Business Model and Abstraction Layer

**Oracle
BI Server**

Intelligent Caching Services

Multidimensional Calculation and Integration Engine

Intelligent Request Generation and Optimized Data Access Services



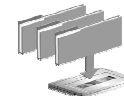
**OLTP & ODS
Systems**



**Data Warehouse
Data Mart**



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

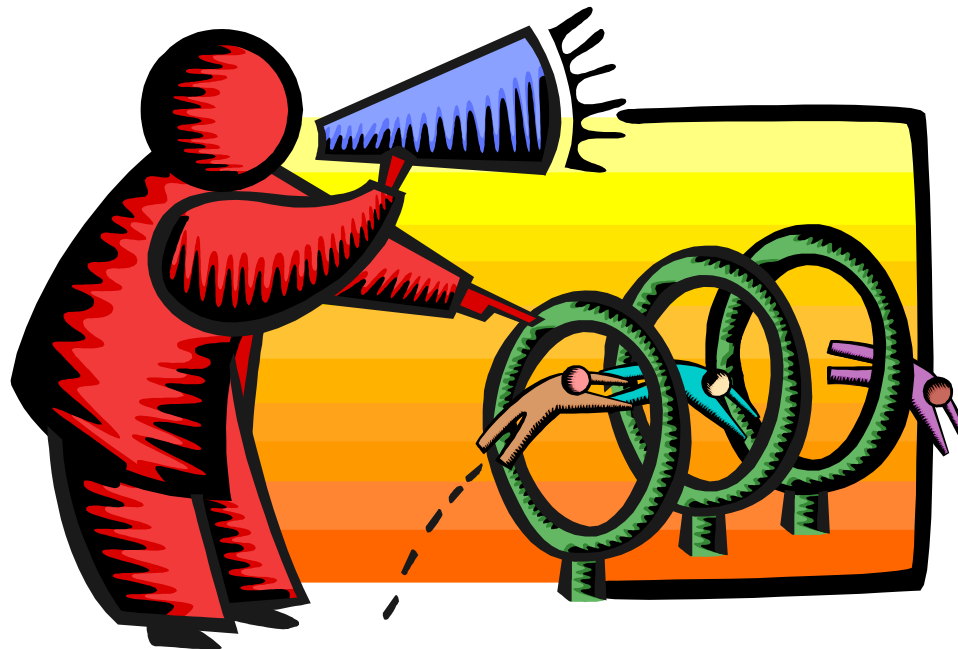


**Files
Excel
XML**



**Business
Process**

Demo of BI EE on Oracle OLAP





Definition of OLAP

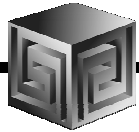
OLAP stands for On Line Analytical Processing.
That has two immediate consequences: the *on line* part requires the answers of queries to be fast, the *analytical* part is a hint that the queries itself are complex.

i.e. Complex Questions with FAST ANSWERS!



Why use OLAP?

- 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
- **EASY to IMPLEMENT and SUPPORT!**



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**



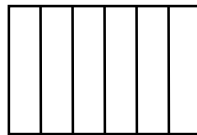
OLAP Option – High-level View

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

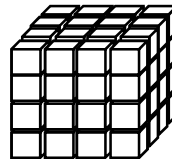


ROLAP vs. MOLAP

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

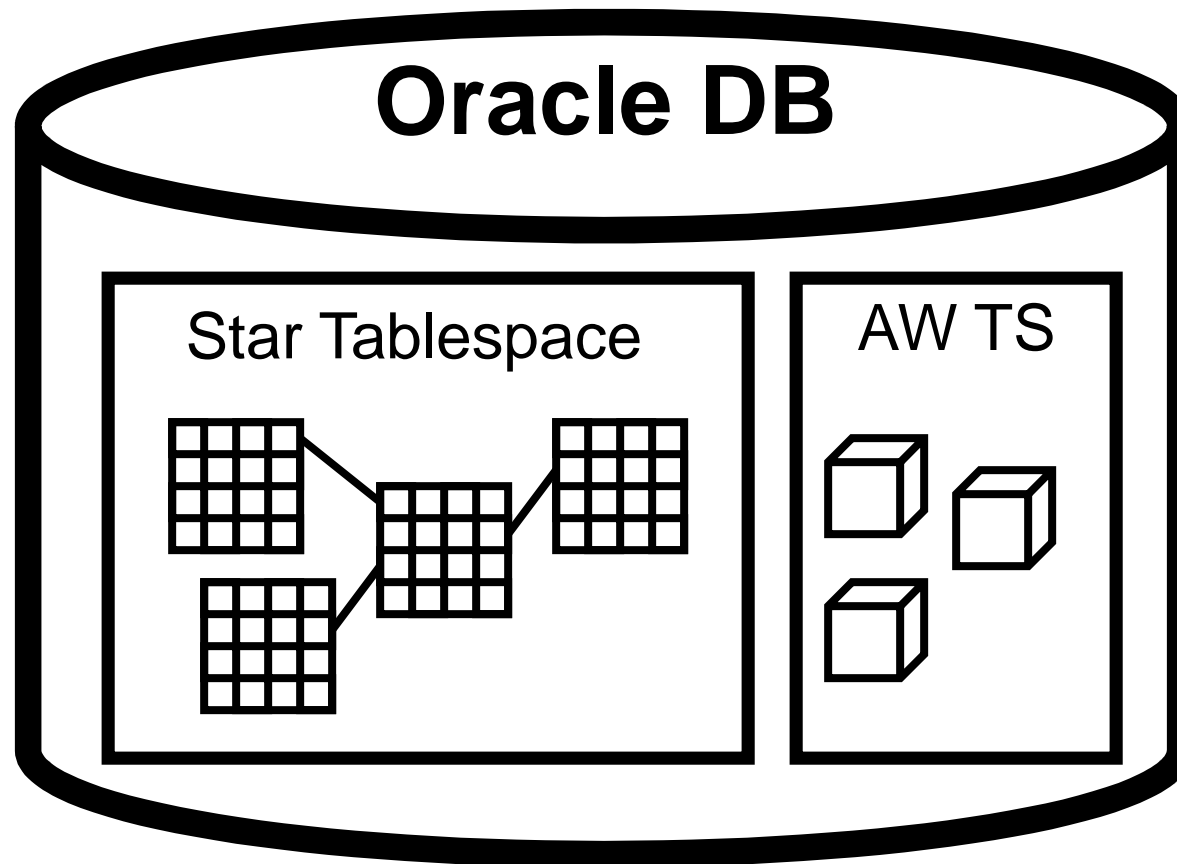


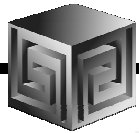
Relational



Multidimensional

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

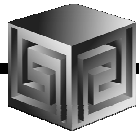
Schema: GLOBAL_AW

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		✓



Managing Analytic Workspaces

Analytic Workspace Manager dantoshm2:1521:orcl Model View

File View Tools Help

GLOBAL
GLOBAL_AW
Analytic Workspaces
GLOBAL (attached RW)
Dimensions
CHANNEL
Levels
TOTAL_CH
CHANNEL
Hierarchies
Attributes
Mappings
CUSTOMER
PRODUCT
TIME
Cubes
SALES_CUBE
Measures
Calculated Mea
Mappings
PRICE_AND_COST
Measure Folders

Dimensions:

Name	Long Description	Type
CHANNEL	Channel	User
CUSTOMER	Customer	User
PRODUCT	Product	User
TIME	Time	Time

Cubes:

Name	Long Descri...	Dimensions
SALES_CUBE	Sales Cube	TIME,CUSTOMER,PRODUCT,CHANNEL
PRICE_AND_CO...	PRICE AND ...	TIME,PRODUCT

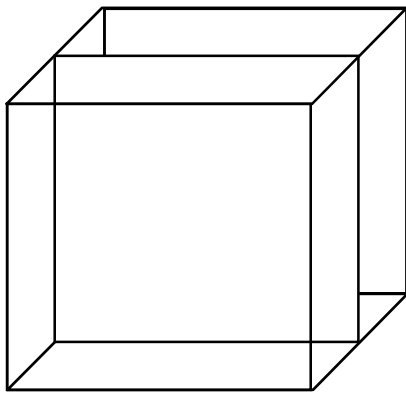
Measures:

Name	Cube
SALES	SALES_CUBE
UNITS	SALES_CUBE
BASE_COST	SALES_CUBE
COST	SALES_CUBE
BASE_PRICE	SALES_CUBE

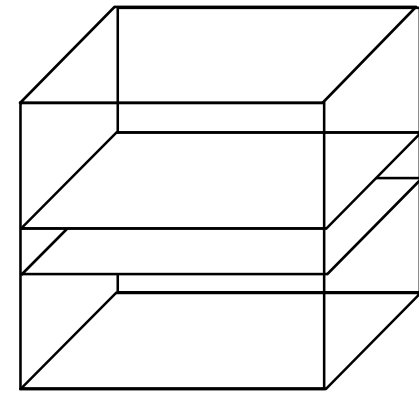
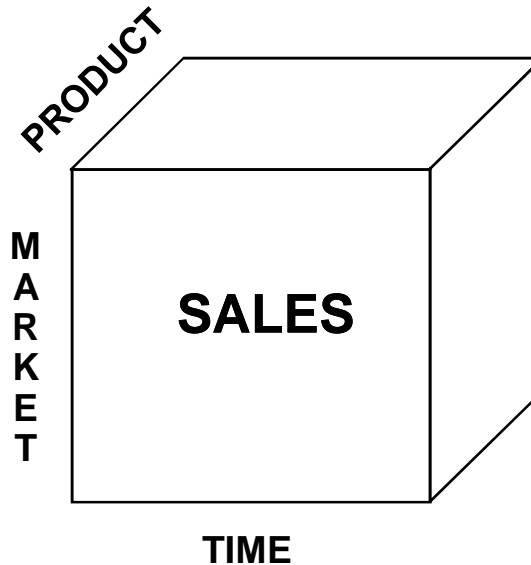


OLAP AW Stores Data in Cubes

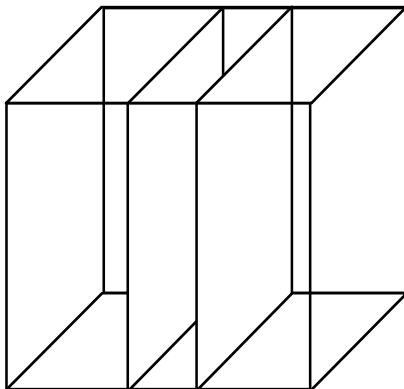
Fast Flexible Access to Summarized Data



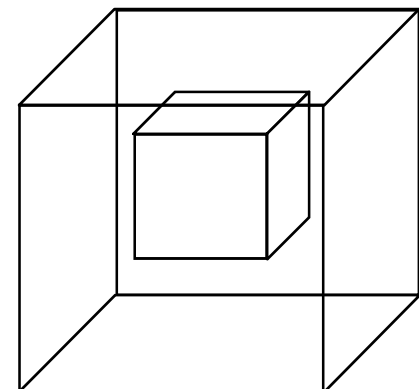
Product Mgr. View



Regional Mgr. View



Financial Mgr. View

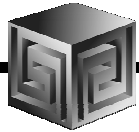


Ad Hoc View



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**



Dimensions

Definition:

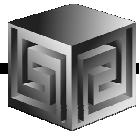
- **Dimensions are collections of keys or lookup values that allow for querying and subsetting data.**
- **Dimensions can be flat, parent-child or hierarchical in nature**
- **Examples:**
 - ☐ **Time (year,quarter, month, day)**
 - ☐ **Geograpy (continent,region,country,state)**
 - ☐ **Product(all products, division, group, class, item)**



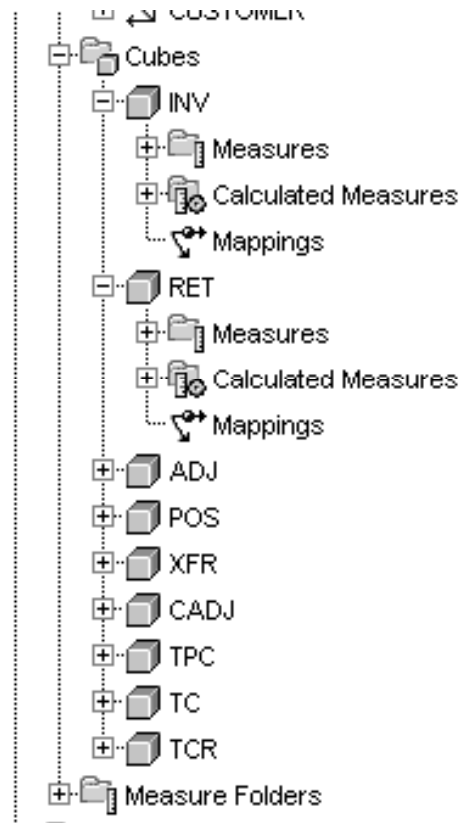
Cubes Defined

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)**



Cubes in AWM





Define Measures

Analytic Workspace Manager cc-m2:1521:orc110 Model View

File View Tools Help

INTERNET_APPSERVER_REGISTRY
IP
LEV_AW
Analytic Workspaces
LEV_AW (attached RW)
Dimensions
REASONS
TIME
PRODUCT
CUSTOMER
Cubes
INV
Measures
GROSS_SALES
GROSS_UNITS
GROSS_COGS
Calculated Measures
Mappings
RET
Measures
Calculated Measures
Mappings
ADJ
POS
XFR
CADJ
TPC
TC
TCR
Measure Folders
LEV_PROGRAMS
LEV_DBA
MDDATA
MDSYS
MGMT_VIEW

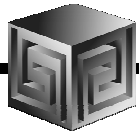
General Implementation Details Rules Summarize To Cache

Specify General Measure Information

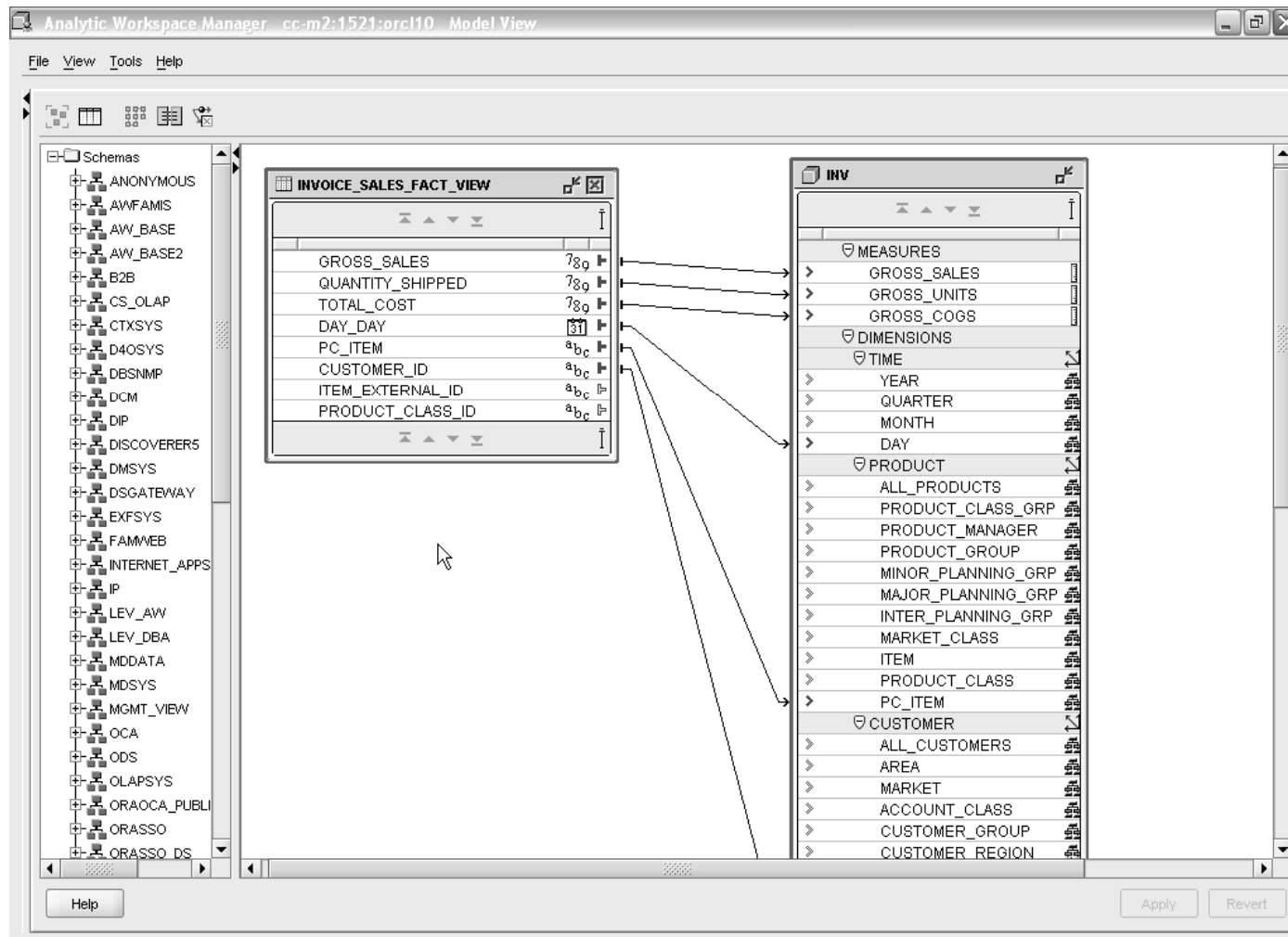
Name: GROSS_SALES
ID: INV.GROSS_SALES.MEASURE
Short Label: Gross Sales
Long Label: Gross Sales
Description: Gross Sales

☐ Use Aggregation specification from the cube
☒ Override the Aggregation specification of the cube

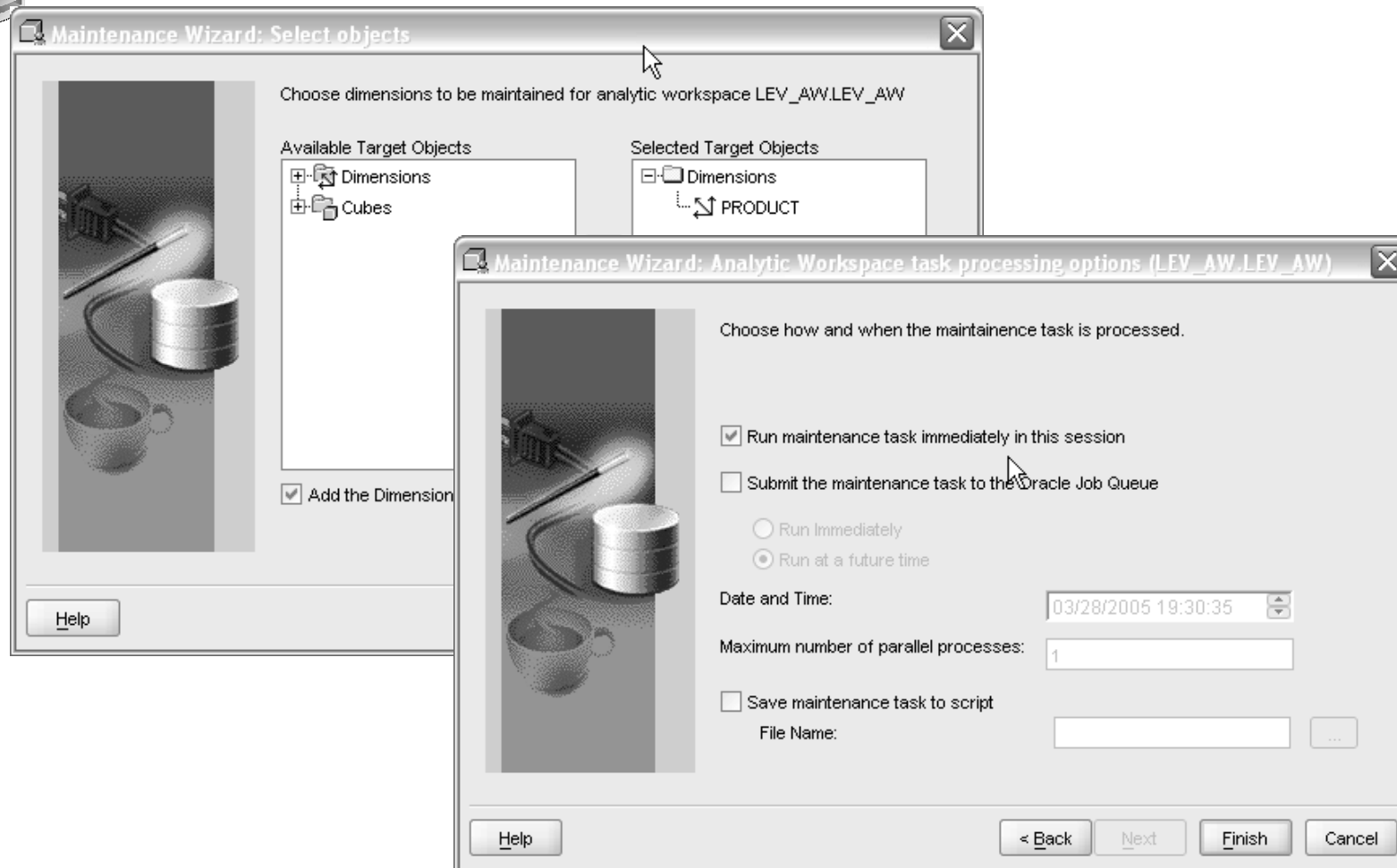
Help Apply Revert

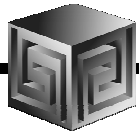


Map Cube

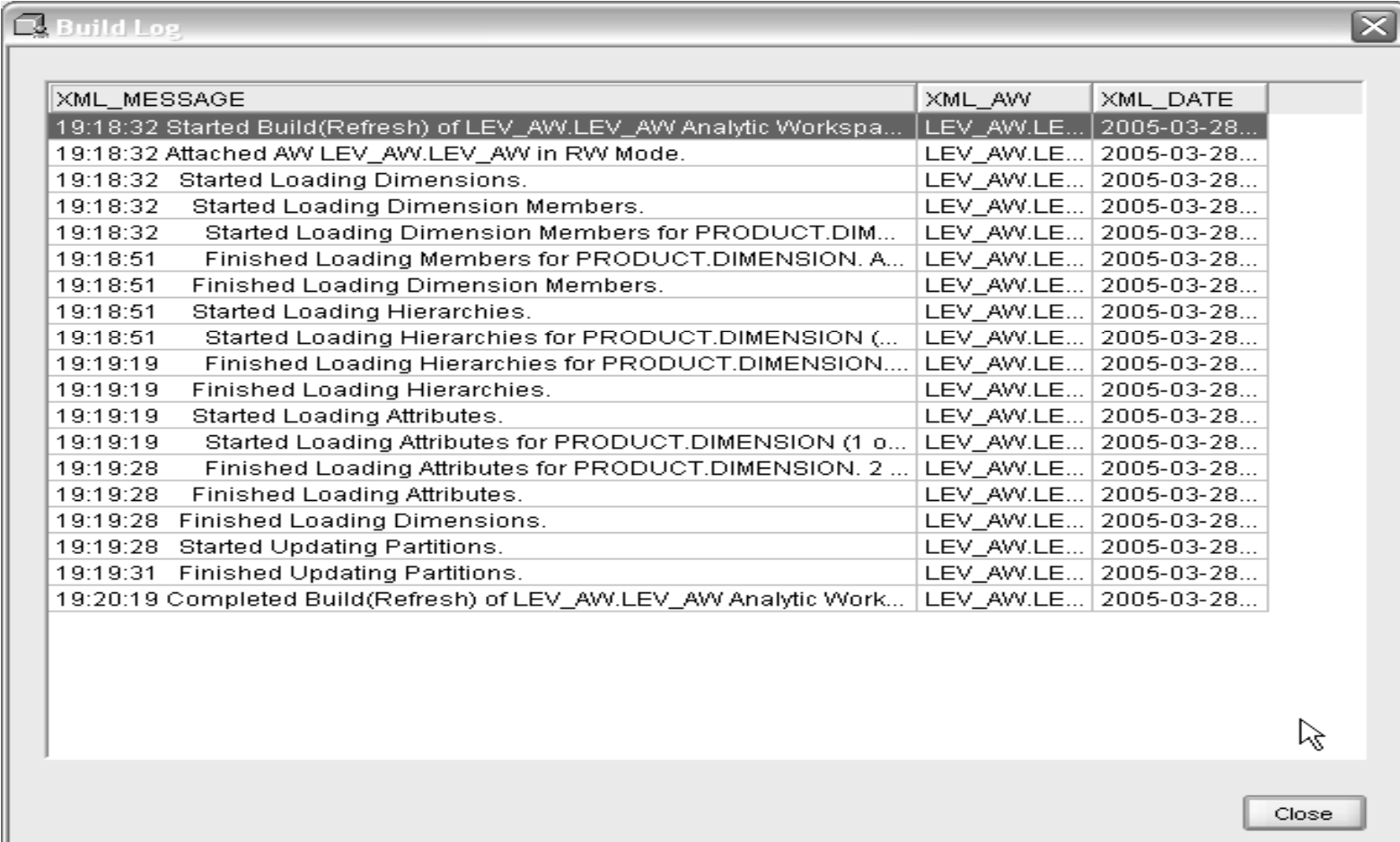


Maintaining Dims/Cubes





Maintaining Dims/Cubes



The screenshot shows a 'Build Log' window with a table of build operations. The table has three columns: XML_MESSAGE, XML_AW, and XML_DATE. The operations include starting and finishing the build, loading dimensions, dimension members, hierarchies, and attributes, and updating partitions. The window has a 'Close' button at the bottom right.

XML_MESSAGE	XML_AW	XML_DATE
19:18:32 Started Build(Refresh) of LEV_AW.LEV_AW Analytic Workspa...	LEV_AW.LE...	2005-03-28...
19:18:32 Attached AW LEV_AW.LEV_AW in RW Mode.	LEV_AW.LE...	2005-03-28...
19:18:32 Started Loading Dimensions.	LEV_AW.LE...	2005-03-28...
19:18:32 Started Loading Dimension Members.	LEV_AW.LE...	2005-03-28...
19:18:32 Started Loading Dimension Members for PRODUCT.DIM...	LEV_AW.LE...	2005-03-28...
19:18:51 Finished Loading Members for PRODUCT.DIMENSION. A...	LEV_AW.LE...	2005-03-28...
19:18:51 Finished Loading Dimension Members.	LEV_AW.LE...	2005-03-28...
19:18:51 Started Loading Hierarchies.	LEV_AW.LE...	2005-03-28...
19:18:51 Started Loading Hierarchies for PRODUCT.DIMENSION (...)	LEV_AW.LE...	2005-03-28...
19:19:19 Finished Loading Hierarchies for PRODUCT.DIMENSION....	LEV_AW.LE...	2005-03-28...
19:19:19 Finished Loading Hierarchies.	LEV_AW.LE...	2005-03-28...
19:19:19 Started Loading Attributes.	LEV_AW.LE...	2005-03-28...
19:19:19 Started Loading Attributes for PRODUCT.DIMENSION (1 o...	LEV_AW.LE...	2005-03-28...
19:19:28 Finished Loading Attributes for PRODUCT.DIMENSION. 2 ...	LEV_AW.LE...	2005-03-28...
19:19:28 Finished Loading Attributes.	LEV_AW.LE...	2005-03-28...
19:19:28 Finished Loading Dimensions.	LEV_AW.LE...	2005-03-28...
19:19:28 Started Updating Partitions.	LEV_AW.LE...	2005-03-28...
19:19:31 Finished Updating Partitions.	LEV_AW.LE...	2005-03-28...
19:20:19 Completed Build(Refresh) of LEV_AW.LEV_AW Analytic Work...	LEV_AW.LE...	2005-03-28...



Looking at OLAP 11g

- **Oracle 11g is currently Available limited to SQL access today!**
- **Oracle OLAP has many NEW things**
 - ☐ **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!)**



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 'stack07 - global - main3' > 'Views' > 'CUSTOMER_SHIPMENTS_VIEW'. The main window shows the 'Enter SQL Statement' editor with the following query:

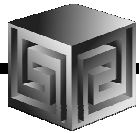
```
SELECT * FROM TABLE(CUBE_TABLE('GLOBAL.CUSTOMER;SHIPMENTS'));
```

Below the editor, the 'Results' tab is active, displaying the following data:

	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	

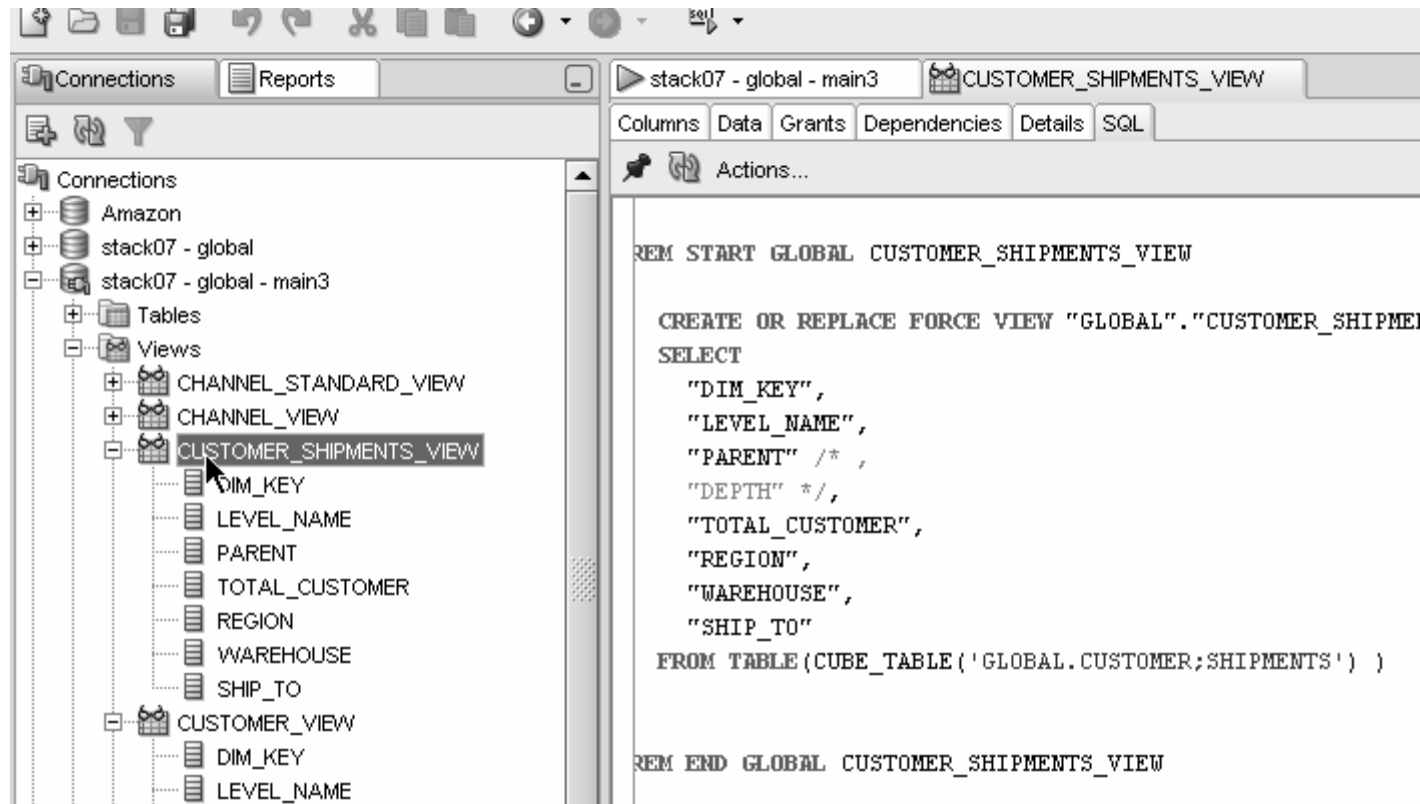
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OLAP 11g Changes

- 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, the 'abases' tree shows the hierarchy: '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 'Dimension Name: CHANNEL', 'Hierarchy Name: STANDARD', and a 'View Name' field. Below the dialog, a table lists the columns and their data types and object types.

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 shows the SQL Developer interface. The top pane contains the following SQL query:

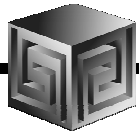
```
FROM time_view t,  
product_view p,  
customer_view cu,  
channel_view ch,  
units_cube_view f  
WHERE t.dim_key = f.TIME  
AND p.dim_key = f.product  
AND cu.dim_key = f.customer  
AND ch.dim_key = f.channel  
AND t.long_description = '2000'  
AND p.long_description = 'Total Product'  
AND cu.long_description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

The bottom pane shows the execution plan for the query. The 'Explain' tab is selected. 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: (Slider from 0 to 100)

☐ Level-Based Presummarization

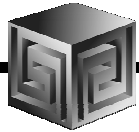
Choose the regions of the cube to be presummarized and stored in the analytic workspace.

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

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

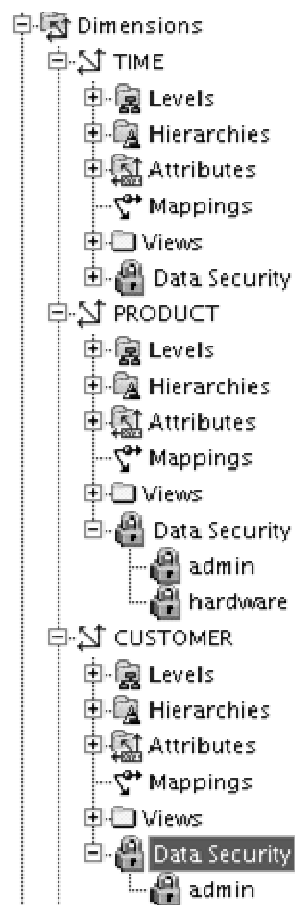
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OLAP 11g Changes

- Create security policies based on hierarchies

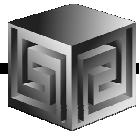


The 'Create Data Security Policy' dialog box is shown with the 'Member Selection' tab selected. It displays a hierarchy tree under 'Available:' and a list of selected members under 'Selected:'. The 'Selected' list includes '1. Start with Hardware' and '2. Add Descendants of Hardware'. A smaller version of the dialog box is also shown below it, with the 'General' tab selected, showing the 'Data Security Policy Name' as 'north america' and a table for access privileges.

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)

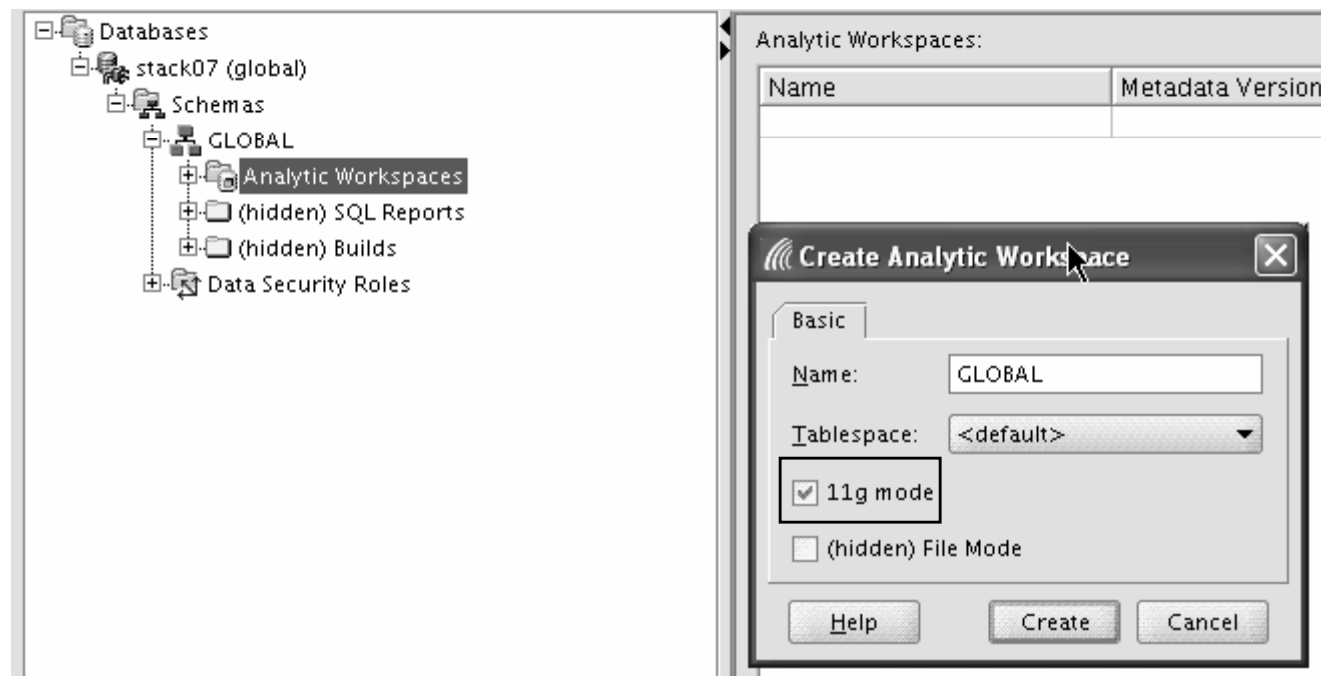
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OLAP 11g Changes

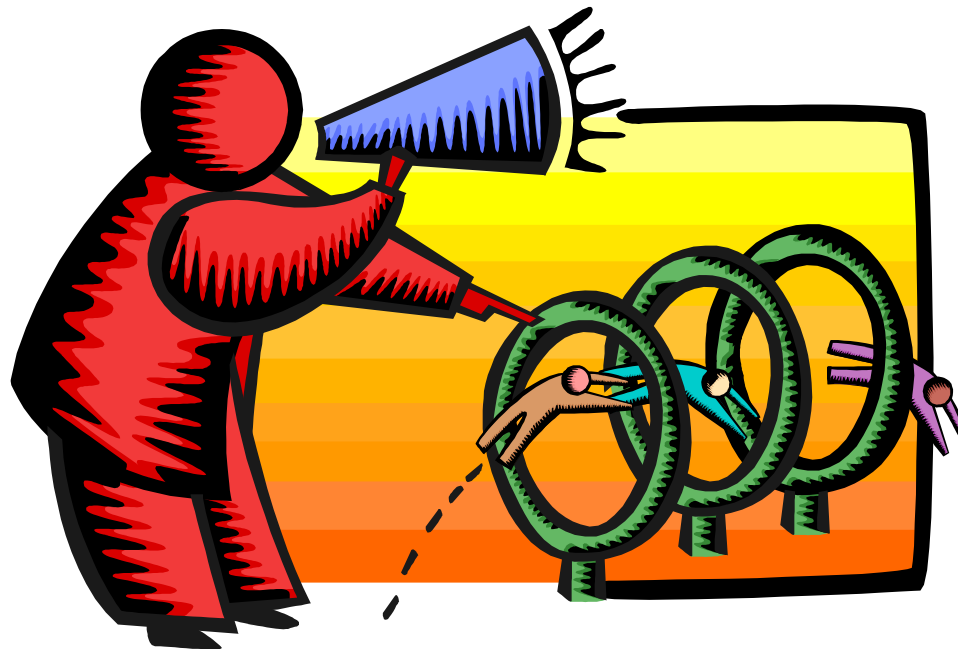
- Can Create AWs in 11g mode (automatic views)
- If no 11g mode, have same flexibility as 10g



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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!**



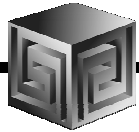
Getting the Data Out

- **Once the Data is in OLAP how do we get the data out?**
- **Alternatives**
 - ☐ **BI Beans applications (Custom or pre-built)**
 - ☐ **Discoverer**
 - ☐ **Oracle Reports**
 - ☐ **SQL Access from any SQL tool**
 - ☐ **Spreadsheet Add-in**
 - ☐ **Any except Spreadsheet add-in can be in a portal and with web interface**



What Access Tool?

- **Java OLAP API designed for products**
- **Discoverer for ad hoc analysis**
- **BI Beans for custom applications (using JDev)**
- **Spreadsheet Add-in for access from Excel**
- **Oracle Reports for highly formatted reports**
- **Oracle Apps for analysis of Apps data**
- **Oracle BIEE**
- **BI Publisher**
- **3rd Party tools fill in gaps**



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

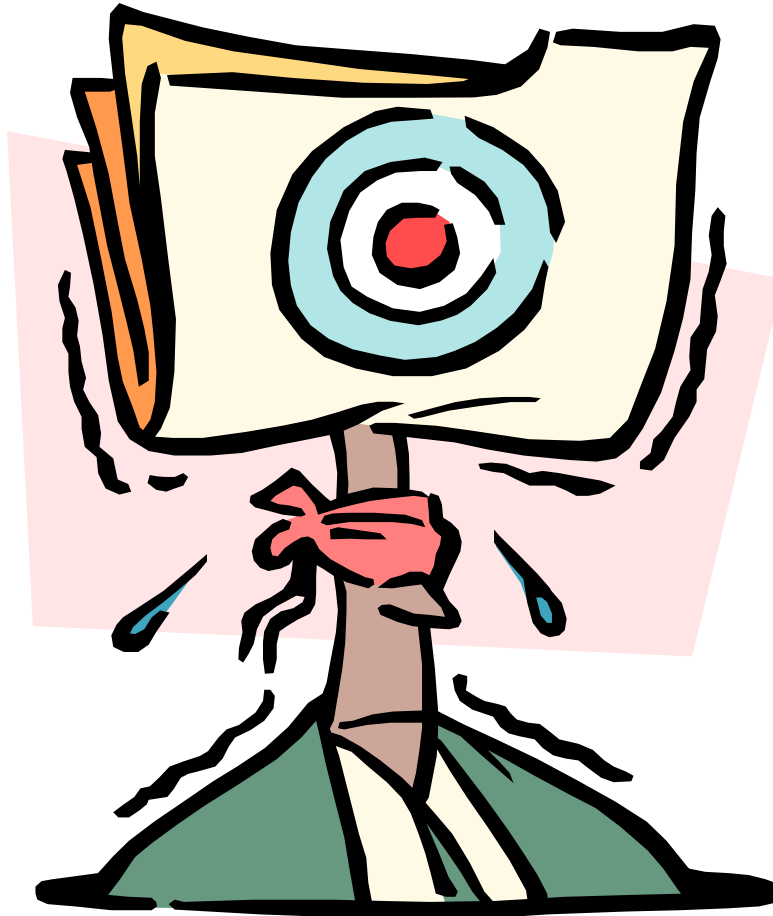
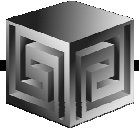
- **Oracle Warehouse Builder (ETL, integrated)**
- **Discoverer Administrator (Discoverer)**
- **Analytic Workspace Manager (AWs)**
- **Oracle BI Administrator (OBI EE)**



Further Information

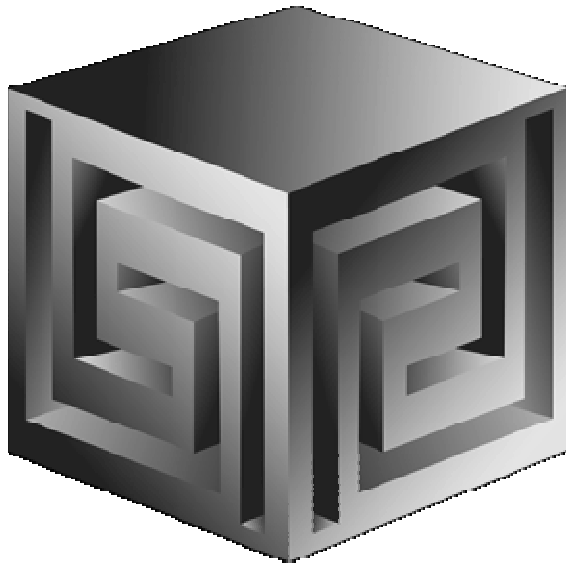
- Oracle BI Sales
 - ❑ <http://www.oracle.com/bi>
- Oracle BI Technical
 - ❑ <http://www.oracle.com/technology/tech/bi/index.html>
- Oracle BI EE on top of Oracle OLAP
 - ❑ Collaborate 208: Using Oracle BI EE with Oracle OLAP Cubes on www.vlamis.com/presentations
- VMWare image with Demo environment
 - ❑ Send dvlamis@vlamis.com an email
- Oracle OLAP and AWM Sales
 - ❑ http://www.oracle.com/solutions/business_intelligence/olap.html
- Oracle OLAP Technical
 - ❑ <http://www.oracle.com/technology/products/bi/olap/index.html>

QUESTIONS?



Building Cubes and Analyzing Data using Oracle OLAP 11g

Collaborate '08 Session 219



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