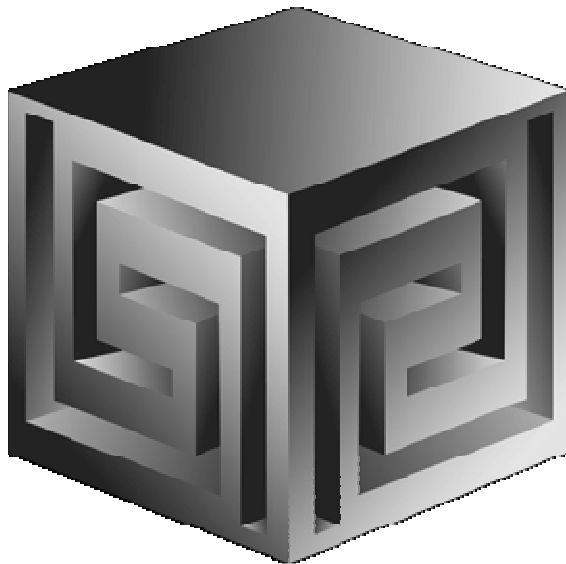


Oracle OLAP— What's All This About?

IOUG Live! 2006



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<http://www.vlamis.com>

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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 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**

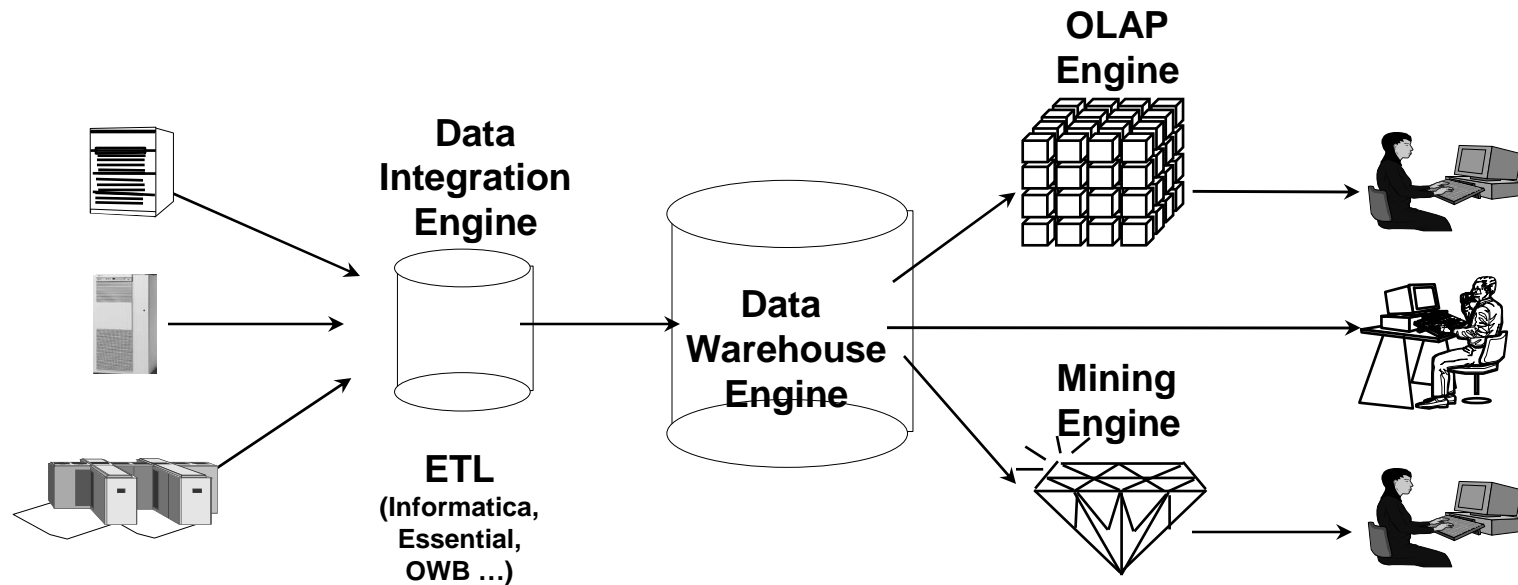


Agenda

- **Historical background**
- **Why Oracle OLAP?**
- **What is Oracle OLAP?**
- **Oracle OLAP storage options**
- **Structure of Analytic Workspace**
- **Building OLAP Cubes**
- **Getting the data out – BI Beans**
- **Front-end options**
- **Hands-on with Oracle OLAP**



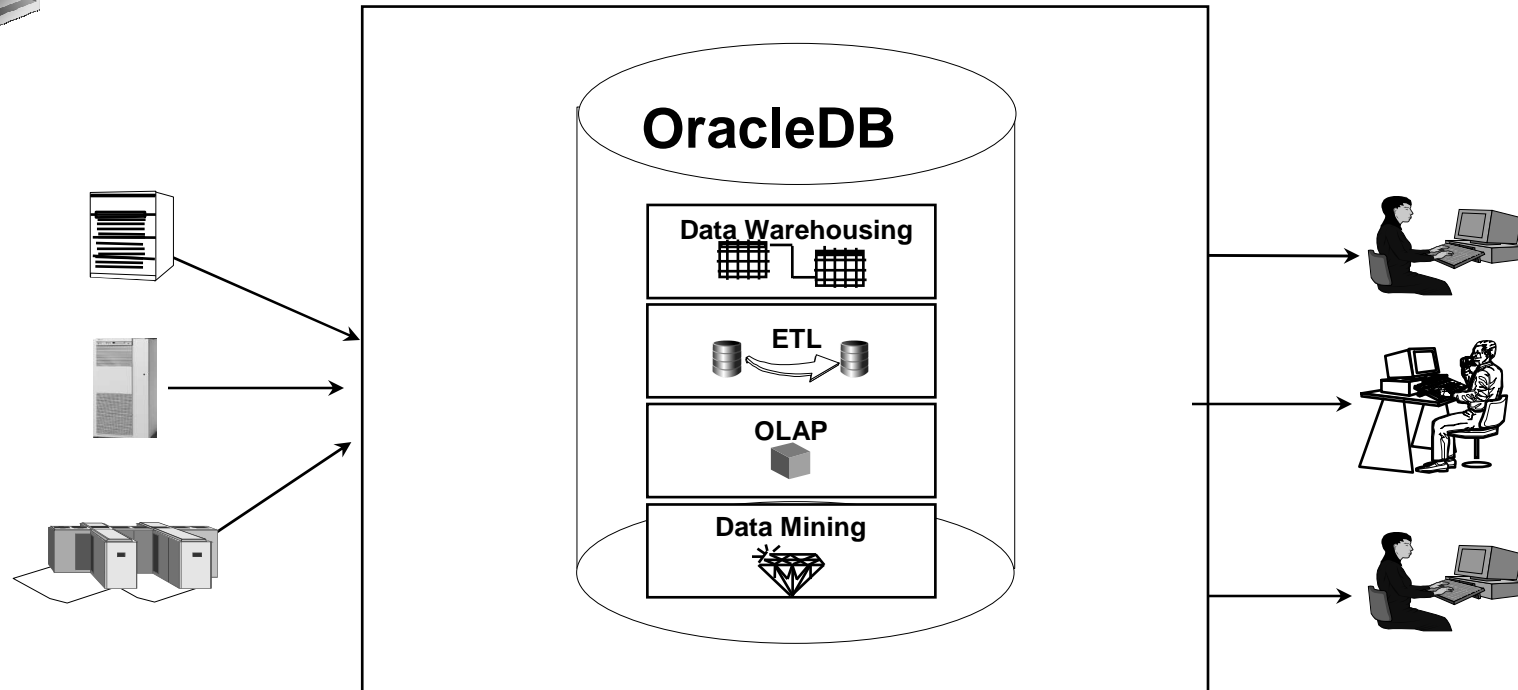
Business Intelligence the Old Way



- Special purpose engines for differing tasks
- Metadata migration tools ease replication
- User interfaces generally different for different tools



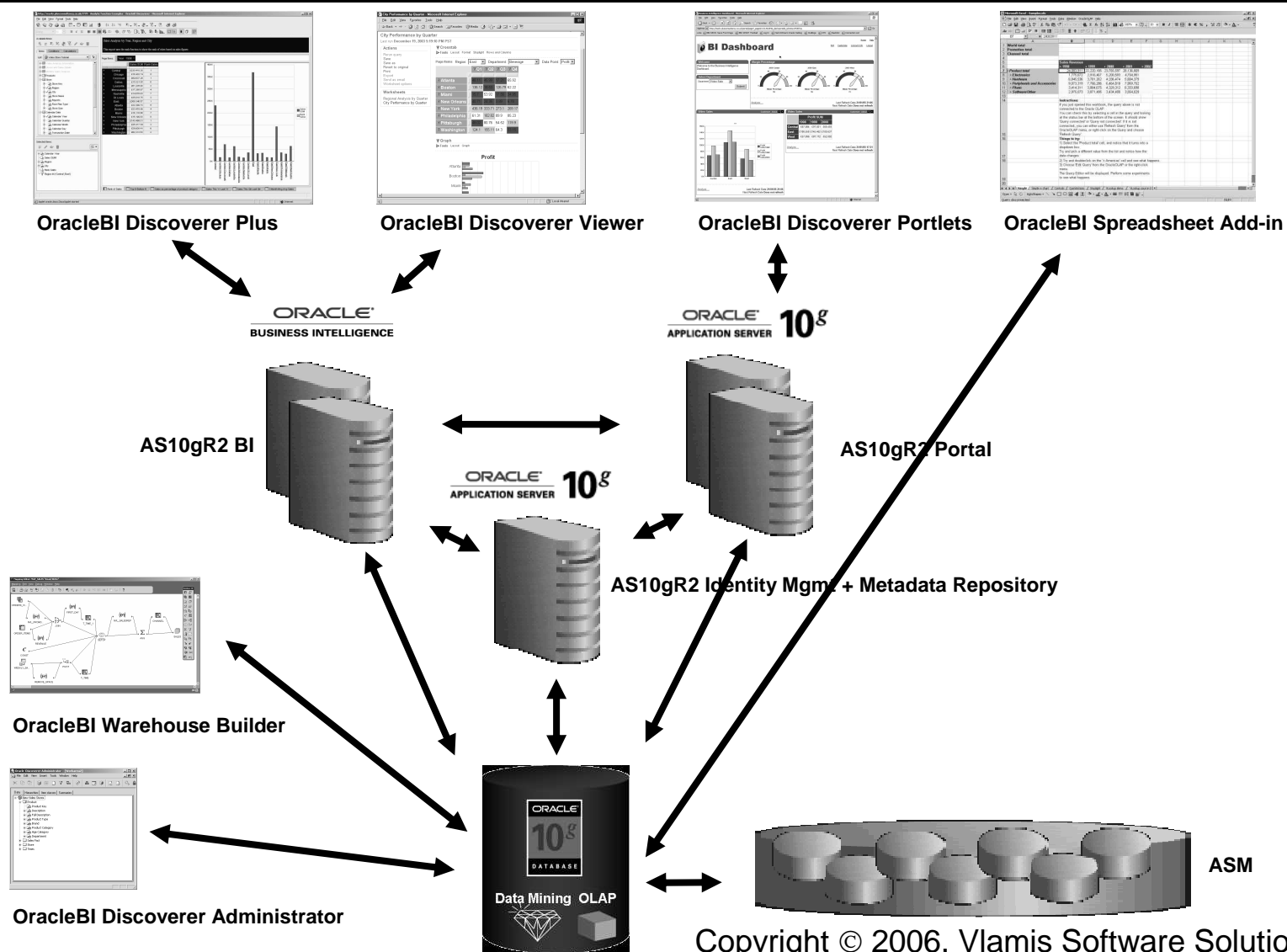
BI the New Way: Oracle DB



- Single business intelligence platform
 - Reduce administration, implementation costs
 - Faster deployment & Improved scalability and reliability



Oracle BI Product Architecture





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 OLAP Add to a DW?

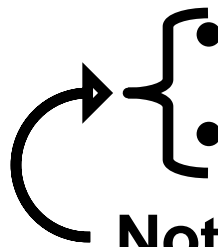
- **Multidimensional user view of data**
- **Users create own reports**
- **Users create own measures**
- **Easy drill-down, rotate**
- **Iterative discovery process (not just reports)**
- **Ad-hoc analysis**
- **Easy selection of data with business terms**



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



Not exposed with Discoverer



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**



OLAP Option – Technical View

The OLAP Option consists of five key elements:

- 1. Multidimensional data types, used for holding cubes and dimensions, temporary or stored permanently in LOBs within schemas**
- 2. A multidimensional calculation engine**
- 3. A Java development framework with reusable OLAP components**
- 4. Extensions to SQL to allow SQL access to these multidimensional datatypes**
- 5. An additional layer of OLAP-specific metadata known as the OLAP Catalog**



Metadata Required by OLAP API

RDBMS data

- **Stored in "OLAP Catalog"**
- **Edited with OEM or OWB**
- **Based on CWM**

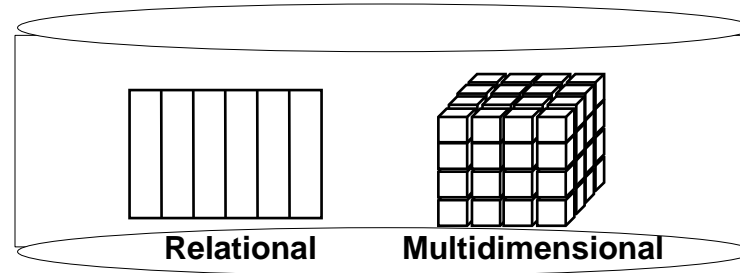
Analytic Workspace data

- **Stored in Standard Form AW objects**
- **Created / Edited with AWM**
- **Similar to OEO/Administrator metadata**
- **Series of properties and objects in each AW**
- **Once set up, can use BI Beans-based apps**

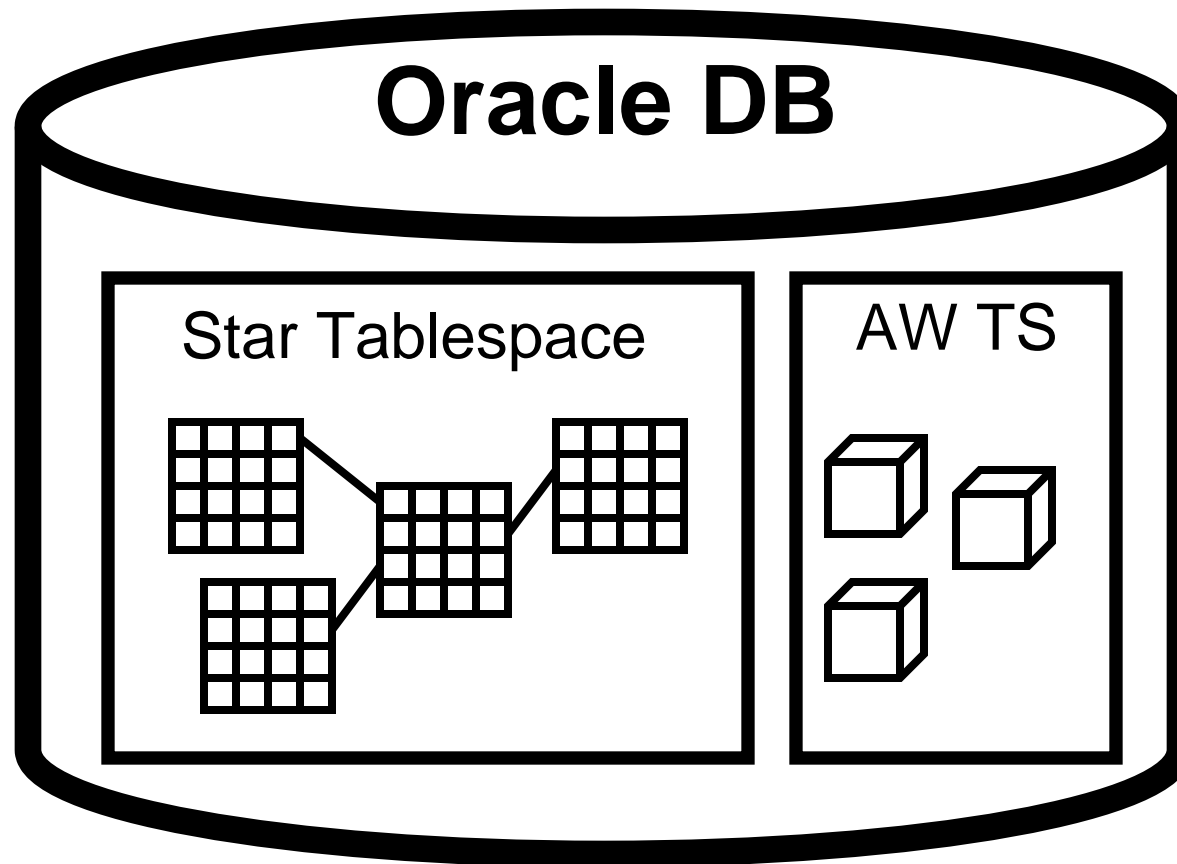


ROLAP vs. MOLAP

- 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		✓



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

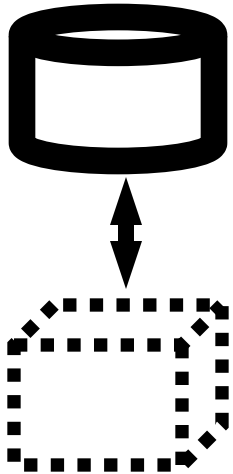
Measures:

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

Advantages of RDBMS Storage



Oracle Star Schema

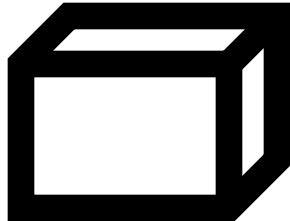
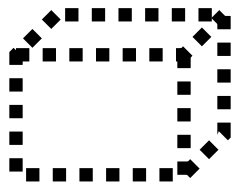


- Store data in familiar RDBMS
- Easy access to data using SQL
- Can use materialized views
- Best for read-only applications
- Model with OWB
- Data may already be in schema



Advantages of AW Storage

- **Faster multidimensional access**
- **Personal user workspaces**
- **Best for read/write applications**
- **Best for heavier analysis**
- **OLAP DML language**



**Analytic
Workspace**

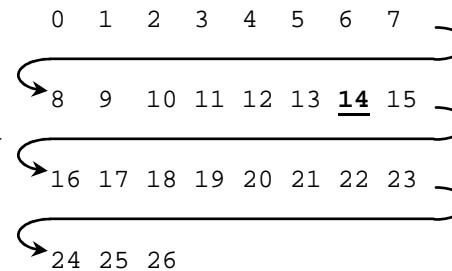
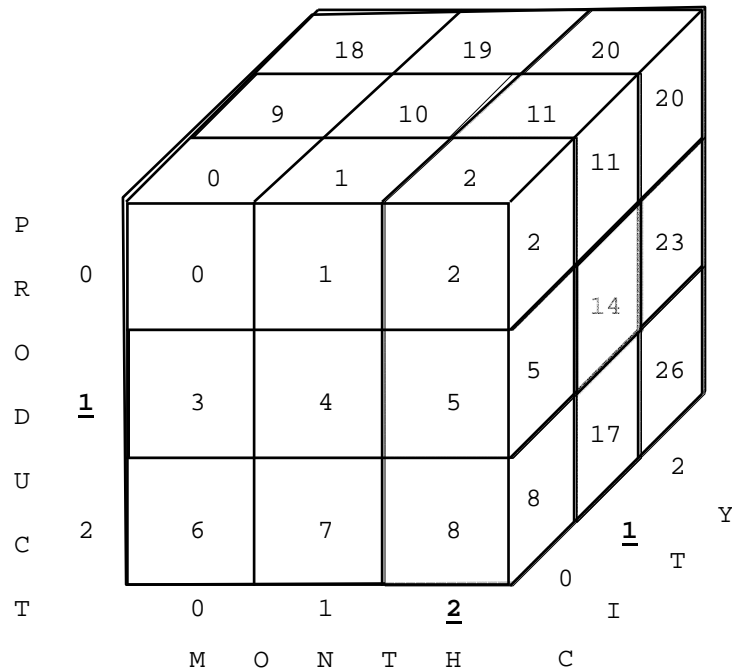


Finding data is simple multiplication and addition

Formula for calculating cell offset:

$$\text{month} + \text{product} * (\# \text{ of months}) + \text{city} * (\# \text{ of months} * \# \text{ of products}) = 14$$

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



Offset 14 * 8 bytes each = 112.

Fseek to byte 112 to find data.

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

"How Does Express Really Work Anyway" for details.



Relational Cubes vs. AW Cubes

- Relational cubes include
 - ☐ Star schema
 - ☐ OLAP catalog metadata
 - ☐ Summary data in materialized views
- Analytic workspace cube include
 - ☐ Analytic workspace built to the database standard form specification
 - ☐ OLAP catalog metadata in AW



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)**



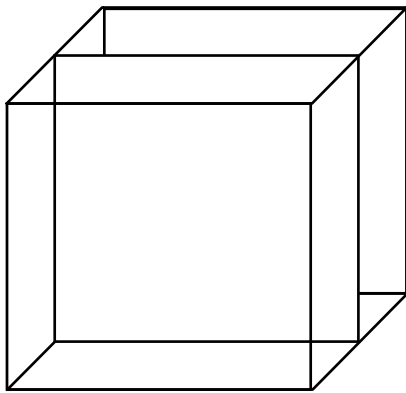
What Are AW Cubes?

- **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**

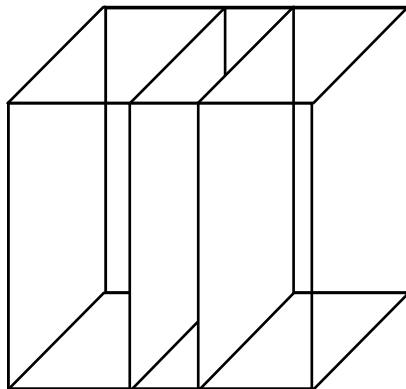


OLAP AW Stores Data in Cubes

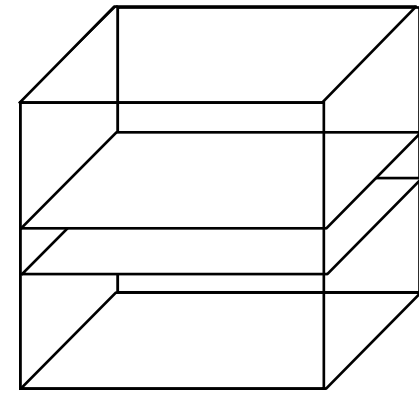
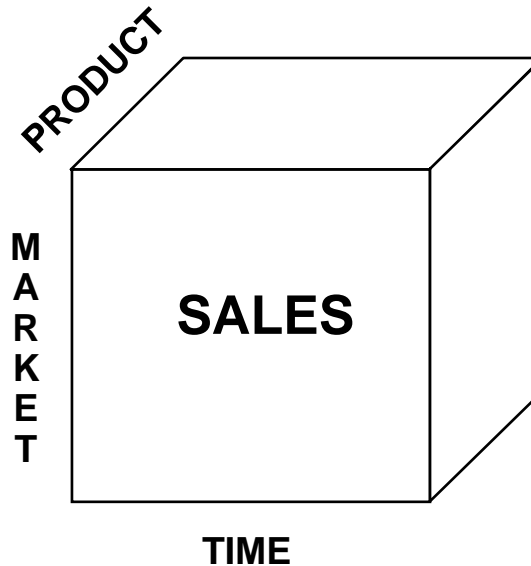
Fast Flexible Access to Summarized Data



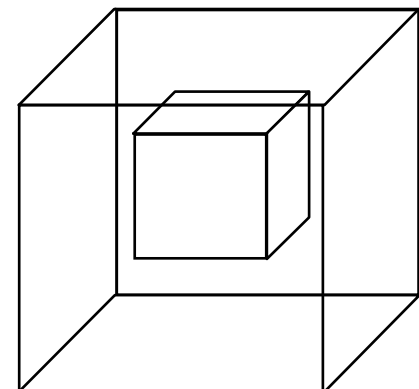
Product Mgr. View



Financial Mgr. View

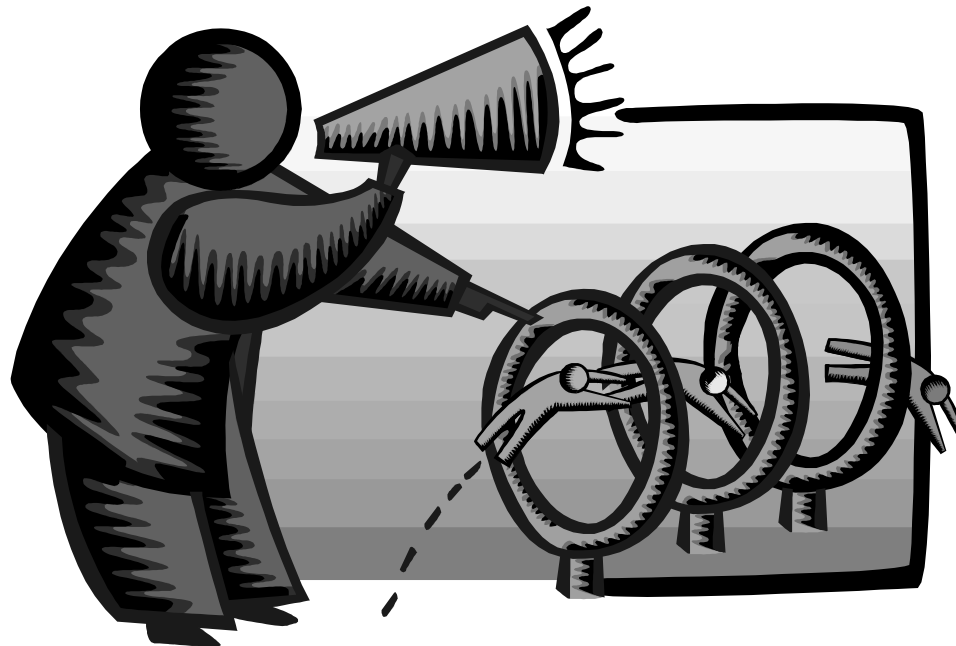


Regional Mgr. View



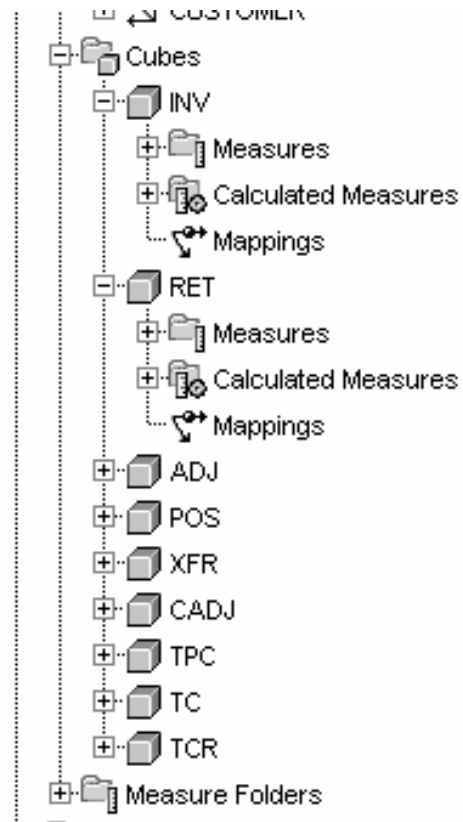
Ad Hoc View

Building Cubes in AWM





Cubes in AWM





Define Measures

Analytic Workspace Manager - cc-m2:1521:orcl10 - 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

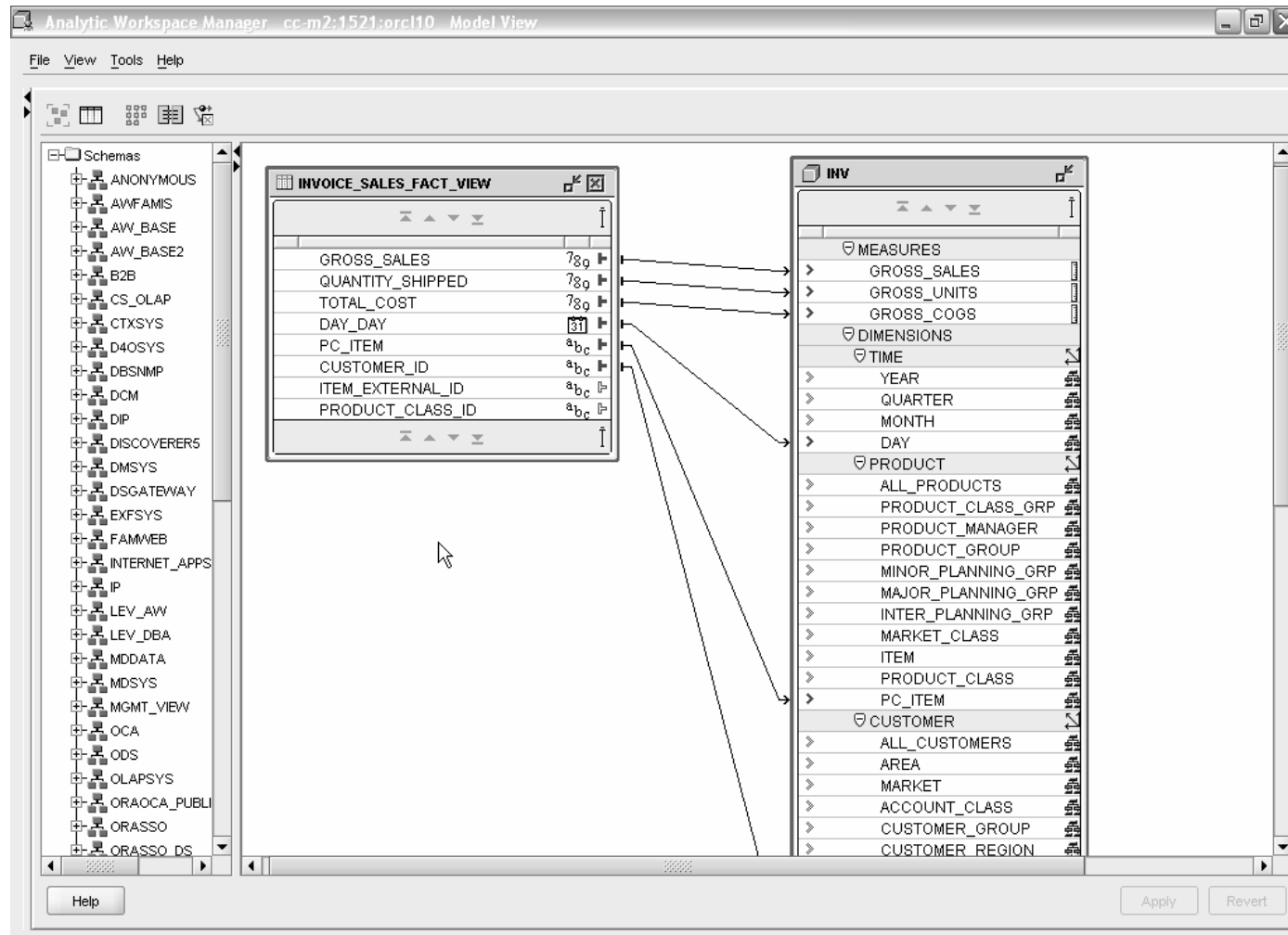
Name: GROSS_SALES
ID: INV.GROSS_SALES.MEASURE
Short Label: Gross Sales
Long Label: Gross Sales
Description: Gross Sales

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

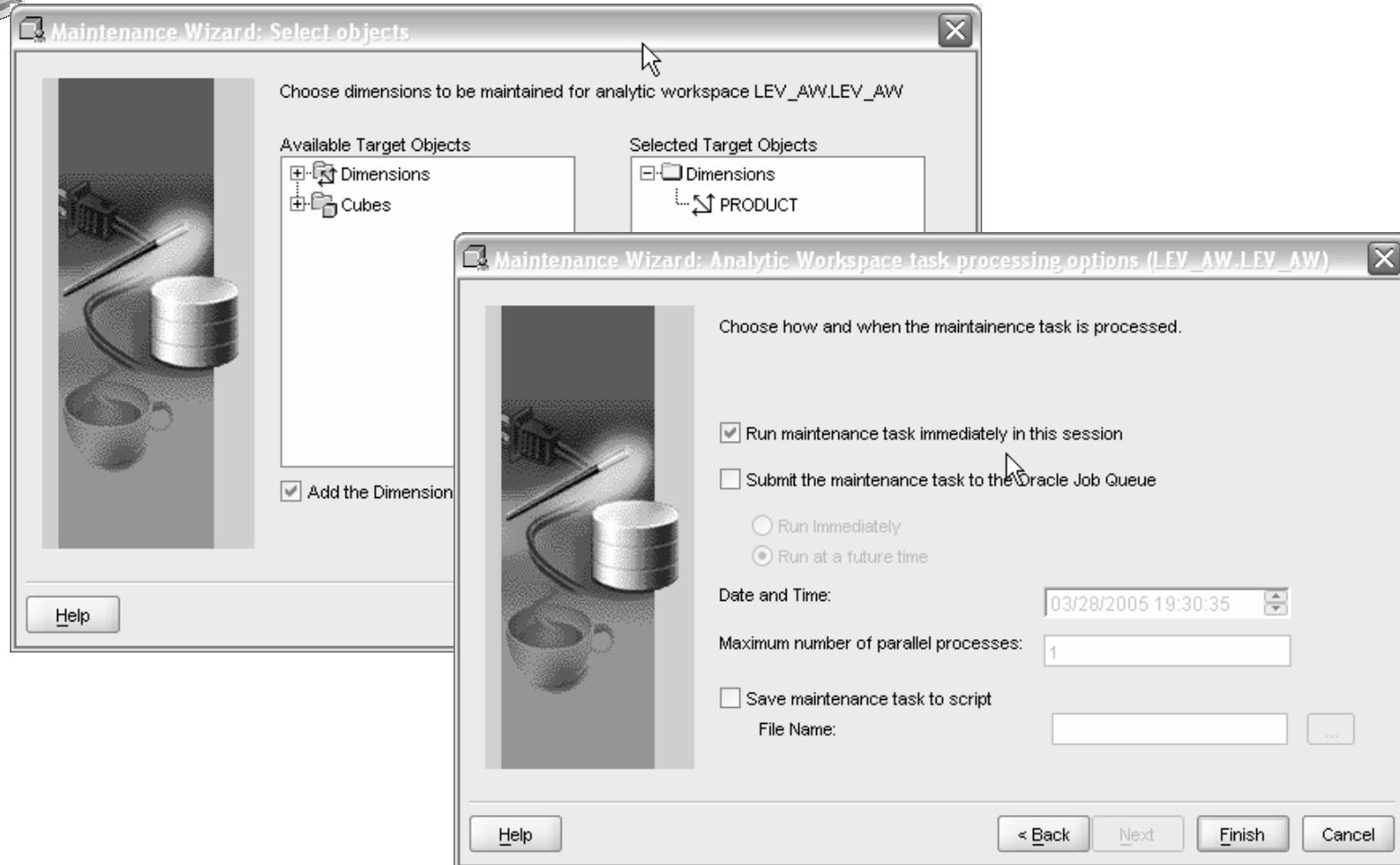
Help Apply Revert



Map Cube

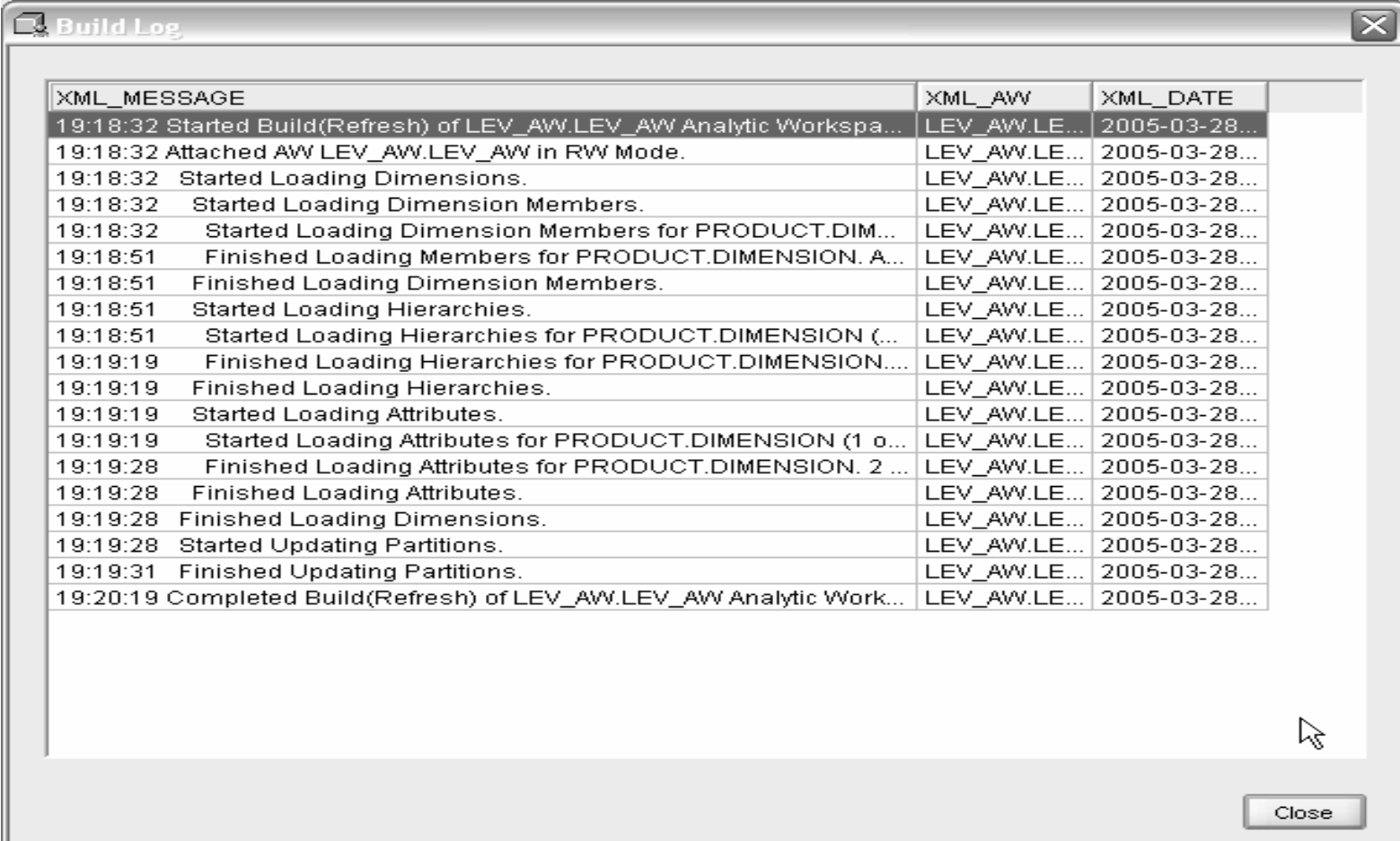


Maintaining Dims/Cubes





Maintaining Dims/Cubes



The image shows a 'Build Log' window with a table of build events. The table has three columns: XML_MESSAGE, XML_AW, and XML_DATE. The events include starting and finishing loading dimensions, dimension members, hierarchies, and attributes for a product dimension, as well as updating partitions and completing the build.

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...



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!**

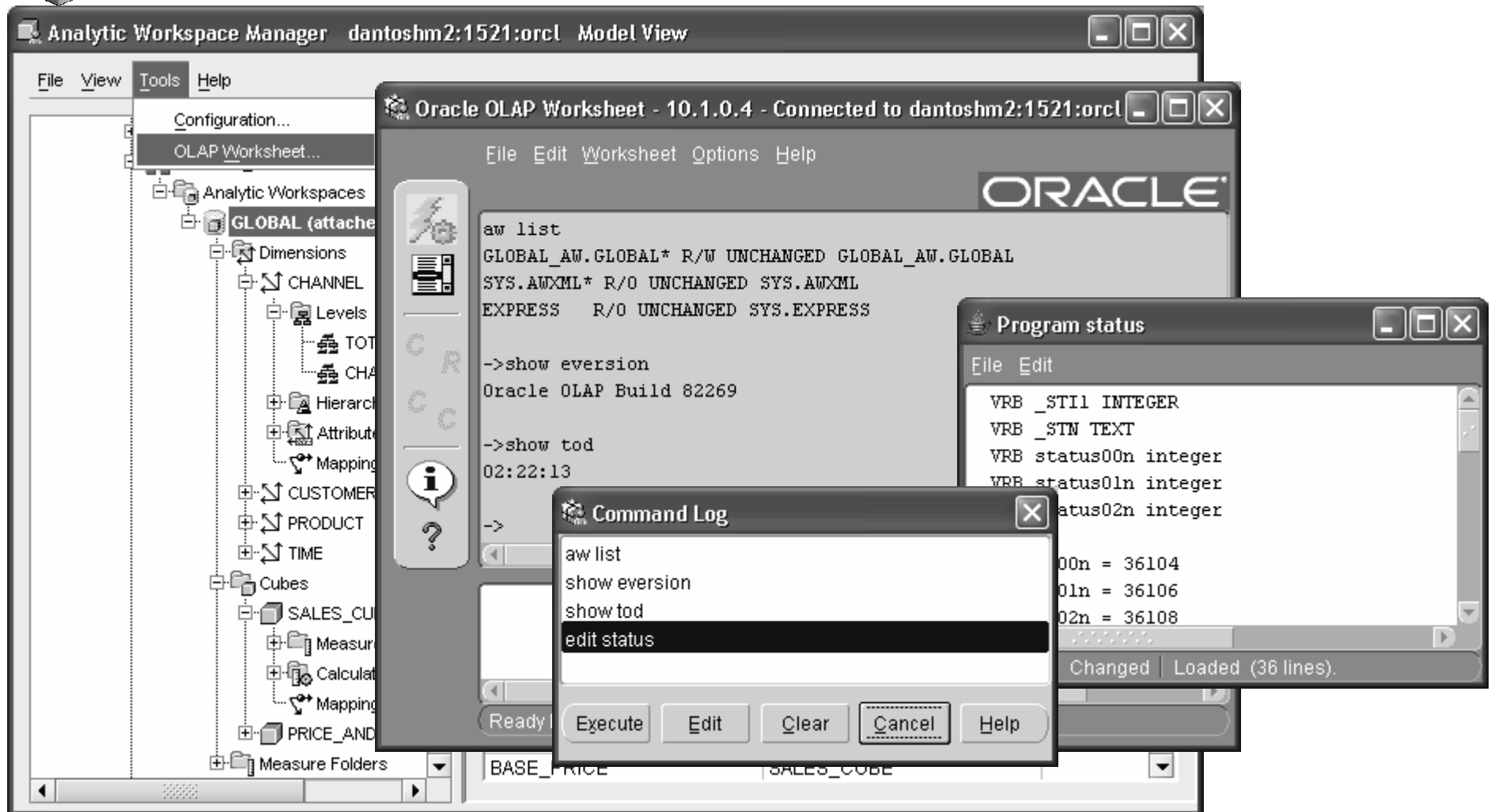
AW Creation in AWM10g



- **If create an AW in the Object view:**
 - ☐ AW is NOT in standard form
 - ☐ AW won't be seen in the Model view

- **If create an AW in the Model view:**
 - ☐ Can define the AW using logical elements (dimensions, levels, hierarchies, cubes, measures, mappings)
 - ☐ AW can also be seen in the Object view which shows the physical implementation of standard form

OLAP Worksheet (like SQL Worksheet) Launched from AWM





Oracle BI – Getting the Data In

- **Storing / calculating with the data**
 - ☐ Oracle RDBMS
 - ☐ Oracle OLAP (an option to the RDBMS)
- **Getting the data in / managing**
 - ☐ Oracle Warehouse Builder
 - ☐ Oracle Enterprise Manager
 - ☐ Analytic Workspace Manager



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**
- **3rd Party tools fill in gaps**



What Are BI Beans?

- **BI Beans 9.0.2 first released in May 2002**
- **Part of Oracle10g Developer Suite and Oracle BI**
- **Integrated extension for Oracle9i/10g JDeveloper**
- **Set of Java Beans (API) and integrated BI Wizards (JDev)**
- **Integrated tightly with Oracle9i/10g Database**
- **Exploits the Analytics of the 9i/10g Database**
 - ☐ **SQL Analytics**
 - ☐ **OLAP Analytics**



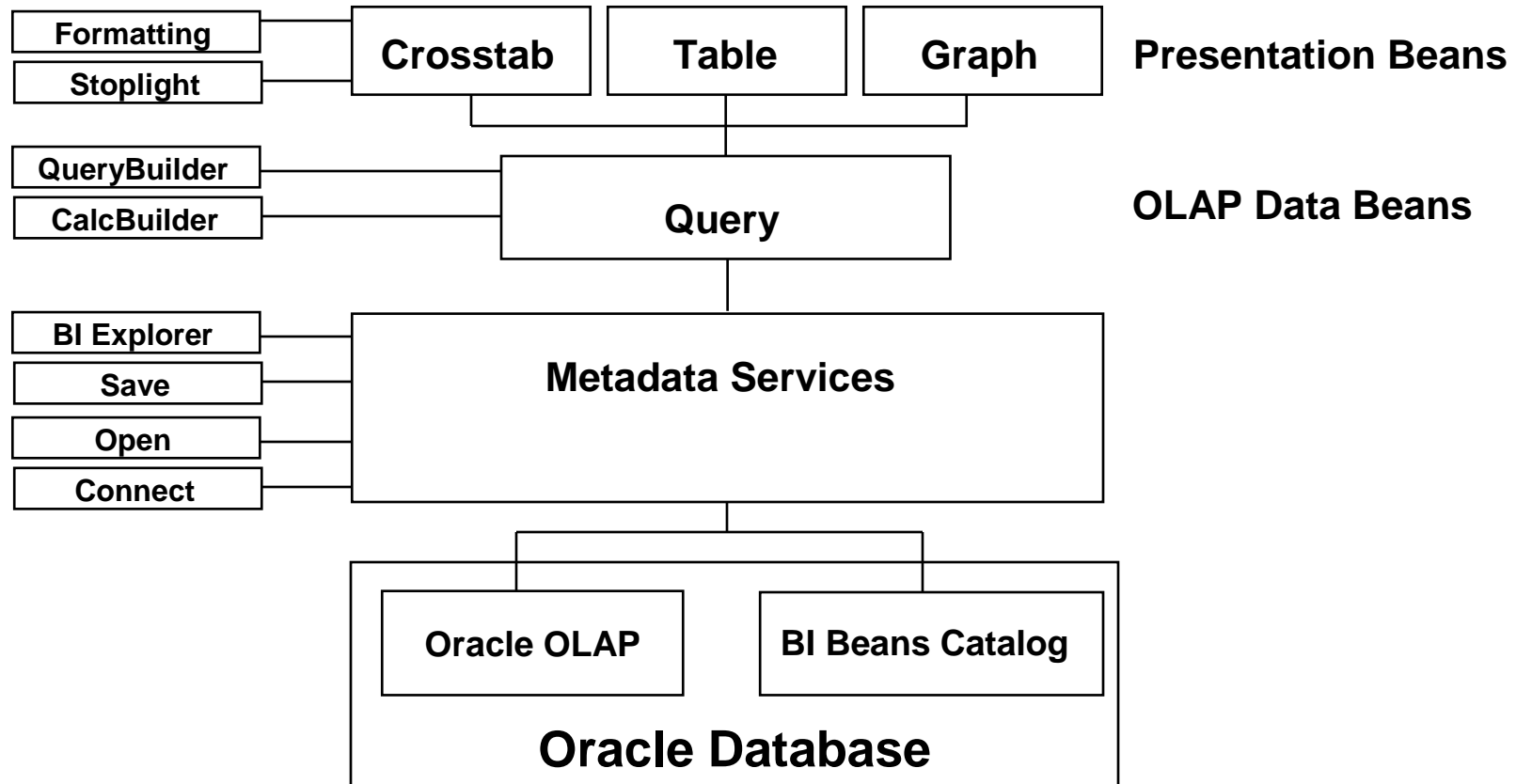
BI Beans Key Features

- **Leverage Integrated Oracle technology stack**
 - ☐ Development
 - ☐ Administration
- **High Developer Productivity**
 - ☐ JDeveloper Wizards - object and 100% Java code generation
 - ☐ Live data access at design time
- **Analytic Power**
 - ☐ Simplified access to the power of Oracle
 - Multidimensional Engine
 - Relational Data Warehouse Schema
- **Collaboration Support**
 - ☐ Share analyses across user community
 - ☐ Secure

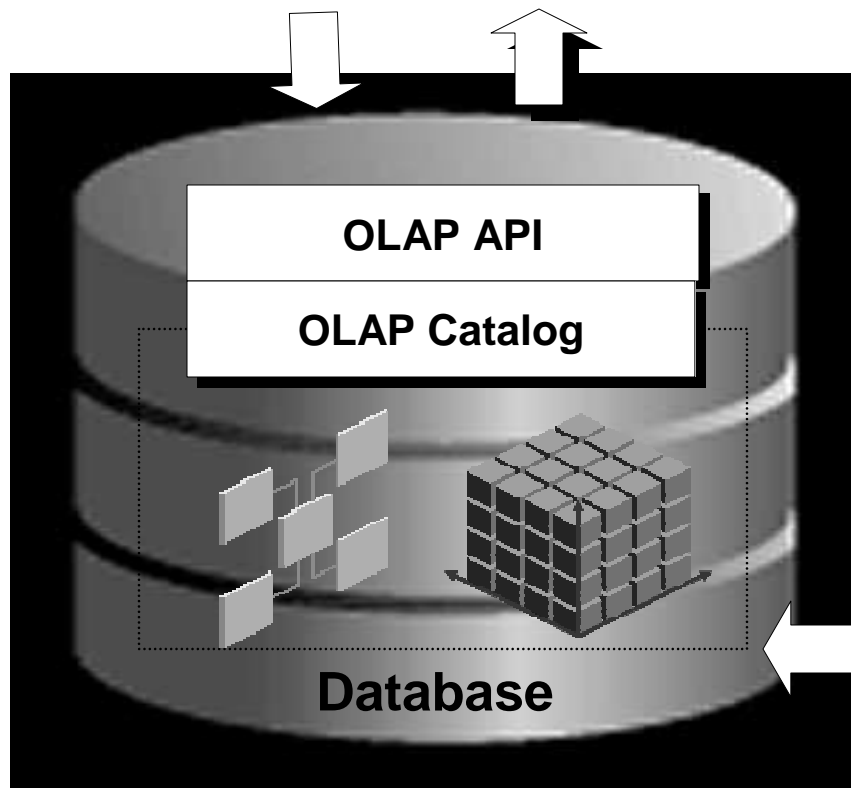
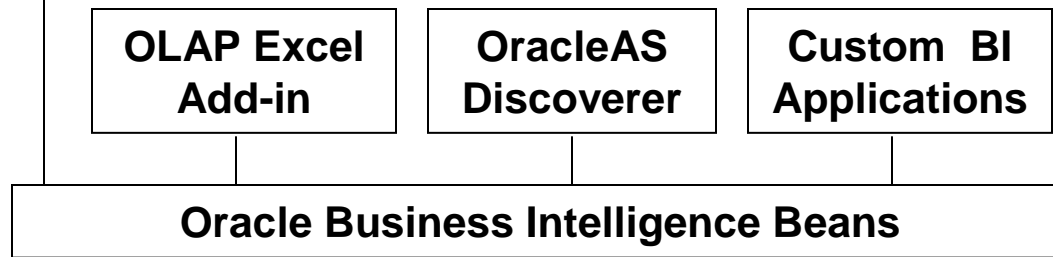


BI Beans Components

High level components reflect business usage



Ad-hoc Access OLAP via Discoverer



OracleAS Discoverer

- An intuitive ad-hoc query, reporting, analysis, and Web-publishing tool
- Enables advanced analyses on both operational and OLAP data sources

Warehouse Builder

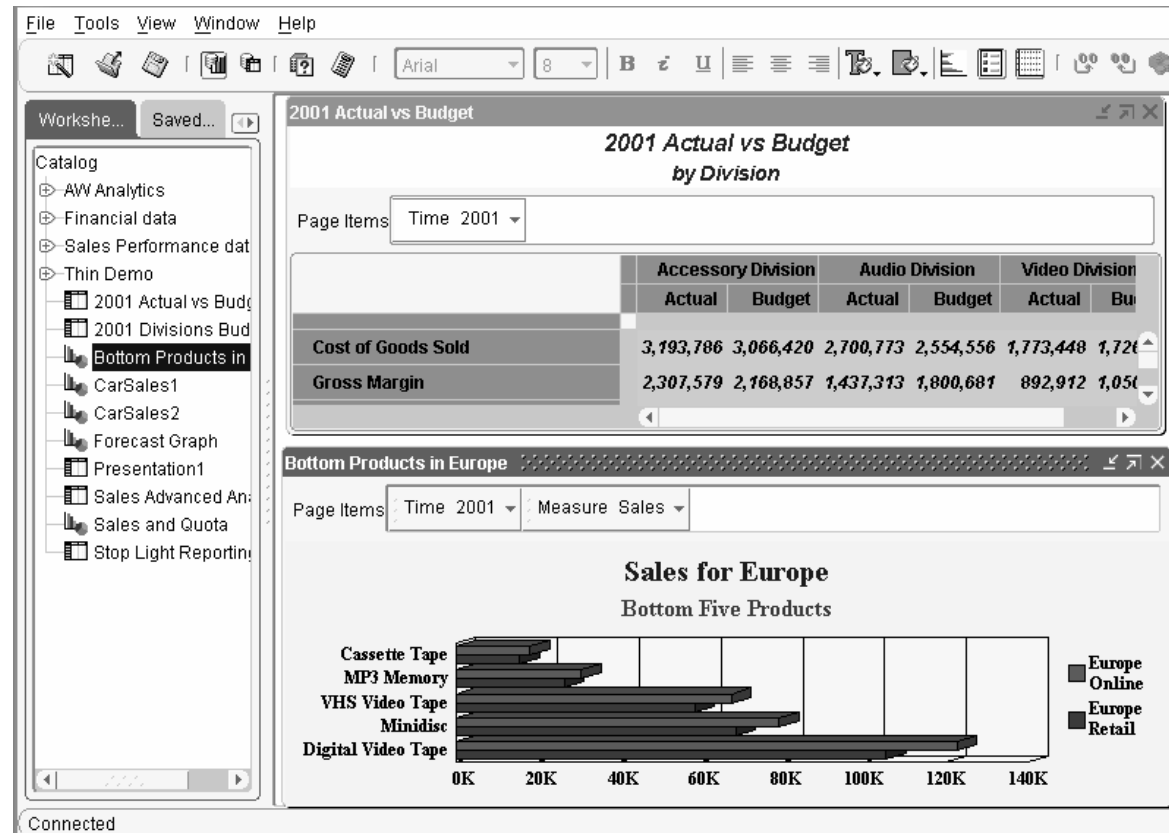
Enterprise Manager

AW Manager

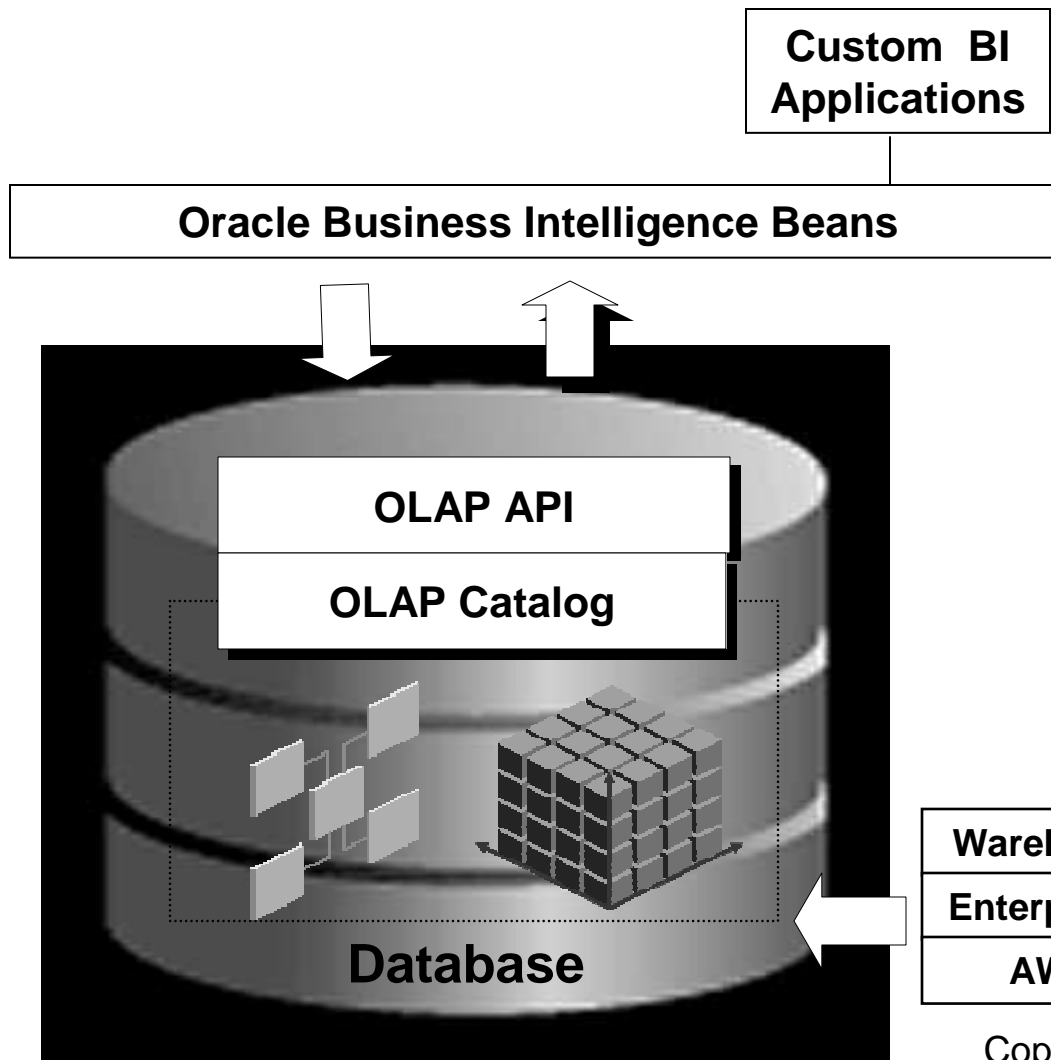


Discoverer 10g – Discoverer OLAP

- Currently AWM creates EUL for SQL Access
- Disco 10g adds Direct Access to OLAP



Custom Development via BI Beans



Custom BI Applications

- BI Beans integrated with JDeveloper provides a powerful environment for rapidly developing powerful business intelligence applications
- Targeted applications enable companies to deliver valuable insights to a wide range of end users: executives, analysts, information consumers

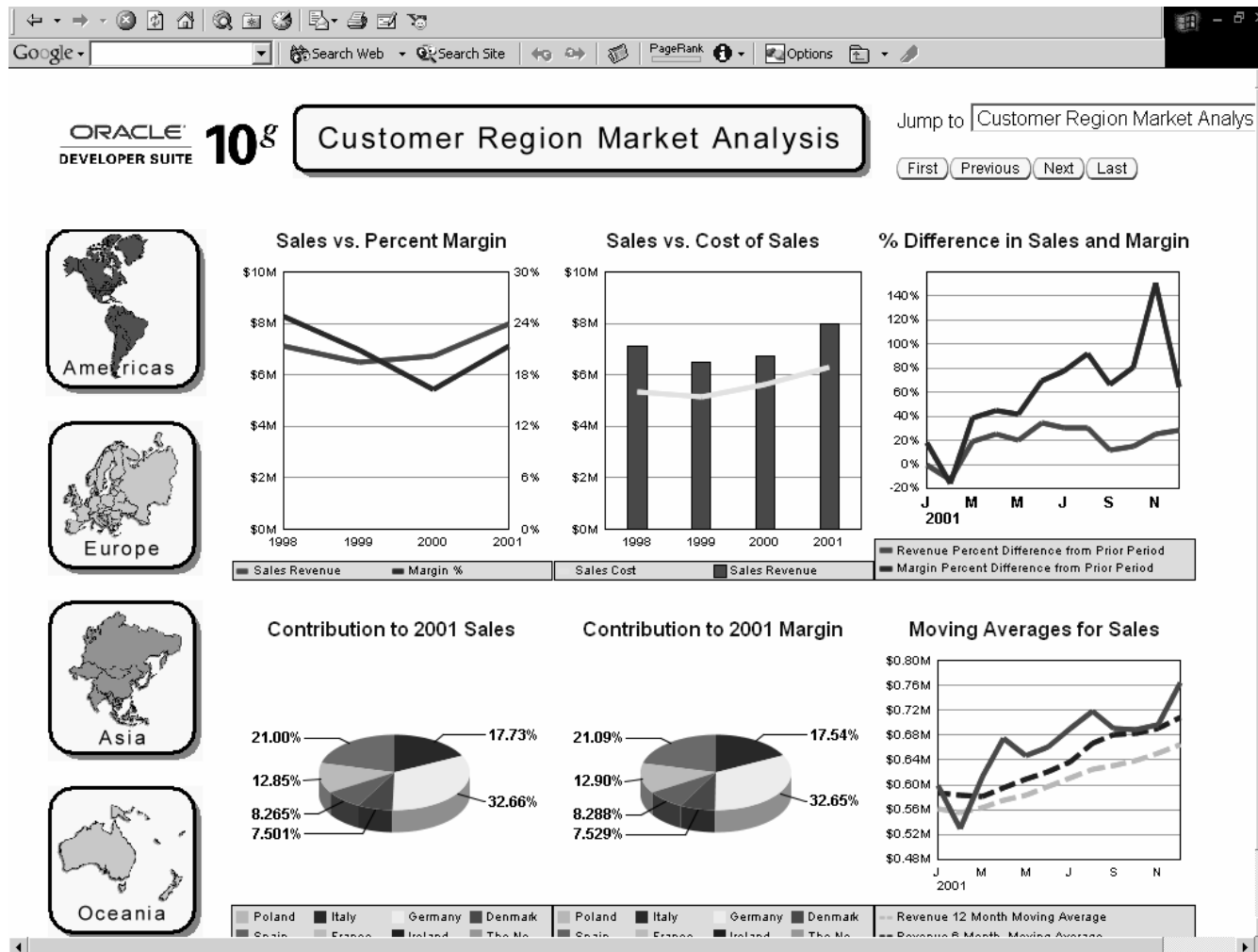
Warehouse Builder

Enterprise Manager

AW Manager



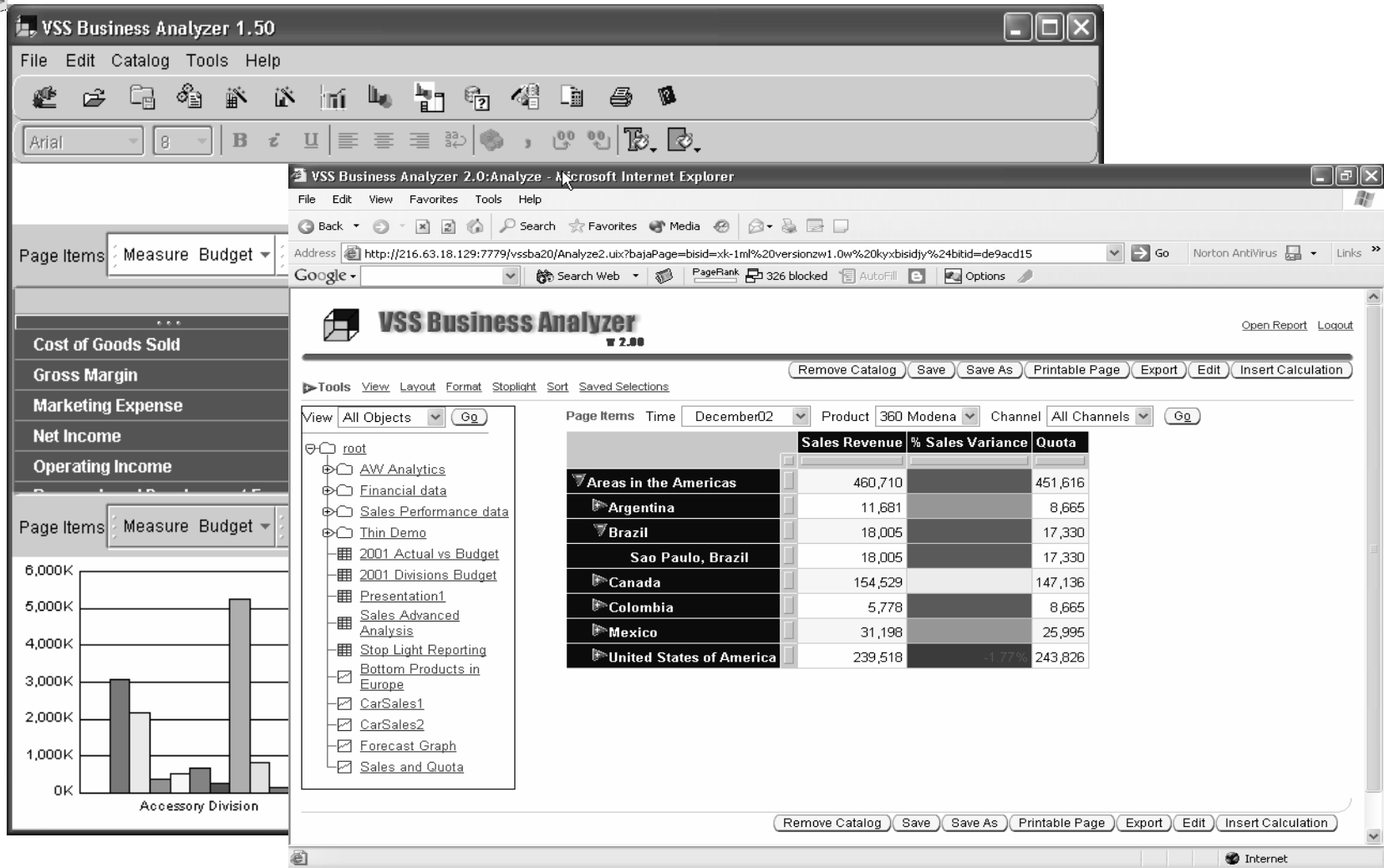
Custom BI Application



BI Beans Applications



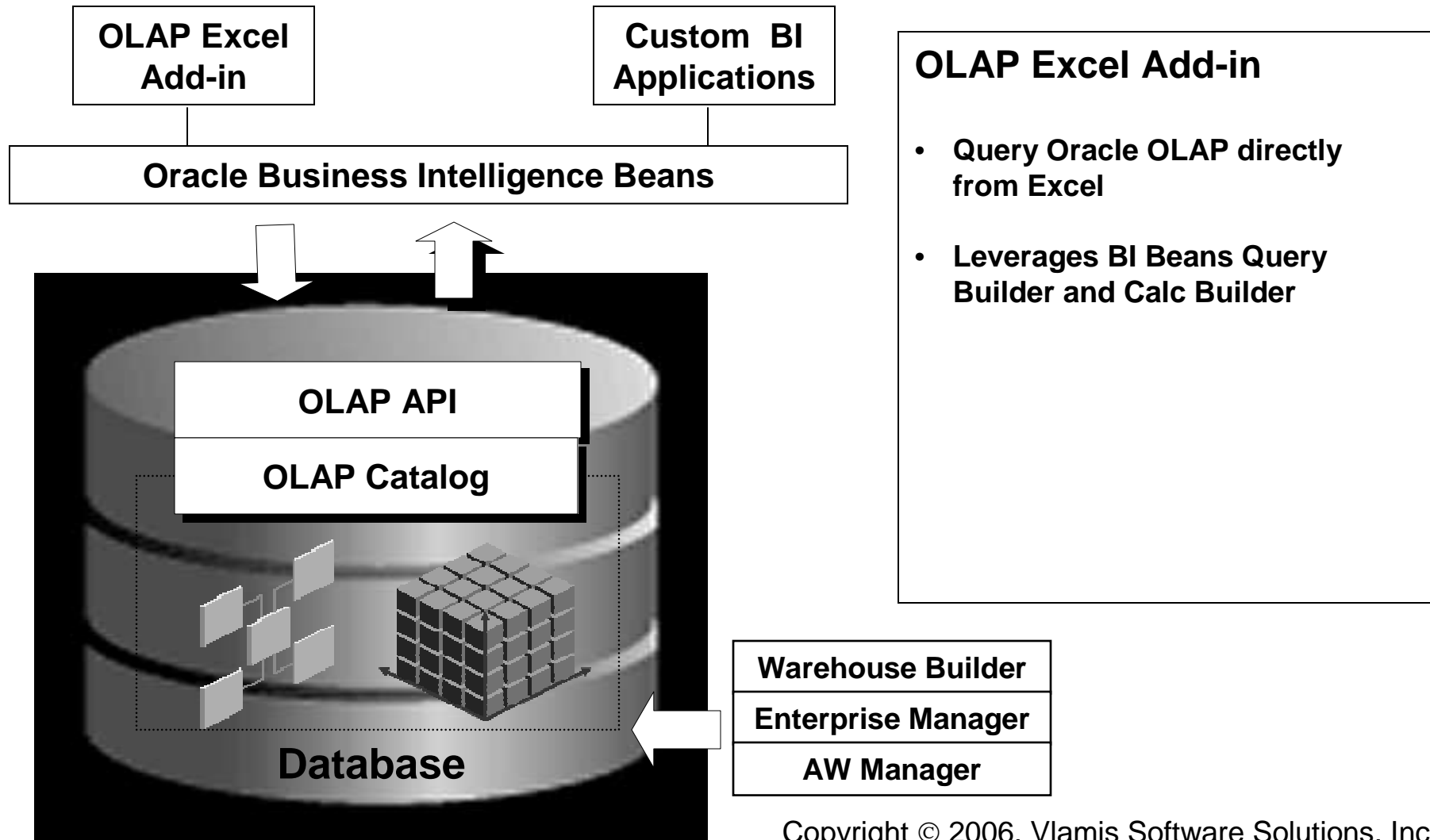
Thick Client



Thin Client

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Access to All OLAP Data from Excel





Spreadsheet Add-In

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window OracleOLAP Help

Worldwide All Channels

	Sales	Quota	Quota Var %
2000	2000	2000	2000
CD Player	16,558,146	16,154,468	2.50%
Amplifier	14		
VHS Camcorders	13		
Receiver	13		
Digital Camcorders	12		
	70		

Oracle OLAP Query Wizard

Items Layout Dimensions

Choose Product From: Standard hierarchy

Available:

- Exception
- Top/Bottom
 - Top 10 based on Sales
 - Bottom 5.0% based on Quota
 - Making up top 3.0% of Quota
- Hierarchy
- Time/Ordinal
- Match

Selected:

Steps Members

1. Start with Equipment/Parts: Top 5 based on Sales

Sort Save

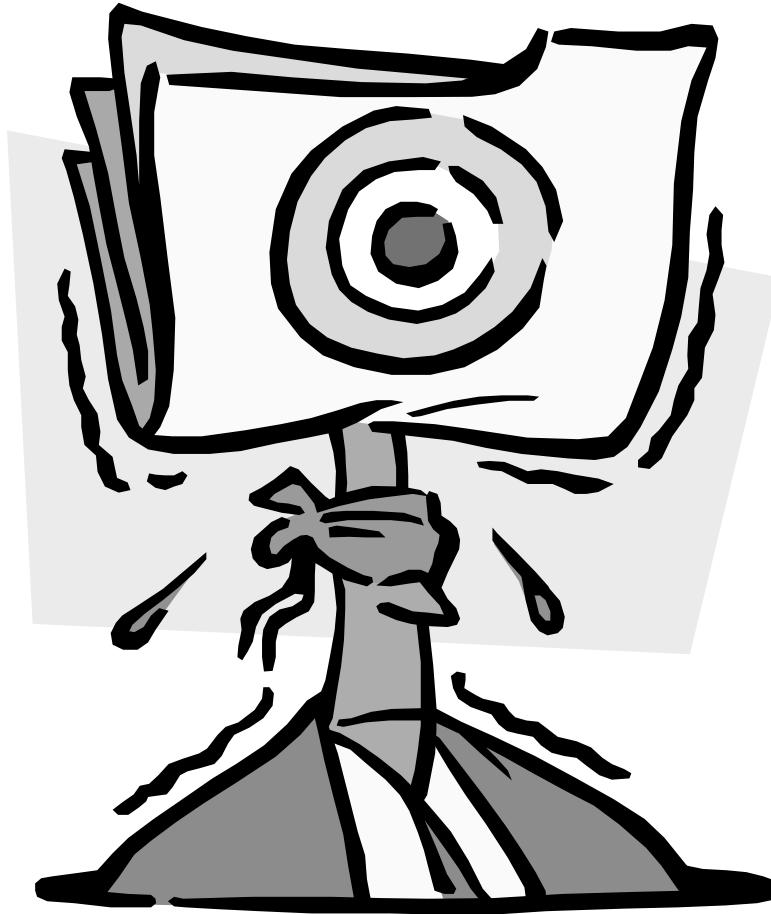
Help OK Cancel

Sheet1 Sheet2 Sheet3

Ready

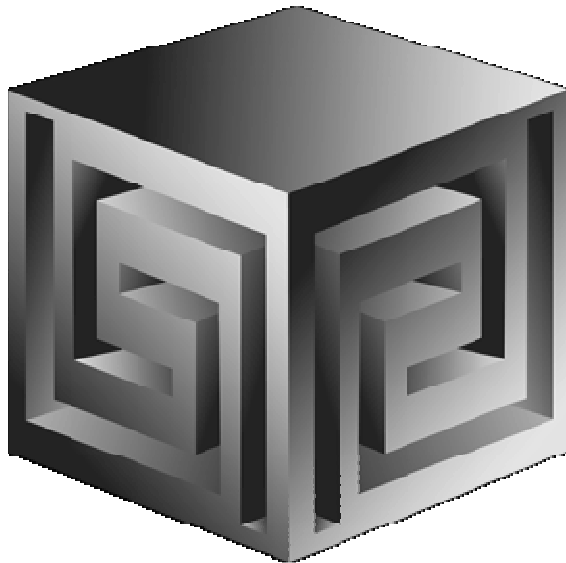
NUM

QUESTIONS?



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