Fast Complex BI Analysis with Oracle OLAP

Oracle OpenWorld 2011

Dan Vlamis

Vlamis Software Solutions

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Vlamis Software Solutions, Inc.

- Founded in 1992 in Kansas City, Missouri
- Oracle Partner and reseller since 1995
- Developed more than 200 Oracle BI systems
- Specializes in ORACLE-based:
  - Data Warehousing
  - Business Intelligence
  - Data Transformation (ETL)
  - Web development and portals
- Delivers
  - Design and integrated BI and DW solutions
  - Training and mentoring
- Exclusive supplier world-wide for Windows-based
-           Oracle BIC2G BI & EPM VMs
- Expert presenter at major Oracle conferences
- www.vlamis.com (blog, papers, newsletters, services)

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Dan Vlamis Background

- Connected with Oracle product management and developers
- Oracle ACE
- President of Vlamis Software Solutions, Inc. since 1992
- Speak at national software conferences
- Co-author of book "Oracle Essbase & Oracle OLAP"
- Track chair for 2011 Collaborate conference
- BA Computer Science Brown University
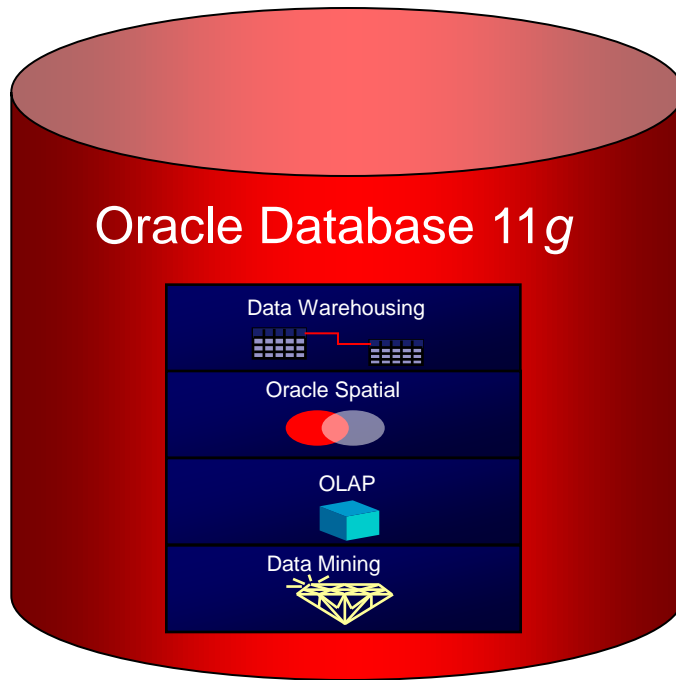
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Why OLAP for BI?

- BI often presents data dimensionally
- Dimensions are natural way to look at data
  - By, across, over, time, geography, product
  - Comparison of multiple dimension values
- Multi-dimensional storage of data speeds analysis
- Natural to express dimensional comparisons
  - Share of parent
  - Compared to last year
- Allows for hierarchical dimensions with multiple levels
  - E.g. by country, drill to state, drill to city

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Oracle OLAP
Leveraging Core Database Infrastructure

Oracle Database 11*g*

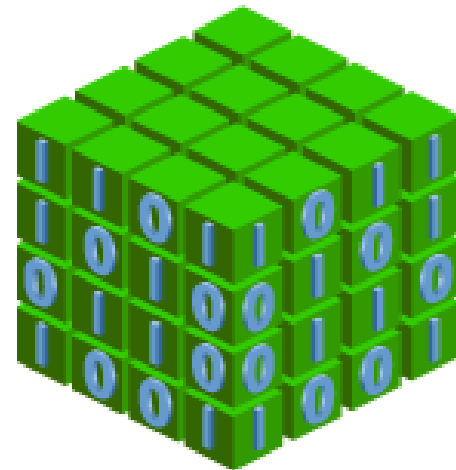Data Warehousing

Oracle Spatial

OLAP

Data Mining

- Single RDBMS-MDBMS process
- Single data storage
- Single security model
- Single administration facility
- Grid-enabled
- Accessible by any SQL-based tool
- Embedded BI metadata
- Connects to all related Oracle data

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Oracle OLAP

- A summary management solution for SQL based business intelligence applications
  - An alternative to table-based materialized views, offering improved query performance and fast, incremental update
- A full featured multidimensional OLAP server
  - Excellent query performance for ad-hoc / unpredictable query
  - Enhances the analytic content of Business intelligence application
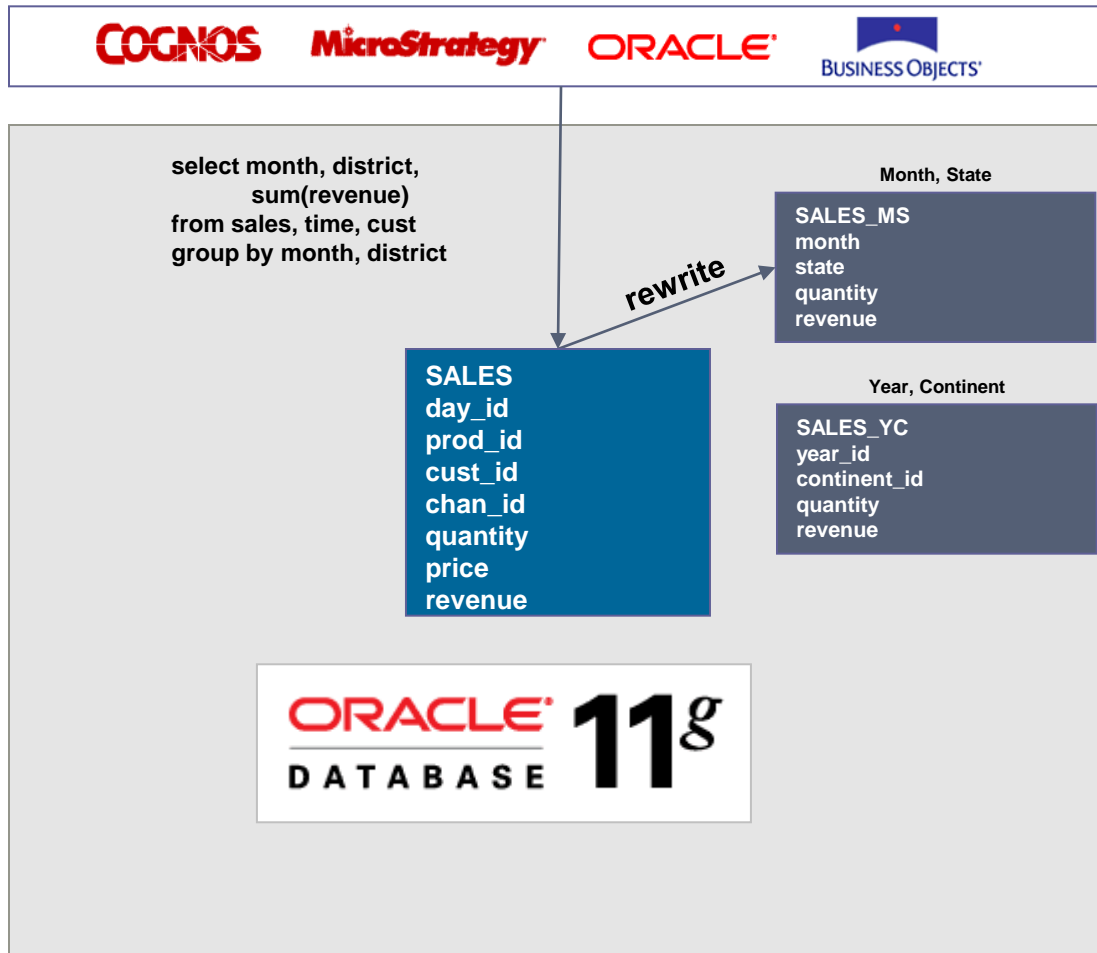 - Fast, incremental updates of data sets

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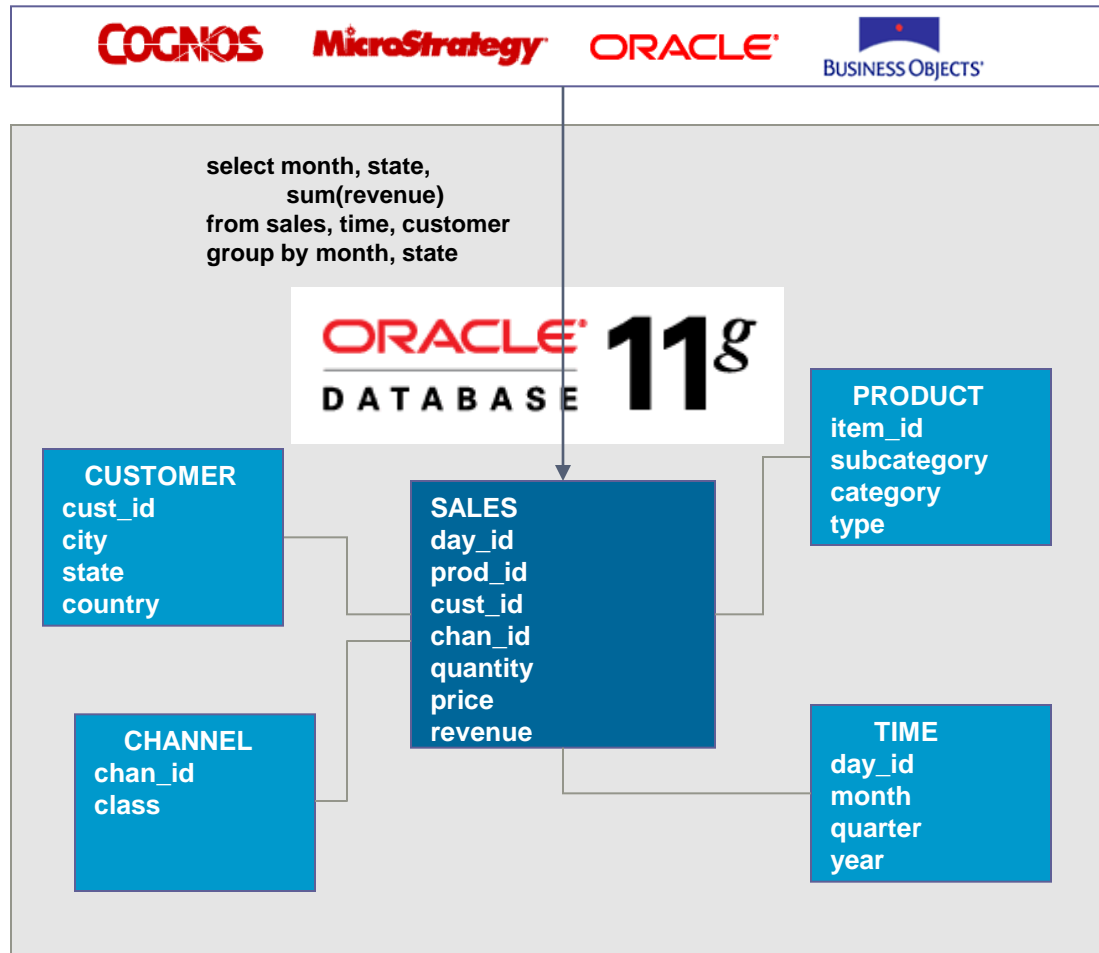
- Query tools access star schema stored in Oracle data warehouse
- Most queries at a summary level
- Summary queries against star schemas can be expensive to process

**select month, district,
sum(revenue)
from sales, time, cust
group by month, district**

rewrite

Month, State

**SALES_MS
month
state
quantity
revenue**

**SALES
day_id
prod_id
cust_id
chan_id
quantity
price
revenue**

Year, Continent

**SALES_YC
year_id
continent_id
quantity
revenue**

- Most DW/BI customers use Materialized Views (MV) today to improve summary query performance
- Define appropriate summaries based on query patterns
- Each summary is typically defined at a particular grain
  - Month, State
  - Qtr, State, Item
  - Month, Continent, Class
  - etc.
- The SQL Optimizer automatically rewrites queries to access MV's whenever possible
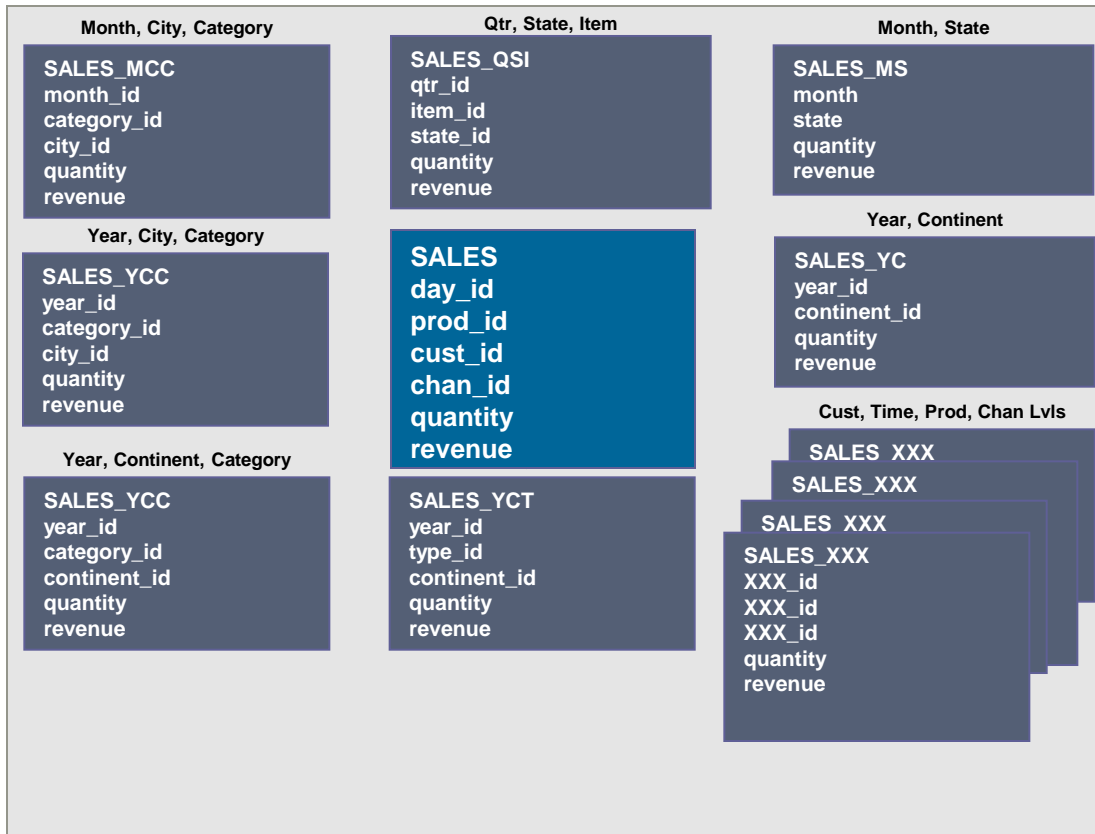
Materialized Views
Challenges in Ad Hoc Query Environments

COGNOS   **MicroStrategy**   **ORACLE**   **BUSINESS OBJECTS**

Month, City, Category

SALES_MCC
month_id
category_id
city_id
quantity
revenue

Year, City, Category

SALES_YCC
year_id
category_id
city_id
quantity
revenue

Year, Continent, Category

SALES_YCC
year_id
category_id
continent_id
quantity
revenue

Qtr, State, Item

SALES_QSI
qtr_id
item_id
state_id
quantity
revenue

SALES
day_id
prod_id
cust_id
chan_id
quantity
revenue

SALES_YCT
year_id
type_id
continent_id
quantity
revenue

Month, State

SALES_MS
month
state
quantity
revenue

Year, Continent

SALES_YC
year_id
continent_id
quantity
revenue

Cust, Time, Prod, Chan Lvls

SALES XXX
SALES_XXX
SALES XXX
SALES_XXX
XXX_id
XXX_id
XXX_id
quantity
revenue

- Creating MVs to support ad hoc query patterns is challenging
- Users expect excellent query response time across any summary
- Potentially many MVs to manage
- Practical limitations on size and manageability constrain the number of materialized views

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Cube-based Materialized Views
Much Better Manageability & Performance
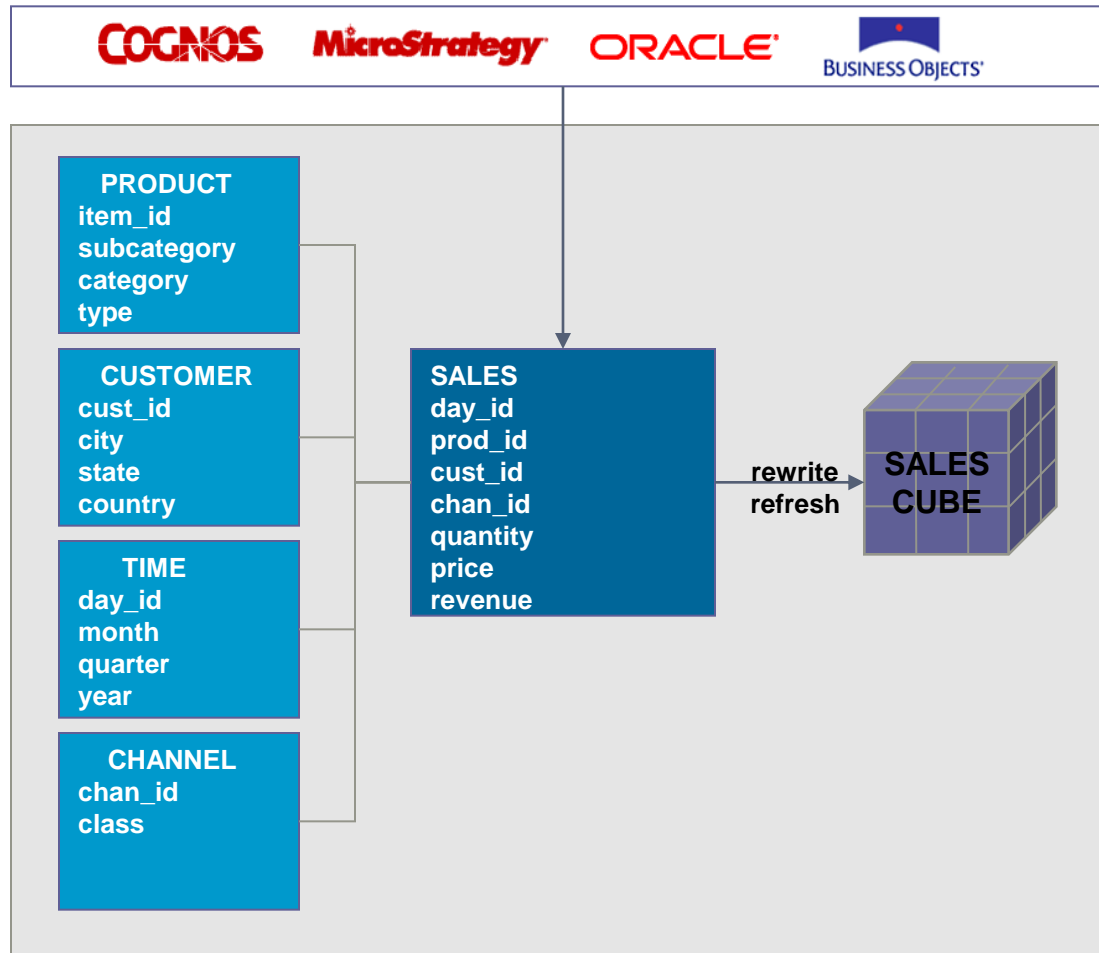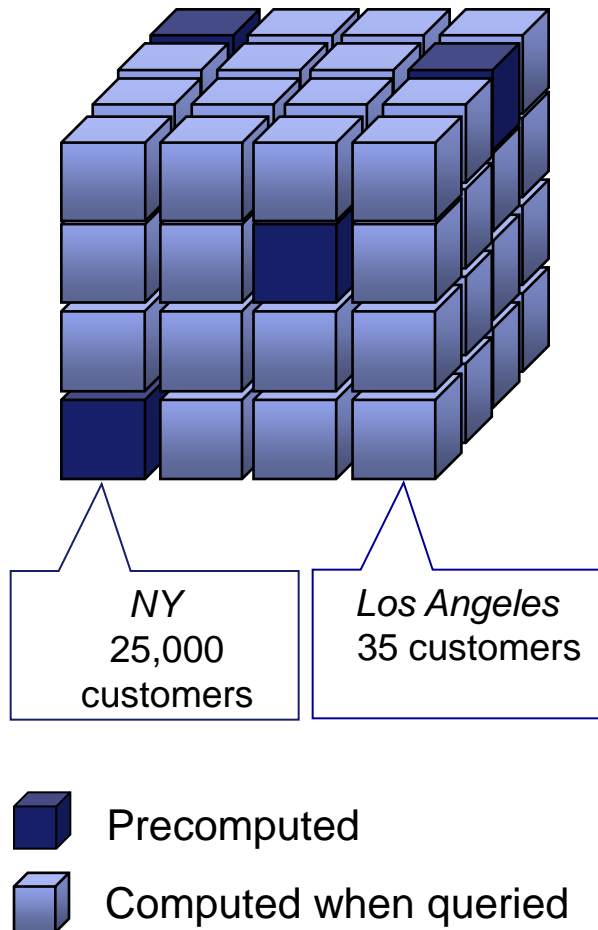

- A single cube provides the equivalent *of thousands of summary combinations*

- The 11g SQL Query Optimizer treats OLAP cubes as MV's and rewrites queries to access cubes *transparently*

- Cube refreshed using standard MV procedures

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Cost Based Aggregation
Pinpoint Summary Management

NY
25,000
customers

Los Angeles
35 customers

■ Precomputed

□ Computed when queried

- Improves aggregation speed and storage consumption by pre-computing cells that are most expensive to calculate

- Easy to administer

- Simplifies SQL queries by presenting data as fully calculated

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Easy Analytics
Fast Access to Information Rich Results

- Time-series calculations
- Calculated Members
- Financial Models
- Forecasting
  - Basic
  - Expert system
- Allocations
- Regressions
- Custom functions
- …and many more

Snapshot of some functions

deprdecl	aggregate	abs	rank	chgdims
deprdeclsw	allocate	antilog	rem	instat
deprsl	categorize	antilog10	remainder	limit function
deprsoyd	correlation	arccos	round	statall
fintsched	fcopen	arcsin	sign	statdepth
fpmtsched	fcquery	arctan	sin	statequal
growrate	info	arctan2	sinh	statfirst
irr	normal	bin_to_num	smooth	statlast
npv	random	bitand	sort	statlen
vintsched	stddev	ceil	sqrt	statlist
vpmtsched	any	cos	tan	statmax
cumsum	average	cosh	tanh	statmin
lag	count	decode	truncate	statrank
lagabspct	every	exp	width_bucket	statval
lagdif	largest	floor	begindate	coalesce
lagpct	median	greatest	dayof	na2
lead	mode	intpart	ddof	nafill
movingaverage	none	least	enddate	naflag
movingmax	percentage	log function	endof	nullif
movingmin	smallest	log10	isdate	nvl
movingtotal	forecast	max	makedate	nvl2
total	modulo	min	mmof	ascii

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How do Expenses compare this Quarter versus Last Quarter

What is an Item's Expense contribution to its Category?
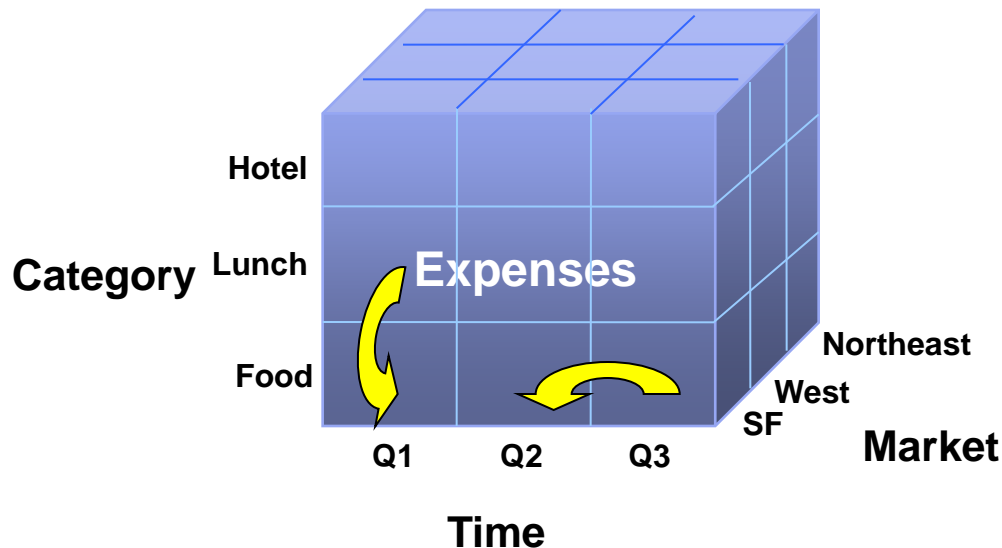
- Data stored in dense arrays
- Offset addressing – no joins
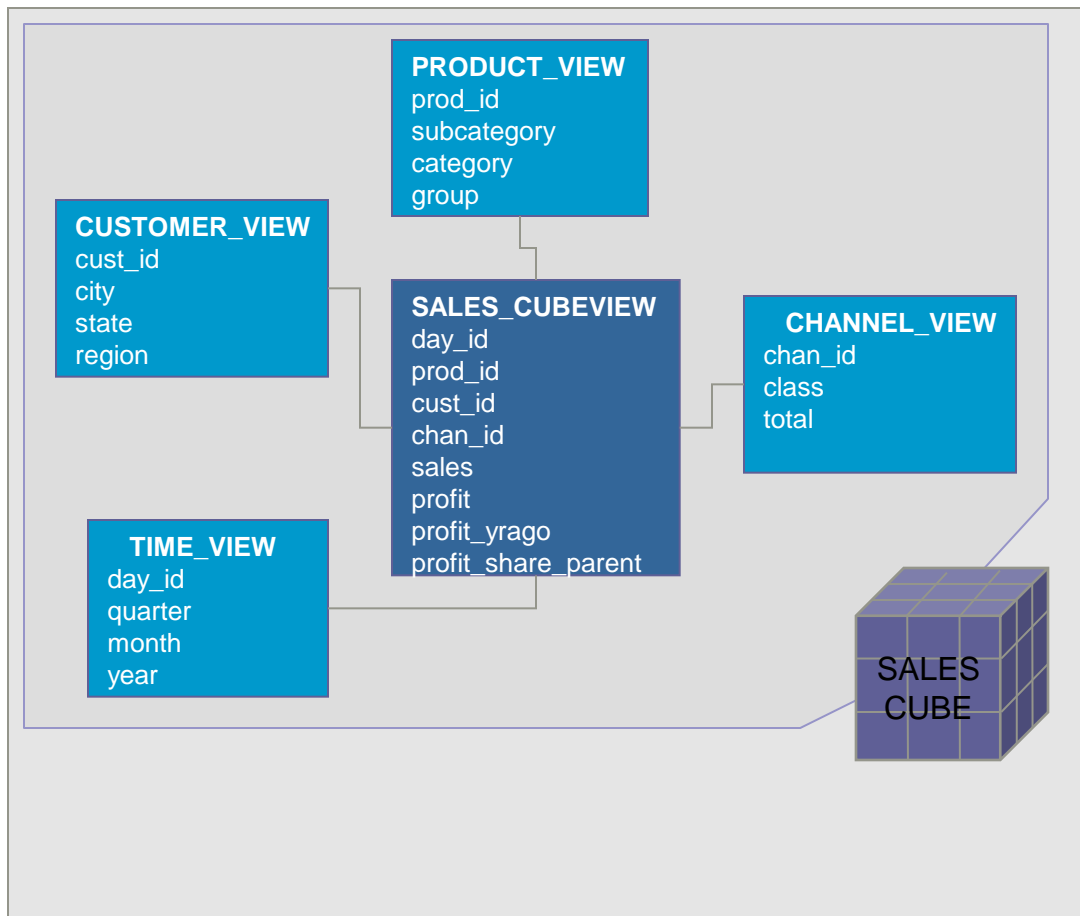- More powerful analysis
- Better performance

One Cube Accessed Many Ways…

- One cube can be used as
  - A summary management solution to SQL-based business intelligence applications as cube-organized materialized views
  - A analytically rich data source to SQL-based business intelligence applications as SQL cube-views
  - A full-featured multidimensional cube, servicing dimensionally oriented business intelligence applications

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Cube Represented as Star Model
Simplifies Access to Analytic Calculations

PRODUCT_VIEW
prod_id
subcategory
category
group

CUSTOMER_VIEW
cust_id
city
state
region

SALES_CUBEVIEW
day_id
prod_id
cust_id
chan_id
sales
profit
profit_yrago
profit_share_parent

CHANNEL_VIEW
chan_id
class
total

TIME_VIEW
day_id
quarter
month
year

SALES CUBE

- Cube represented as a star schema
- Single cube view presents data as completely calculated
  - Analytic calculations presented as columns
  - Includes all summaries
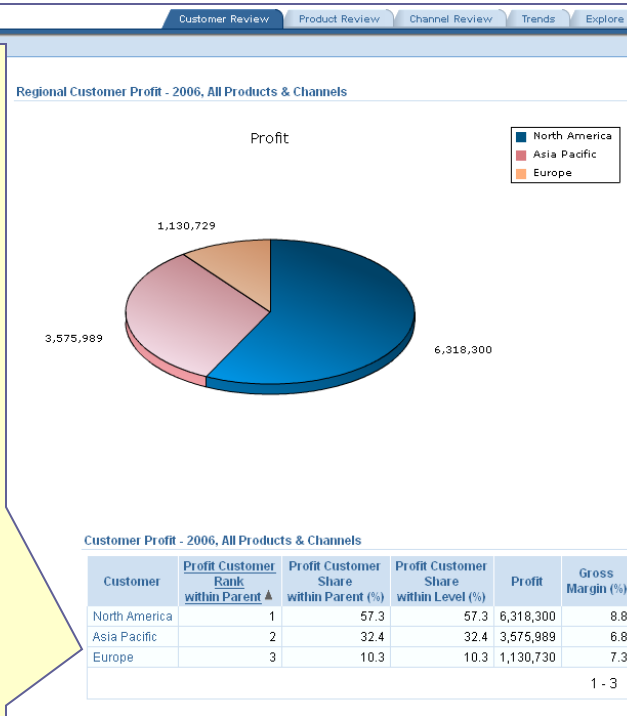- Automatically managed by OLAP

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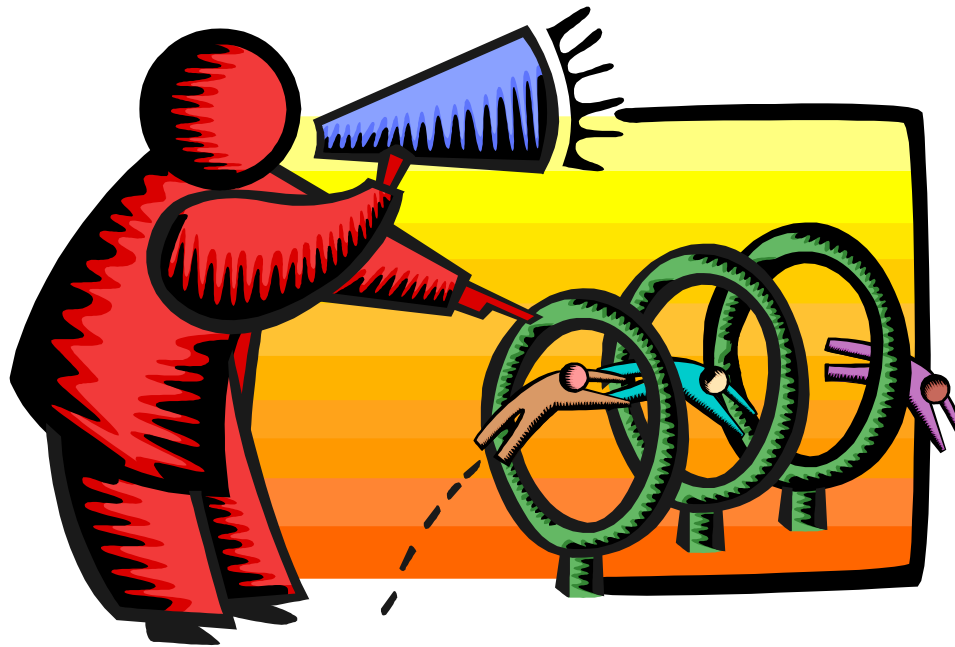
Application Express on Oracle OLAP

```
SELECT cu.long_description customer,
  f.profit_rank_cust_sh_parent,
  f.profit_share_cust_sh_parent,
  f.profit_rank_cust_sh_level,
  f.profit,
  f.gross_margin
FROM time_calendar_view t,
      product_primary_view p,
      customer_shipments_view cu,
      channel_primary_view ch,
      units_cube_view f
WHERE t.level_name = 'CALENDAR_YEAR'
   AND t.calendar_year = 'CY2006'
   AND p.dim_key = 'TOTAL'
   AND cu.parent = 'TOTAL'
   AND ch.dim_key = 'TOTAL'
   AND t.dim_key = f.TIME
   AND p.dim_key = f.product
   AND cu.dim_key = f.customer
   AND ch.dim_key = f.channel;
```
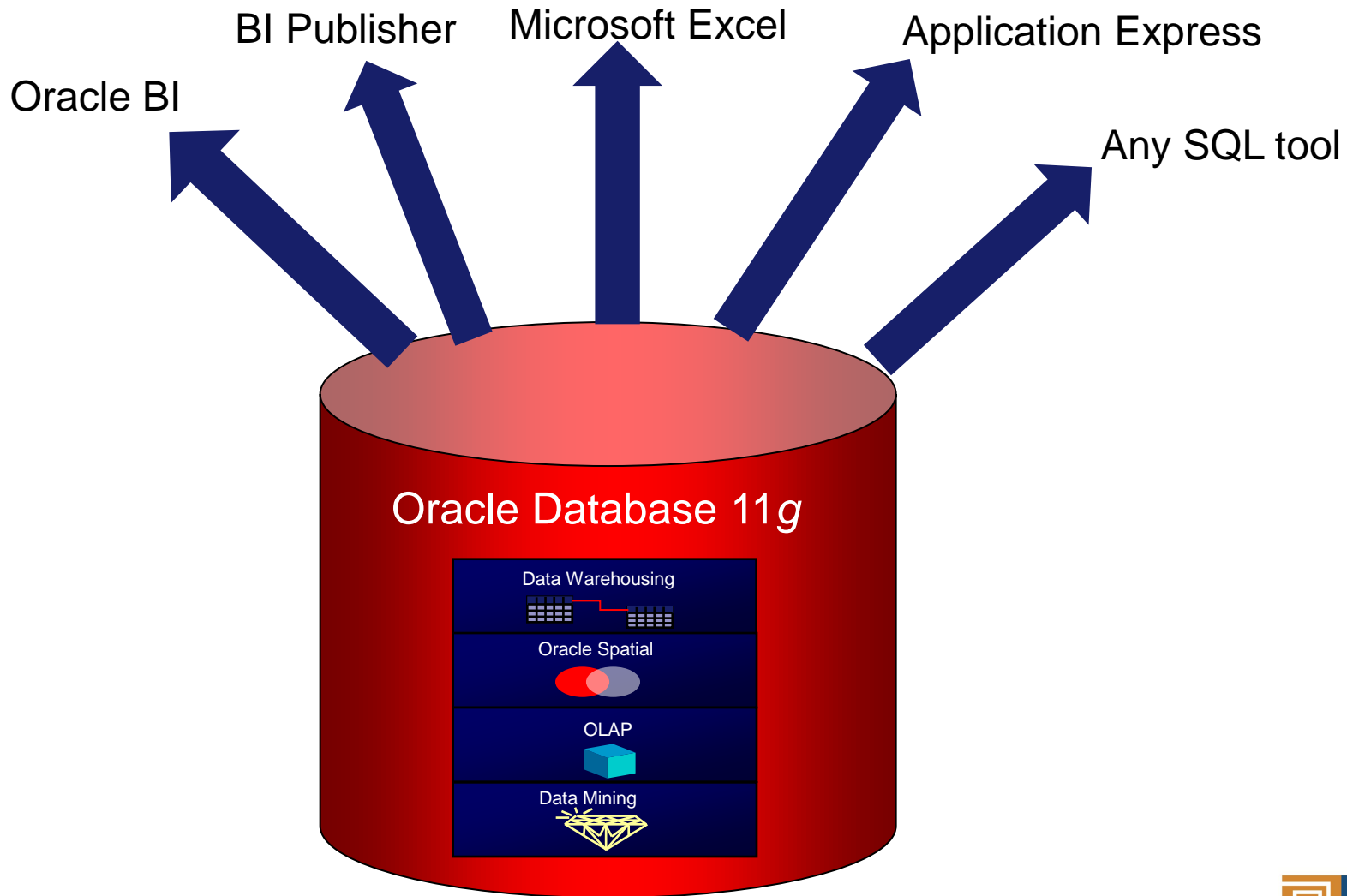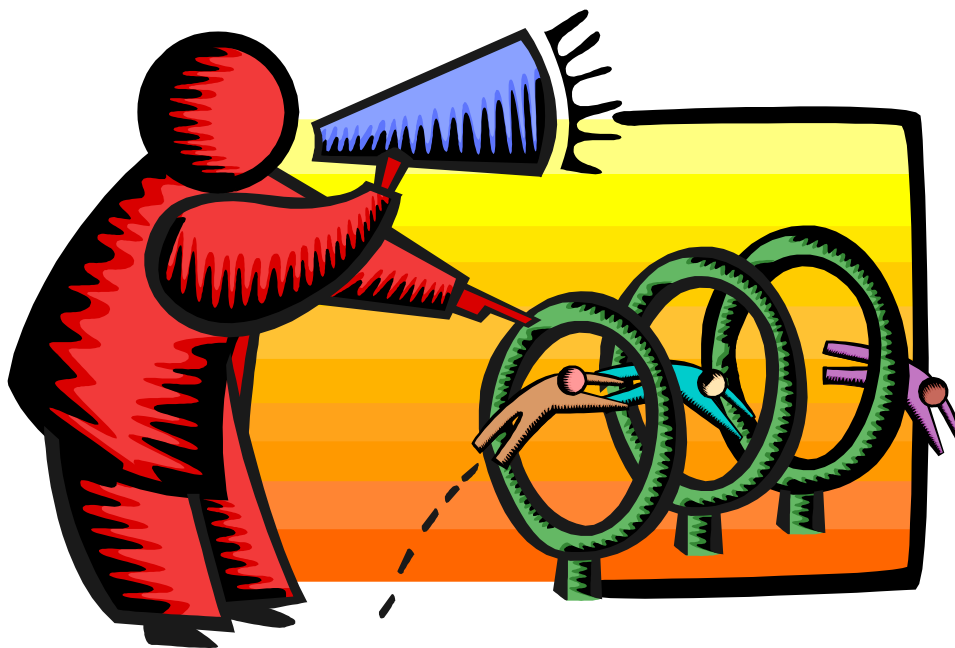
Customer Review | Product Review | Channel Review | Trends | Explore

Regional Customer Profit - 2006, All Products & Channels

Profit

- North America
- Asia Pacific
- Europe

1,130,729
3,575,989
6,318,300

Customer Profit - 2006, All Products & Channels

Customer	Profit Customer Rank within Parent ▲	Profit Customer Share within Parent (%)	Profit Customer Share within Level (%)	Profit	Gross Margin (%)
North America	1	57.3	57.3	6,318,300	8.8
Asia Pacific	2	32.4	32.4	3,575,989	6.8
Europe	3	10.3	10.3	1,130,730	7.3
					1 - 3

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Building Cubes in AWM

Same Data, Multiple Frontends

Oracle BI

BI Publisher

Microsoft Excel

Application Express

Any SQL tool

Oracle Database 11*g*

Data Warehousing

Oracle Spatial

OLAP

Data Mining

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Excel as Front End for Database

Top OLAP 11g New Features

- SQL Query
  - SQL cube scan
  - SQL cube join
  - CUBE_TABLE
  - Optimized looping
  - System maintained dimension and fact views
- SQL-like calculation expressions
- Cost-based aggregation
- Security
  - SQL Grant / Revoke
  - Permit with Extensible Data Security and AWM

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Top OLAP 11g New Features

- Cube and maintenance scripts
  - Declarative calculation rules
  - Based on logical model
- All metadata in the Oracle Data Dictionary
  - Dimensional Model
  - Calculation definitions
  - Security policies
  - Data source mappings
  - SQL representation of model

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Oracle OLAP 11g Summary

- Improve the delivery of information rich queries by SQL-based business intelligence tools and applications
  - Fast query performance
  - Simplified access to analytic calculations
  - Fast incremental update
  - Centrally managed by the Oracle Database

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OLAP as a Calculation Engine

- How are we doing?
- Facts have more meaning in context
- Context often requires inter-row calculations
- OLAP excels at inter-row calculations
- Ratios automatically scale and normalize data
- Examples:
  - Share of region
  - Share of parent
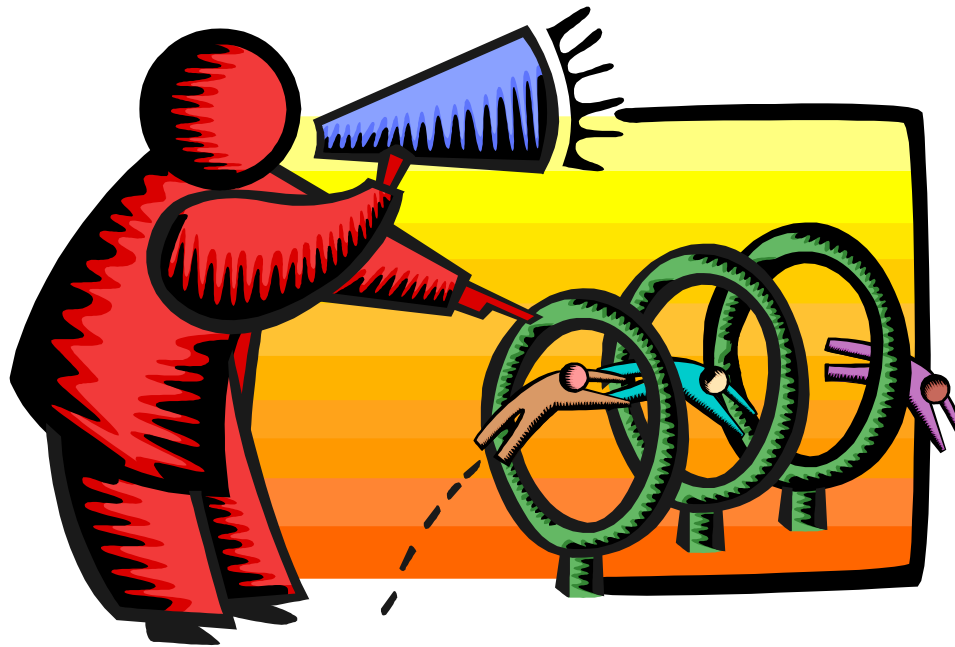 - Percent change from year ago
  - Index calculations

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Calculations in the Database

- Prototype in the report
- Move to middle tier to standardize and simplify and scale
- Move to database tier for performance
- Data volumes are expanding
- Analytic DB options do the calculations in the DB
    - OLAP
    - Data Mining
    - Spatial

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Oracle OLAP Learning Opportunities

Presenter	Company	Time	Title
Dan Vlamis	Vlamis	Sun 9:00	Fast Complex BI with Oracle OLAP
	Oracle Demo	Mosc South SL-054	Using Oracle OLAP for Advanced Analytics in BI and Data Warehousing
	Vlamis & Simba	Tues 5:00	Reception
Amyn Rajan	Simba	Wed 10:15	Using Excel and Oracle for Business Intelligence and Ad Hoc Reporting
Marty Gubar	Oracle	Thurs 9:00	Developing Cubes with Advanced Analytics in Oracle Database 11g
Bud Endress	Oracle	Thurs 1:30	How to Add Rich Analytics to Your Oracle Data Warehouse
Chris Claterbos	Vlamis	Thurs 3:00	Fast Complex BI with Oracle OLAP
Russ Tront	Simba	Thurs 3:00	Enabling Oracle OLAP for Enterprise Business Intelligence

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MARK YOUR CALENDARS!
BIWA Summit @
COLLABORATE 12
April 22-26, 2012
Mandalay Bay Convention Center
Las Vegas, Nevada

http://events.ioug.org/p/cm/ld/fid=15

QUESTIONS?

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