



**ORACLE®**

## **Fast Delivery of Intelligent BI Solutions**

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Oracle BI/DW Product Management

# Agenda

- The Requirement: Intelligent Ad hoc Data Exploration
- Overview: Embedded OLAP in Oracle Database 11g
- Calculation Capabilities Scale to Business Requirements
- Advanced Analytic Queries Using Simple SQL
- Ad hoc Analysis Using Excel and OBIEE

# The Requirement

## Example Report

Calculations include:

- Time-series
- Comparison to peers (i.e. share)
- Alerts (uncover issues at levels below current selection)
- Statistical Forecasts
- ... and multiple layers of nested calculations
- ... at any level of detail

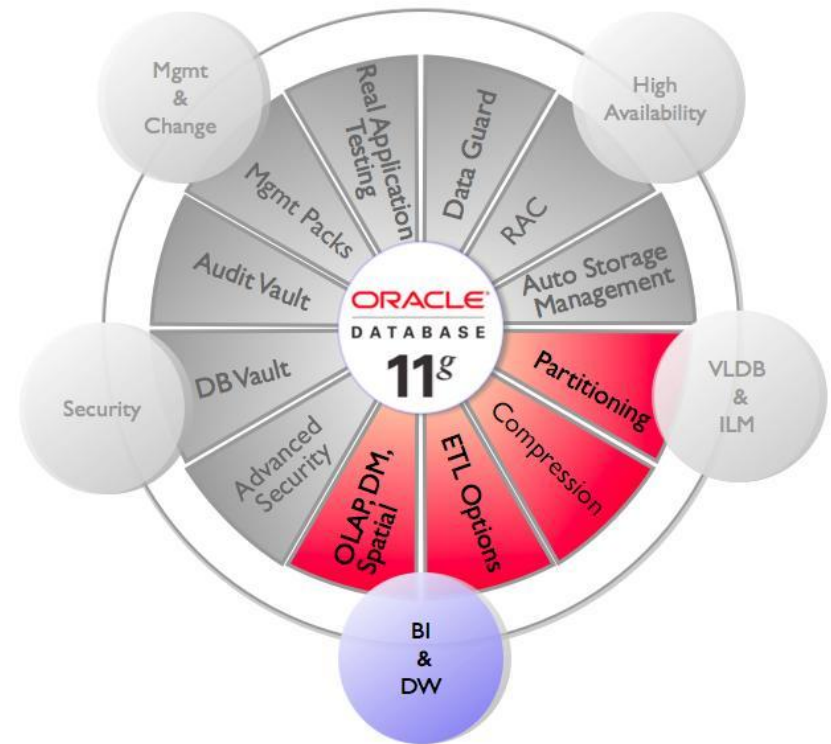
Sales Revenue Analysis

	Q1-CY2009	Q2-CY2009	Q3-CY2009	Q4-CY2009	Q1-CY2010	Q2-CY2010	Q3-CY2010	Q4-CY2010
<b>Computers *</b>								
Sales	33,777,199	28,581,026	30,982,913	34,565,477				
Sales % Chg PY	20.3	18.1	9.6	9.5				
Product Alert	✓	✗	✗	✗				
Sales YTD	33,777,199	62,358,225	93,341,138	127,906,615				
Sales YTD % Chg PY	20.3	19.3	15.9	14.1				
Sales YTD Share of Parent Product	81.5	81.0	80.5	80.3				
Sales YTD Share % Chg PY	2.5	1.1	(1.2)	(1.4)				
Cross Over Best Fit Fcst	33,777,199	28,581,026	30,982,913	34,565,477	36,313,991	31,450,588	34,078,273	37,120,510
<b>Cameras and Camcorders *</b>								
Sales	2,961,771	2,699,287	3,192,047	3,540,144				
Sales % Chg PY	1.1	14.1	29.6	25.8				
Product Alert	✗	✓	✓	✓				
Sales YTD	2,961,771	5,661,058	8,853,105	12,393,249				
Sales YTD % Chg PY	1.1	6.9	14.1	17.2				
Sales YTD Share of Parent Product	7.1	7.7	8.3	8.2				
Sales YTD Share % Chg PY	(13.9)	(2.3)	16.8	13.4				
Cross Over Best Fit Fcst	2,961,771	2,699,287	3,192,047	3,540,144	3,526,328	3,068,517	3,437,529	3,843,667
<b>Portable Music and Video *</b>								
Sales	4,692,772	3,990,017	4,313,055	4,923,392				
Sales % Chg PY	9.4	9.9	8.9	12.4				
Product Alert	✓	✓	✓	✓				
Sales YTD	4,692,772	8,682,789	12,995,844	17,919,236				
Sales YTD % Chg PY	9.4	9.6	9.4	10.2				
Sales YTD Share of Parent Product	11.3	11.3	11.2	11.4				
Sales YTD Share % Chg PY	(6.8)	(5.9)	(1.8)	1.2				
Cross Over Best Fit Fcst	4,692,772	3,990,017	4,313,055	4,923,392	5,083,426	4,369,709	4,714,648	5,236,437

# Oracle Database 11g

## The Optimal Information Platform

- Cohesive, integrated database platform
- Secure, highly available, scalable and manageable
- Rich analytic platform



# World's First Database Machine

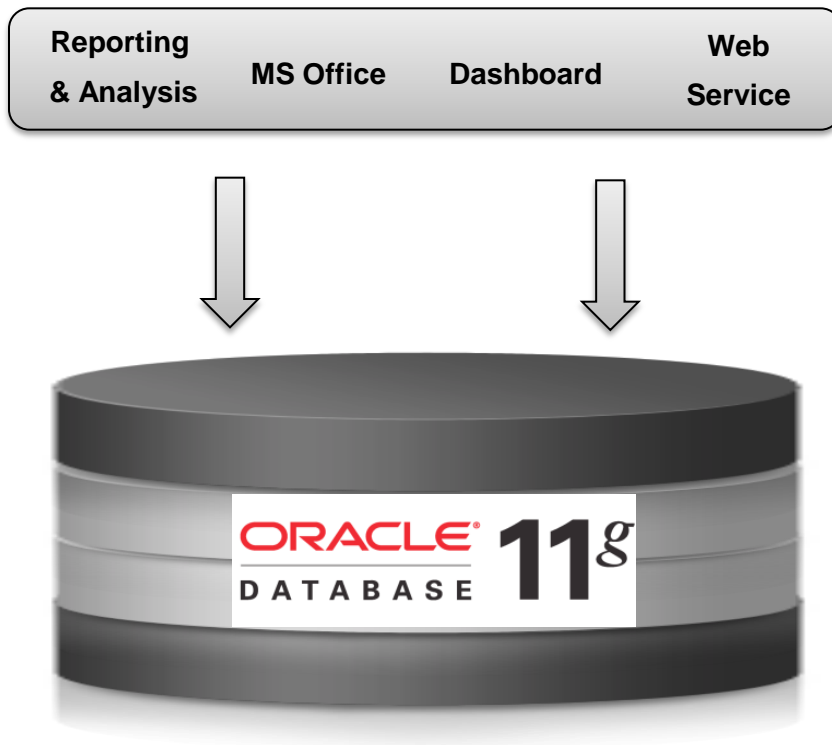
Using Sun FlashFire Technology



- Extreme performance for data warehousing
- Pre-installed and configured system out of the box
- Extends suite of Oracle Database 11g functionality

# Oracle Database 11g: Embedded OLAP

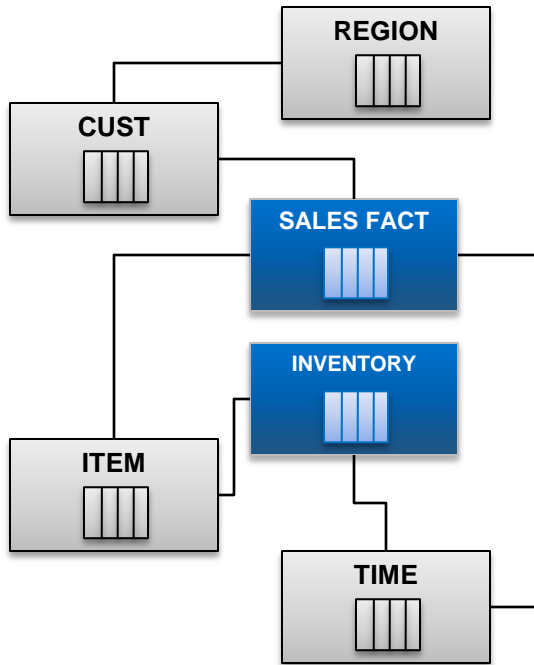
## Simplify Heterogeneous Query Environments



- **Business rules in Oracle Database**
  - Single definition shared by all client tools and applications
  - Available in Oracle data dictionary
- **Calculation complexity pushed into analytic engine in the database**
  - Calculations leverage dimensional metadata
  - Simplifies implementations
  - Delivers efficient computation

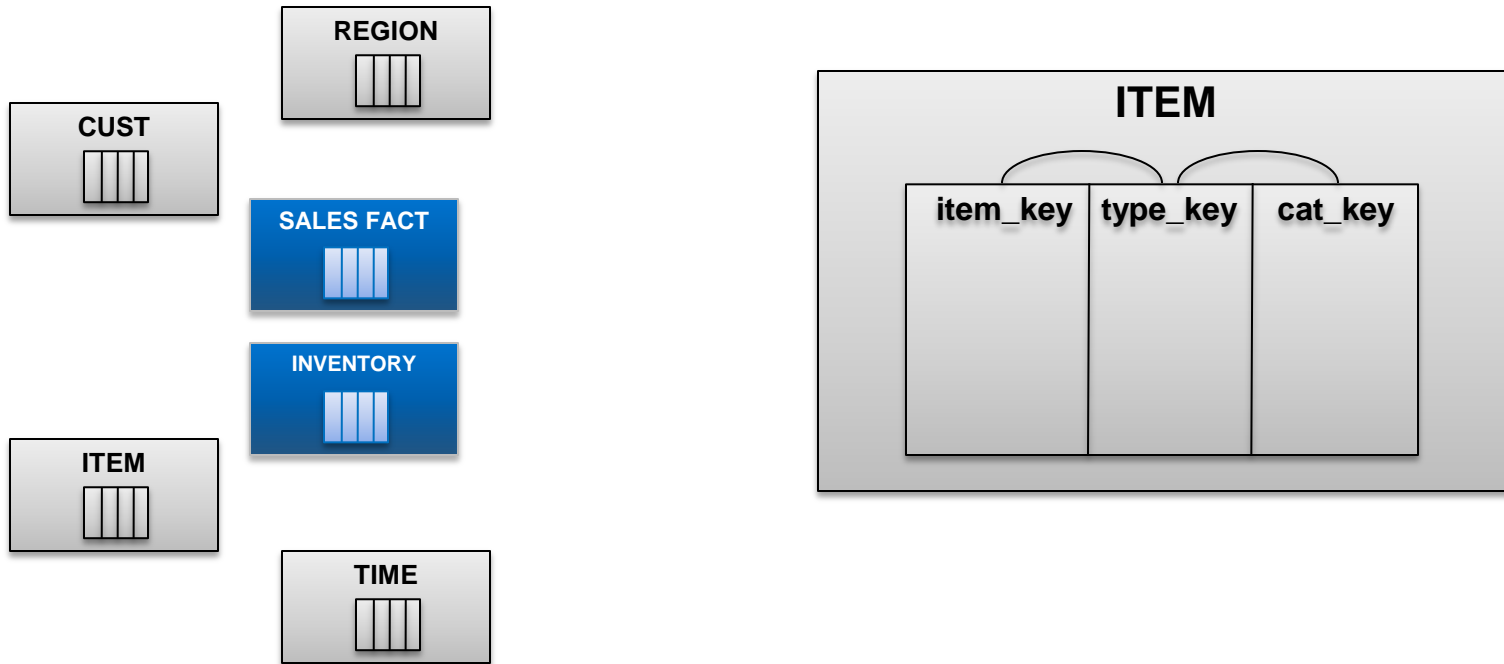
# Oracle Database Metadata

## Table Relationships



# Column Relationships

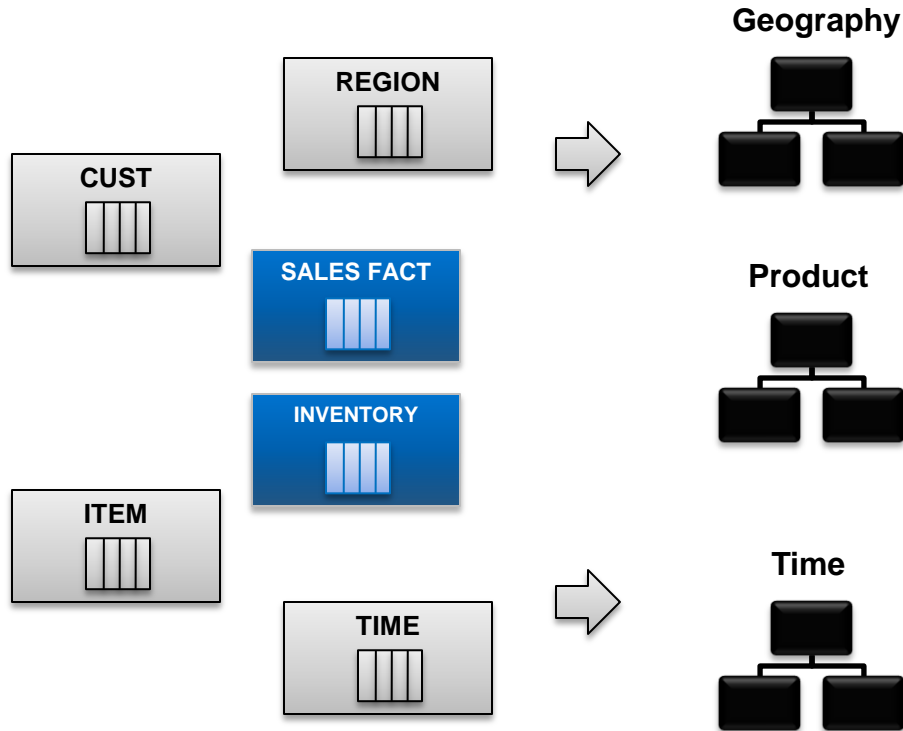
Not Captured in Table's Metadata





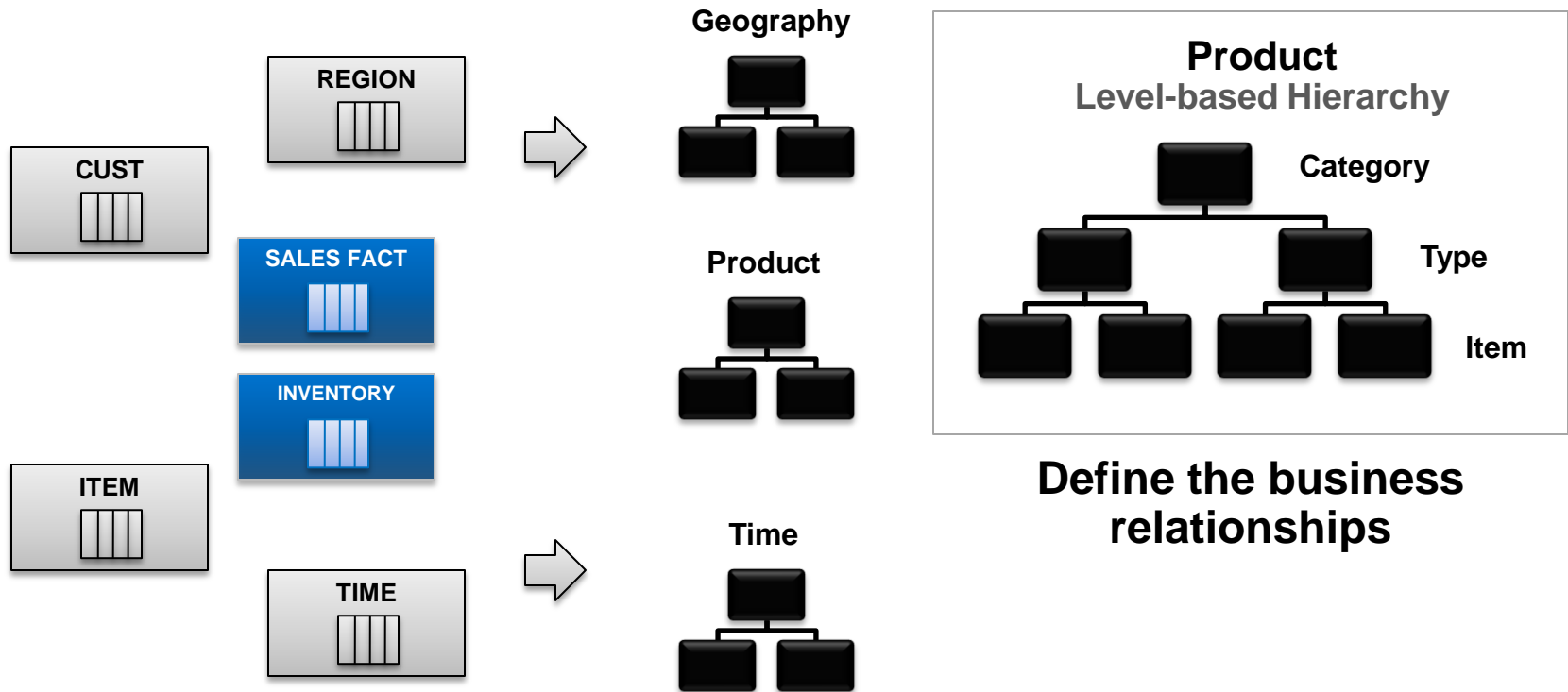
# Value of Dimensional Metadata

## Dimensions Formalize Data Relationships



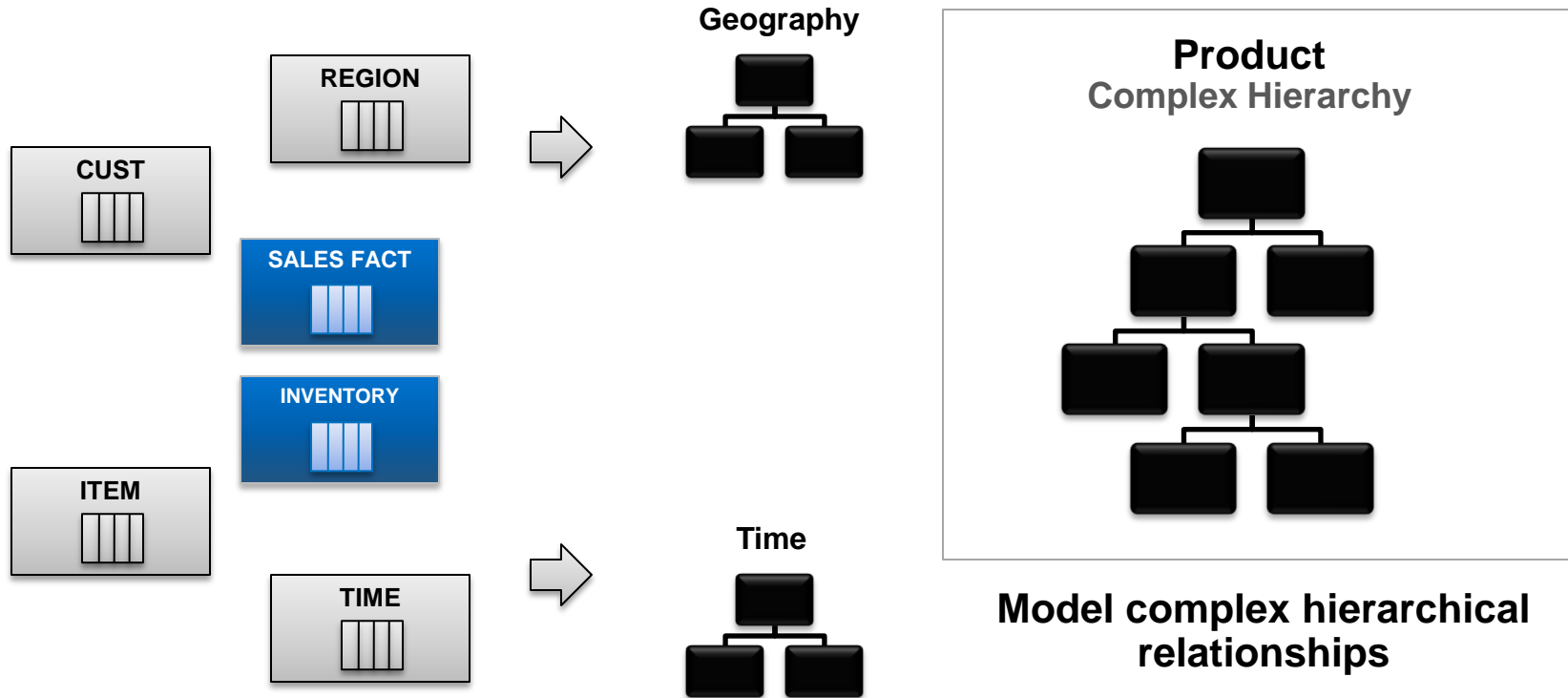
# Value of Dimensional Metadata

## Dimensions Formalize Data Relationships



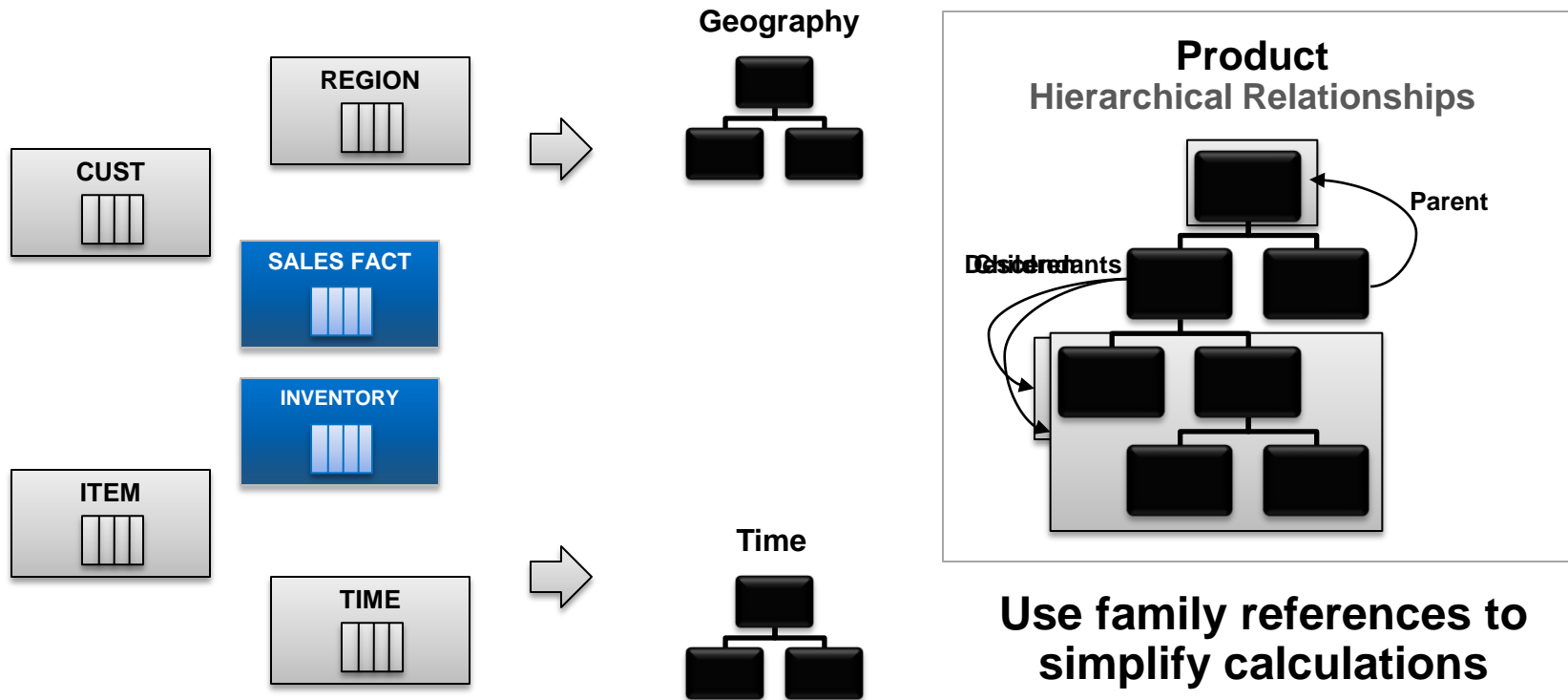
# Value of Dimensional Metadata

## Dimensions Formalize Data Relationships



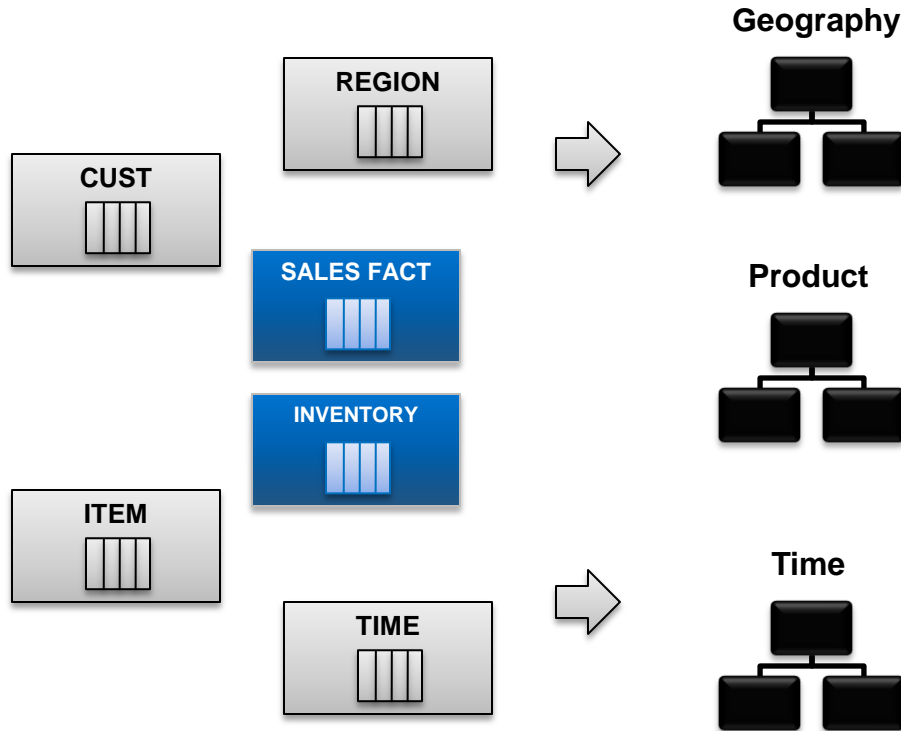
# Value of Dimensional Metadata

## Dimensions Formalize Data Relationships



# Value of Dimensional Metadata

## Time Dimension Supports Any Calendar Type

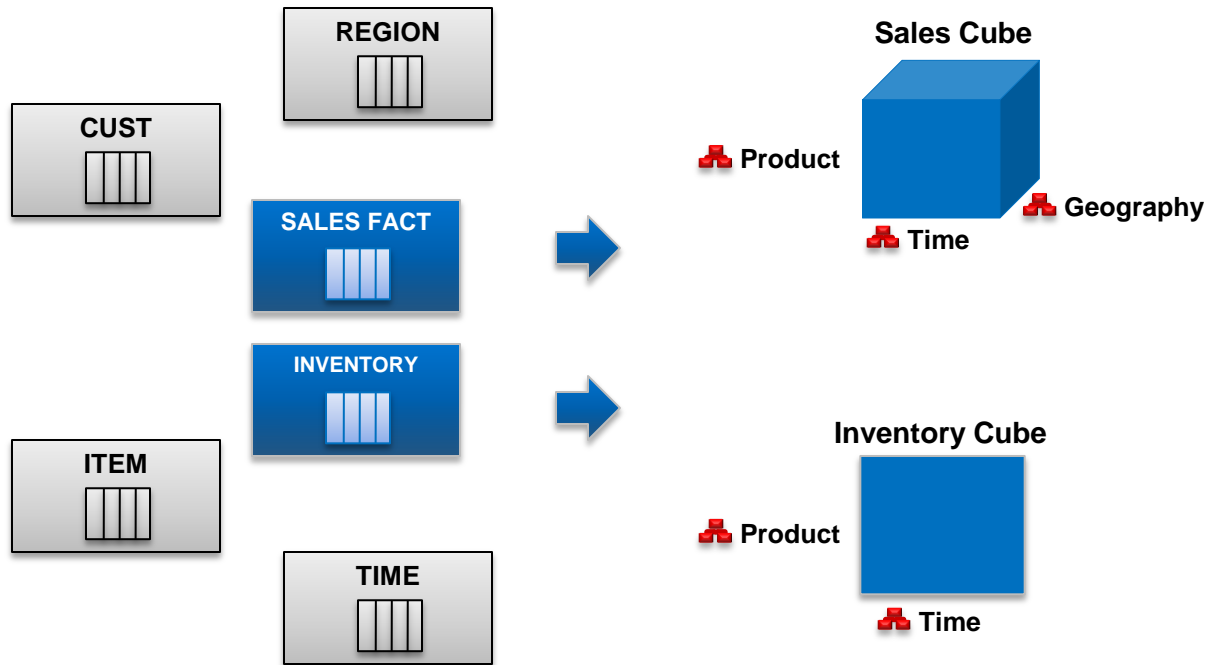


M A R C H	Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31	Fiscal Year End			

Time dimension simplifies time-series calculations

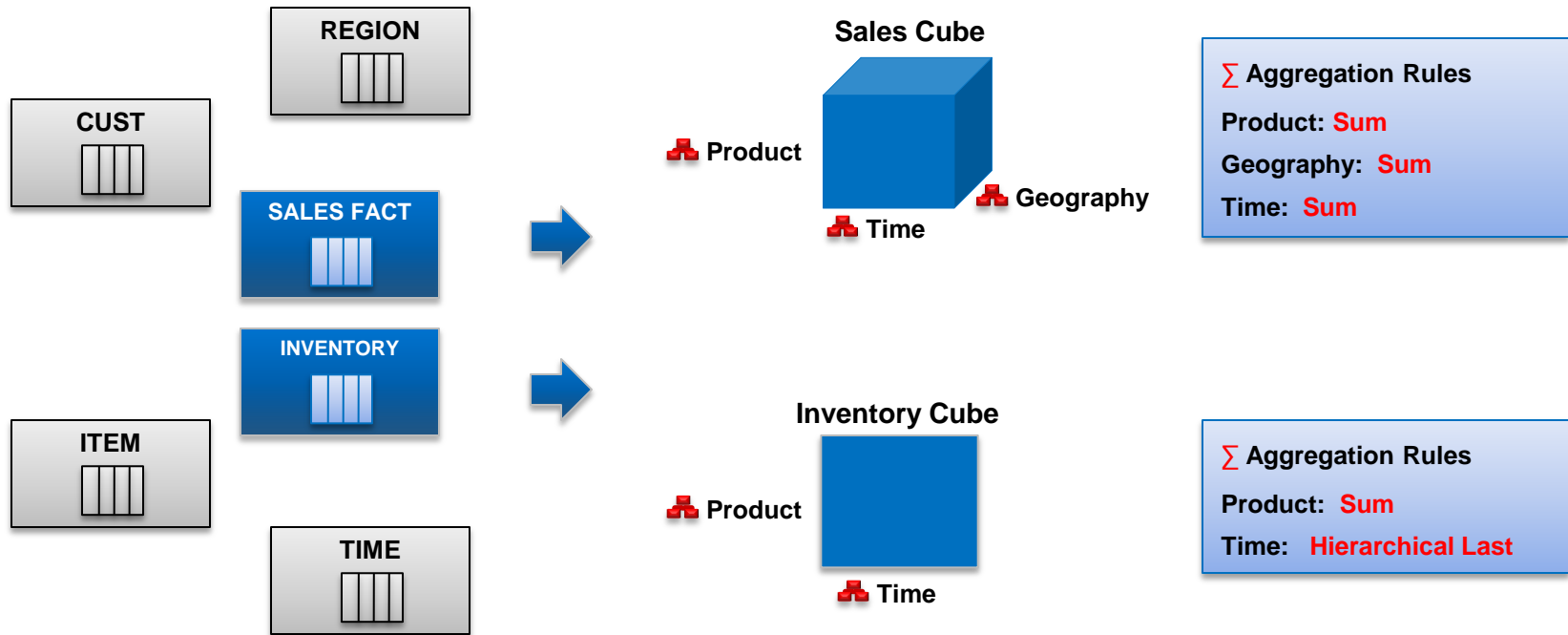
# Value of Dimensional Metadata

## Dimensions Shared Across Cubes



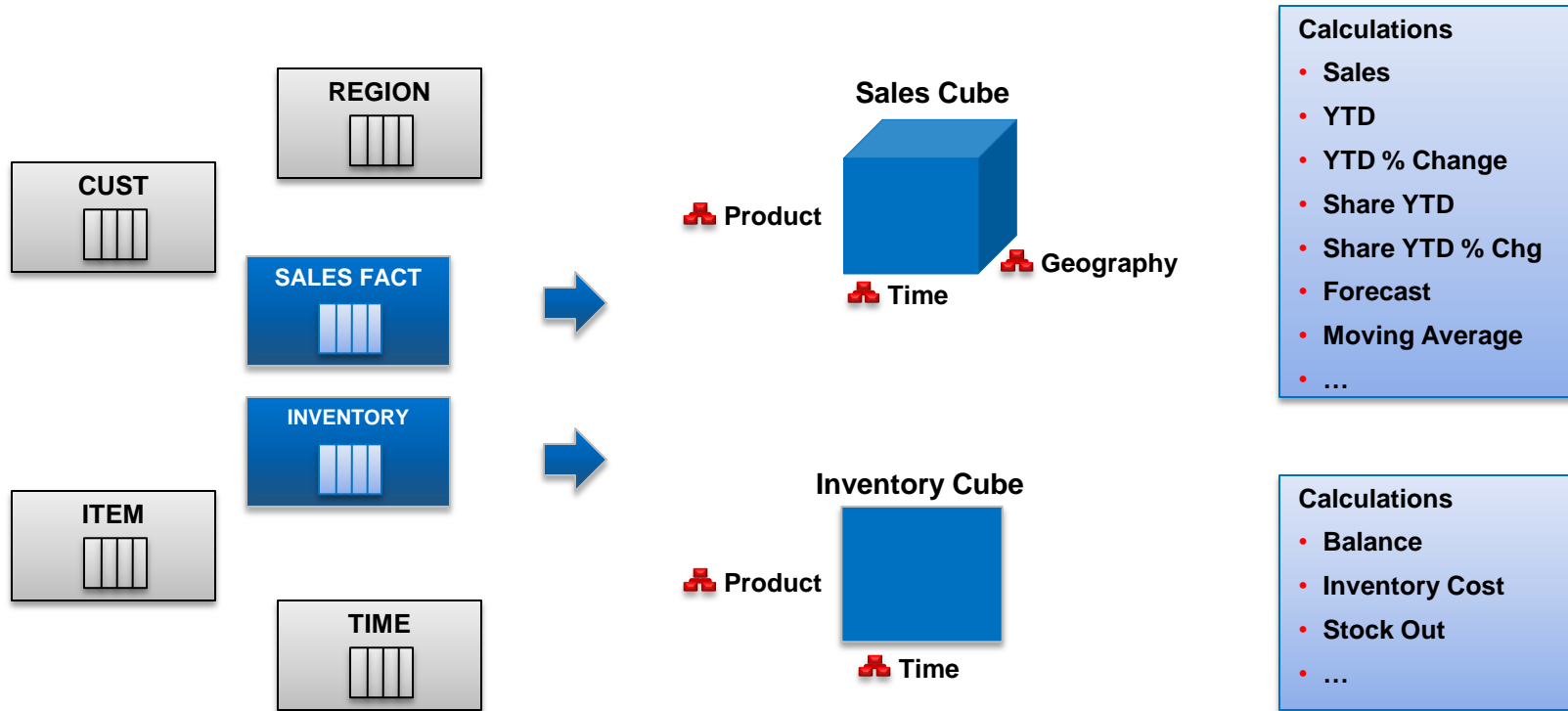
# Value of Dimensional Metadata

## Aggregation Rules



# Value of Dimensional Metadata

## Analytic Calculations Leverage Metadata





# Calculation Glide-Path

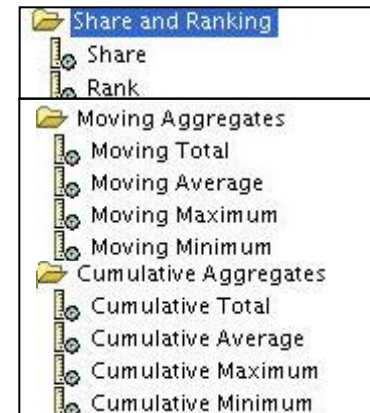
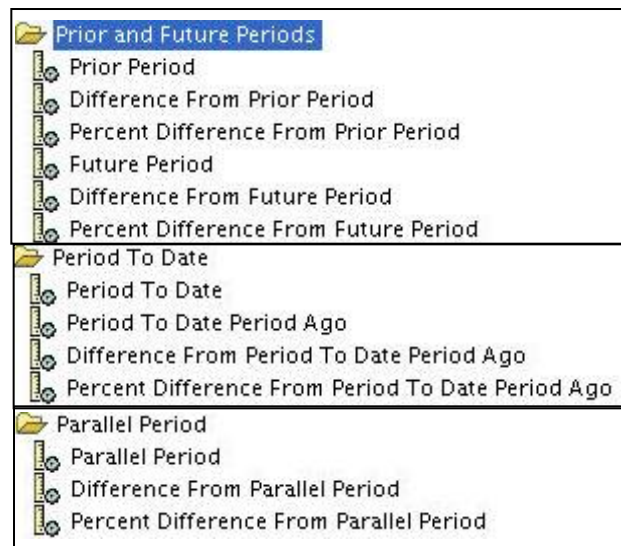
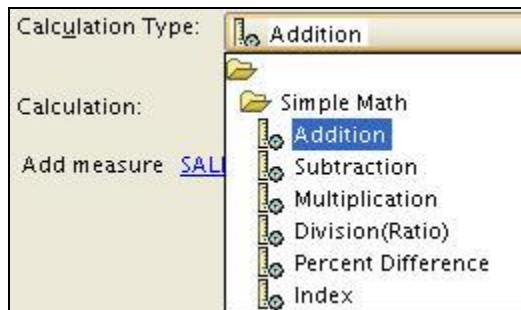
**Solution Scales as Calculation Complexity Grows**

Calculation definition options support most any analytic calculation requirements:

1. Calculation Templates
2. Calculation Expression Syntax
3. OLAP DML Programs, Functions and Models

# Calculation Templates

Choose from a wide range of common business calculations



# Customize the Calculation

**Create Calculated Measure**

General

Specify General Calculated Measure Information

Name:

Short Label:

Long Label:

Description:

Calculation Type:

Calculation:

Rank members of the [PRODUCT](#) dimension and [PRODUCT.STANDARD](#) hierarchy based on measure [SALES\\_YTD\\_PY\\_PCT\\_CHG \(...\)](#). Calculate rank using [RANK](#) method with [member's parent](#) in order [highest to lowest](#). Rank NA(null) values [nulls last](#).

[member's level](#)  
[member's parent](#)  
[member's ancestor](#)

Expression:

# Easy to define nested calculations

**Create Calculated Measure**

General

Specify General Calculated Measure Information

Name: PRODUCT\_RANK\_PCT\_CHG\_YTD

Short Label: Product Rank by % Chg Sales YTD

Long Label: Product Rank by % Chg Sales YTD

Description: Product Rank by % Chg Sales YTD

Calculation Type: Rank

Calculation:

Rank members of the **PRODUCT** dimension and **PRODUCT.STANDARD** hierarchy based on measure **SALES\_YTD\_PY\_PCT\_CHG (...)**. Calculate rank using **RANK** method with **member's parent** in order **highest to lowest**. Rank NA(null) values **nulls last**.

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

Expression:

```
RANK() OVER HIERARCHY (PRODUCT.STANDARD ORDER BY SALES_CUBE.SALES_YTD_PY_PCT_CHG DESC NULLS LAST WITHIN PARENT)
```

Help Create Cancel



# Calculation Expression Syntax

- OLAP Expression Syntax:
  - Patterned after SQL analytic and window functions
  - Extended to leverage unique properties of OLAP model
  - Can leverage OLAP DML code

# Calculation Expression Syntax

## Similarity to Standard SQL Syntax

- Identical to SQL syntax for:
  - Single Row Functions
    - Approximately 90 single row functions are identical to SQL
    - Examples: nvl, nullif, to\_date, ||, replace, etc.
  - Conditional Statements
    - Supports standard comparative operators
    - Examples: case, decode, <, <=, =, >, >=, !=, etc.

# Calculation Expression Syntax

## SQL Syntax Extended for OLAP Metadata

- Enables a single calculation to span various levels of aggregation
- Leverages native understanding of hierarchical relationships
- Requires no densification for time-series calculations
- Includes the following functions:

AVERAGE_RANK	HIER_PARENT	MAX
AVG	HIER_TOP	MIN
COUNT	LAG	RANK
DENSE_RANK	LAG_VARIANCE	ROW_NUMBER
HIER_ANCESTOR	LAG_VARIANCE_PERCENT	SHARE
HIER_CHILD_COUNT	LEAD	SUM
HIER_DEPTH	LEAD_VARIANCE	
HIER_LEVEL	LEAD_VARIANCE_PERCENT	

# Calculation Expression Syntax

## Example of Extended SQL Syntax

### Window function example (RANK)

- One OLAP Expression is equivalent to several SQL rank expressions

```
--OLAP
- Rank within parent at any level
RANK() OVER HIERARCHY (PRODUCT.STANDARD ORDER BY SALES_CUBE.QUANTITY DESC NULLS
    LAST WITHIN PARENT)

--SQL
--Rank departments
RANK() OVER (PARTITION BY total_product_id ORDER BY sales DESC NULLS LAST)
--Rank categories
RANK() OVER (PARTITION BY department_id ORDER BY sales DESC NULLS LAST)
--Rank types
RANK() OVER (PARTITION BY category_id ORDER BY sales DESC NULLS LAST)
--Rank sub types
RANK() OVER (PARTITION BY type_id ORDER BY sales DESC NULLS LAST)
-- Rank items
RANK() OVER (PARTITION BY sub_type_id ORDER BY sales DESC NULLS LAST)
```



# Calculations Using OLAP DML

- OLAP DML is a dimensionally aware procedural programming language
  - Supports looping, conditional logic, multidimensional selection and more
  - Includes hundreds of analytic functions
- OLAP DML can be used:
  - Within a custom measure expression
  - To assign data to stored measures within a cube
    - Forecasts
    - Allocations
    - Systems of expressions (a.k.a 'models')
    - Assignments based on user defined expressions

# Calculations Using OLAP DML

## Example: Product Alert

```
"Look at product sales for the children of the current product  
limit product to children using product_parentrel _product
```

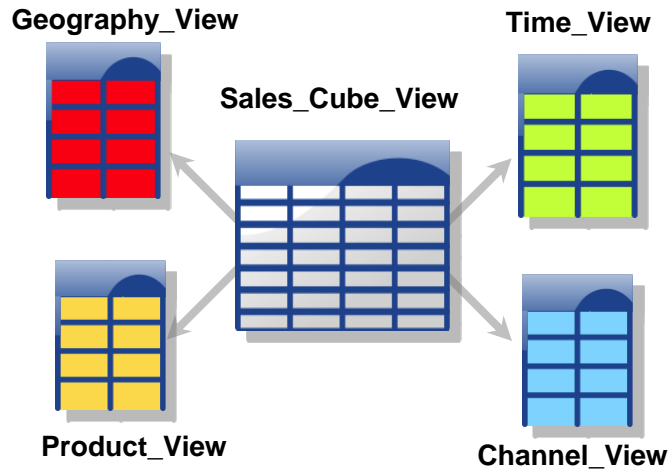
```
"Have any products fallen compared to last year?
```

```
_alert = ANY(sales_cube_sales_py_pct_chg lt 0,  
             time channel geography)
```

```
return _alert
```

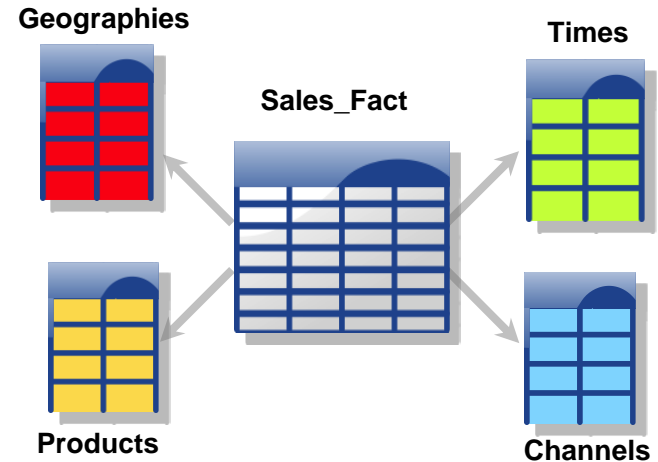
# Cubes Exposed as a “Star”

## CUBE VIEWS



- Single cube view contains many summary levels
- Calculations exposed as columns and computed in OLAP engine

## TABLES



- Fact table contains leaf data
- Calculations computed in relational engine using functions in select list

# Simple Queries for Complex Analytics

## Basic Query:

```
SELECT c.long_description as chan,
       p.long_description as prod,
       t.long_description as time,
       s.sales
FROM channel_sales_channel_view c,
     product_standard_view p,
     geography_regional_view g,
     time_calendar_view t,
     sales_cube_view s
WHERE c.dim_key = s.channel
     AND g.dim_key = s.geography
     AND p.dim_key = s.product
     AND t.dim_key = s.time
     AND c.level_name = 'CLASS'
     AND g.level_name = 'ALL_REGIONS'
     AND p.level_name = 'DEPARTMENT'
     AND t.dim_key in ('CY2009')
```

## Analytic Query:

```
SELECT c.long_description as chan,
       p.long_description as prod,
       t.long_description as time,
       s.sales,
       s.sales_ytd,
       s.sales_ytd_py_pct_chg,
       s.product_alert
FROM channel_sales_channel_view c,
     product_standard_view p,
     geography_regional_view g,
     time_calendar_view t,
     sales_cube_view s
WHERE c.dim_key = s.channel
     AND g.dim_key = s.geography
     AND p.dim_key = s.product
     AND t.dim_key = s.time
     AND c.level_name = 'CLASS'
     AND p.level_name = 'DEPARTMENT'
     AND g.parent = 'ALL_REGIONS'
     AND t.dim_key in ('CY2009', 'APR2009')
```

# Turn Application Express into a BI Tool

## APEX Interactive Report:

Product 	Time	Sales	Product Alert	% Chg PY	YTD	YTD % Chg PY	YTD Share Of Prnt Prod	YTD Share % Chg PY	Best Fit Forecast
Cameras and Camcorders	Q1-CY2009	2,961,770		1.0	2,961,770	1.0	7.1	-13.9	2,961,771
Cameras and Camcorders	Q2-CY2009	2,699,287	-	14.1	5,661,057	6.9	7.6	-2.3	2,699,287
Cameras and Camcorders	Q3-CY2009	3,192,047	-	29.5	8,853,104	14.1	8.2	16.8	3,192,047
Cameras and Camcorders	Q4-CY2009	3,540,143	-	25.8	12,393,248	17.2	8.2	13.4	3,540,144
Computers	Q1-CY2009	33,777,199	-	20.3	33,777,199	20.3	81.5	2.5	33,777,199
Computers	Q2-CY2009	28,581,026		18.1	62,358,225	19.3	81.0	1.1	28,581,026
Computers	Q3-CY2009	30,982,913		9.5	93,341,138	15.8	80.5	-1.2	30,982,913
Computers	Q4-CY2009	34,565,476		9.4	127,906,615	14.0	80.3	-1.4	34,565,477
Portable Music and Video	Q1-CY2009	4,692,772	-	9.3	4,692,772	9.3	11.3	-6.8	4,692,772
Portable Music and Video	Q2-CY2009	3,990,016	-	9.8	8,682,789	9.6	11.3	-5.9	3,990,017
Portable Music and Video	Q3-CY2009	4,313,054	-	8.8	12,995,844	9.3	11.2	-1.8	4,313,055
Portable Music and Video	Q4-CY2009	4,923,391	-	12.3	17,919,235	10.1	11.4	1.2	4,923,392

1 Drill down on any dimension

2 Calculations work perfectly across all summary levels

# Generate OBIEE Metadata Over Cubes

**AWM Plug-in Automates Process**

The image displays a workflow for exporting cube metadata from the Oracle BI Administration Tool to the OBIEE Administrator. It features three overlapping windows:

- Analytic Workspace Manager (AWM):** Shows a tree view of databases and schemas. A table titled "Dimensions:" is visible with the following data:

Name	Long Description	Type
CHANNEL	Channel	User
- Export Analytic Workspace SALESTRACK To OBIEE Administrator:** A dialog box with the following fields:
  - Physical Database: SALESTRACK
  - Business Model: SALESTRACK
  - Presentation Catalog: SALESTRACKIt includes a "Choose cubes to be included in the export" section with "Available Cubes" and "Selected Cubes" lists. The "Selected Cubes" list contains "FORECAST" and "SALES\_CUBE".
- Oracle BI Administration Tool - olaptrain.rpd:** Shows the "Presentation", "Business Model and Mapping", and "Physical" views. A red arrow points from the "Export" button in the dialog box to this window.

# OBIEE Answers Leverages OLAP

## Calculations Computed in OLAP Engine

The screenshot displays the Oracle Answers interface. On the left is a navigation pane for 'Oracle 11g Cubes' with categories: Columns, Channel, Time, Geography, Product, and Sales. The 'Sales' category is expanded, showing various metrics like 'Sales YTD', 'Sales YTD % Chg Pr Year', etc. The main area shows a 'Compound Layout' with a table titled 'Table'. The table has columns: Department, Calendar Quarter, Sales, Sales YTD, YTD Pr Year, YTD % Chg Pr Year, 3 Per Moving Total, Target, and % of Target. The data is grouped by Department (Cameras and Camcorders, Computers, Portable Music and Video) and further by Calendar Quarter (Q1-CY2007 to Q4-CY2007). Below the table is a 'Download - Copy' link.

Department	Calendar Quarter	Sales	Sales YTD	YTD Pr Year	YTD % Chg Pr Year	3 Per Moving Total	Target	% of Target
Cameras and Camcorders	Q1-CY2007	2,961,771	2,961,771	2,929,822	1.1	11,666,664	10,572,098	28
	Q2-CY2007	2,699,287	5,661,058	5,294,958	6.9	12,393,249	10,572,098	54
	Q3-CY2007	3,192,047	8,853,105	7,758,539	14.1	9,431,476	10,572,098	84
	Q4-CY2007	3,540,144	12,393,249	10,572,098	17.2	6,732,191	10,572,098	117
Computers	Q1-CY2007	33,777,199	33,777,199	28,073,255	20.3	124,920,893	112,123,808	30
	Q2-CY2007	28,581,026	62,358,225	52,264,348	19.3	127,906,615	112,123,808	56
	Q3-CY2007	30,982,913	93,341,138	80,544,054	15.9	94,129,416	112,123,808	83
	Q4-CY2007	34,565,477	127,906,615	112,123,808	14.1	65,548,390	112,123,808	114
Portable Music and Video	Q1-CY2007	4,692,772	4,692,772	4,290,265	9.4	17,377,895	16,264,253	29
	Q2-CY2007	3,990,017	8,682,789	7,921,044	9.6	17,919,236	16,264,253	53
	Q3-CY2007	4,313,055	12,995,844	11,882,202	9.4	13,226,463	16,264,253	80
	Q4-CY2007	4,923,392	17,919,236	16,264,253	10.2	9,236,447	16,264,253	110

# Analyze Cubes Using Excel

## Simba MDX Driver Connects to OLAP

The screenshot shows Microsoft Excel with a PivotTable of sales data. The PivotTable is structured as follows:

Row Labels	Sales	Sales Ytd	Sales YTD % Chg
Computers *	7,271,944.08	15,883,944.16	23.04
Total Personal Computers *	5,964,383.54	13,011,358.96	23.81
PDAs *	7,439.33	13,160.48	26.23
All Computer Furniture *	5,092.	11,350.2	46.
Computer Printers and Supplies *	1,183,226.21	2,589,529.72	20.36
Total Server Computers *	111,803.	258,544.8	12.41
Cameras and Camcorders *	668,075.48	1,412,331.17	3.55
Portable Music and Video *	1,018,474.48	2,211,285.94	12.14
Total iPlayer Family *	1,018,474.48	2,211,285.94	12.14
iPlayer Accessories	371,698.26	771,474.99	11.52
All iPlayer Players	646,776.22	1,439,810.95	12.47

The PivotTable Field List task pane on the right shows the following configuration:

- Report Filter: Regional
- Column Labels: Calendar
- Row Labels: Standard
- Values: Sales, Sales Ytd, Sales YTD % Chg

1 Reads Oracle Data Dictionary for metadata

2 Generates optimized queries against cube

<http://www.simba.com/>



# Summary

- Oracle OLAP improves the delivery of information rich queries by SQL-based tools and applications
  - Simple definition of analytic calculations
  - Simple access to analytic calculations
  - Fast performance
  - Leverage existing Oracle Database expertise

# For More Information

search.oracle.com

Oracle OLAP



## Oracle Technology Network

For demonstrations, white papers, tutorials and more, visit:

<http://www.oracle.com/technology/products/bi/olap/olap.html>