

NoCOUG Spring Conference:

Managing OLAP Catalog metadata in Oracle9i R2 Database

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Agenda

- Oracle9i OLAP Architecture
- What is OLAP Catalog?
- Creating OLAP Catalog Metadata
 - Choosing the Right Metadata Creation Method
 - Case 1: Basic Star/Snowflake Schema (OEM)
 - Case 2: Complex Schema
(CWM2 PL/SQL packages)
 - Case 3: Analytic Workspace
(OLAP Table Function + CWM2 PL/SQL packages)

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IAF Software



- Established in 2000 in Santa Clara, CA
- Subsidiary of IAF Consulting, independent DW consulting firm in Japan
- Customers: Toshiba, NTT, Mitsui
- Products for Oracle9i OLAP
 - IAF Coaster: Metadata-based design and management tool for Oracle9i OLAP
 - IAF Vista: BI tool for Oracle9i OLAP developed using JDeveloper9i and BI Beans

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Oracle9i OLAP Architecture

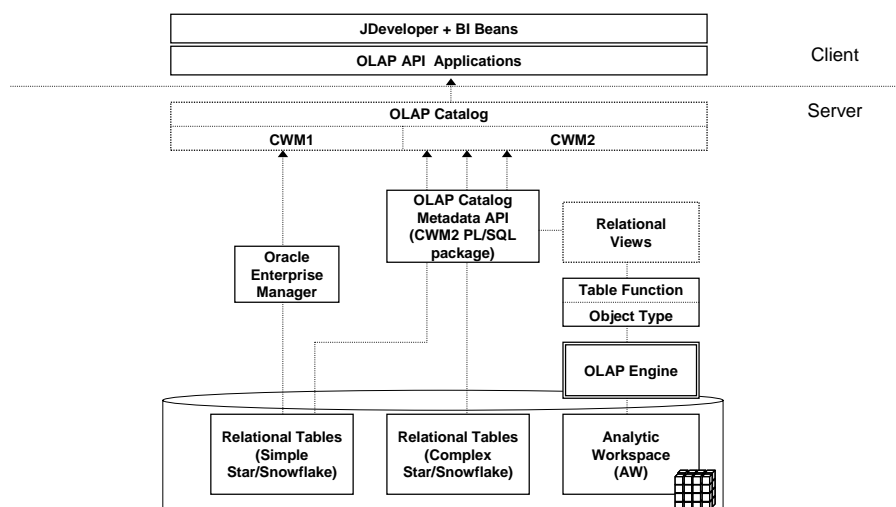
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Oracle9i OLAP

- OLAP processing engine
- Analytic Workspaces
- OLAP DML
- PL/SQL Table Functions
- OLAP API (Oracle's Java API for OLAP)
- OLAP Catalog (OLAP metadata repositories)
- Tools within Oracle Enterprise Manager

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Oracle9i OLAP Architecture

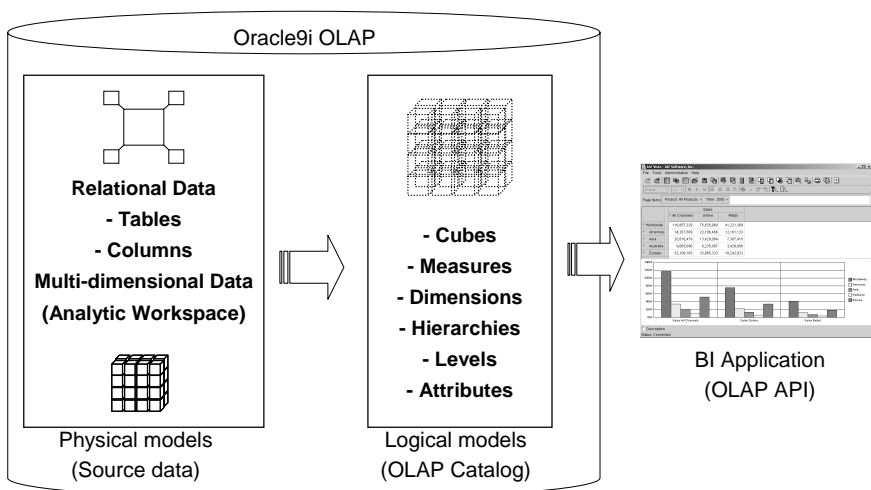


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What is OLAP Catalog?

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OLAP Metadata Model



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OLAP Catalog

- Metadata designed specifically for use with Oracle OLAP
- Meta data tables owned by OLAPSYS
 - ALL_OLAP2_xxx
- Two methods for creating OLAP metadata
 - Oracle Enterprise manager
 - OLAP Catalog Metadata API (CWM2 packages)
- OLAP 1 Catalog (CWM1) and OLAP 2 Catalog (CWM2)

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Creating OLAP Catalog Metadata

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Choosing the Creation Method

DW Storage/Design	OEM	CWM2 API
CASE1: Basic Star/snowflake schema - Unsolved, Level-based	Y	Y
CASE2: Complex Schema - Solved, Level-based - Dimension w/ Complex Hierarchy - Parent-child Dimension	N	Y
CASE3: Multidimensional data - Analytic Workspace	N	Y

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Case 1: Basic Star/Snow-flake Schema (Oracle Enterprise Manager)

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Case 1: Basic Star/Snow-flake Schema

- Fact table
 - Single fact table
 - Fact data must be unsolved
- Dimension table
 - Star or snow-flake
 - Level-based
 - Level columns cannot be NULLs
 - Multiple hierarchies have the same base level

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Case 1: Basic star/snow-flake schema –Example-

Product Dimension (Level-based dimension - star -)

Prod_ID	Prod_Desc	Category_ID	Category_Desc	Total_ID	Total_Desc
P1001	LaptopPC	C2001	PC	T3001	ALL
P1002	DesktopPC	C2001	PC	T3001	ALL
P1003	25" TV	C2002	TV	T3001	ALL
P1004	17" TV	C2002	TV	T3001	ALL

Sales Fact (Unsolved, Single)

Date	Prod_ID	Sales
Nov-14	P1001		100
Nov-14	P1002		200
Nov-14	P1003		450
Nov-14	P1004		400
Nov-15	P1001		150
.....			

Product Dimension (Level-based dimension - snow-flake)

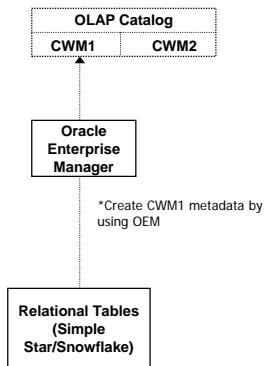
Prod_ID	Prod_Desc	Cat_ID	Cat_ID	Cat_Desc
P1001	Laptop PC	C2001	C2001	PC
P1002	Laptop PC	C2001	C2002	TV
P1003	Desktop PC	C2002		
.....				

Category Dimension

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Case1: Enterprise Manager

- Create OLAP Catalog metadata with a wizard-based tool



1. Create Dimension
- ↓
2. Create Cube
- ↓
3. Create MV (Optional)
- ↓
4. Create Measure Folder (Optional)

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Tips: Time Dimension

- Time dimension
 - Should contain 'end date' and 'time span' to provide full time support

Time Dimension

Date	Month	M_ED	M_TS	Quarter	Q_ED	Q_TS	Year
...								
14-Nov-02	November	30-Nov-02	30	Q4	31-Dec-02	92	2002	
15-Nov-02	November	30-Nov-02	30	Q4	31-Dec-02	92	2002	
...								
01-Jan-03	January	31-Jan-03	31	Q1	31-Mar-03	92	2003	
.....								

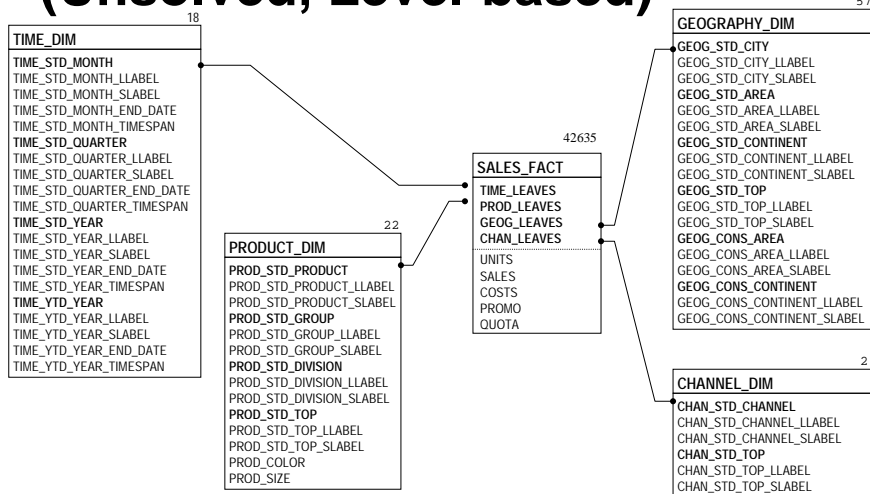
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DEMONSTRATION

OEM

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Demo Schema (Unsolved, Level-based)



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Case 2: Complex Schema (CWM2 PL/SQL packages)

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Case 2: Complex Schema

- Fact table
 - Multi fact table
 - Solved fact table (embedded total)
- Dimension table
 - Parent-child
 - Level based with NULL columns (Skip-level)
 - Multiple hierarchies have different base levels (Ragged hierarchies)

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Case 2: Complex Schema –Example 1–

Sales Fact (solved)

Time	Prod_ID	Sales
Nov-14	P1001	100
Nov-14	P1002	200
Nov-14	P1003	450
Nov-14	P1004	400
Nov-14	C2001	300
Nov-14	C2002	850
Nov-14	T3001	1150

Product Dimension (Parent Child dimension)

Prod_ID	Prod_Desc	Comment	Parent ID
P1001	Laptop PC	Item	C2001
P1002	Desktop PC	Item	C2001
P1003	25" TV	Item	C2002
P1004	17" TV	Item	C2002
C2001	PC	Category	T3001
C2002	TV	Category	T3001
T3001	ALL	Total	-

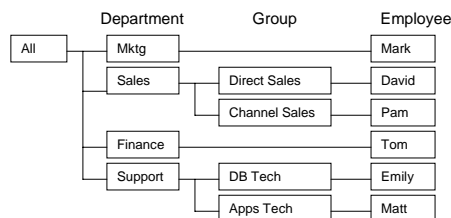
Embedded total data in the same fact table

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Case 2: Complex schema –Example 2–

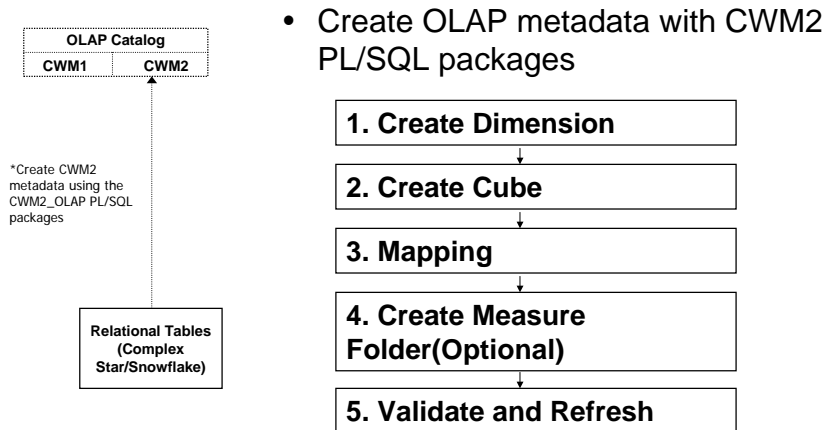
Employee Dimension (Level-based dimension with NULL)

Emp_ID	Emp_Name	Group_ID	Group_Name	Dept_ID	Dept_Name
E1001	Mark	NULL	NULL	D3001	Mktg
E1002	David	G2001	Direct Sales	D3002	Sales
E1003	Pam	G2002	Channel Sales	D3002	Sales
E1004	Tom	NULL	NULL	D3003	PR
E1005	Emily	G2003	DB Tech	D3004	Support
E1006	Matt	G2004	Apps Tech	D3004	Support



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Case2: CWM2 PL/SQL Packages



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Case 2: CWM2 PL/SQL Packages

1. Create Dimension

- CWM2_OLAP_DIMENSION
- CWM2_OLAP_DIMENSION_ATTRIBUTE
- CWM2_OLAP_HIERARCHY
- CWM2_OLAP_LEVEL
- CWM2_OLAP_LEVEL_ATTRIBUTE

2. Create Cube and Measure

- CWM2_OLAP_CUBE
- CWM2_OLAP_MEASURE

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Case 2: CWM2 PL/SQL Packages

3. Mapping

- CWM2_OLAP_TABLE_MAP

4. Creating Measure Folder (Option)

- CWM2_OLAP_CATALOG

5. Validate and Refresh

- CWM2_OLAP_VALIDATE
- CWM2_OLAP_METADATA_REFRESH

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DEMONSTRATION CWM2 PL/SQL API

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Tips: Unsolved/Solved

- CWM2_OLAP_HIERARCHY.CREATE_HIERARCHY
 - SOLVED_CODE parameter
 - UNSOLVED LEVEL-BASED
 - SOLVED LEVEL-BASED
 - SOLVED VALUE-BASED (Parent-Child)
- CWM2_OLAP_TABLE_MAP.MAP_FACTTBL_LEVELKEY
 - STORETYPE parameter
 - LOWEST
 - ET (Embedded Total)
 - ROLLUP

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Tips: Parent-child Dimension

Parent-child Dimension

PROD	PARENT	DESC
All	–	Prod Total
PC	All	Personal PC
TV	All	Television
Desktop	PC	Desktop PC
Laptop	PC	Laptop PC
PlasmaTV	TV	Plasma TV

- Parent-child dimension must be converted to solved/level-based dimension before registration

CWM2_OLAP_PC_TRANSFORM

Solved, Level-based Dimension

PROD	PARENT	DESC	GID	LVL1	LVL2	LVL3
All	–	Prod Total	3	-	-	All
PC	All	Personal PC	1	-	PC	All
TV	All	Television	1	-	TV	All
Desktop	PC	Desktop PC	0	Desktop	PC	All
Laptop	PC	Laptop PC	0	Desktop	PC	All
PlasmaTV	TV	Plasma TV	0	PlasmaTV	TV	All

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Case 3: Multidimensional Data (Table Function + CWM2 PL/SQL Packages)

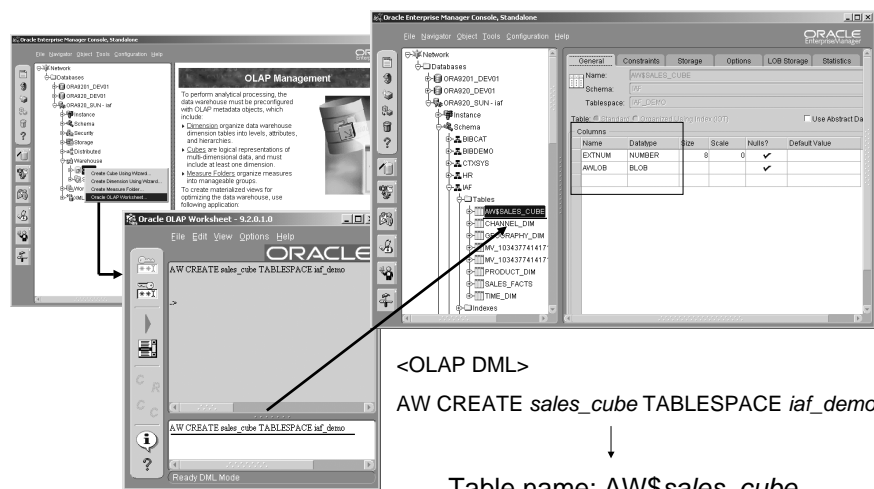
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Case 3: Analytic Workspace

- Multi-dimensional data objects
- Stored in Oracle relational tables as a Binary Large Object (BLOB)
- Created by OLAP DML
 - Manually (AW CREATE, DEFINE and Fetch)
 - Import from EIF (Express DB export) file (AW CREATE and Import)
 - CWM2_OLAP_AW_CREATE (OLAP Catalog needed)
 - This package has been replaced with DBMS_AWM package for 9.2.0.3
 - **AW Manager**

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Case 3: Analytic Workspace



The screenshot shows the Oracle Enterprise Manager console with two main windows. The 'OLAP Management' window on the left provides instructions on how to perform analytical processing and create materialized views. The 'Oracle OLAP Worksheet - 9.2.0.1.0' window on the right shows a SQL script: `AW CREATE sales_cube TABLESPACE iaf_demo`. An arrow points from this script to the text below.

<OLAP DML>

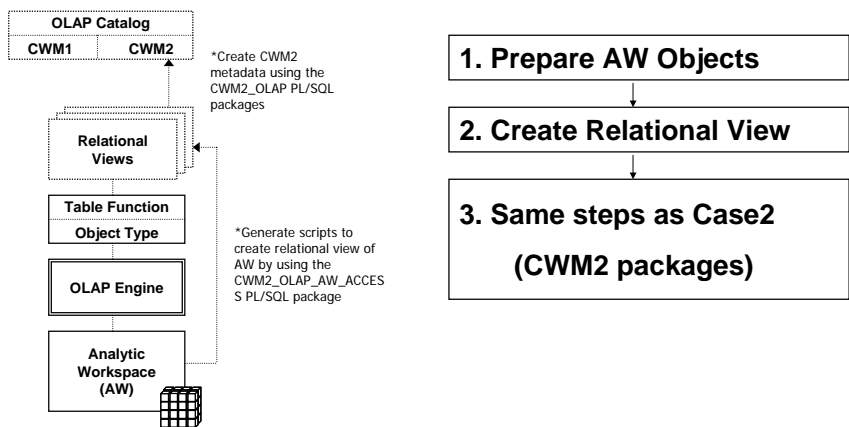
AW CREATE sales_cube TABLESPACE iaf_demo

↓

Table name: AW\$sales_cube

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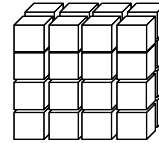
Case 3: Analytic Workspace



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Case 3: Preparing AW Objects

- Basic AW Objects
 - Measure
 - Dimension
 - Hierarchy Dimension
 - Parent-Child Relation
 - Level Dimensions etc.
- Additional AW Objects for OLAP API
 - Grouping IDs (GROUPINGID)
 - Family Relations (HIERHEIGHT)

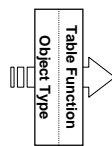


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Case 3: Creating Relational View

AW (AW\$Sales_Cube)

EXTNUM (NUMBER)	AWLOB (BLOB)
001	



Relational View (Solved, Level-based dimension)

PROD	PPROD	LVL1	LVL2	LVL3	GID	PGID
ALL	-	-	-	ALL	3	-
PC	ALL	-	PC	ALL	1	3
TV	ALL	-	TV	ALL	1	3
Desktop	PC	Desktop	PC	ALL	0	1
Laptop	PC	Laptop	PC	ALL	0	1
.....						

Family Relation

GID/PGID

- > Create type prod as object ...;
- > Create type prod_tbl as table of prod;
- > Create view prod_view
as select * from table (cast
(**olap_table** ('sales_cube duration session', 'prodtbl').....;

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Tips: Analytic Workspaces

- CWM2_OLAP_AW_ACCESS
 - Generating script that create views of AW objects
 - This function has been dropped in 9203
- GID and PGID are used by the OLAP API to improve performance
- AW Manager
 - Designed to create and manage Analytic Workspaces more easily.
 - After creating OLAP Catalog (CWM1) using OEM, AW Manager create AW.

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D E M O N S T R A T I O N

AW & CWM2 PL/SQL API

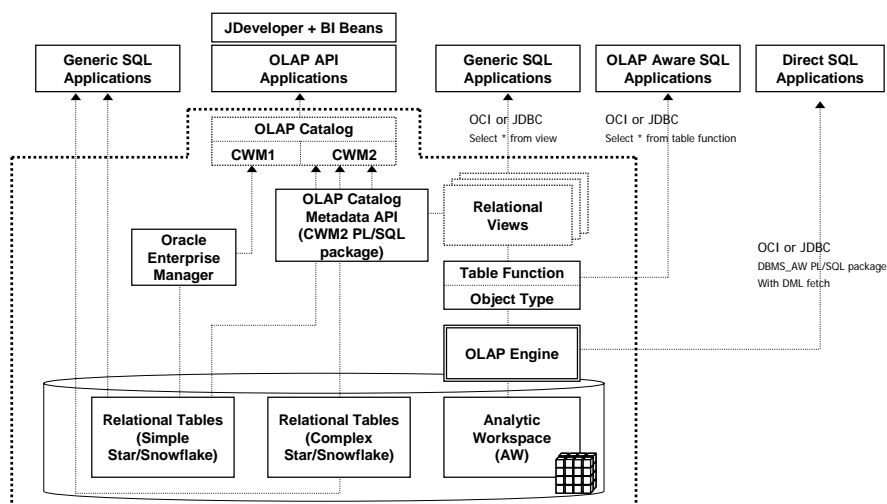
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Summary

- Oracle9i OLAP Architecture
- OLAP Catalog Defined and Described
- Creating OLAP Catalog Metadata
 - Choosing the Right Metadata Creation Method
 - Case 1: Basic Star/Snowflake Schema (OEM)
 - Case 2: Complex Schema (CWM2 PL/SQL packages)
 - Case 3: Analytic Workspace (OLAP Table Function + CWM2 PL/SQL packages)

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Summary



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Useful References

- OTN (otn.oracle.com)
 - Product download
 - Technical documents (Manual and whitepaper)
 - Discussion forums (Topic: “OLAP” and “BI Beans”)
- IAF Software (www.iafsoft.com)
 - This presentation and white paper
 - OLAP API (CWM2) complete sample script
 - Demonstration (Viewlet)
 - Product information (IAF Coaster/IAF Vista)

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