Deloitte.

BI Accelerator:
Case Study of Retail Industry
NYOUG Annual Day 2008

Forrest Snowden

Shyam Varan Nath

Deloitte Consulting LLP

September 10, 2008

Audit.Tax.Consulting.Financial Advisory.

Agenda for Today

|	
Forrest Snowden (Overview of RBIA)	Speaker One
Shyam Varan Nath (Technical Details of RBIA)	Speaker Two

About – Forrest Snowden

- Deloitte Consulting LLP, Senior Manager, Information Management
- <u>Retail</u>:
  - 6 years at the DeMoulas/Market Basket to put myself through college, 1980-1986
  - Dixons Store Group (largest UK retailer), 2005-2006
  - Wal-Mart, 1999
- <u>Consulting</u>: 22 Professional Years of Experience (16 years in Consulting)
  - General Manager, Command Information (A Carlyle Group), 2005-2007
  - Head of UK DW/BI Practice, Sr. Mgr. KPMG/BearingPoint, 1999 - 2006
  - Sr. Product Manager, IBM, WebSphere Payments
  - Sr. Architect, Bank of Boston, 1993-1994
  - Sr. Quality Engineer, Raytheon Missile Systems Division, 1986-1991
- <u>Clients</u>:
  - Pfizer, Lafarge, Citigroup, Chase, Baxter Health Care, BCBS, Lafarge
- <u>Education</u>:
  - Babson College, MBA
  - Tufts University, BSEE

Trends in the Retail Sector

- We are beginning to see emergence of the next generation of retail analytic solutions for areas such as merchandising, pricing, …

- We are on the cusp of a wave of Multi-channel retail transformation efforts

- Transformation will be big, intrusive

  and invasive to the current operations

  of large retailers

- On-Line retailers may begin to recognize

  the benefit of select physical locations
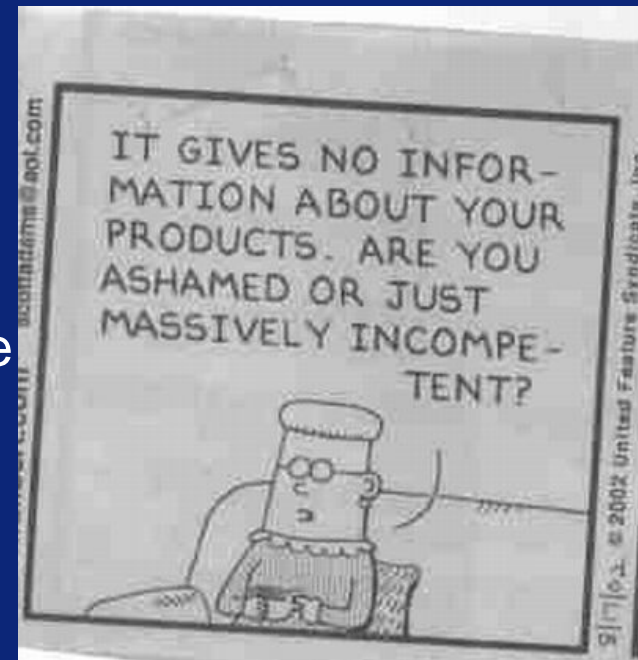
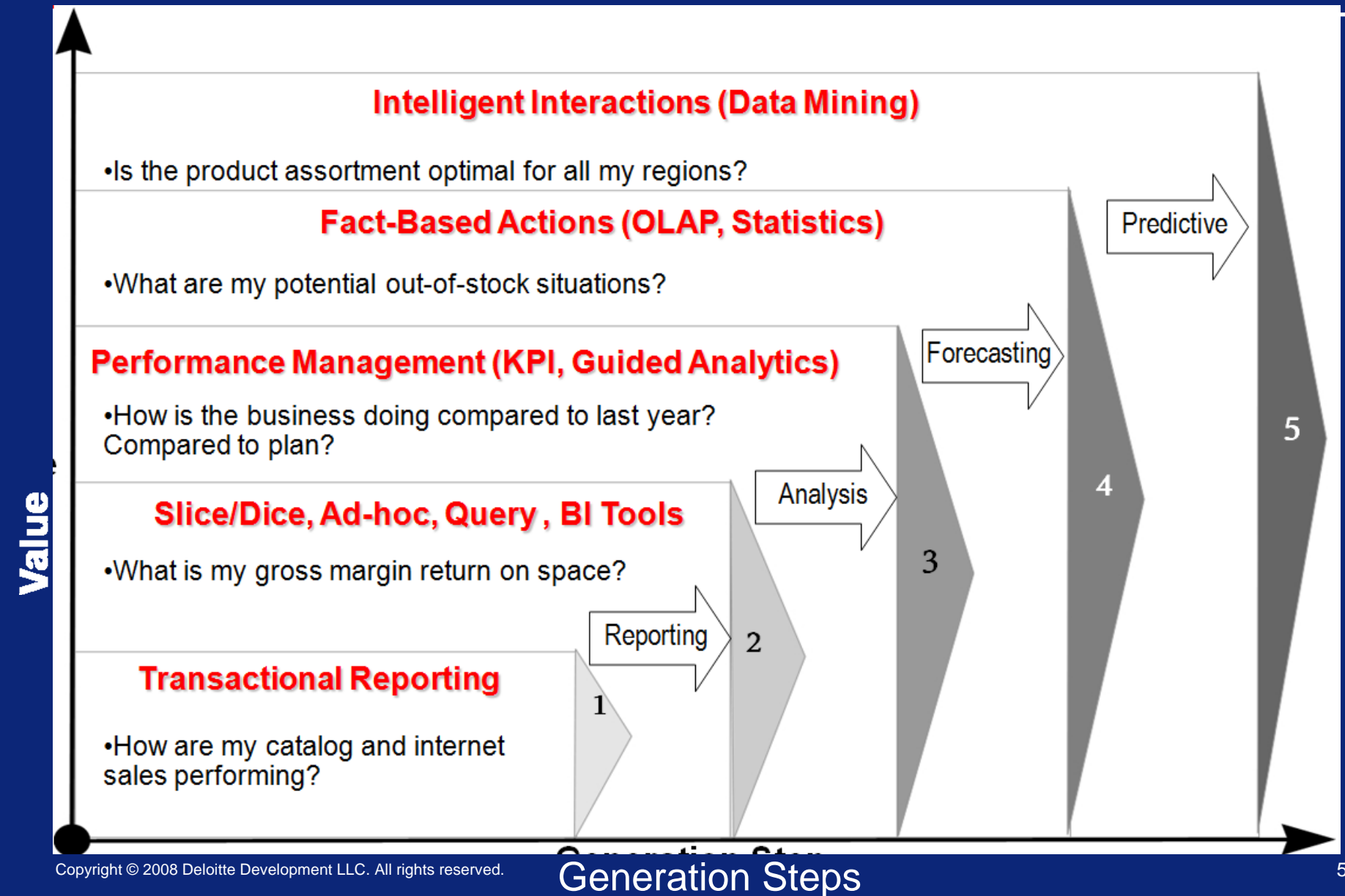# Key Business Issues

Key issues:

- How should retailers improve pricing, promotion and merchandising practices with the help of technology?
- How can retailers leverage business intelligence and analytics to grow their businesses?
- Remain competitive

Answers: Retail BI Accelerator

- Leverage pre-built software known as an accelerator
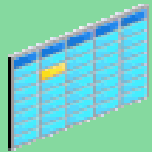- As an example, harness the power of a market ready retail BI Accelerator that's integrates with your DB and BI tools

Value v/s Generation Steps in Analytics

Value (vertical axis)

Generation Steps (horizontal axis)

Intelligent Interactions (Data Mining)
- Is the product assortment optimal for all my regions?

Fact-Based Actions (OLAP, Statistics)
- What are my potential out-of-stock situations?

Performance Management (KPI, Guided Analytics)
- How is the business doing compared to last year? Compared to plan?

Slice/Dice, Ad-hoc, Query , BI Tools
- What is my gross margin return on space?

Transactional Reporting
- How are my catalog and internet sales performing?

Reporting — 1, 2

Analysis — 3

Forecasting — 4

Predictive — 5

Technology Layers

- Layered BIDW stack to use the advanced analytics
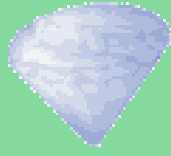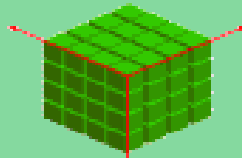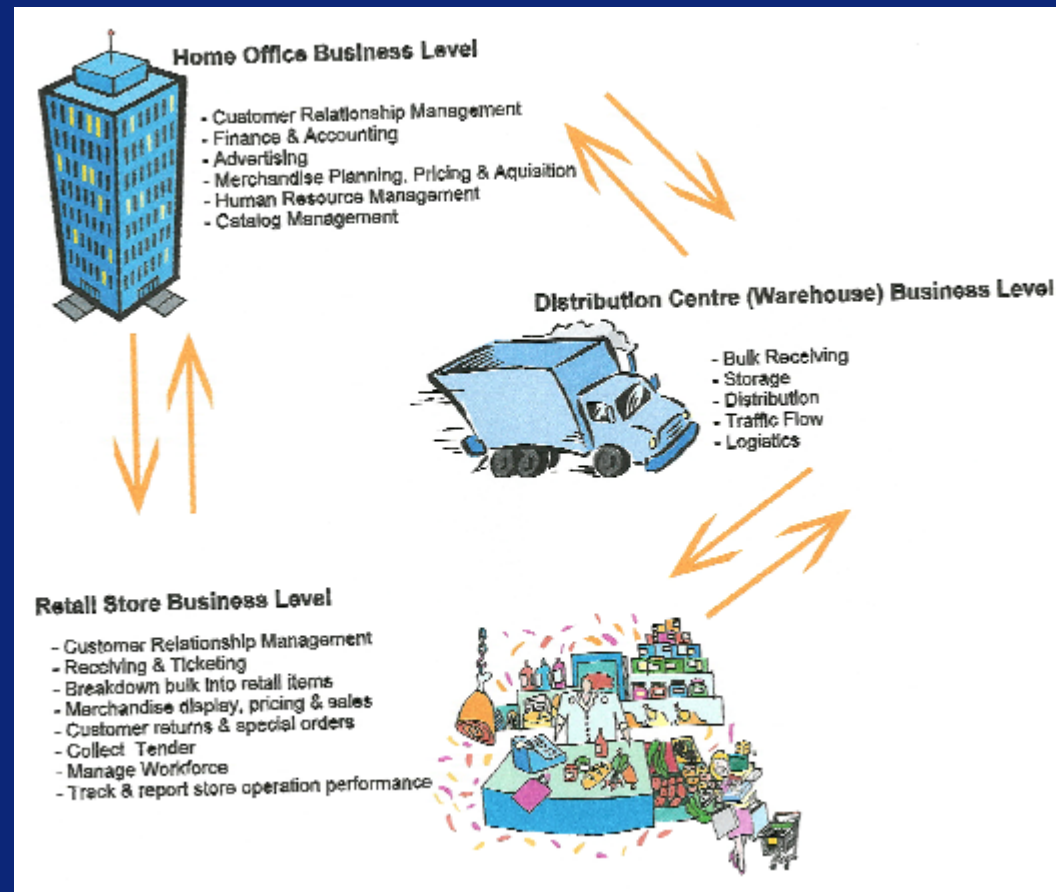
The Value of a Retail Accelerator

- **Rapid ROI.** With its low cost of entry, fast implementation, measurable impact on costs and productivity
- **Pre-built.** Start with pre-built BI reports and dashboards incorporating the industry leading practices on top of Industry Standard Reference Data model (ARTS)
- **Oracle Products.** Oracle components like OWB, Oracle Data Warehouse, OLAP, Data Mining and OBIEE in combination with Retail Industry

Reference Data Model - ARTS

- Association for Retail technology Standards provides ARTS - the standard based data model for retail industry
  - Not restricted to DW alone. Can be used for SOA, ODS or other data integration effort
  - Relevant (up-to-date) for retailers needs
  - Repository driven
- ARTS data model applies to different segments of retail industry

Home Office Business Level
- Customer Relationship Management
- Finance & Accounting
- Advertising
- Merchandise Planning, Pricing & Aquisition
- Human Resource Management
- Catalog Management

Distribution Centre (Warehouse) Business Level
- Bulk Receiving
- Storage
- Distribution
- Traffic Flow
- Logistics

Retail Store Business Level
- Customer Relationship Management
- Receiving & Ticketing
- Breakdown bulk into retail items
- Merchandise display, pricing & sales
- Customer returns & special orders
- Collect Tender
- Manage Workforce
- Track & report store operation performance

ARTS Retail Subject Area Composition

- The ARTS Retail Data Model currently supports following business areas
  - Merchandise flow management
  - Inventory management
  - Item and price maintenance
  - Point of sale processing
  - Tender control
  - Store administration/operations
  - Customer relationship management
  - Sales and productivity reporting
  - Ordering (partially supported)
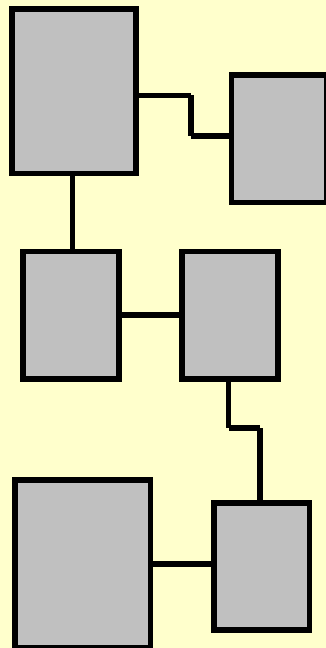 - Workforce Management (partially supported)

RBIA Architecture
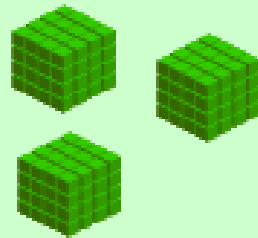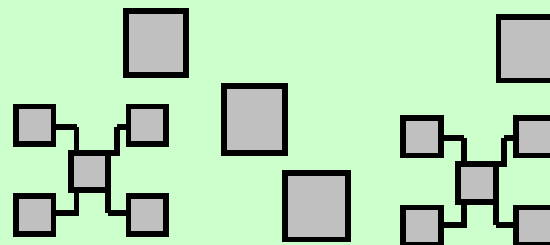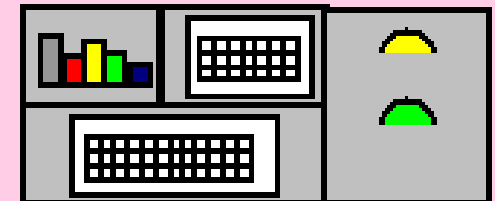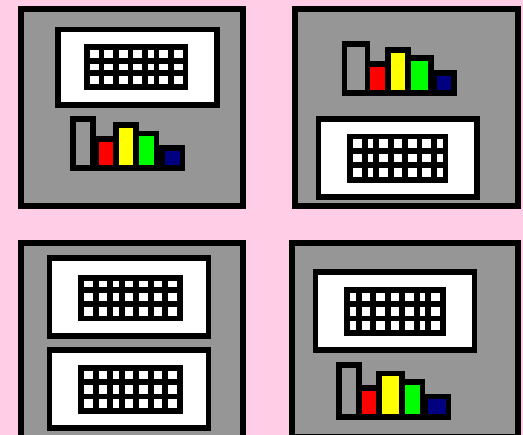
RBIA Technical Overview

About – Shyam Varan Nath

- Specialist Master in Deloitte Consulting – Technology Integration, Information Management Practice
- Skills in Oracle BI, DW, Data Mining etc
- Certified DBA – OCP on 4 different RDBMS versions since 1998
- Spoke in NYOUG in 2006 (Quarterly and Annual Day), was part of Oracle Corporation – BI Consulting Practice
- Speaker in IOUG/Collaborate, Oracle Open World
- Founder and President of Oracle BI, Warehousing and Advanced Analytics, SIG or Oracle BIWA SIG
- Other Industries – Telecomm, Healthcare, Banking/Finance, Law Enforcement
- Bachelor' in EE from Indian Institute of Technology (IIT Kanpur)
- Masters – MBA and MS in Computer Science (Florida Atlantic University, Boca Raton, FL)

http://OracleBIWA.org

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Oracle BIWA Summit 2008 is a forum for business intelligence, warehousing and analytics professionals to exchange information, experiences and best practices.
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   Director of Research
   Accenture Institute for High Performance Business
Juan Loaiza - Vice President of Systems Technology Group, Oracle Inc.
Ray Roccaforte - Vice President of Data Warehousing and
   Business Intelligence Platform, Oracle Inc.
Usama Fayyad - Chief Data Officer, Yahoo! Inc.
	• Hands-On Workshops

• 3 Tracks of Technical Talks with More than 75 sessions running in 6+ parallel rooms	• Solution Showcase
• Meet the Oracle Experts	• Solution Providers Sessions
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IOUG Contribution Award 2007

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TECHNOLOGY NETWORK

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PRODUCTS
Database
Middleware
Developer Tools
Enterprise Management
Applications Technology
Products A-Z

TECHNOLOGIES
BI & Data Warehousing
Embedded
Java
Linux
.NET
PHP
Security
Windows Server System
Technologies A-Z

ARCHITECTURE
Enterprise 2.0
Extreme Transaction Processing
Grid
Service-Oriented Architecture
Virtualization

COMMUNITY
Join OTN
Oracle ACEs
Oracle Wiki
Blogs

COMMENT: In The Field

New IOUG Award Is Double Honor
By Ari Kaplan

BOOKMARK

From the Oracle Contribution Award to Ken Jacobs to Tom Kyte

It's not often that a single award can honor two people, but that's what the Independent Oracle Users Group (IOUG) has done with one award this year.

The Oracle Contribution Award has been one way that the IOUG has recognized extraordinary contributions by Oracle employees to the user group and the user community. Each year at the annual COLLABORATE conference, which is cosponsored by the IOUG, the Oracle Applications User Group, and Quest, the IOUG has presented this award to an Oracle employee for outstanding dedication and service to the user group community.

Through this award, the IOUG has acknowledged people who have positively affected the success of the IOUG through their support of the organization. Recent recipients of the Oracle Contribution Award include Shyam Varan Nath (2007), Mary Lou Dopart (2006), James Hobbs (2005), Ken Jacobs (2004), Mary Ann Zirelli (2003), and Kate Kerner (2002).

The IOUG Is Pleased to Rename...

The IOUG has renamed the Oracle Contribution Award after Ken Jacobs, Oracle's vice president of product strategy in Oracle Server Technologies, for his many contributions to Oracle users. The years that Ken Jacobs has provided support, strategic guidance, and leadership to the IOUG have truly made a mark on our organization, and we very much appreciate all that he has done for the IOUG.

Jacobs has had an extensive career with Oracle, including helping to establish the first Oracle office in Washington DC in 1981; serving in various consulting, support, product management, and product marketing capacities; and helping to guide the development of the Oracle Database product over the years.

Market Basket Analysis – from Cross-sell / Up Sell

The Product Includes:

Industry Specific DW DW Data Model

- ✓ Industry Standard (ARTS) Compliant
- ✓ 3rd Normal Form -LDM, PDM
- ✓ Dimensional (STAR & OLAP)

Oracle Tech Stack

- ✓ Database 10GR2 EE With Options: Partitions, OLAP, Data Mining
- ✓ Oracle Designer
- ✓ OBI EE

Industry Specific DW Content

- ✓ Pre-built DW with 650+ Tables and 10500+ attributes
- ✓ Pre-built OLAP Cubes (15+)
- ✓ Pre-built Data Mining Models (10+)
- ✓ Pre-built Reports (320+) with Role based Dashboards
- ✓ Intra ETL using OWB
- ✓ Leveraging 10gR2 DW features including Statistics & Advanced SQL

Database EE 10g.R2 Platform

Role-Based Dashboard

Retail BI Warehouse Data Model

Oracle Database 10g (Enterprise Edition)

- OLAP
- Data Mining
- Partitioning
- RAC
- Spatial

Reference Data Model in RBIA

Items & SKU's

✓ Service, Prepared, Construction, Collection

✓ Inventory, Pricing, Shelf Rule

✓ Selling, Deposit, Spiff, Restriction Rule

✓ Vendor Item, Flavor, Variety, Manufacturer, Syndicated data, POS Identity

✓ Flexible Hierarchy

Organization

✓ Store, Warehouse, DC, e-Commerce

✓ Market Areas, Trading Areas, Touch points

✓ Inventory Location, Selling Location

✓ Syndicated Data

✓ Flexible Hierarchy

Vendor

✓ Appointment, Contract

✓ Factor, Rating, Deal, Discrepancy Rule

✓ Vendor Item, Assignment to Business Unit

Location / Geography

✓ Syndicated Data
✓ Flexible Hierarchy
✓ Related Address

Employee

✓ Flexible Roles, Schedules & Tasks

✓ Splits, Commissions & Spiffs

Customer

✓ Affiliation
✓ Prospect
✓ B2B & B2C
✓ Syndicated Data

Time

✓ Time

✓ Types of Calendar, Transformation

✓ Flexible

Base Data Model – Third Normal Form

POS System (ARTS 5.0 Compliant)

- ✓ Control: Internal Transfer, Security
- ✓ Retail : Sale Return, No Purchase, Tender, Till
- ✓ Store Financial: Tender Deposit/Loan/Pickup
- ✓ Transfer, Receipts
- ✓ Reference to Customer Order

Order Management)

- ✓ B2C & B2B: Reference to POS
- ✓ Back Office State:
    - ✓ AB^3C: Fulfillment, Shipping, Partial Shipment, Delivery
- ✓ Front Office State:
    - ✓ Create, Add/Change/Delete
    - ✓ Pickup, Partial Pickup, Return, Layaway

Inventory

- ✓ Receipts, Requisition, Transfer, Return
- ✓ Inventory State
    - ✓ On Hand, On Order, On Layaway
    - ✓ Damaged, To Be Returned
    - ✓ Shrinkage

Merchandising & Category Mgmt

- ✓ Movements, Space Allocation, Shrinkage
- ✓ Syndicated Data, Clustering
- ✓ Mark Up/Down, Clearance

Events & Promotions

- ✓ Events, Campaign, Media, Launch
- ✓ Creatives, Message, Depiction,& Rendering

Planning & Budgeting

- ✓ Merchandise &
- ✓ Category Sales Plan
- ✓ Stores Sales Plan
- ✓ Promotions Sales Plan, Budget
- ✓ Marketing Budget

Aggregate Data Model (Facts and Dimensions)

Retail Sale, Return, Tender, Markdown, Till

- ✓ Day/Week @
- ✓ Item/Subclass/Dept
- ✓ Employee/Touch Points
- ✓ Override, Discount
- ✓ Time Series
- ✓ Flow Analysis
- ✓ POS, Tender

Inventory Position

- ✓ Day/Week @, Item/Subclass/Dept
- ✓ .Out-of-stock, Zero Selling
- ✓ Forecast
- ✓ Time Series

Merchandising Category

- ✓ Scorecard
- ✓ Items, Employee, Customer, Frequent Shopper
- ✓ What-if
- ✓ Forecast & Time Series

Actual vs. Plan

- ✓ Forecast & Time Series
- ✓ Merchandise & Category
- ✓ Stores Sales Plan
- ✓ Promotions

Customer Order

- ✓ Day/Week @ Item / Subclass / Dept
- ✓ Employee / Touch Points

Events & Promotions

- ✓ Actual vs. Plan vs. Updated Plan
- ✓ Contribution:
- ✓ Campaign, Media
- ✓ Message, Rendering
- ✓ Forecast & Time Series
- ✓ RFMP, Migration

Derived Data Model (Data Mining)

Retail Sale, Return, Tender, Markdown, Till

- ✓ Day/Week @
- ✓ Item/Subclass/Dept
- ✓ Employee/Touch Points
- ✓ Override, Discount
- ✓ Time Series
- ✓ Flow Analysis
- ✓ POS, Tender

Inventory Position

- ✓ Day/Week @, Item/Subclass/Dept
- ✓ .Out-of-stock, Zero Selling
- ✓ Forecast
- ✓ Time Series

Merchandising Category

- ✓ Scorecard
- ✓ Items, Employee, Customer, Frequent Shopper
- ✓ What-if
- ✓ Forecast & Time Series

Actual vs. Plan

- ✓ Forecast & Time Series
- ✓ Merchandise & Category
- ✓ Stores Sales Plan
- ✓ Promotions

Customer Order

- ✓ Day/Week @ Item / Subclass / Dept
- ✓ Employee / Touch Points

Events & Promotions

- ✓ Actual vs. Plan vs. Updated Plan
- ✓ Contribution:
- ✓ Campaign, Media
- ✓ Message, Rendering
- ✓ Forecast & Time Series
- ✓ RFMP, Migration

Pre-built Advanced Analytics

Mining Model

Clustering Algorithm
✓ Item basket
✓ Associate basket
✓ Customer bundle
✓ Frequent shopper
✓ customer bundle

Classification / ABN
✓ Store loss
✓ Associate loss
✓ Item POS loss
✓ Associate Sales

Decision Tree
✓ Price Elasticity
✓ Customer Price
✓ Elasticity

OLAP Model

Times Series
✓ POS Flow Analysis
✓ In-store Sales
✓ Tender & Till

Forecasting
✓ Out-of-Stock
✓ Store Compensation
✓ Promotion Analysis
✓ Cost & Contribution
✓ Sales & Margin

What If
✓ Loss prevention
✓ Transaction Analysis
✓ Shrink Analysis
✓ Customer Value
✓ Frequent Shopper
✓ Customer RFM

Screenshots and Demos

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Login to the RBIAA

RBIA - OBIEE Screens

http://localhost:9704/analytics/saw.dll?Dashboard&_scid=IhFpXbd*vhw&PortalPath=/shared/Customer/_Portal/Demogr

Internet Explorer cannot di... | Oracle BI Interactive Da... X

ORACLE Interactive Dashboards

My Dashboard Advanced Analytics Category **Customer** Inventory Loss Prevention Merchandise Mining Analysis OLAP Order
Management POS Promotion Store Operation Workforce

Demography Welcome, rbiaii!

Dashboards – Answers – More Products ▽ – Settings ▽ – Log Out

HouseHold Analysis | Age Band | Frequency Defection | Cluster Mailing List | Customer Loyalty Analysis

Page Options ▽

Business Year 'BY 2003'
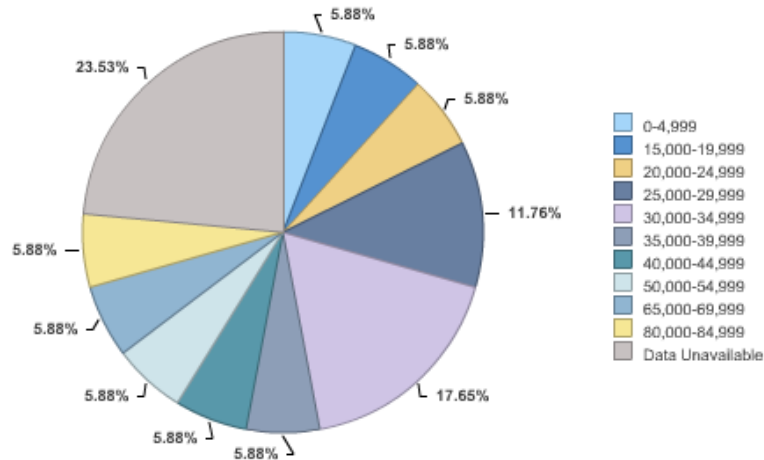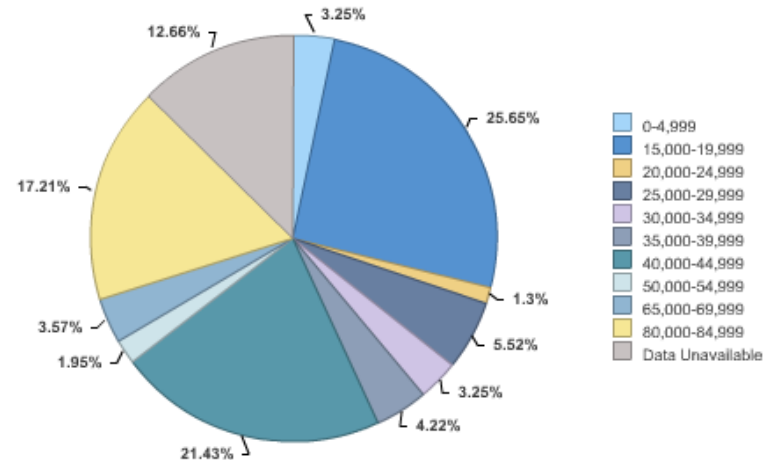**Household Size Band Range** 'House with 1 P' Go

Customer Demographics by Income and Household Size

Customer With Sales

5.88% , 5.88%, 5.88%, 11.76%, 23.53%, 5.88%, 5.88%, 5.88%, 5.88%, 17.65%

% of Sales Value

3.25%, 12.66%, 25.65%, 17.21%, 1.3%, 5.52%, 3.25%, 4.22%, 21.43%, 1.95%, 3.57%

Legend: 0-4,999; 15,000-19,999; 20,000-24,999; 25,000-29,999; 30,000-34,999; 35,000-39,999; 40,000-44,999; 50,000-54,999; 65,000-69,999; 80,000-84,999; Data Unavailable

		House with 1 Person		
Business Year	Income Band Range	Customer With Sales	Sales Value	% of Sales Value
	0-4,999	1	$1,000	3.25%
	15,000-19,999	1	$7,900	25.65%
	20,000-24,999	1	$400	1.30%
	25,000-29,999	2	$1,700	5.52%

Done Local intranet | Protected Mode: Off 100%

Loss Prevention – Shrink & Theft
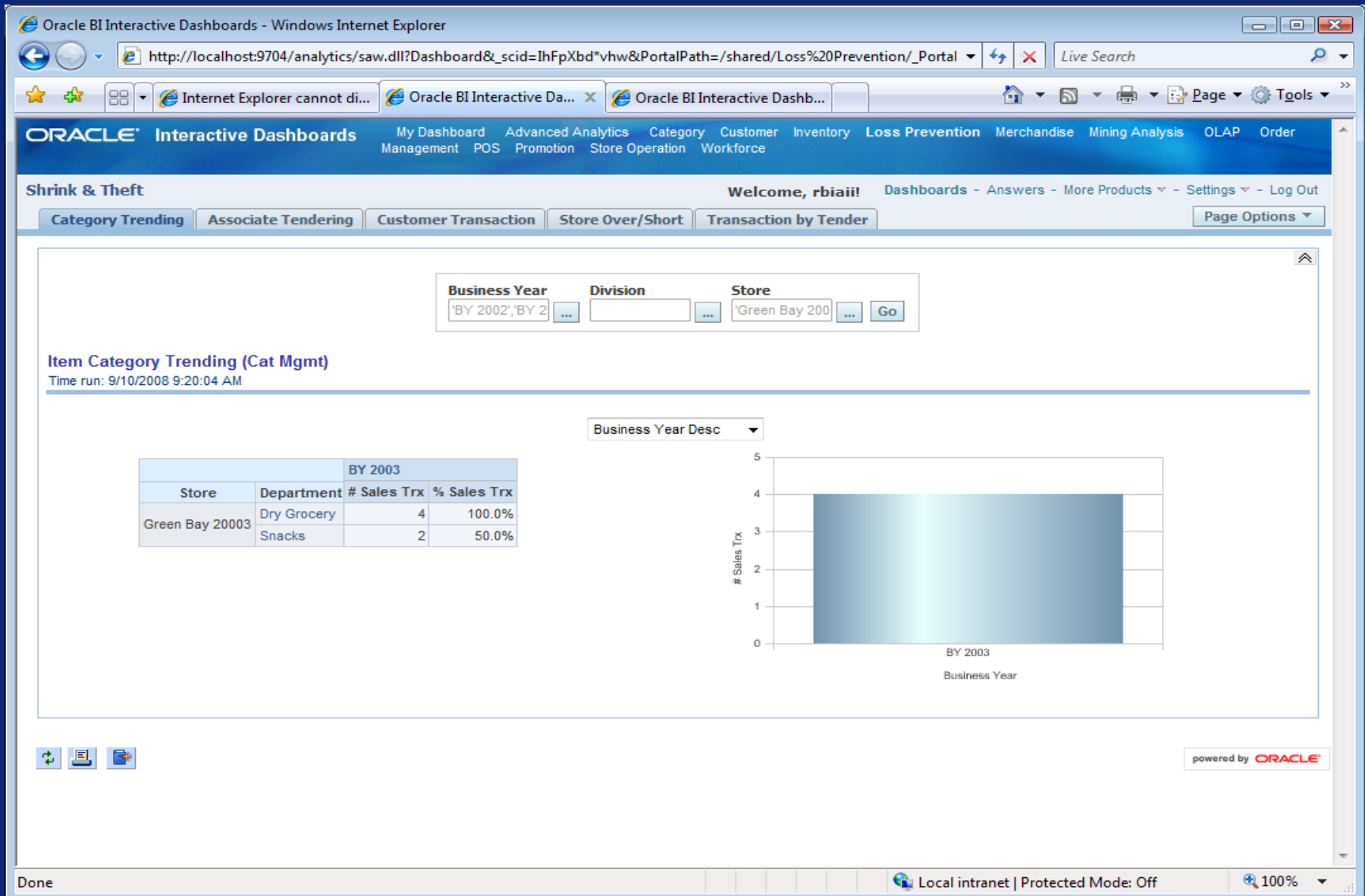
Typical Problems Addressed by ODW-R

- Determining how are my catalog and internet sales performing?

- Determining what is my gross margin return on space?

- Determining how is the business doing compared to last year? Compared to plan?

- Determining what are my potential out-of-stock situations?

- Determining if the product assortment is optimal for all my regions Retaining customers and

- avoiding churn

- Profiling customers to understand behavior

- Finding rare events Maintaining and improving profit margins

- Targeting customers with the right offer and thus reducing customer acquisition costs
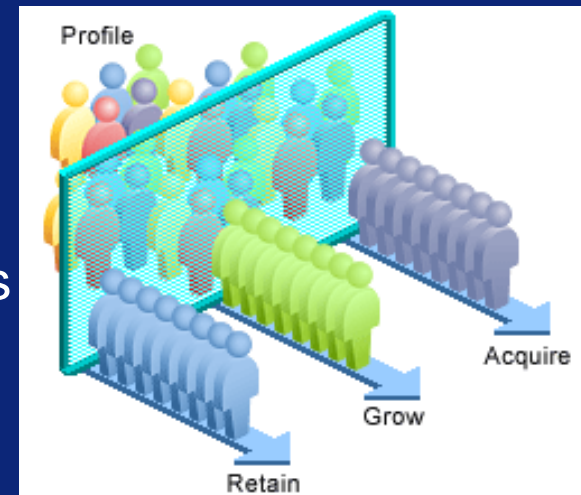
Installing the RBIA – the tech stack

1. Install Oracle software—DB and BIEE.
2. Install ODWR (OUI part)
3. Post-Installation (OLAP, OWB)

Installation creates in BIA_RTL schema:

- Physical tables (base/reference/lookup/derived)
- Materialized Views (for aggregate)
- Views
- MV Logs for Materialized Views
- Indexes
- Primary Foreign Key constraints
- Sequences
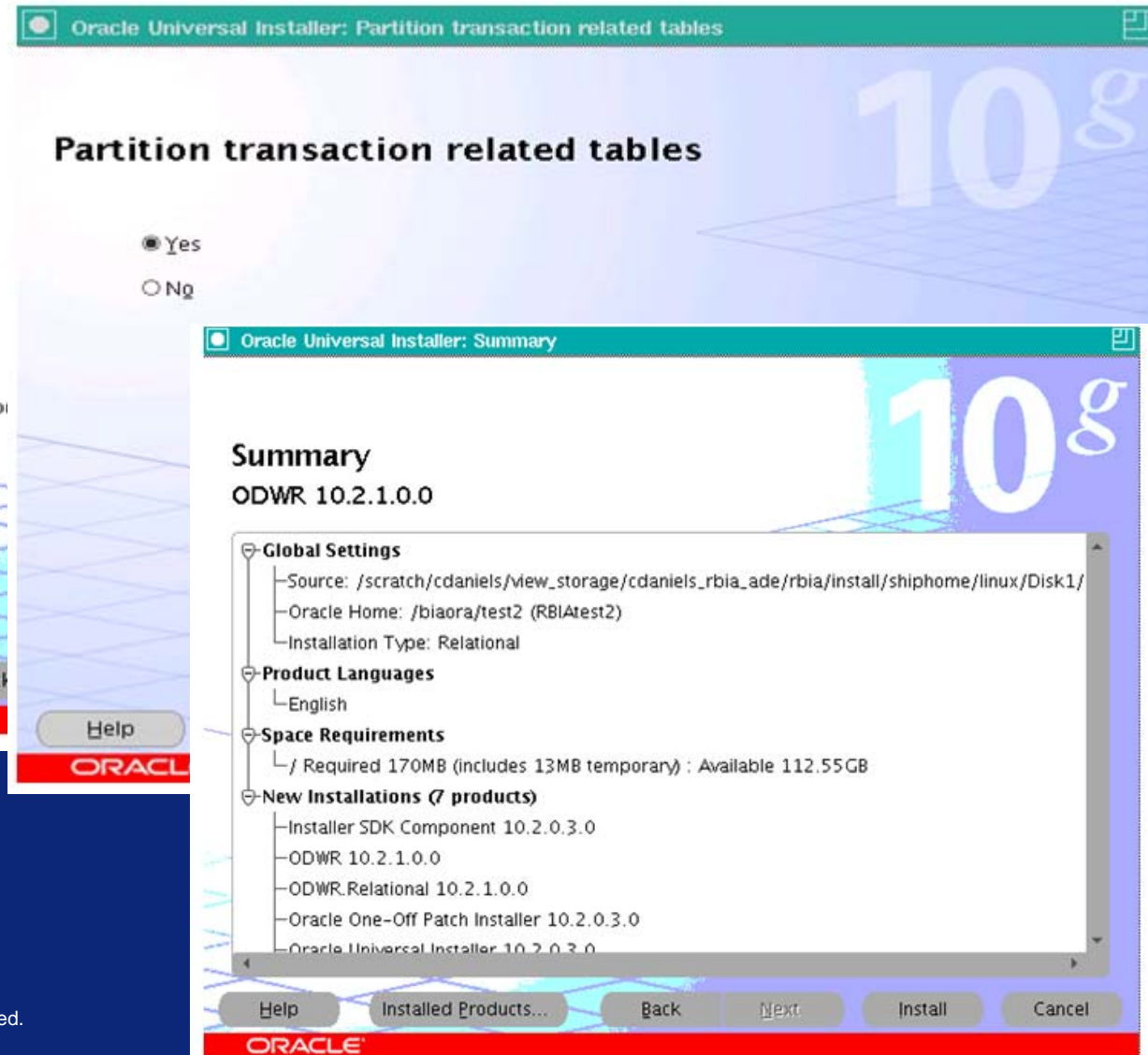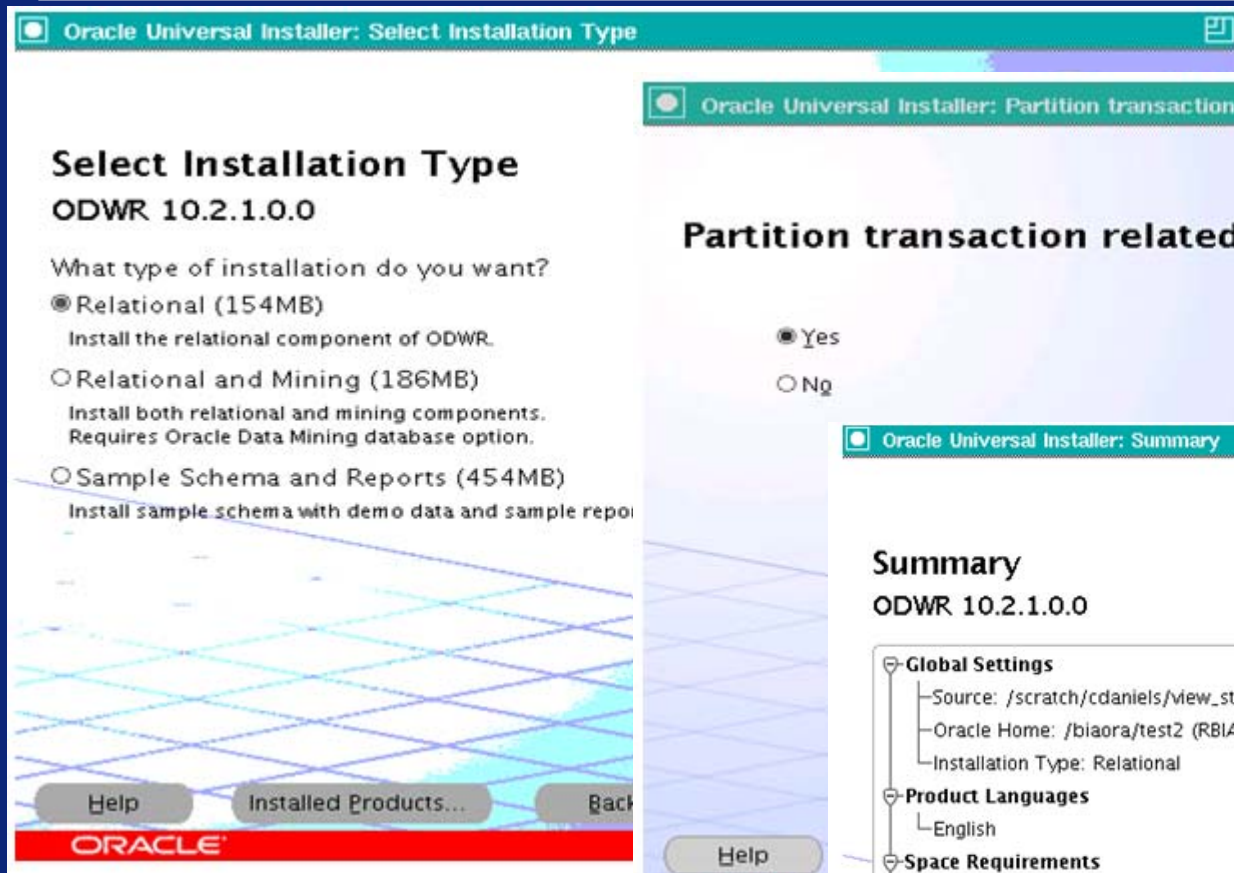- Intra-ETL from Base to Derived & Aggregate

```
C:\Windows\system32\cmd.exe - sqlplus "/ as sysdba"
SQL> select username from dba_users order by 1;

USERNAME
------------------------------
ANONYMOUS
BIA_RTL
BIA_RTL_MINING
BIA_RTL_OLAP
CTXSYS
DBSNMP
DIP
DMSYS
EXFSYS
HR

USERNAME
------------------------------
IX
MDDATA
MDSYS
MGMT_VIEW
OE
OLAPSYS
ORDPLUGINS
ORDSYS
OUTLN
PM
SCOTT

USERNAME
------------------------------
SH
SI_INFORMTN_SCHEMA
SYS
SYSMAN
SYSTEM
TSMSYS
WMSYS
XDB

30 rows selected.
```

Install - Screenshots

Oracle Universal Installer: Select Installation Type

Select Installation Type
ODWR 10.2.1.0.0

What type of installation do you want?

⦿ Relational (154MB)
   Install the relational component of ODWR.

◯ Relational and Mining (186MB)
   Install both relational and mining components.
   Requires Oracle Data Mining database option.

◯ Sample Schema and Reports (454MB)
   Install sample schema with demo data and sample repo

Help   Installed Products...   Back

ORACLE

Oracle Universal Installer: Partition transaction related tables

10^g

Partition transaction related tables

⦿ Yes

◯ No

Help
ORACL

Oracle Universal Installer: Summary

10^g

Summary
ODWR 10.2.1.0.0

⊟ **Global Settings**
  ├ Source: /scratch/cdaniels/view_storage/cdaniels_rbia_ade/rbia/install/shiphome/linux/Disk1/
  ├ Oracle Home: /biaora/test2 (RBIAtest2)
  └ Installation Type: Relational
⊟ **Product Languages**
  └ English
⊟ **Space Requirements**
  └ / Required 170MB (includes 13MB temporary) : Available 112.55GB
⊟ **New Installations (7 products)**
  ├ Installer SDK Component 10.2.0.3.0
  ├ ODWR 10.2.1.0.0
  ├ ODWR.Relational 10.2.1.0.0
  ├ Oracle One-Off Patch Installer 10.2.0.3.0
  └ Oracle Universal Installer 10.2.0.3.0

Help   Installed Products...   Back   Next   Install   Cancel

ORACLE

Install – OLAP and Mining

Post-Installation Steps

- Unlock the accounts

The installer will lock the BIA_RTL and BIA_RTL_MINING

database accounts at the end of the installation.

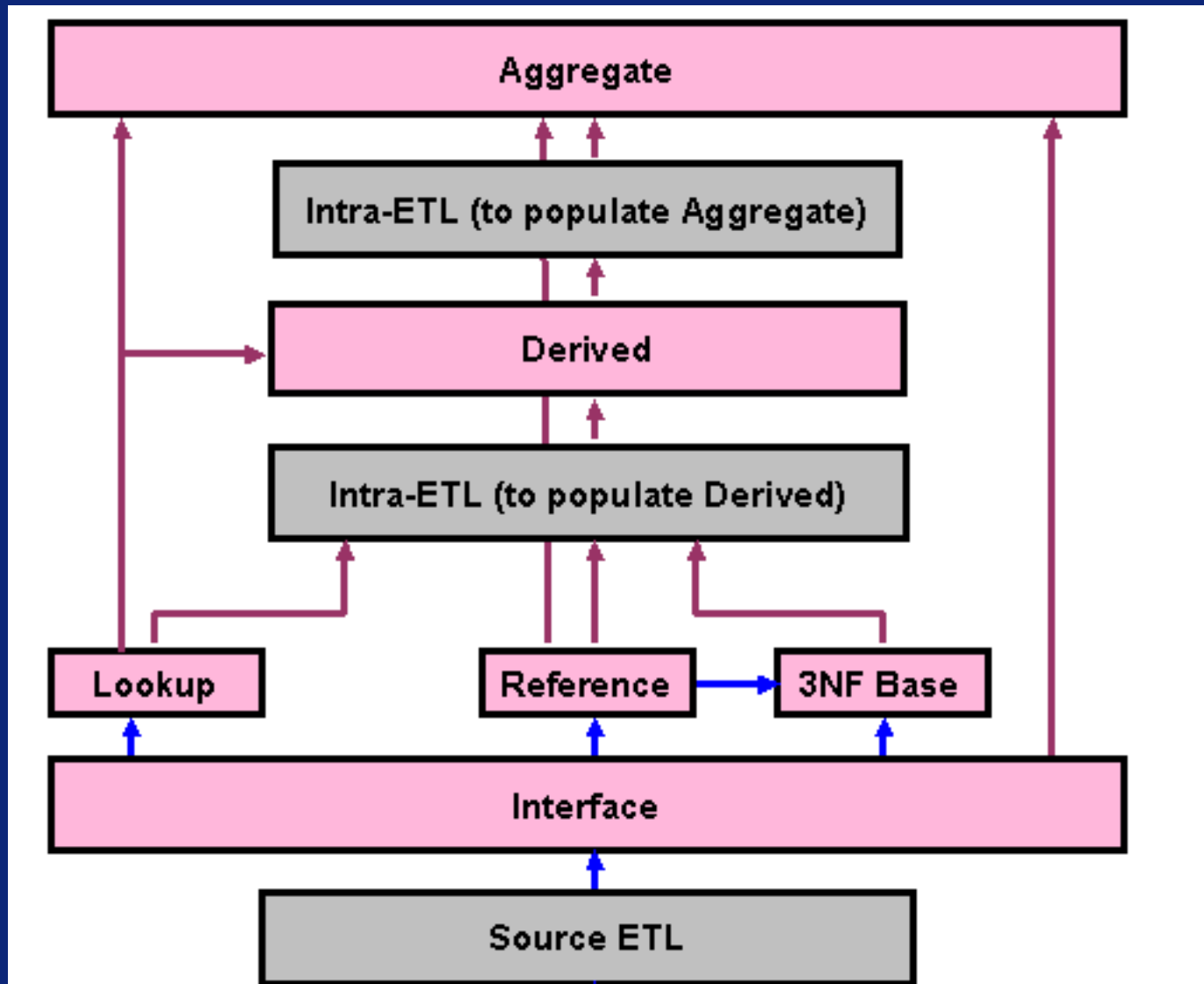Login your database with DBA ID and PW to unlock these accounts:

(For BIA_RTL)

SQL> alter user bia_rtl account unlock;

 User altered.

 (For BIA_RTL_MINING)

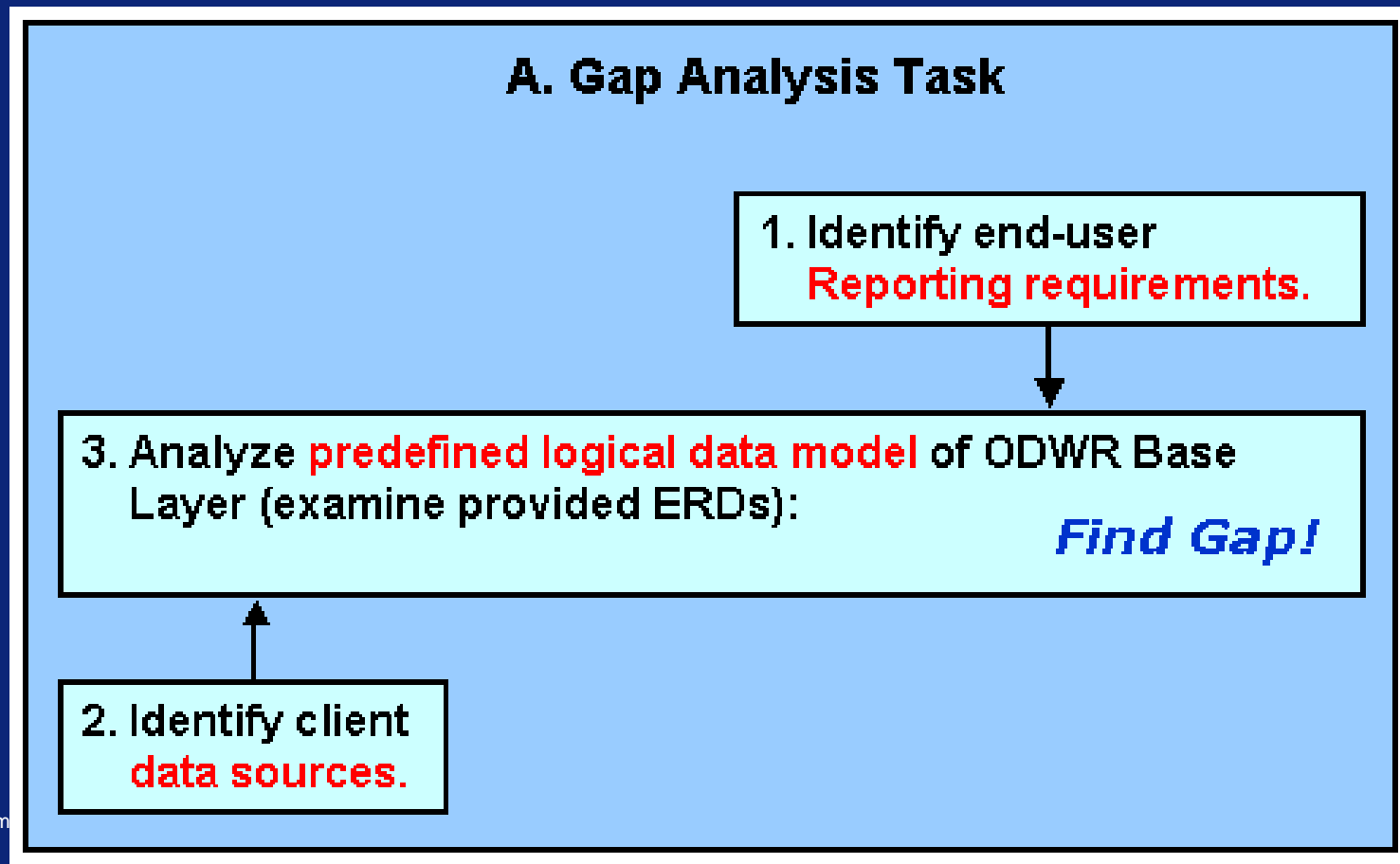SQL> alter user bia_rtl_mining account unlock;

 User altered.

- Install OBIEE Repository, Catalog
- OLAP and ODM components

System Flows

Customizing the Solution

• Fit-Gap Analysis

• The first task is to determine what is the gap between end-user reporting requirements and the predefined logical data model

A. Gap Analysis Task

1. Identify end-user
   Reporting requirements.

3. Analyze predefined logical data model of ODWR Base Layer (examine provided ERDs):

   Find Gap!

2. Identify client
   data sources.

…Customizing the Solution

- Modify the logical model and generate scripts
- Change the physical layer using the changes
- Make changes to ETL to populate the base layer

B. Tasks to Perform *Before* Populating Base Layer

4. Modify logical model as necessary.	Run scripts →	5. Instantiate the Base Layer physical model using provided scripts.

Run scripts ↑

6. Run scripts to populate the Base Layer physical model.
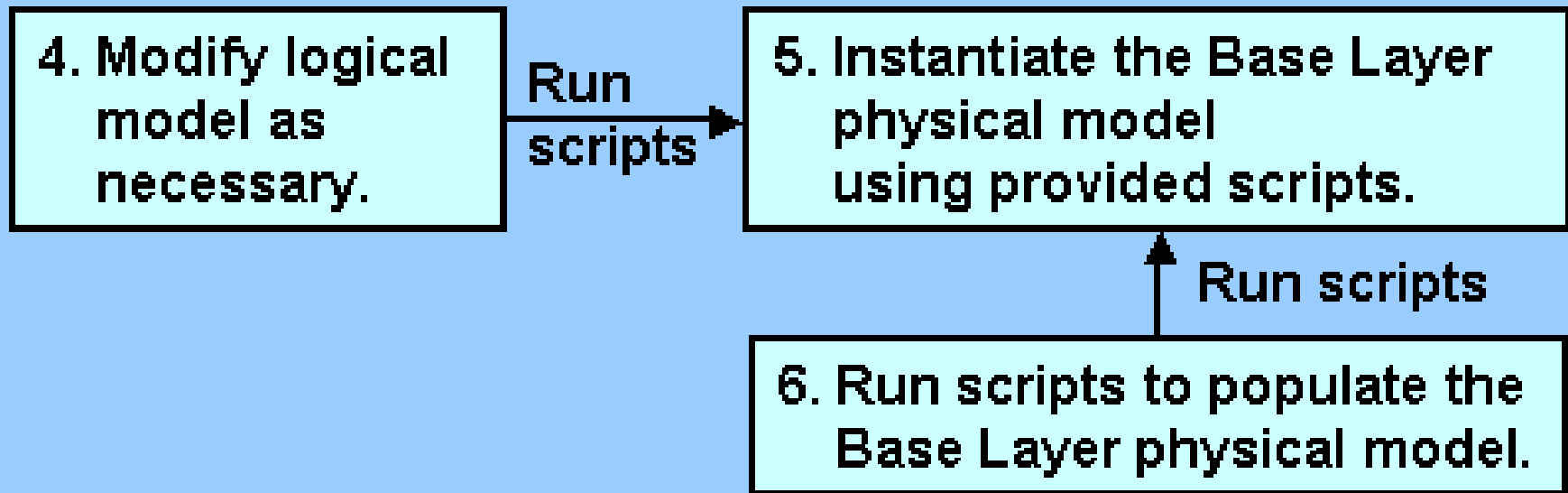
Tasks to Perform on Analytic and Reporting Layers

- Modifying the models of the Analytic layer (OLAP, Data Mining), as needed
- Modifying the reports and dashboards (OBIEE), as needed

C. Tasks to Perform on Derived and Aggregate Layers

7. Modify relational, MOLAP, and mining models as necessary.

8. Modify reports and dashboards as necessary.

Changing the OBIEE Layer – Reports and Dashboards

- Workflow to changing the OBIEE Reports

OBIEE – Three Layers

Checklist to Customize the RBIA

- Business requirement/ gap analysis , Source to target data element mapping
- **Logical data model and report design enhancement based on gap analysis**
- **Physical database design customization/enhancement based on logical data model enhancement in the following areas:**
    - **Aggregate Layer**
    - **Derived Layer**
    - **Base Layer**
    - **Interface Layer**
- Data staging strategy finalization
- ETL specification preparation
- ETL scripting, mappings and process flows definition (preferably using OWB)
- Intra-ETL changes
(ETL between Base->Derived->Aggregate)
- BI solution customization/enhancement (based on gap analysis finding)
    - Prepackaged ETL scripts
    - BI reports – relational
    - OLAP cubes and reports , Mining models and reports

Supporting Threads

- BI solution system testing
- User documentation – operation manual with ETL process details and so on
- User training
- User acceptance testing
- BI solution deployment in production environment
- Production data load into the data warehouse
  - Initial
  - Incremental
- Maintenance support

Summary

- Looked at needs of Retail Industry

- Looked at how Business Intelligence and Advanced Analytics can help solve some of the Retail issues

- Use of BI Accelerator – reduce risk and speed up the technology implementation

- Some screen shots and sneak peak

Questions

- Contact info:
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