ORACLE 9I OLAP SERVICES AND EXPRESS—WHAT NOW?

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PREFACE

At the time of this writing (February, 2001), Oracle 9i is still in development. Limited access to information has prevented a thorough review of Oracle 9i OLAP Services. More information should be available once beta copies of Oracle 9i become available. The IOUG-A Live! presentation will include more information on Oracle 9i OLAP Services.

INTRODUCTION

Oracle is finally doing it. It will have taken six years since Oracle purchased Express from Information Resources, Inc. (IRI), but Express is finally being integrated into its flagship RDBMS engine. Oracle 9i OLAP Services represents a major change in how OnLine Applications Processing (OLAP) data is stored in Oracle. Data is now stored relationally, but presented multidimensionally. At least at Oracle, the OLAP wars are over; relational OLAP (ROLAP) won.

HISTORY

To understand what has changed, it is best to start back at the beginning of Express. The Express language and environment has gone through many changes over the years. Express has been purchased by various companies searching for an analytic platform for decision support applications.

EXPRESS IS BORN

Express was started by several people from MIT who needed a platform to develop decision support applications. In the 1970's, their company, Management Decision Systems (MDS), developed this into a product on the Primos and IBM Virtual Machine (VM) platforms. This product was eventually called *Mainframe Express* (MFX) or "classic Express." In 1985 the product was rewritten in C and ported to the PC platform running MS-DOS. This product would be known as *pcEXPRESS*. The language went through several changes at this time, but the underlying concepts used remained the same—storing data in multidimensional arrays.

IRI ACQUIRES MDS

Information Resources, Inc. (IRI) had been using Express as a platform to analyze its consumer packaged goods supermarket scanner data. In 1985, IRI purchased MDS and eventually developed *DataServer* (later renamed Oracle Sales Analyzer) as a software product designed to deliver its scanner data and the analysis tools required by its clients. Along the way, IRI ported the new pcEXPRESS database engine to various mainframe environments and added many extensions still found in Express today.

ORACLE PURCHASES EXPRESS

In 1995, Oracle Corporation needed a tool to analyze its financial data and was impressed enough with Express and the product eventually renamed Oracle Financial Analyzer that they bought the Express product line from IRI. Oracle opted to keep the Massachusetts-based development team in a separate division rather than integrate the developers into its California-based organization. Oracle attempted to integrate Express into its flagship RDBMS product offering, especially with its Relational Access Manager offering, but never truly integrated the tools or databases. In 1998, Oracle integrated the development teams into the rest of its organization. Major enhancements necessary to support data warehouses in the RDBMS made possible delivering OLAP functionality directly out of the RDBMS engine, and the OLAP Services project was started as part of Oracle 9i development.

OLAP SERVICES INTRODUCED

OLAP Services changes the way that Oracle-based OLAP data is stored and OLAP applications are built. Data is now stored natively in the RDBMS. Access to the data is through a new Java OLAP API (application programming interface). BI Beans provides a new interface for accessing the data. Managing OLAP data no longer requires knowledge of an environment foreign to traditional RDBMS developers and DBAs.

SO WHAT'S WRONG WITH EXPRESS?

Express is a multidimensional database management system (MDBMS). All data is stored in a proprietary binary file that Express manages. In order to interact with this data, a user must become familiar with different concepts, a different set of database management tools, a different set of user interfaces, and a different computer language. Many of the numerous DBA's and developers raised on Oracle RDBMS technology resist learning yet another environment. This has hindered the acceptance of Express. Add to this the complications of moving data between an RDBMS and a MDBMS and it's no wonder that Oracle has opted to move the data storage into its RDBMS engine.

STORING DATA RELATIONALLY INSTEAD OF MULTIDIMENSIONALLY

At its heart, OLAP Services is about storing data in a series of standard relational tables of rows and columns and accessing the data as if it is stored multidimensionally. This, of course, enables standard Oracle tools such as loaders, backup utilities, and data management tools to be used against this data. Materialized views enable higher-level totals to be stored in a data warehouse for efficient access, eliminating many of the traditional performance problems in ROLAP systems. By placing the responsibility for maintaining these materialized views in the server database (instead of application code), applications are greatly simplified and are much less error prone.

RDBMS DATA ACCESS CATCHES UP TO MDBMS DATA ACCESS

Traditionally, one of the key benefits of a MDBMS has been fast data access. Array access is inherently fast because a DBMS can calculate the exact position to locate a cell of data through simple multiplication and addition—no indexes required. See *How Does Express Really Work Anyway* at www.vlamis.com for more information. As larger multidimensional databases are stored with greater sparsity, the need to efficiently compress out NA values with structures such as conjoints and composites has mitigated this advantage. In addition, advanced index methods such as bitmapped indexes have improved RDBMS access for data warehousing purposes. RDBMS systems are finally up to the task of managing OLAP data.

JAVA OLAP API PROVIDES DATA ACCESS

The new Java OLAP API is the translation layer that marries the multidimensional interface required by true OLAP applications to the RDBMS storage layer. Features such as multidimensional cursors enable rapid access to any cell of data and built-in knowledge of concepts such as selection scripts enable application developers to concentrate on application development instead of selection management.

BI BEANS ENABLE RAPID APPLICATION DEVELOPMENT

While the Java OLAP API enables Java programmers to access OLAP Services data, most developers will want to use Oracle's enterprise Java Beans for Business Intelligence (BI Beans) to develop applications. These enterprise Java Beans provide the visual interface to interact with OLAP Services data. Although BI Beans will work in many standard Java Beans integrated development environments, Oracle will deliver wizards with JDeveloper that simplify the task of developing OLAP applications.

WORKING WITH OLAP SERVICES

OLAP Services is part of Oracle 9i. It is so integrated with the rest of the RDBMS that it is not possible to install just OLAP Services without the RDBMS. As of the writing of this paper, software is unavailable so descriptions are necessarily vague. Some concepts are very familiar, with seemingly only name changes, while other concepts are totally new.

MANAGING OLAP SERVICES

The OLAP Services management tools are integrated into the rest of Oracle Enterprise Manager. What used to be the Express Instance Manager is now the OLAP Services Instance Manager. Express services has been renamed OLAP Services. While some of the configuration keys have changed, many of the concepts and details remain the same, such as individual sessions, and settings such as ServerDBPath. Other areas have totally changed, such as the replacement of Batch Manager with the job scheduler in Oracle Enterprise Manager and using RDBMS security to control which user ids have rights to manage OLAP Services.

JAVA OLAP API EXAMPLES

The Java OLAP API is the application programming interface that provides multidimensional access to data warehouse data. The API includes primitives that handle typical OLAP needs, such as calculated measures and selection scripts. The following code fragment demonstrates selecting the products where the dollars measure is greater than 1,000,000 for geography Orlando for time period May2001:

```
Source geogSel = geography.selectValue("ORLANDO");
Source timeSel = time.selectValue("MAY2001");
Source result = prodSel;
NumberSource DollSel = (NumberSource) dollars.join(geogSel).join(timeSel).join(prodSel);
Source prodSel = product.select(DollSel.gt(1000000));
```

OLAP Services translates this OLAP API language into SQL, using new SQL primitives such as concatenated rollup, scrollable cursors, and query rewrite for efficient access.

BI BEANS ENABLE ACCESS TO OLAP DATA FOR THE MASSES

BI Beans are enterprise JavaBeans that provide access to OLAP Services calls through a standard interface. Some Beans are "back-end" beans that supply services such as database connections, while others are user interface beans such as Table, Crosstab, and Graph. These form the heart of an OLAP user interface.

MIGRATING EXPRESS APPLICATIONS

Details on migration paths for existing Express applications are still sketchy, but clearly with the storage changing to the RDBMS and the user interface changing to JavaBeans, applications will be affected. Oracle has publicly stated that Express is not going away and the traditional Express stored procedure language remains intact. In order to fully take advantage of the new interfaces, however, applications will have to change. How much applications have to change will depend on how applications were developed.

IS MIGRATION REALLY NECESSARY?

Oracle has consistently stated that Express will continue. Many applications work fine in their current environment. For many existing Express applications, Express provides the services needed by the application. Each application will have to be evaluated to determine whether the benefits of the new environment based on Oracle 9i justify the changes necessary to migrate to Oracle 9i OLAP Services.

CUSTOM ORACLE EXPRESS OBJECTS APPLICATIONS

Custom applications using custom Express stored procedure code for the back end and Express Objects for the front end will likely need major changes. Loading data into OLAP Services may no longer be necessary if the data is already in the RDBMS. New capabilities such as asymmetric queries may simplify database designs. User interfaces will likely have to be regenerated using a tool such as JDeveloper but new capabilities in BI Beans such as a Calculation Bean will handle some tasks that previously had to be custom coded.

ORACLE SALES ANALYZER AND ORACLE FINANCIAL ANALYZER APPLICATIONS

Oracle Sales Analyzer and Oracle Financial Analyzer databases will likely have an easier time migrating to the new environment. Over time Oracle has integrated these offerings more and more into the rest of the Oracle E-Business Suite offerings. Applications more tightly integrated with the rest of Oracle E-business Suite with no customizations will likely have the easiest time migrating to the new platform.

CONCLUSION

So what does the future hold? Clearly, OLAP Services represents a major leap forward for integration between Oracle's RDBMS and OLAP offerings. This integration makes it possible for all Oracle databases to benefit from OLAP technology. Many of the concepts applicable to Express design carry over to Oracle 9i OLAP Services, but the changes in storage and new user interface possibilities will cause most users of existing Express-based applications to reevaluate what can and can't be done. This is only the beginning…

Oracle 9i OLAP Services and Express—What Now?
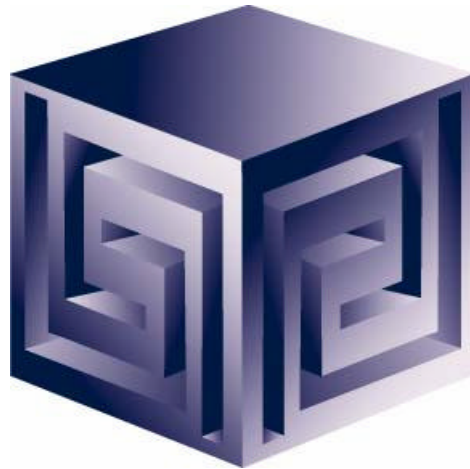
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Vlamis Software Solutions, Inc.

- **Founded in 1992 in Kansas City, Missouri**

- **A Member of Oracle Partner Program since 1995 along with various Oracle Beta Programs**

- **Designs and implements databases/data marts/data warehouses using RDBMS and Multidimensional tools**

- **Specializes in Data Transformation, Data Warehousing, Business Intelligence, Oracle Financials and Applications Development**

- **Founder Dan Vlamis is former developer at Oracle-Waltham office for Sales Analyzer Application**

- **Oracle Certified Solutions Provider** ORACLE® | CERTIFIED SOLUTION PARTNER

Disclaimer

Oracle 9i is still in Development and all statements, illustrations and features shown during this presentation are subject to change.

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Agenda

- **Historical background**

- **Why Oracle 9i Advanced Analytic Services?**

- **What is Oracle 9i Advanced Analytic Services?**

- **Architecture and relationship to BI Beans**

- **Managing Advanced Analytic Services**

- **Java OLAP API (was OLAPI)**

- **Differences from Express**

- **Legacy Express Applications**

Historical Background

- **Express developed in 1970s as DSS platform for consultants from MIT**

- **Developed into "Mainframe Express" on IBM VM and Primos platforms by MDS (Management Decision Systems)**

- **Rewritten in C and released as pcEXPRESS in 1986 by IRI (Information Resources, Inc.)**

- **Ported to multiple platforms as Express MDB**

- **Purchased by Oracle in 1995**

- **Oracle integrates development staff late 1998**

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Requirements of OLAP Systems

- **Multidimensional user view**

- **Drill down, rotate**

- **User-created measures**

- **Iterative discovery process**

- **Multiple levels (embedded totals)**

Do these attributes imply a proprietary MDBMS?

No.

Express Features and Limitations

- Multidimensional data store provides quick access

- All data in single proprietary file

- Express SPL powerful for calcing and extending apps

- GUI environment uses Visual Basic language

- RAM moves data from RDBMS into Express

- Designed for multiple read/only users

- Difficult for IT to adopt, Max database size

- Difficult to integrate and schedule back ups

- Long learning curve for new developers

- Not consistent with Oracle direction

- Star and snowflake only, performance concerns

- No mult-writer support

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Key Developments

- **Integrating Express Server team into Oracle Server team**

- **RDBMS gets OLAP functionality in SQL**

- **Data Warehouse features in Oracle 8i:**
  - **Bitmap and bitmap join indexes**
  - **Materialized views**
  - **Query rewrite**
  - **"N-pass" functions**

- **Increasing use of very sparse data**

- **Oracle focus on integration**

RDBMS Community Bigger than Express Community

Oracle RDBMS DBAs/Developers	Express DBAs/Developers
Oracle RDBMS Tools	Express Tools
Oracle RDBMS Development Staff	Express Development Staff

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Advanced Analytic Services

Business Intelligence Beans

OLAP Services

Java OLAP API

CWM Metadata Provider	SQL Generator	Query Processor	Multidimensional Engine	M-D Metadata Provider
Metadata	Data	Future	Data	Metadata

Oracle Relational Database   **Analytic Workspace**

Forecasts • Models • Allocations Consolidations • Scenarios • Custom Functions
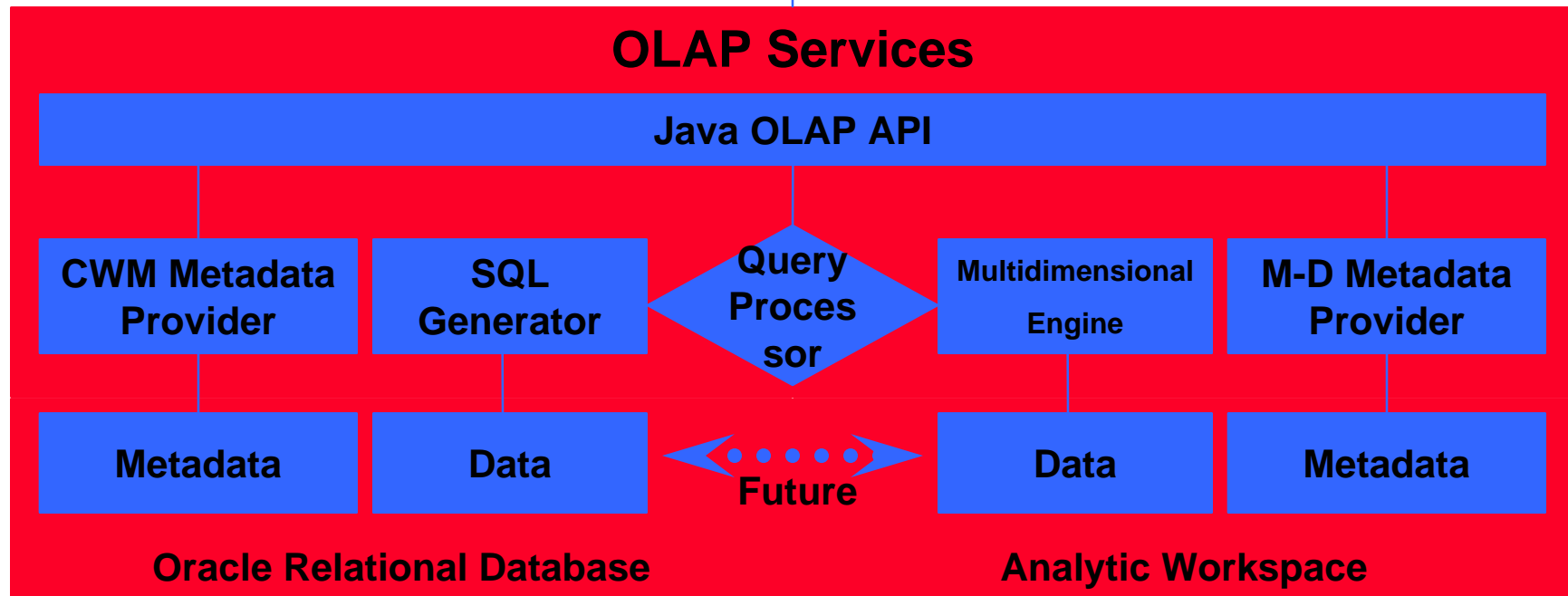
Data Warehouse - Query and Reporting

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Query Processor Details

- **If data in Analytic Workspace: gets data using OLAP DML**

- **If data in RDBMS: generates SQL, using new N-pass functions, etc. to calculate data necessary**

- **Can generate incredibly complex SQL**

- **Data filtered in RDBMS**

Java Development Environment

HTML

Java

iAS

Oracle

Business Intelligence Beans
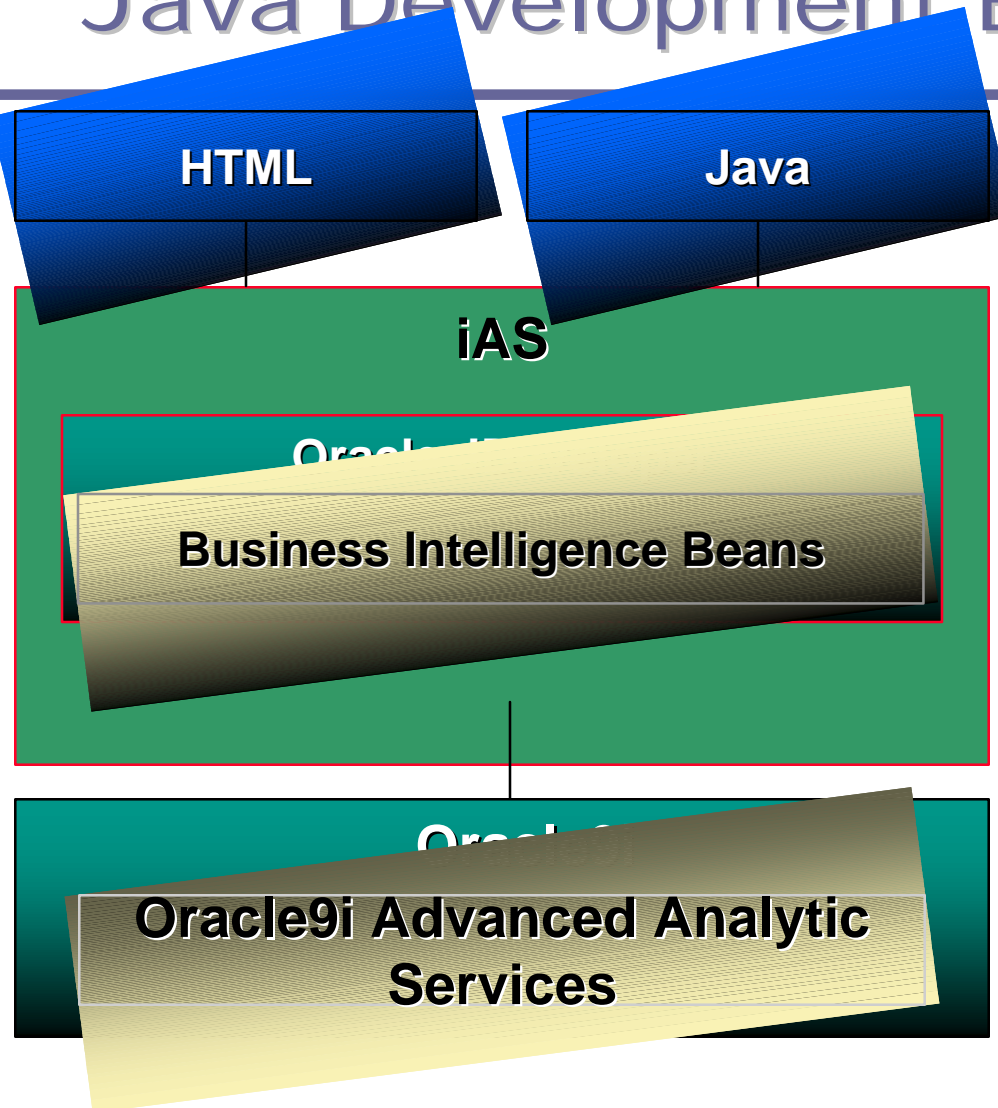
Development

Deployment

Oracle

Oracle9i Advanced Analytic Services

Database Services

Components of Advanced Analytic Services

- **Instance Manager now in Oracle Enterprise Manager**

- **OLAP folder of OEM defines multidimensional structure (replaces RAA)**

- **Java OLAP API accesses data**

- **OLAP Worksheet provides command line to OLAP DML**

- **BI Beans provide linkage to Java OLAP API**

- **JDeveloper is environment for building apps (replaces OEO)**

Administration with OEM

- **Acquiring System Administration Privileges**
- **Starting / Stopping / Pausing OLAP Services**
- **Changing the Configuration Settings**
- **Managing Sessions**
- **Viewing Status Messages**
- **Granting Access Rights to Users**
- **Creating Databases (Metadata, dimensions, Measures and Cubes)**
- **Running Batch Jobs**
- **Scheduling Jobs**
- **Managing the Service Environment**
- **Managing OLAP Services Agent**

Oracle Enterprise Manager Sample Screen

Oracle Enterprise Manager Console Standalone

File Navigator Object Tools Configuration Help

ORACLE
Enterprise Manager

- Network
  - Databases
    - EXTPROC_CO
    - INST1_HTTP
    - OEMREP
    - ORCL – olapdb
      - Instance
        - Configur
        - Sessions
        - Locks
        - In–Doub
        - Resource
        - Resource
        - Resource
      - Schema
      - Security
      - Storage
      - Replication
      - OLAP
        - Me   OLAP Services Instance Manager...
        - Cubes
        - Dimensic
      - JVM

OLAP Management

Oracle9i provides integrated data warehousing support via OLAP services, and OLAP metadata stored within the database.

- To administer <u>OLAP services</u>, right-click the OLAP folder to launch Oracle OLAP Instance Manager.

- To administer <u>OLAP metadata</u>, expand the OLAP folder.

To learn more about database management, click the Quick Tour button.

Quick Tour

Right-click OLAP to get Instance Mgr choice

OLAP Services Instance Manager
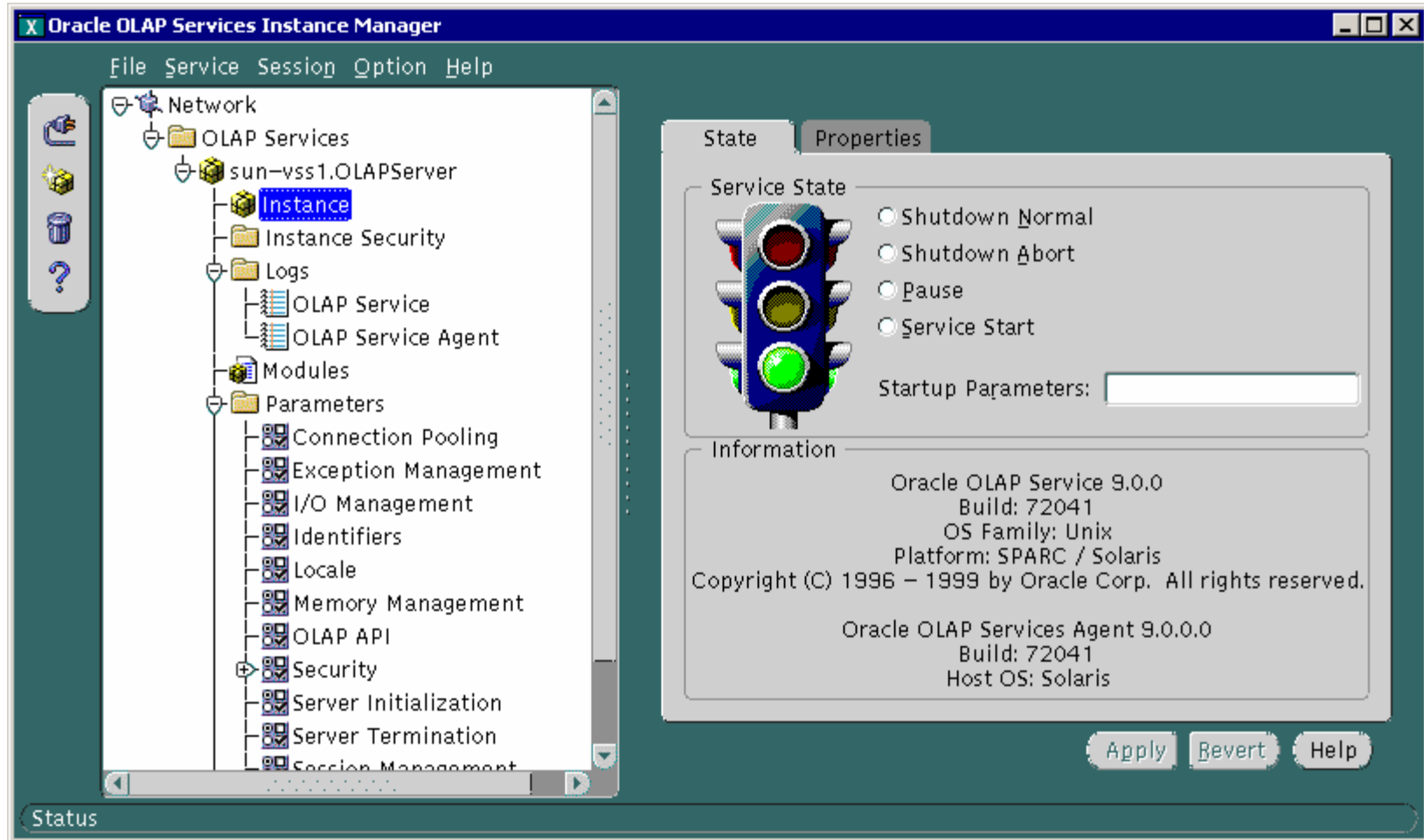
Oracle Enterprise Manager Sample Screen (replaces RAA)

Data Viewer

OLAP Service Manager (xscosvc)

- **Command line program similar to oesmgr**

- **Designed to be run in batch**

- **Capabilities:**

  - **View list of OLAP Services**

  - **Obtain status of service (is it running?)**

  - **Start, stop, pause services**

  - **List sessions (not in oesmgr)**

  - **Kill sessions (not in oesmgr)**

Java OLAP API

- **Object-oriented**
- **Mathematically consistent**
- **Java (industry standard)**
- **Compatible with JOLAP standard**
- **Declaratively (not procedure) based**
- **Data in relational or analytic workspace**
- **Multidimensional cursors**
- **Really designed for low-level access**
- **Most developers will use BI Beans instead**

OLAP API Calculation Capabilities

- **Multidimensional object model**

- **Totals broken out by multiple attributes**

- **Row and column calculations**

- **Union dimensions**

- **Measures as dimensions**

- **Calculated dimension members (e.g. income 0-20K, 20-50K, 50-75K, >75K)**

- **Asymmetric queries**

- **Multiple measures per cell (e.g. color-coding)**

Report is Asymmetric, Attribute, Measure as dimension, Mult meas/cell

Number of customers for each attribute combination.
Red indicates loss, green shows growth from last yr

	Male				Female	
	0-16	17-30	31-50	51+	17-30	31-50
<$10,000	153	198	234	28	59	89
$10,000-20,000	2045	4231	6329	67	2529	3459
$20,000-40,000	955	2328	3405	32	952	1573
$40,000-100,000	1325	1432	1245	65	764	985
>$100,000	64	103	98	5	32	83

Simple Java OLAP API Example

English

Select the products where the dollars measure is greater than 1,000,000 for geography Orlando for time period May2001.

Express

```
limit geography to 'ORLANDO'
limit time to 'MAY2001'
limit product to dollars gt 1000000
```

Java OLAP API

```
Source geogSel = geography.selectValue("ORLANDO");
Source timeSel = time.selectValue("MAY2001");
Source dolByProd = dolSrc.join(geogSel).join(timeSel);
Source prodSel = product.select(dolByProd.gt(1000000));
Source dolGT1Mill =
     dolSrc.join(geogSel).join(timeSel).join(prodSel);
```

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JOLAP Standard

- **Java OLAP Interface (JOLAP)**
  - **Part of Java v2, Enterprise Edition**
  - **Developed by Oracle, Hyperion, IBM, SAS, and others**
  - **http://java.sun.com/aboutJava/communityprocess/jsr/jsr_069_jolap.html**

- **Common Warehouse Metamodel (CWM)**
  - **Sponsored by Object Management Group (OMG)**
  - **Developed by Oracle, IBM, Hyperion, and others**
  - **http://www.omg.org/technology/cwm/index.htm**

Metadata

RDBMS data

- Stored in "Olap catalog"
- Edited with OEM
- Based on CWM
- Once set up, can use OLAP API against data

Analytic Workspace data

- Stored in Express Common Metadata (ECM) format
- Properties on Analytic Workspace objects
- Similar to OEO/Adminstrator metadata
- Once set up, can use OLAP API against database

Differences From Express

- **No more loading data into Express**

- **Run apps directly against relational db**

- **Integrated "cube builder" app in OEM**

- **Java OLAP API instead of SNAPI**

- **Develop UI in JDeveloper in Java**

- **Define data declaratively, not procedureally**

- **Many functional enhancements, including:**

  - Incremental query construction

  - Asymmetric queries with nested dimensions

Administration of Instance

- **Many concepts remain the same as Express**

- **Express Service renamed OLAP Service**

- **Instance administered with OLAP Services Instance Manager (part of OEM)**

- **On Unix systems, oes.key file replaced with olap.key**

- **Parameters very similar (many still have Express or OES in name)**

- **Still have sessions**

Express DBs Still There

- **Express DBs now called Analytic Workspaces**

- **Attach to Analytic Workspaces with database attach OLAP DML command**

- **DB file to attach should be in ServerDBPath parameter**

- **MDBMS metadata stored in "Express Common Metadata" properties of objects**

Express Has Not Gone Away...
It has just been absorbed

- **Analytic Workspaces are Express DB files**

- **Oracle marketing will downplay Express**

- **Design considerations for Analytic Workspaces same as for Express DBs**

- **Express engine still there**

- **Express SPL still there (but only operates on storage in analytic workspaces)**

- **Analytic Workspaces better at complex calculations (for now)**

- **Use OLAP Worksheet for OLAP DML commands**

OLAP Worksheet

OLAP DML Changes

- **All SPL commands there except following:**
  - Operating and file system commands and ODBC
  - XCA commands and options
  - External Call (EXTCALL) command
  - SQL CONNECT command and SQL.DBMS option
  - SNAPI (use Java OLAP API instead)

- **Added support for:**
  - Parallel aggregate
  - Data conversion functions, new data types

Express Futures

- **Express not going away**

- **New releases of OES coming out**

- **New releases of Express Web Agent**

- **New releases of OFA and OSA on OES**

- **Most big development focused on Advanced Analytic Services**

Terminology Map

Express	Advanced Analytic Services
Express database	Analytic Workspace
Oracle Express Server	OLAP Service
Express Instance Manager	OLAP Services Instance Manager
Express Agent	OLAP Agent
Express SPL (or 4GL)	OLAP DML
RAA	OLAP folder of OEM
RAM	Automatic*

* Not necessary to use RAM any more since relational data directly accessible

Terminology Map (continued)

Express	Advanced Analytic Services
oes.key	olap.key
oesdba	olapdba
SNAPI	Java OLAP API
Oracle Express Objects	JDeveloper
Express Basic	Java
Express Administrator	None
OESCMD and Administrator command line	OLAP Worksheet

Open Questions

- **Is fetching data from the RDBMS "fast enough"?**
- **When will it be necessary to use Java OLAP API vs. using BI Beans?**
- **How extensible will BI Beans be?**
- **Will JOLAP really develop into THE OLAP standard?**
- **How different will JOLAP be from Java OLAP API?**
- **How many vendors will adopt the Java OLAP API?**
- **How long until Oracle apps use Oracle 9i features?**
- **How get data from Express back into the RDBMS?**

Migration Issues

- **Is migration really necessary?**

- **Express not going away**

- **New capabilities may alter much of design**

- **Reasons for migrating:**

  - **Increase db size**

  - **Performance**

  - **New features (BI Beans)**

  - **Moving data painful (load times, disk space)**

- **Consider leaving data in Analytic Workspace**

Migration Paths

Legacy Express Applications

- OEO apps

  Metadata perhaps translate, otherwise recode

- Express Web Agent apps

  Same as above

- Custom Express apps

  Depends

- OSA and OFA

  Non-custom data and reports should migrate

Other Presentations

401: OLAP Applications, BIBeans, And Java OLAP API
Chris Claterbos, Vlamis Software Solutions, Inc.

Monday, April 30, 2001   Time:10:00 AM - 11:00 AM

418: Business Intelligence Portals and Oracle Portal
Elizabeth Reardon, Vlamis Software Solution, Inc.

Tuesday, May 1, 2001Time:9:30 AM - 10:30 AM

476: Oracle9i for e-business: Business Intelligence
John Haydu, Oracle Corporation

Wednesday, May 2, 2001 Time:9:30 AM - 10:30 AM

278: Oracle's SQL Analytic Functions in 8i and 9i

David Fuston, Vlamis Software Solutions, Inc.
Thursday, May 3, 2001   Time:9:30 AM - 10:30 AM

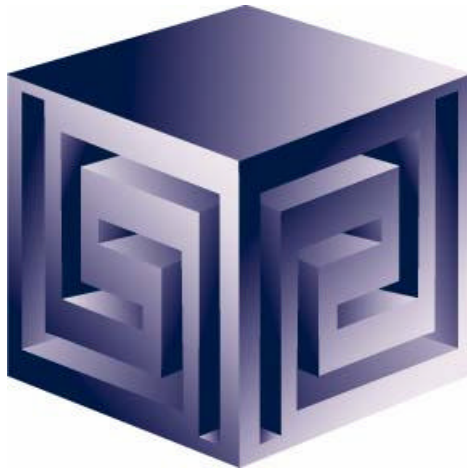**477: Oracle9i OLAP A Scalable Web-Based Business Intelligence Platform**

Bud Endress, Oracle Corporation

Thursday, May 3, 2001   Time:11:00 AM - 12:00 PM

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