Express Evolution: What Oracle 9i OLAP Offers The Express Customer

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Introduction

Oracle Express has for many years been the industry’s leading OLAP server, offering unparalleled functionality, query performance and application support. With Oracle 9i, Oracle have taken the best features of Oracle Express and embedded them in the database kernel.

By moving to Oracle 9i OLAP, customers can benefit from improved application performance, scalability, availability, and manageability, whilst retaining the majority of their investment in Oracle Express technology.

What, as an Express customer, does this mean to you? This paper will explain the new Oracle 9i OLAP technology, showing the similarities between it and Oracle Express, and demonstrating how technologies such as Oracle Warehouse Builder, Oracle Enterprise Manager and Oracle Discoverer can be used to build and manipulate the Oracle 9i OLAP Analytic Workspace.

From the perspective of an Express developer, the presentation will explore and discuss those areas of functionality previously thought of as unique to Express and dedicated OLAP servers, and will show how these functions are now provided via Oracle 9i OLAP.

Who Are Plus Consultancy?

Plus Consultancy, based in Brighton, UK and with offices in Holland and the USA, are Oracle Certified Partners specialising in Business Intelligence and Data Warehousing. We were the first Oracle Certified Partner dedicated to the delivery of BI solutions, as soon as Oracle took ownership of the technology in 1995, and have in fact been supplying and developing Express solutions since 1983.

We now bring this same level of expertise and experience to all of the new Oracle 9i technology. With a client list including Powegen, BT, Bank Of Ireland and Ericsson, Plus Consultancy are considered the number one independent Oracle Business Intelligence consultancy in Europe.
What Is Oracle Express?

Express is the bedrock of all of Oracle's OLAP technology. First developed by Management Decision Systems, then sold to Information Resources, Oracle acquired the rights to the technology in 1995. The Express family covers server products, desktop, development tools, client-server and web-based query tools and application products. As well as Plus Consultancy, there are a significant number of third party implementers that work with some if not all of the products.

The Express Technology Evolution

The first version of Express required a significant amount of processing power and virtual memory, and the product was only available on large IBM 3270 mainframes running the VM/CMS operating system. When the database became more portable with the release of Express MDB, the original software became known as Classic Express. This is now Oracle Express Server and will be replaced by Oracle 9i OLAP.

In addition to the server product, there was also pc-Express, and Oracle Personal Express. However, with the advent of web technology the need for such a 'personal' piece of software has lessened.

As well as the Express database products, applications were also built that were powered by Express technology. Financial Management System and Sales Management System were eventually succeeded by Oracle Financial Analyzer and Oracle Sales Analyzer, and, with Oracle 9i OLAP, these are due to be replaced by a single product, Oracle Enterprise Planning And Budgeting.

BI Beans are now on release as the latest evolution of the Express developer toolset, which can trace its heritage back to Express-View, which eventually turned into Oracle Express Objects and Oracle Express Analyzer. The one product that seems to be surviving them all, and is probably Express' best kept secret, is Oracle Web Agent.

Those of you with longer memories will perhaps remember Financial Consolidation & Reporting System (FCRS), Express-Mate and Craftsman, the product billed as removing the need for Express developers and consultants.

For many years Express has led the way for benchmarks, functionality and scalability, but there has always been room for improvement. So where does Express, in its current guise, fit into the bigger BI & DW picture?
Express And The "Big Picture"

Oracle Express, as a dedicated Multidimensional OLAP Server, traditionally has been a key part of an overall Business Intelligence and Data Warehousing architecture, as shown by the diagram below.

In this architecture, data is taken from multiple source systems such as Oracle e-Business Suite, SAP R/3 or R/4, legacy mainframe applications, together with flat files and comma separated files. This data is processed using an Extraction, Transformation and Load tool such as Oracle Warehouse Builder, staged in a number of staging areas and temporary tables, before being loaded into a Data Warehouse, typically held on an Oracle 7 or Oracle 8i database.

Whilst the data warehouse was typically used to store detail level data over many years, users were typically given access to the warehouse data through a separate OLAP presentation layer, typically through a dedicated multidimensional database such as Oracle Express. Designed for fast query response, and natively supporting such concepts as dimensions, hierarchies, cubes and aggregation, dedicated products such as Oracle Express opened up the data warehouse to OLAP techniques such as what-if analysis, forecasting and trends, together with a whole new range of fast, interactive query tools.

Together with a dedicated OLAP server such as Oracle Express, organisations often implemented a separate, dedicated Data Mining engine such as Oracle Darwin to find ‘nuggets of information’ within their data warehouse. Using techniques such as Neural Networks, Decision Trees and Genetic Algorithms on a dedicated database, patterns and trends within data could be found, rules determined, and models built to increase understanding of the business.
How Could Express Be Improved?

Business Intelligence & Data Warehousing systems of the type mentioned above have been in place for many years now, and in general have offered a good balance between detail level storage within the data warehouse, fast, interactive analysis using the dedicated OLAP server, and access to data mining facilities using products such as Oracle Darwin. However, over time, limitations have become apparent with this type of architecture, leading to issues with scalability, the time taken to perform each load, integration between products, and cost of ownership.

**Scalability**

Whilst the Oracle database holding the data warehouse has shown the ability, over the years, to scale to many terabytes of data, Express databases have traditionally been limited to database sized determined by the file system of the operating system they are running on. Whilst techniques exist to ‘chain together’ multiple Express data files into a larger database, doing so can be cumbersome and this does not take advantage of recent developments in clustering and load-balancing.

**Load Times**

Whilst there are advantages in running separate data warehousing, OLAP and data mining servers, this has traditionally meant loading your data multiple times, extending the load process considerably and taking up many times more disk space. Issues with load times become more apparent with recent moves towards daily, hourly or even ‘real-time’ data warehousing.

**Product Integration**

Express, as mentioned earlier in this paper, was a technology originally developed outside of Oracle, and integration between the Express server and the core Oracle database has been somewhat limited. Each product handles security differently, Oracle through it's own security system and Express through integration with the host operating system, and each product has had it’s own distinct set of administration and development tools.

**Cost Of Ownership**

Maintenance of multiple database products within an overall business intelligence and data warehousing architecture leads to increased administration costs, both in terms of the cost of keeping the system running, and the licence costs for software and maintenance. Staff with often completely separate sets of skills need to be retained, servers have to be purchased to house each individual element of the system, and software costs can easily mount up.

So what have Oracle done to address these issues?
Welcome To The World Of Oracle 9i

With Oracle 9i, Oracle have redefined the business intelligence and data warehousing marketplace. With Oracle 9i, one server does it all.

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**Figure 2.** Oracle 9i integrates Data Warehousing, ETL, OLAP and Data Mining into one server

Oracle 9i not only builds on the market-leading Data Warehousing features of Oracle 8i, it now includes the functionality previously found in Oracle’s Express OLAP server, Darwin data mining server, and Pure*Integrate/Pure*Extract ETL products. By integrating relational data-warehouse capabilities with ETL, OLAP, and data-mining functionality into a single server platform, Oracle9i provides tremendous benefits:

- Reduced administration costs: only one server-product, administered using one management tool (Oracle Enterprise Manager).
- Faster deployment: new applications can be deployed much faster, since there is no longer any need to manually integrate multiple products.
- Improved scalability, reliability, security: Core benefits of the relational database are now extended to the entire BI platform.

With Oracle9i, areas such as OLAP and data-mining can now achieve mission-critical availability. A single platform centralizes the management of data-security, so that access policies are consistent regardless of the application.

Together with Oracle 9i Application Server, the middleware on which you deploy your Oracle 9i-powered applications, and Oracle 9i Developer Suite, the tools with which you develop Oracle 9i applications, Oracle have delivered a simple, integrated but immensely powerful business intelligence and data warehousing platform. **Oracle 9i OLAP Release 2**

Oracle have finally delivered on their promise to integrate Express into the core Oracle database.
The Express multidimensional database server, together with its programming language, storage mechanisms and range of functionality, has been moved, lock stock and barrel, into the core Oracle database kernel. Together with the existing relational OLAP functionality already present in the Oracle database since Oracle 8i, the Oracle database now offers a full range of OLAP functionality, without compromising on the functionality that has made Express the number one OLAP server.

It is important to understand that Express as a product is not "dead" – on the contrary, the codebase that made up Express server has now been incorporated fully into the Oracle database, and now rebranded as Oracle 9i OLAP. As this paper will demonstrate, the core Express functionality has been preserved, and in some cases expanded upon, and you will quickly recognize most of the elements that make up the 'Express world', albeit with a new set of names.

A Better Express Than Express

Express customers will certainly want to understand if 9iR2 is a worthy replacement for Express. Does it do everything Express does? Is it just as fast? Why would I want to use Oracle 9i OLAP rather than Express?

The bottom line is that 9iR2 is a better Express than Express.

- Oracle 9i OLAP supports every calculation that Express does. It also supports additional calculations, such as cost allocations, that aren't available in Express.
- Oracle 9i OLAP performs as well as or better than Express on every calculation and every management process (e.g., aggregating data, solving models, etc.)
- Oracle 9i OLAP provides transparent access to multidimensional data and calculations to SQL based applications.
- Oracle 9i OLAP is, in Oracle's words, "Unbreakable" – it's part of the database and therefore is every bit as secure and as reliable as the core Oracle database.
Key Concepts

Oracle 9i OLAP is a rebranded version of Oracle Express that is integrated into the Oracle database kernel. Whilst much of what makes up Oracle 9i OLAP will be familiar to existing Express customers, it is worth taking a moment to understand some of the key concepts behind Oracle 9i OLAP, and see how they relate to how things have traditionally been done with Express.

Express server is now embedded in the Oracle 9i Database

From Oracle 9i release 2 onwards, the Oracle Express codebase has been fully integrated into the Oracle Server kernel and there is no separate ‘OLAP Server’ process running alongside Oracle. According to sources within Oracle, some 40% of the code within the Oracle Server is now dedicated to business intelligence and data warehousing.

Now called Oracle 9i OLAP.

The Multidimensional database found within Oracle 9i, previously known by the brand name ‘Oracle Express Server’, is now known as Oracle 9i OLAP.

Express databases now called “Analytic Workspaces”

With Oracle Express, Express databases were stored in files with a .db extension, and these files were managed by the operating system. Each operating system placed limits on the size of these files, which could be backed-up using normal filesystem backup tools. With Oracle 9i OLAP, OLAP databases are stored as binary objects, one per table, within an Oracle schema, which are managed by the Oracle relational database management server. The only limit to OLAP databases now are the limits Oracle places on them. Backups are handled in the same way as normal Oracle backups.

Integrates in with existing Oracle ROLAP capability.

Oracle 9i OLAP is a multidimensional database, just like Express, and it works alongside the existing ROLAP functionality in the Oracle database. A new feature, called the OLAP Catalog, sits as an additional metadata layer over both the ROLAP and MOLAP databases, and acts as an abstraction layer, allowing new Oracle OLAP applications to both work with MOLAP and ROLAP databases in the same manner.

Can be accessed through either SPL, Java API, or PL/SQL

Together with the Express programming language, now known as OLAP DML (Data Manipulation Language), Oracle 9i OLAP can now be queried using PL/SQL, using the DBMS_AW.EXECUTE() built in package, and a whole new Java-based API which replaces the traditional SNAPI and XCA.

Administered through OEM & Analytic Workspace Manager

Express Administrator, the standalone administrative console for Oracle Express Server, has now been replaced with a combination of Oracle Enterprise Manager and, from Oracle 9i release 9.2.0.2, Analytic Workspace Manager.
Command line interface through OLAP Worksheet

Those of you familiar with the ‘blue screen’ interface will immediately feel at home with the OLAP Worksheet, a feature within Oracle Enterprise Manager that allows command-line access to Oracle 9i OLAP.

SNAPI and XCA replaced by JDBC and OLAP API

With Oracle’s move towards Java and the internet, SNAPI and XCA have been replaced by a Java OLAP API, which, although offering many new features and preserving existing functionality (persistence of queries, for example), breaks compatibility with tools and applications such as Oracle Financial Analyzer, Oracle Sales Analyzer and Oracle Express Objects.

Complementary Functionality, or "Horses For Courses"

So, given that the Oracle database can now do both relational OLAP, and multidimensional OLAP, organisations can now create applications that take the best from each type of OLAP server, playing to the strengths of each type of approach.

The Oracle relational database, and the SQL query language, provides detail data, summary management, and one-dimensional calculations using the SQL-99 OLAP extensions. Oracle 9i OLAP extends these capabilities to provide forecasting, modelling, what-if scenarios and multidimensional calculations.
Key Components

Oracle 9i OLAP is made up of a number of key components

Calculation Engine – The Express Engine

The power behind Oracle 9i OLAP comes from the dedicated multidimensional engine ported from Oracle Express Server.

The multidimensional engine provides support for the OLAP DML (Express SPL renamed) and management of multidimensional objects. With Oracle 9i release 2, this engine has been completely integrated into the Oracle database and runs within the Oracle database kernel.

Analytic Workspace – The .db files

Express databases are now Oracle 9i OLAP ‘Analytic Workspaces’. Each one is a BLOB (Binary Large Object), and is held within a table, assigned to an Oracle tablespace, and is owned by an Oracle users. Analytic Workspaces can be permanent or temporary, have permissions granted against them like any other database object, and are backed up along with the rest of the Oracle database. The AW contains everything an Express DB contains, including dimensions, variables, formulas and valuesets. It stores data the same way as Express (e.g. variable by dimensions or composites), uses about the same about of disk, and so on.

OLAP DML – Express Programming Language

Oracle 9i OLAP fully supports the Express SPL, but it’s now know as the ‘OLAP DML’. The OLAP DML does everything the Express SPL does - you can import Express code into an Analytic Workspace, and run it with only minor modifications, such as;

- The DATABASE command becomes the AW command, with syntactical changes, for example “AW ATTACH PRODUCTION.SALES” and “AW DELETE TEST.SALES”
- SQL CONNECT isn’t in the OLAP DML, as now you’re always connected to an Oracle instance. Be aware though that ODBC connectivity is now gone, with connections to Oracle and non-Oracle databases handled via Database Links Heterogenious Connectivity, and JDBC
- Some operating system like commands aren’t supported (e.g., FILEDELETE)
- CD becomes CDA (change directory alias)

There are other changes, but these are all related to the embedding of the MOLAP engine within the Oracle database and do not affect the analytic capability of the SPL/OLAP DML. 99.9% of Express SPL code runs as is.
PL/SQL Table Functions

Table functions and Abstract Data Types provide the means for presenting data through SQL. Both the OLAP API and SQL based applications can access data in analytic workspaces through table functions and relational views, giving tools such as Oracle Discoverer and Business Objects access for the first time to Express/Oracle 9i OLAP data.

OLAP API

The new Java OLAP API provides access to both relational and multidimensional data types, and presents these in an identical way to OLAP applications through the use of the OLAP Catalog. The OLAP API provides the ability to build up queries in a number of stages, just as with Express at the moment, to allow multidimensional cubes to be progressively 'sliced and diced' to get to just the piece of information that is required. This contrasts with SQL, which generally has to compose the entire query in one go.

OLAP Catalog metadata

Oracle 9i provides a layer of metadata above both the ROLAP (Oracle database tables) and MOLAP (Oracle 9i OLAP, Analytic Workspace) databases that provides an abstract layer for OLAP applications to work with. By describing OLAP databases in terms of cubes, dimensions, hierarchies and measures, applications can reference these objects without worrying whether the database is stored relationally or multidimensionally, whilst database administrators are free to move data between ROLAP and MOLAP databases without breaking the OLAP application.
**Now Features SQL Access**

A big development for Express customers moving to Oracle 9i OLAP is the ability to use SQL tools to access the new Oracle 9i OLAP Analytic Workspaces. Now, tools such as Oracle Discoverer, Business Objects, Microsoft Excel and any JDBC or OCI compliant query tool can obtain read-only access to an Analytic Workspace.

This is achieved through the creation of SQL views that are mapped via Oracle to items in the Analytic Workspace. Tools such as the Analytic Workspace Manager, and, from January 2003, Oracle Warehouse Builder, can build these SQL views, and, should you wish to use Oracle Discoverer, build the Discoverer End User Layer, together with dimensions, hierarchies and summaries.

All of this is seamless as far as the end-user is concerned. If the end user is able to query a relational database, they can query an Analytic Workspace. This is not the only way in which Oracle 9i OLAP can be queried, but it opens up new possibilities to use relational query tools instead of just dedicated Oracle 9i OLAP query tools.
Express & Oracle 9i Comparative Product Suites

With the move to Oracle 9i OLAP, although the core Express Server product lives on as the 9i OLAP option within the Oracle 9i database, there are big changes with regard to the query, administration and development tools used to administer the multidimensional server.

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<td>Oracle Web Agent</td>
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*Figure 3. The Express product range, and the new Oracle 9i OLAP equivalents.*

From a licensing point of view, Oracle Express Server is now replaced by the additional, paid option to the Oracle 9i database, and is called the 'OLAP Option'. It costs around half the licensing fee payable for Oracle Express Server, although of course you will need an Oracle 9i database to host it in.

The Express programming language, Express SPL, is now renamed Oracle OLAP DML and is largely the same as the old Express programming language, although commands to do with security, SQL access and file system access have been altered or removed.

Oracle Financial Analyzer and Oracle Sales Analyzer are being replaced with a single product, Oracle Enterprise Planning And Budgeting (although sources at Oracle have in fact advised that this name may change prior to the product launch).

Oracle Enterprise Planning & Budgeting (EPB) uses the new technology of Oracle 9i OLAP to deliver scalable planning and analysis over the Internet, offering sophisticated data modeling and multi-dimensional analysis in a web environment, tailored for each customer’s own business processes. EPB is delivered as part of Oracle’s e-Business Suite, which allows it to share the same definition of dimensions and hierarchies as the other Oracle Applications, and it ties itself into the entire set of business processes using Oracle Workflow. EPB leverages the analytic power of Oracle 9i OLAP and the Java OLAP API, the presentation of Oracle Business Intelligence Beans, and the storage and scalability of the Oracle9i database.

This new product builds on the functionality of Oracle Financial Analyzer and Oracle Sales Analyzer, but extends the functionality to include allocations, statistical forecasting, a report library, industry specific templates, and many out of the box calculations. EPB will be the migration path for existing customers of Oracle Financial Analyzer and Oracle Sales Analyzer.
EPB, whilst providing the basic analysis and budgeting facilities previously found in OFA and OSA, puts these facilities within a ‘workflow’ framework, modelling the organisation’s process flow using elements of the Oracle ‘Workflow’ product.

By incorporating your own business process flow, EPB becomes a tailored application that fits your unique planning and analysis procedures. You specify this in the Planning Framework, which then builds the application flow.

![Figure 11: Oracle Enterprise Planning & Budgeting Process Flow](image)

By incorporating your own business process flow, EPB becomes a tailored application that fits your unique planning and analysis procedures. You specify this in the Planning Framework, which then builds the application flow.

The centralized calendar controls deadlines around the tasks in the planning cycles and period end cycles. Events, such as a date in the calendar or the submission of a headcount budget, trigger notifications and actions, such as the automatic consolidation of the budget. The responsibility hierarchy determines who is responsible for what data. The application uses this to assign data to users, as well as actions they are required to perform. Examples of actions are approvals and explanations. For instance, budgets need to be approved and variances need to be explained where they are out of tolerance.

Sample Planning Frameworks based around specific industries will be delivered with EPB. You can use one of these out of the box or as a starting point for configuration.
What Are The Query Methods for 9i OLAP?

There are three main methods of querying Oracle 9i OLAP data:

- Using the Java OLAP API
- Using SQL through views and ‘table functions’
- Using OLAP DML through PL/SQL

Applications that use the OLAP API issue OLAP API calls to the OLAP option. The OLAP option’s SQL generator creates SQL against the relational view. The relational view is defined over a table function OLAP_TABLE and OLAP_TABLE gets data from the analytic workspace.

It should be noted that the OLAP API accesses data through the RDBMS engine (the view) rather than accessing the Analytical Workspace directly. This would seem to introduce a performance lag compared to directly working with the MOLAP database; however, tests have shown that, because of the efficiency of the underlying OLAP_TABLE function introduced with Oracle 9i, the additional overhead is small as to be irrelevant (around <0.02 seconds), and, by using SQL, we can obtain a few advantages.

- Routing all OLAP queries through SQL makes sure that you always get the same results regardless of whether you source data in relational tables or analytic workspaces.
- It provides the means for the OLAP API to join both relational and analytic workspace data in the same query. Like any other application, the OLAP API doesn’t even need to know that an analytic workspace is behind the view – it just looks like a relational view.
• It minimizes the code paths in the software, which generally leads to faster and more stable software and better engineering efficiency, leaving more time for new feature development.

‘Generic’ SQL applications can select data directly from relational views. Again, the relational views look just like any other relational data type in the database so SQL applications work ‘as is’ against relational views serviced by analytic workspaces.

SQL applications can choose to be ‘OLAP aware’ by writing queries directly to the table function. By doing so, applications can send OLAP DML commands to the MD engine. For example, the application might want to limit the data that is returned, install a calculation, run a forecast or perform a product ranking. Although the OLAP DML might be used to limit the view of data or to perform a calculation, the data is returned to the relational engine (just like any other view). This allows SQL based applications to make incremental changes to their SQL generators while accessing the power of the multidimensional engine.

Finally, applications can issue commands directly against the multidimensional engine without using OLAP_TABLE. In this case, the PL/SQL package DBMS_AW.EXECUTE is used to send commands to the multidimensional engine. You can send any OLAP DML command you want via an OCI or JDBC connection (load data, aggregate data, solve a model, define a formula, etc.). If you’ve written to Express’ SNAPI API, you can think of OCI or JDBC and DBMS_AW.EXECUTE as being the replacement to SNAPI and its’ SN.EXECUTE command.

Two other PL/SQL packages, DBMS_AW.INTERP and DBMS_AW.INTERPCLOB provide the means to return data from analytic workspaces to PL/SQL programs.
The Oracle 9i OLAP Toolbox

So what tools are available to us, when building OLAP applications, with Oracle 9i?

The OLAP Worksheet

When developing Express databases and programs, often the easiest way to do a job is through the command line. Using the ‘Blue Screen’ interface found with Express 5.0.3, or the command line interface available within Express Administrator, commands can be directly entered into Express which are directly acted upon by the database server.

Command line access to Oracle 9i OLAP is provided through the ‘OLAP Worksheet’. Users first authenticate themselves using an Oracle username and password, and then are presented with a Java application that talks directly with the MOLAP engine within Oracle 9i.

An example session using OLAP Worksheet is given below;

Access to the OLAP worksheet is through Oracle Enterprise Manager, through right-clicking the ‘Warehouse’ node and selecting the option. Users can enter OLAP DML commands directly into the worksheet, or switch to ‘SQL Mode’ and run SQL commands against the underlying Oracle schema.

Oracle Enterprise Manager

Oracle Enterprise Manager is the single point of administration for Oracle OLAP. Whilst the Analytic Workspace Manager, detailed later in this paper, is used for detailed administration of Analytic Workspaces, Enterprise Manager is used for building and administering the metadata that makes up the OLAP Catalog.
As well as carrying out general database administration tasks in Oracle Enterprise Manager, the DBA prepares the database for OLAP analysis by:

- Defining dimensions. In Oracle9i, dimensions are extended to support Oracle9i OLAP Services.
- Defining cubes. Cubes define the relationship between dimension tables and fact tables. That is, they define the joins between key columns in a fact table with key columns in a dimension lookup table. In addition, cubes define measures. Measures are derived from fact columns, however they contain additional Metadata such as aggregation methods, calculation hierarchies, and solve orders which can be used by Oracle9i OLAP Services.
- Defining Materialized Views, which store summary data.
- Measure folders, which provide a means of organizing measures for applications and/or users.

With Oracle 9i, Oracle now supports a common metadata standard used by the rest of the BI + DW industry, "Common Warehouse Metadata". Metadata should now be shareable between not only Oracle products (Oracle Warehouse Builder, Oracle 9i OLAP and so on) but also between tools and products of other BI & DW vendors.

Metadata is saved in both CWM standard and the Oracle data dictionary. Job scheduling is also managed in Oracle Enterprise Manager, with its Metadata being saved in the OEM repository.
Analytic Workspace Manager

Although Oracle Enterprise Manager can administer the OLAP Catalog (the abstraction layer of metadata above the ROLAP and MOLAP engines) and the underlying schemas and database objects in the Oracle database, it became obvious with the release of Oracle 9i release 1, and then release 2, that more tools were needed to administer Analytic Workspaces.

Analytic Workspaces, as the successor to Express databases, have the same internal metadata and data structures as Oracle Express. Whilst the OLAP catalog, and the Java OLAP API, hide the differences between the Analytic Workspace and 'normal' Oracle data structures, a tool was still required to administer the MOLAP database, just as Express Analyzer was needed to administer Express MOLAP databases.

From Oracle 9.2.0.2 (due Q4), Analytic Workspace Manager (AWM) will be delivered, alongside Oracle Enterprise Manager and OLAP Worksheet, as a new tool to administer Analytic Workspaces. A screenshot of AWB is given below:

As well as administering the variables, dimensions, hierarchies and measures within an Analytic Workspace, the AWM can be used to migrate existing ROLAP cubes (or 'star schemas') into a MOLAP Analytic Workspace.

Figure 7: The Analytic Workspace Manager
On completion of this migration, AWM will also offer to create the SQL views to allow the Analytic Workspace to be queried via SQL, and also set up the Oracle Discoverer End User Layer.
A later release of the Analytic Workspace Manager, due Q1 2003, will, in addition to the functionality described above, include facilities to migrate existing Express databases into Analytic Workspaces, including the creation of the SQL views and Discoverer End User Layer. Whilst it is possible now to migrate Express databases, using database exports and imports into the Analytic Workspace, using this future version of AWM will considerably ease the process and remove the need to create the SQL views manually.

Oracle Warehouse Builder

Oracle Warehouse Builder (OWB) has been for some time the best way to design and build Oracle 8i and 9i data warehouses. Delivered as part of Oracle 9i Developer Suite, it contains functionality to design the target warehouse, define data sources, map sources to target, and generate loading scripts using PL/SQL and SQL*Loader.

With recent versions of OWB, ‘bridging’ functionality has been built into the product to provide interfaces between the Oracle database and other Oracle BI & DW products. These include;

- Bridge to Express that creates the Relational Access Administrator (RAA) layer, enabling Express to query ROLAP cubes;
- Bridge to Discoverer that creates the End User Layer, copying across all the metadata developed in OWB into the Discoverer business layer;
- Bridge to tools such as ERWin and Oracle Designer
- Bridge to Oracle 9i OLAP

The Oracle 9i OLAP bridge in the current version of OWB (9.02) is somewhat limited in that it only creates the data structures within the Analytic Workspace; you would still need to manually populate the Analytic Workspace with data, and create any SQL Views or entries in the OLAP Catalog.

However, the next release of OWB, codenamed “Paris” and due in Q1 2003, contains the same functionality as the AWM, allowing OWB to populate both ROLAP data warehouses and marts, but also MOLAP Analytic Workspaces, creating the SQL views and Discoverer EUL in the process.

Creation and population of Analytic Workspaces using OWB will take place after the creation of the corresponding ROLAP schema, and will involve “cloning” the ROLAP cube into the Analytic Workspace. Future versions of OWB beyond the “Paris” release will almost certainly contain additional mapping functionality, allowing users to map directly to Analytic Workspace objects, rather than having to go through a ROLAP intermediate stage.
**Business Intelligence Beans**

Business Intelligence Beans, or "BI Beans", are Oracle’s technology for delivering OLAP applications over the internet. They are the replacement technology for Oracle Express Objects, and Oracle Express Analyzer, which use the now discontinued SNAPI and XCA to communicate.

BI Beans is a set of standards-based JavaBeans™ that enables developers to build business intelligence applications. These applications can expose the new analytic capabilities of the Oracle9i database to both casual information viewers and high-end users who require complete ad-hoc query and analysis functionality. BI Beans is also seamlessly integrated with Oracle9i/JDeveloper for ease of development.

BI Beans consists of components in the following three categories: presentation beans (graph, crosstab and table), OLAP beans (query and calculation builders), and catalog services. Working together, the beans leverage the Oracle9i/technology stack, exploit the advanced analytic features of Oracle9i OLAP, and increase application developer productivity by using JDeveloper as the development environment for business intelligence applications.

With Oracle9i Business Intelligence Beans, you can create boardroom-quality presentations, leverage advanced analytics of Oracle9i OLAP, support collaboration across the enterprise, and rapidly develop business intelligence applications. These business intelligence applications can be deployed as Java Applets, Java Servlets, or Java Server Pages™ (JSP).

**Figure 10: Oracle 9i BI Beans Architecture**

Developing with BI Beans allows you to build applications that have the full range of functionality you have come to expect from Express applications. By using beans such as the Calculation Builder, and the Query Builder, you can build rich, functional analysis applications, and in some cases, offer features not found in Express before.
The example screenshot given above shows the Query Builder bean within Oracle 9i BI Beans. This builds on the 'Selector' found within Express applications, and allows queries to be built up in stages, presenting a series of examples to the user to help define the query.

**Oracle Web Agent**

Oracle Web Agent is probably Express’ "best kept secret". Web Agent brings powerful analytical capabilities to any computer with a Web browser. Combining the power of Express technology with the simplicity of the World Wide Web, the Express Web Agent lets any user perform business-critical ad hoc analysis of multidimensional data over corporate intranets and the Internet.

The Express Web Agent provides a scalable, high-performance interface that allows Web browsers to access the full capabilities of Express Server. At the heart of this interface is an Express stored procedure language (SPL) cartridge, which plugs into the Oracle WebServer Web Request Broker. In addition, the Express Web Agent supports the Common Gateway Interface (CGI), enabling Express to work with any Web server.

A Developer’s Toolkit, provided with the Express Web Agent, makes it easy to create OLAP Web sites. The Toolkit offers a set of predefined stored procedures that encapsulate HTML and automatically generate code. These procedures free developers from having to learn the exact syntax of HTML tags, allowing them to focus on the functionality of applications. The Toolkit also provides higher-level procedures that are Express data-aware. With just one program call, developers can create a chart or table with all the powerful analysis and querying capabilities of Express.
The Express Web Agent Developer’s Toolkit supports products that are already familiar to developers. For example, developers can use any HTML authoring tool to insert custom tags that generate live data-aware views—like reports and charts—into static HTML documents or pre-existing page templates. Built to be completely open and extensible, the Toolkit supports both Java and ActiveX. The Toolkit also makes it easy to add new functions that generate HTML tags or present data in different formats, such as geographic maps or business charts.

The good news is that Oracle plan to port Oracle Web Agent to Oracle 9i OLAP. Applications written using Web Agent should be easily migrated to Oracle 9i, by importing the Express database, and program code, into an Analytic Workspace (checking that no deprecated commands are used, such as SQL reach-through or filesystem access), and then replace the current “Express version” of Web Agent with the new “Oracle 9i OLAP version” of Web Agent.

Applications written using Web Agent will be the easiest of all Express applications to port to Oracle 9i OLAP, as it has a clear, simple migration path that will involve little rewriting of applications. The Oracle 9i release of Web Agent is due for release in Q4 2002.
Migrating Express Applications

So, given all of the information so far, what do you do about migrating Express applications to Oracle 9i OLAP?

Oracle Express Databases, and Oracle Web Agent Applications

To start with, migration of Express data to Oracle 9i OLAP Analytic Workspaces is very straightforward. You can import Express data straight away, and Oracle Financial Analyzer or Oracle Sales Analyzer metadata in the database also gets imported. Express SPL code runs Oracle 9i OLAP. When the Oracle 9i OLAP version of Oracle Web Agent becomes available, you can use Web Agent applications with 9i OLAP. It’s that simple.

The process of importing data into 9i OLAP is very simple and is just like any other data transfer between versions of Express. The procedure is:

1. Export data from Express to an 'EIF' file
2. Create a new analytic workspace in Oracle 9i OLAP, and
3. Import the EIF file into 9i OLAP.

Express SPL code runs 'as is' in 9i OLAP. This fully preserves your investment in SPL code used for ETL, calculations and other purposes. In a few cases, SPL code will need to be adjusted to account for new commands in 9iR2 and commands that have been deprecated.

Oracle Financial Analyzer and Oracle Sales Analyzer Applications

OFA and OSA applications will not work against the Oracle 9i OLAP Analytic Workspace, as they use SNAPI to communicate with the Express database, and this has been replaced by the Java OLAP API for Oracle 9i OLAP.

As mentioned earlier in this paper, Oracle are providing a new product, Oracle Enterprise Planning and Budgeting (EPB), to replace OFA and OSA. A migration path will be provided by Oracle for OFA and OSA users to move to EPB, although the degree to which this is automatic will depend on the amount of customisation that has taken place to the OFA/OSA environment.

EPB will be delivered in two stages, Version 1 in Q1 2003, and Version 2 in Q3 2003. Version is more of a technology milestone, and does not allow data entry into the EPB database. It will however contain reporting, analysis, business flow and authorisation features, and will be the first dedicated Oracle application to work with Oracle 9i OLAP.

Version 2 of EPB will allow data entry, will provide more calculation templates and custom calculation syntax, some industry templates, and will deliver the migration tools from OFA and OSA.

OFA and OSA databases will be migrated into a combination of MOLAP and OLAP databases and new 'workflow' functionality will also be provided,

This workflow element will be something that Organisations will need to consider when migrating OFA and OSA applications, although they will still be able to use it
for basic analysis without incorporating this, if they just want to migrate OSA applications.

OFA and OSA users therefore have a clear migration path, although they will need to wait until Q3 2003 to migrate, when Oracle will provide the necessary toolset.

*Express Tools Migration*

Potentially the largest migration task will be migrating Oracle Express Objects and Oracle Express Analyzer applications. Applications built using these tools will need to be rewritten in Java, using Oracle Jdeveloper and the BI Beans.

Although this seems a daunting task, in reality the work required will be less than building a completely new application as the design work will have been done already. The Express Objects and Analyzer applications can be taken as a specification, and, although organisations will probably want to take advantage of some of the new opportunities presented by the move to Java, and the new deployment options, applications with similar functionality to that provided via Express Objects and Analyzer will be quick to develop.

Similarly, the underlying Express code that sat behind the Express Objects application will be quickly portable to an Oracle 9i OLAP Analytic Workspace, as most code runs ‘as is’ and only minor changes will be needed.
Oracle Web Agent Applications

As mentioned earlier in this paper, Oracle Web Agent is one of the only Express tools to be ported directly to Oracle 9i.

Oracle are due to release the 9i OLAP compatible version of Web Agent before the end of 2002. Porting existing Express Web Agent applications to 9i OLAP should merely be a case of transferring the Express database to a 9i OLAP Analytic Workspace, removing deprecated code, and then using the 9i OLAP Web Agent instead of the Express version.

Key Release Dates

The release schedule for the Oracle 9i OLAP tools mentioned in this paper are as follows;

- Q3 2002 : Jdeveloper 9.0.3, with 9i OLAP release 2 compatible BI Beans
- Q4 2002 : Oracle 9i 9.2.0.2, with Analytic Workspace Manager v.1
- Q4 2002 : Oracle 9i OLAP Web Agent
- Q1 2003 : “Paris” release of OWB, containing AWM v.1 functionality
- Q1 2003 : Enterprise Planning & Budgeting v.1 (read-only)
- Q1 2003 : Analytic Workspace Manager v.2, includes Express migration tools
- Q3 2003 : Enterprise Planning & Budgeting, v.2 (read-write)
- Q4 2003 : OFA/OSA to EPB Migration Tools

All of these dates are our understanding at the time of writing, and are subject to change by Oracle.
Conclusions

Given the options now available, and the planned release dates, just what should organisations be looking to do with their existing Express investments?

First of all, don’t panic!

The Express product line will be supported for years to come, and investments in Express projects will give excellent returns on investment, just as they always have. Most Express products have a clear migration path to Oracle 9i OLAP, and the skills your developers will have built up will be just as relevant in the future.

However, organisations may wish to start thinking about migration, to find out exactly what is involved, so the question is – what can be done now?

So What’s Possible Now?

First of all, Express databases and programs can be imported, as is, into Oracle 9i OLAP Analytic Workspaces. This facility is available from Oracle 9i release 2 (9.2.0.1 and onwards) and is accomplished through exporting an EIF file from Express, then importing it into the Analytic Workspace.

Any programs within the database will need to be checked for deprecated code. Items to look for include filesystem access, SQL code, and elements dealing with security. Most code should, however, work as is with little modification.

Once you have a database within an Analytic Workspace, you can start to write Java code, using Jdeveloper, that uses the Java OLAP API and the BI Beans. You should make sure that Jdeveloper 9.0.3 is used, together with the latest release of BI Beans, as only the latest version of the BI Beans works with 9i OLAP release 2. These applications can then be used to replace existing Oracle Express Objects and Oracle Express Analyzer applications.

From the release of Oracle 9i release 9.2.0.2, and the Analytic Workspace Manager, you can build SQL views through to the Analytic Workspace, to allow SQL-based query tools (such as Oracle Discoverer, Business Objects, Cognos Impromptu) to query the Analytic Workspace.

Oracle Reports can also be used at this stage, as it includes ‘pluggable data sources’ that allow reporting against relational databases (such as Oracle), Oracle Express databases, and Analytic Workspaces. Oracle Reports therefore is a useful tool for bridging the transition between Express, Oracle and 9i OLAP.

Lastly, before the end of 2002, Oracle 9i OLAP Web Agent should be available. This will mean that migrating Web Agent applications should be relatively easy, making them one of the first candidates for moving to the Oracle 9i world.
And What’s Not Possible Yet?

As Oracle 9i OLAP supports the Java OLAP API rather than SNAPI, you will not be able to move existing OFA and OSA installations to 9i OLAP until Oracle release Enterprise Planning and Budgeting (EPB).

EPB is due for release in stages during 2003, first of all read-only (and therefore a replacement for Oracle Sales Analyzer), then read-write (replacing Oracle Financial Analyzer), then, shortly afterwards, a set of migration tools to migrate OFA and OSA installations.

Therefore, in the meantime, organisations should take the opportunity to examine their OFA and OSA investments, particularly with regard to any customisations that have taken place, and also begin to think about how they can use the new workflow functionality in EPB to model their process flow. They should then begin migrating OSA applications during the first half of 2003, completing the process by migrating OFA applications later in the year.

Organisations will also have to wait until version 2 of the Analytic Workspace Manager before undertaking large scale conversion of existing Express databases to 9i OLAP. Whilst they can copy across Express databases to 9i OLAP now, using database exports and imports, it is not until the second release of the AWM that graphical tools will be available to create the necessary OLAP Catalog metadata for the Analytic Workspaces. This OLAP Catalog metadata is used by the Java OLAP API, and the SQL Views, to enable access to the Analytic Workspace, and is therefore a key component in getting the most out of 9i OLAP.

Thought should also be given to how standalone, personal versions of Express databases will be supported in the 9i OLAP world. Many organisations take cuts of Express databases and run them using Personal Express on users’ laptops, and there is no ‘personal’ version of Oracle 9i OLAP. The recommended approach to meet this requirement would therefore be to either deliver this functionality over the internet, using BI Beans, or, as a possible alternative, copy the data into a ROLAP cube in Personal Oracle, then use Oracle Discoverer Desktop Edition to perform analysis locally. No doubt other solutions will come to light as product development progresses.

Summary

This paper has tried to set out the background behind Oracle 9i OLAP, and give some of the reasons why Express customers would wish to migrate to this new platform.

Express has, for many years, been the number one OLAP platform, offering unsurpassed functionality and performance, and has built up a large, dedicated userbase who have come to depend on the product. Oracle have understood that Express offers unique advantages and now, after many years, have incorporated the best of it into the Oracle database.

Oracle 9i OLAP, as it is now known, is recognisably Express, and users will immediately feel comfortable it. What is new, however, is the additional benefits the Oracle database can now bring to the Express world, offering improvements in terms
of scalability, reliability and maintainability, and Express will now benefit from being part of the mainstream Oracle world.

Express databases, together with custom applications written using Web Agent, can be ported almost immediately. Applications written by customers using Oracle Express Objects and Oracle Express Analyzer can start to be ported, using the existing application as a design and specification, and building it now in Java, using Jdeveloper and BI Beans.

Organisations using Oracle Financial Analyzer and Oracle Sales Analyzer will be able to start moving to 9i OLAP in 2003, when the replacement for these two tools, Enterprise Planning and Budgeting, will be made available. Oracle will provide tools to aid this process towards the end of 2003.

Plus Consultancy, Oracle’s premier Business Intelligence and Data Warehousing partner, are experts in Express and are at the forefront of the adoption of Oracle 9i OLAP technology. If you want to discuss your migration options further, or wish to find out more information about Oracle Express or Oracle 9i, visit us at our website (http://www.plusconsultancy.co.uk) or visit us at the UKOUG on Stand No.1.

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October 2002