

# Oracle Application Express Overview

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# Oracle Application Express Overview

## **EXECUTIVE OVERVIEW**

Oracle Application Express, a feature of the Oracle database 10g, combines rapid web application development with the power of the Oracle database. Its easy to use browser based application builder enables developers and non-programmers to develop and deploy data driven web applications in very little time. Installing Oracle Application Express in your enterprise will help consolidate the management and security of data currently scattered throughout the organization in spreadsheets and personal databases. At the same time, access to information will be improved by making the data available to anyone with a web browser.

## **INTRODUCTION**

Now that there is a web browser connected to the Internet or Intranet on virtually every desktop, the potential to improve the flow of information in your business is enormous. New applications can be launched and updated without the need to distribute software, everyone has access to the latest information from any computer, and users jump almost seamlessly from one application to another.

The reality is that a large part of this potential has still not been realized. Data collection and sharing is a difficult task, with spreadsheets being traded, merged, and scrubbed. Important data is locked in word processing documents, text files and desktop databases. Departments and lines of businesses are wasting time attempting to automate simple business processes using tools that are not secure and not designed for enterprise web deployment.

This paper describes the benefits, architecture and features of Oracle Application Express and how it can help you quickly develop web deployed reporting and data entry applications on consolidated data in an Oracle database.

## **BENEFITS**

Many organizations are wasting valuable time by using spreadsheets and personal databases to manage information. Although easy to use, these products

don't deploy well on the web, they don't handle concurrent updates to data gracefully and they provide little in the way of security. Oracle Application Express offers a new approach to capturing, delivering, and managing information with significant benefits.

### **Better Access through Consolidation**

By consolidating many small workgroup databases and spreadsheets, into a single Oracle database, Oracle Application Express provides the following benefits:

- Improved access by delivering data currently locked in spreadsheets and personal databases to the web, allowing concurrent updates by multiple users as well as providing real time access to a single source of truth for your information.
- Time saved by avoiding the emailing around of spreadsheets as attachments and the merging and scrubbing of multiple copies of data
- Improved security and availability through consolidation of fragmented information into a reliable, secure, scalable Oracle database, managed by professionals.
- Build applications you never could before – even “quick and dirty” applications are immediately deployed on the web ready for enterprise wide use.

The benefits of consolidation can be achieved without taking away control or flexibility from the developer or end user.

### **Getting your Information on the Web Minus the Complexities**

Data driven web applications are typically built to optimize a business process by streamlining the flow of information in the organization. Unfortunately, building web applications is fraught with repetitive and tedious tasks that don't directly solve the business problem at hand. Rather, these tasks deal with the “plumbing” of the application and can take up the bulk of a development effort. The “plumbing” of an application are those parts that handle low level duties such as:

- Maintaining session state on the inherently stateless HTTP protocol
- Authenticating users and enforcing access control rules
- Ensuring concurrent access to data is properly handled

- Maintaining a consistent user interface throughout an application or across multiple applications
- Ensuring the application runs using the appropriate language and local settings

The people in your organization that are familiar with the business process to be optimized should not be burdened with building the plumbing of a web application. Oracle Application Express eliminates this burden by including all necessary facilities in every application automatically. This helps the business process experts do what they do best: solve the problem at hand.

### **Built in Best Practices**

Oracle Application Express has built into it established best practices for building web applications. It is these best practices that help avoid common mistakes and improve developer productivity. For example when building a web application, manually a developer may unintentionally scatter logic to handle access control throughout the application, making it difficult to make changes to the underlying rules that govern the access control. Or, when a developer sets out to build an application he may not be aware that some day the application needs to be delivered in more than one language. The framework provided by Application Express's application builder ensures that such mistakes cannot be made. The following best practices are built in to Oracle Application Express.

#### **Consistency and standardization in application and page structure**

Oracle Application Express uses a pre-defined methodology to render and process pages across the entire application. This speeds up the assembly of pages, but it also makes maintenance easier, since understanding how a page works does not require looking through code or scripts. In Oracle Application Express, a developer can quickly tell what function a page performs and how it works, even if he's never seen the application before.

#### **Separation of user interface, application logic and data access**

The way Application Express uses templates for pages, regions, reports, labels and other elements of an application, encourages developers to separate the user interface or the look of the application from its logic and functionality. This has several benefits. First, this separation makes it easier to understand the definition of the application and doesn't require you to sort through pages HTML code to get to the core of the application. Secondly, maintaining this separation means that you can start on the logic of the application before you decide on the user interface. You can even have another person work on the user interface of the application in parallel. Finally, changing the look of an

application only requires changing a few templates rather than every page or component in the application.

#### **Centralized authentication and authorization**

Rules governing authentication and authorization are defined centrally and independently from the logic of an application. This ensures that you can change the way the user's identity is verified and established at any point in time during the development of an application without changing its logic. Authorization schemes help you define access control rules in a central place and associate them with most any element within an application to ensure maximum flexibility in controlling who gets to see what and who gets to perform what function.

#### **Separately stored translatable strings**

Oracle Application Express stores the entire definition of an application in the database. Included in the application definition are any translatable text contained in elements such as field labels, region titles, and report column headers. Application Express automatically keeps track of translatable string throughout the development process and provides a facility for exporting all strings in a single file for translation by a third party.

### **ARCHITECTURE OVERVIEW**

Oracle Application Express consists of a metadata repository that stores the definitions of applications and an engine for the rendering and processing of pages. Additional tasks performed by the engine include:

- session state management
- authentication services
- authorization services
- page flow control
- validations processing

The engine is implemented in PL/SQL and is accessed from a web browser through the Oracle HTTP Server (Apache) and mod\_plsql (see figure 1).

Applications are rendered in real time from the metadata repository stored in database tables. Building or extending applications does not cause code to be generated. Rather, metadata is created or modified and stored in database tables.

A unique session state management method ensures minimal CPU resource consumption. Session state is managed in the database. Each page view results in a new database session, so when the Oracle Application Express engine is not processing or rendering a page, no database processing resources are consumed.

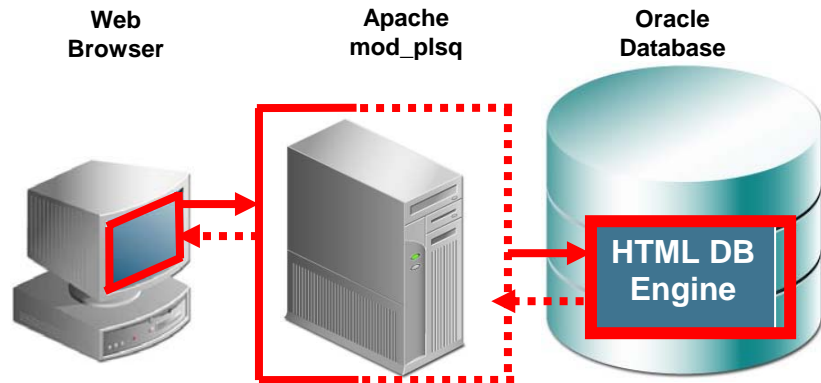
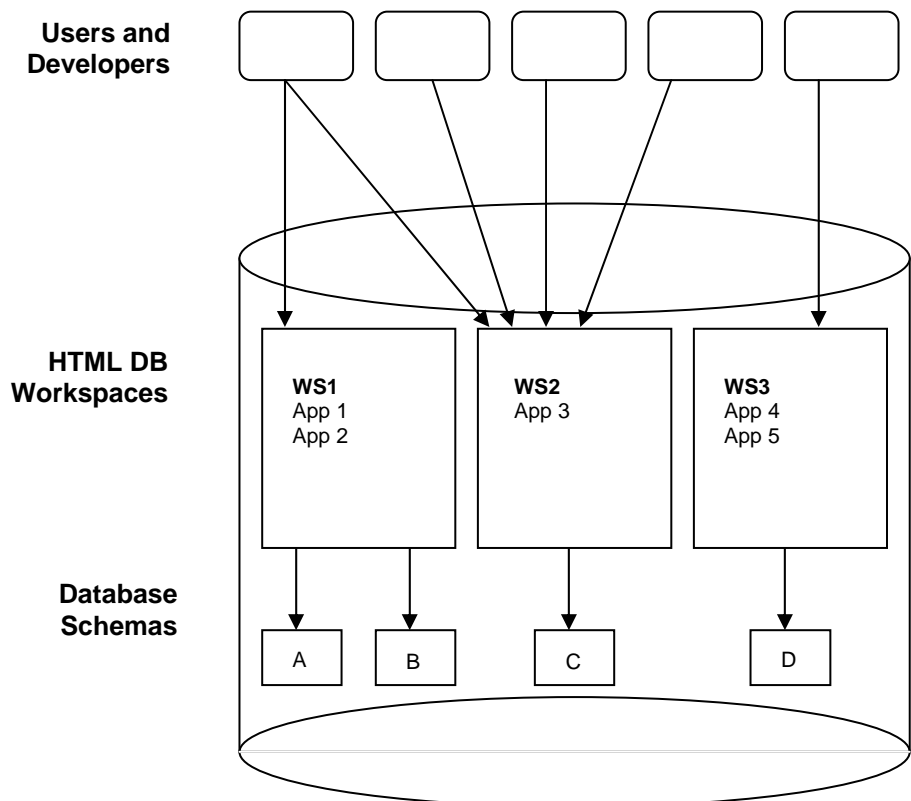


Fig. 1 – Oracle Application Express Architecture

### COMPLETE HOSTED SOLUTION

Oracle Application Express turns a single Oracle database into shared workgroup database service. This service can be trivially accessed via a browser requiring no software to be installed on the desktop for the developer or the end user.



*Fig. 2 – Sharing a database with Workspaces*

### **Workspaces: Sharing a Database**

Anyone interested in tracking some data and sharing it with others on the web can sign up for a workspace within Oracle Application Express using a self service signup wizard. A workspace allows one or more developers to develop applications, each with access to their own database objects.

As illustrated in figure 2, a single Oracle database can contain multiple Oracle Application Express workspaces (WS1 through WS3), each with access to one or more database schemas (A through D). Multiple development efforts can therefore occur in the same database without interfering with each other.

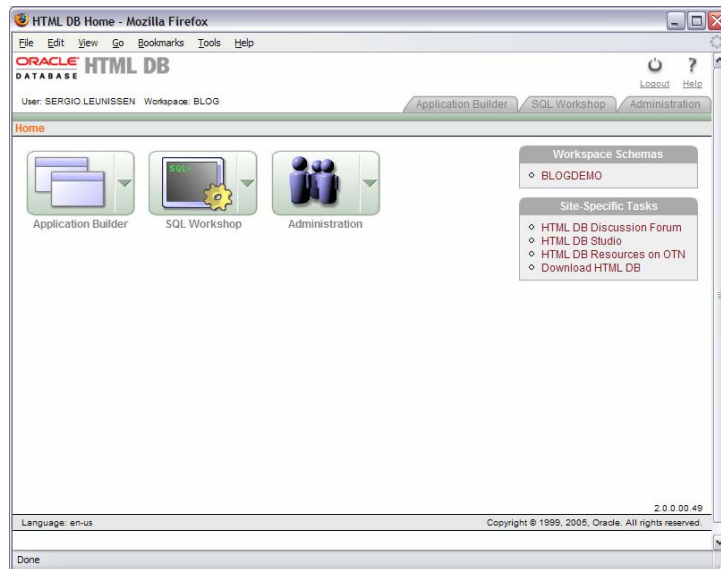
During signup for a workspace, a new schema may be requested or an existing schema with database objects such as tables, views and stored procedures may be associated with the workspace. Workspace requests are queued for an Oracle Application Express administrator to approve using a web-based interface.

Once logged in to a workspace (see figure 3), a user has access to the following components:

- Application Builder
- SQL Workshop
- Data Workshop
- Workspace Administration

### **Application Builder**

The Application Builder is optimized for assembling an HTML user interface on top of database objects such as tables, views and procedures. It provides many wizards to build reporting and data entry applications. More details on its features are discussed just ahead.



*Fig. 3 – Oracle Application Express welcome page*

## SQL Workshop

The SQL Workshop is a tool that enables you to interact with the database through a web browser. Its features include:

- Viewing database objects
- Creating database objects such as tables, views, triggers, and sequences
- Generating DDL scripts for existing database objects
- Running SQL commands
- Querying by Example

## **Data Workshop**

The Data Workshop helps you import and export structured data into and from database tables. For example, with the spreadsheet data import wizard you create a database table and import data from a spreadsheet in a single operation. Other Data Workshop features include:

- import data from a structured text file, for example comma separated values (CSV) or tab separated values
- export data from any table with choice of separator

## **Workspace Administration**

As a workspace administrator, you have control over the environment in which applications are developed and deployed. Workspace administration features include:

- Management of developers and end users
- Management of schemas and storage associated with the workspace
- Monitoring of end user and developer activity
- Reporting on application properties across an entire workspace

## **APPLICATION DEVELOPMENT FEATURES**

So far we've learned that Application Express improves development productivity by eliminating the need for you to program the low level facilities needed to develop and deploy a attractive, sophisticated, and robust data driven web application. In this section we will detail a few important web development features to illustrate this point.

### **Automatic Session State Management**

Oracle Application Express transparently maintains session state in the database, giving developers the ability to "get" and "set" session state values from any page in their application. Each session is assigned a unique identifier (or session

ID) within the Oracle Application Express installation. The Oracle Application Express engine uses this session ID to store and retrieve an application's working set of data (or session state) before and after each page view.

### Declarative Data Entry Forms

Through wizards and many pre-built widgets you can quickly build forms to capture data and insert it into, or update the database. Forms can be enhanced with:

- A wide variety of built in HTML widgets
- Data validations
- Shared list of values
- Field level help

Form wizards generate all the data logic needed to perform inserts, updates and deletes. The data logic includes lost update detection to ensure that access by multiple users concurrently doesn't compromise the integrity of the data in the database.

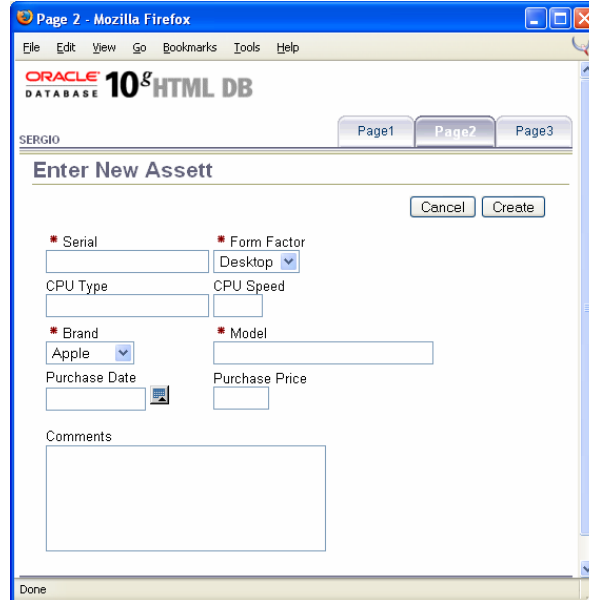


Fig. 4 – a form created with Application Express

## Fully Template Driven User Interface (UI)

Applications built with Oracle Application Express are entirely template driven. Templates are used for most every element of an application, including: pages, regions, reports, field labels, and buttons. The Application Builder ships with ready-made design themes but also allows you to build your own templates using HTML including custom cascading style sheets (CSS), Javascript and images.

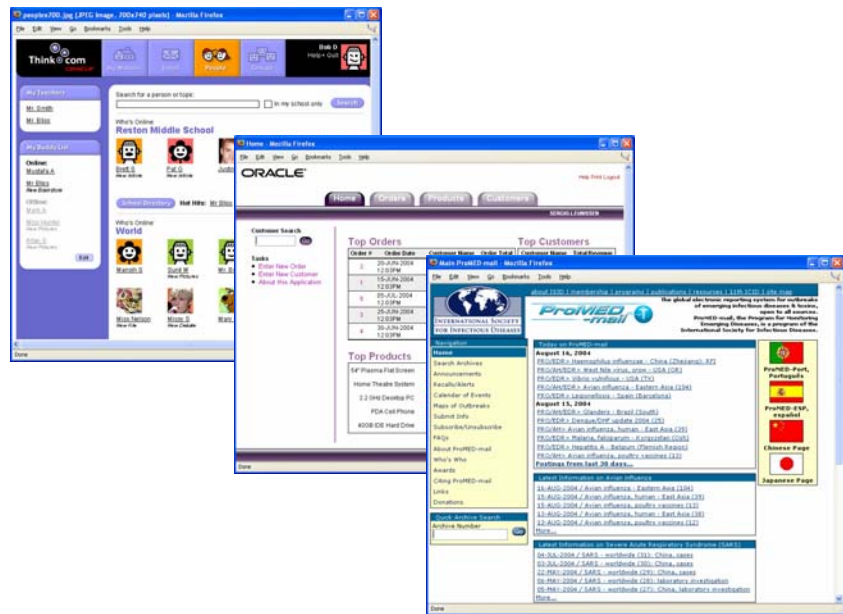


Fig. 5 – Fully template driven application building

## Powerful Reporting

Using the application builder, reports can quickly be created as the formatted result of a SQL query. An Easy Report wizard guides the user through building a report without requiring knowledge of SQL.

Features of the reporting engine include

- Choice of pagination styles, including custom developed styles
- Column based sorting
- Linking to other reports or charts
- Applying HTML based expressions to column values
- Export to spreadsheet application
- Break reports
- Rendering of columns as HTML form elements for bulk updates

Group Code	Family	Common Name	Scientific Name
Clams	Unionidae	heelsplitter, Carolina	Lasmigona decorata
		heelsplitter, Alabama (=inflated)	Potamilus inflatus
		fatmucket, Arkansas	Lampsilis powelli
		fanshell	Cyprogenia stegaria
		blossom, tubercled (pearlymussel)	Epioblasma torulosa torulosa
		bean, purple	Villosa perpurpurea
		bankclimber, purple (mussel)	Elliptoideus sloatianus
		bean, Cumberland (pearlymussel)	Villosa trabalis
		bean, Cumberland (pearlymussel)	Villosa trabalis
		Conifers and Cycads	Cupressaceae
cypress, Santa Cruz	Cupressus abramsiana		
larch, Chilean false	Fitzroya cupressoides		
Pinaceae	Fir, Guatemalan (=pinabete)		Abies guatemalensis
	Taxaceae		torreya, Florida
Crustaceans	Asellidae	isopod, Lee County cave	Lirceus usdagalun
		shrimp, Alabama cave	Palaemonias alabamiae
	Branchinectidae	shrimp, Kentucky cave	Palaemonias ganteri
		fairy shrimp, Conservancy	Branchinecta conservatio
		fairy shrimp, vernal pool	Branchinecta lynchi
fairy shrimp, longhorn	Branchinecta longiantenna		

Fig. 6 – a Report created with Application Express

### Web Services Integration

Applications developed in Oracle Application Express may incorporate calls to external web services using SOAP. The web service response can be transformed using an XSL style sheet and incorporated in a page, or the result may simply be stored in session state. This feature provides a powerful way to integrate with logic or processes running on external servers.

### Fully Extensible with JavaScript and PL/SQL

Application Express offers quick development of database centric web applications through wizards and pre built components. However, the simplicity of the tool does not compromise flexibility needed to extend the functionality of an application with custom PL/SQL or Javascript. When appropriate, the application builder lets you provide custom logic in the form of a few lines of PL/SQL or Javascript or a call to an existing PL/SQL procedure or function or

Javascript function in an existing Javascript library. For example, Application Express provides built in declarative validations but also allows you to create your own Javascript based validations.

### **Built in File Upload Capability**

The Application Builder includes a “File Browse...” widget for building applications-- such as document --libraries that require the end user to upload documents and other files. Uploaded files are automatically stored in the database and can easily be incorporated in a report for downloading.

### **Charting**

Two types of charts are provided in the Application Builder. The first type is based on HTML and gif images and provides vertical and horizontal bar charts. The second type of chart is based on Scalable Vector Graphics (SVG), an XML-based language for Web graphics, and provides bar, line and pie charts. As of the time of writing this paper, SVG requires a plug-in from Adobe or Corel, which is not supported in all browsers.

### **Email Notifications**

Many applications require notifications in the form of an Email message to be sent when a particular business event occurs, for example when a manager approves a purchase order request. Application Express includes an API based on the database’s supplied UTL\_SMTP package that makes sending email from your application easy.

### **Flexible Authentication**

An authentication scheme is a method that will verify a user’s identity and then inform the Oracle Application Express engine that it has succeeded and pass along the relevant username. That username may come from a login page inside an oracle Application Express application or an external login page, as is the case when using Oracle Application Server Single Sign-On for example.

Oracle Application Express applications allow for the authentication scheme to be changed at any time. This gives the developer the flexibility to change to authentication based on LDAP (Lightweight Directory Access Protocol) or Oracle Application Server single Sign-On, for example, without changing any application logic.

### **Reusable Access Control Rules**

Access control rules called authorization schemes can be defined centrally and reused by applying them to elements within an application. For example, authorization schemes can control access to a single field or button all the way up to an entire application.

Authorization schemes can be defined using declarative instructions such as ‘the value of variable X must be Y’ or can be more complex and query the database or perform search in an LDAP directory.

### **CONCLUSION**

Scattering valuable information throughout the organization in spreadsheets and personal databases breaks the flow of information and creates undue exposure to risk of security breaches. Oracle Application Express’s unique architecture allows you to consolidate and secure your data while improving access by delivering it to a web browser.

Oracle Application Express’s application builder provides a rich set of features optimized for web development so that even those with limited development experience can build and deploy a data-driven web application.



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