ENTERPRISE REPORTING WITH ORACLE REPORTS: RELIABLE, EXTENSIBLE, AND INTEGRATED

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Enterprise Reporting with Oracle Reports: Reliable, Extensible, and Integrated

INTRODUCTION

In an increasingly competitive world, enterprises are constantly in need of Business Intelligence (BI) that empowers the decision makers in the organization to act on the information, and thus impart that extra competitive edge to the organization’s products and services. Businesses succeed or fail based on their ability to accurately quantify how many leads become orders, identify their most profitable customers, forecast manufacturing capabilities, manage reliable supply chains, and create sales projections. However, obtaining information on which decision makers can act presents several practical challenges. One such challenge is the massive amount of data available to the enterprise in today’s Information Age. Enterprises know that they have access to all kinds of data but to convert this data into information is their biggest test. In addition to this challenge, enterprises today have data spread over multiple data sources ranging from legacy systems to relational databases and text files. Even if these problems are surmounted, publishing information in a secure and reliable manner remains another big concern for enterprises.

Oracle offers an integrated BI solution that provides users with the capability to easily integrate diverse data sources, convert this data into information, share this information with authorized users, and exploit the information to learn more about the business and its customers.

Oracle Reports is the enterprise reporting component of Oracle’s BI offering. It enables an organization to convert data into information, and publish the information securely and reliably. Oracle Reports provides the tools to create reports in pixel-perfect printable format and to publish reports on your corporate Web site as true Web pages. Oracle Reports is an award-winning solution that has successfully fulfilled the enterprise reporting needs of thousands of organizations for a decade and a half. Its extremely scalable and high-performance capabilities let you publish your reports to several thousand end users. It leverages Oracle Application Server Platform Security and Identity Management to make sure that the information is only available to authorized users. And since Oracle Reports uses Oracle Application Server High Availability, you can rest assured that your reports are available without failure.

Furthermore, you can use Application Programming Interfaces (APIs) documented in Reports Software Development Kit (RSDK), to easily extend existing functionality or create completely new functionality to fit your requirements.
Oracle Reports is a powerful enterprise reporting tool to create and publish high quality, dynamically generated reports for the Web. Through data-driven tables of contents, hyperlinks, and drill-down chart hyperlinks, Oracle Reports provides users with an easy route to the information they require.

**Rapid Development**

Using a declarative, document centric development model, Oracle Reports Developer focuses a new user on the tasks required in the production of a report, while still allowing experienced developers to have total control of their report development. Each major task in report production is expedited by the use of an appropriate wizard, while the use of report templates and a WYSIWYG live preview allows for easy customization of the report structure.

Seemingly daunting tasks such as creating complex data models and layouts become simple drag and drop actions. For example, the Query Wizard allows for the visual representation and construction of complex SQL on which operational reports are often based, while the Report Wizard steps the developer through the task of defining a report structure, data source, break groups, and summaries. The Graph Wizard gives you a choice of more than 50 graph types, and allows you to embed a graph inside your report with a few simple steps.

Unlike many graphical reporting tools, Oracle Reports Developer does not have a limitation on the number of queries defined within the report (many reporting tools allow only a single query per report module), nor on the overall format of the data returned. Based on page/frame model rather than the more simplistic banded reporting paradigm, Oracle Reports Developer allows for an almost unlimited number of report formats, without the need to resort to the complexity of nested report modules or complex procedural code.

On creation of the report definition, the report output is displayed in the Live Previewer. In this WYSIWYG view, the developer is immediately able to see the impact of the format choices on the final report. Hence, the output can be further enhanced by the direct manipulation of report objects.

As the requirements for a report change with the business environment, Oracle Reports Developer simplifies the modification process by use of re-entrant wizard technology.
That is, a developer may return repeatedly to a wizard to make further modifications, without losing the current customizations.

**PUBLISH ALL YOUR DATA TRANSARENTLY AND IN A FLEXIBLE WAY**

In a modern IT environment, data is produced in different places and in different formats. For example, in a manufacturing organization, each geographically distributed warehouse may store inventory data in a relational database, while the headquarters of the organization may prefer to store basic data like average inventory per warehouse in XML format. You would like to collect data from these different sources and present the data as consolidated information, rather than in bits and pieces.

Oracle Reports provides you with access to multiple data sources out of the box. It supports SQL, PL/SQL (REF CURSOR), XML, JDBC, Oracle OLAP, and text files (both delimited and fixed-width format). You can use the JDBC data source to access data from different JDBC-compliant data sources, and you can use the JDBC-ODBC bridge to connect to any data that can be exposed as an ODBC data source, for example, a Microsoft Excel workbook.

You can combine queries from different data sources in a single report and link them to produce master-detail relationships. With Oracle Reports, the source of data is transparent, because data coming from any data source is available to you in exactly the same representation. For example, you can build a report based on master data at headquarters, accessible via an XML stream over the Internet, and your own warehouse inventory data, stored in an Oracle database. You can also aggregate data across data sources and use columns regardless of from where they originally come.

These data sources are written against a Java-based API that also allows you to create and plug in your own data sources. A Java class implementing the Pluggable Data Source API allows you to create access mechanisms for data common to your business and integrate them into Oracle Reports, allowing you to use this data directly in your report. For example, you can use the Java APIs to create a data source that gets data from your Enterprise Java Beans (EJBs), or from a hosted Web Service.

![Figure 2: Oracle Reports supports a variety of data sources and also provides a Java-API so you can create your own data source](image)

In order to easily filter your data, you can include parameters into your query definition, which allows you to pass query criteria at runtime. For example, if you want to restrict the sales data to a particular quarter or year, you can create a report using these criteria as parameters, and ask your users to provide the desired value when they execute the report.
FROM BOARDROOM-QUALITY FORMAT TO ONLINE-FLEXIBILITY

Once you have created the report with all the required data and exact formatting, the next step is to publish the report so that all intended users can access the information easily. Different audiences may need access to the information in different formats. Your next Board meeting may require you to print the report, while remote audiences may need access to the report online. For some audiences, Portable Document Format (PDF) might be the best choice for viewing the data online, while for others a Microsoft Excel compatible format is necessary so that they can further dissect the data. In some cases, you might want to publish the report contents on your enterprise Web site or portal as a Web page that completely blends into the Web site. Oracle Reports gives you the capability to serve all these different audiences using a single report definition.

Paper-based Publishing for Online Viewing and Pixel-perfect Printing

Paper-based publishing has always been an established way of presenting information to users. Oracle Reports respects paper-based publishing by offering various output formats for its paper layout. You can use your report definition to generate output in PDF, HTML, HTML.CSS (which refers to HTML with cascading style sheets), Microsoft Word-compatible RTF, Microsoft Excel-compatible spreadsheet, as well as more data-oriented formats like XML and DelimitedData. The same report definition can also be sent to the printer in PostScript or PCL format. Java advanced imaging support enables you to embed images in several formats including modern formats, such as progressive JPEG, and get a high quality output.

Figure 3: Report output in PDF format and in XML format

The DELIMITEDDATA and XML output formats enable processing of the data by other applications, for example, your customers or suppliers. This way you can produce a boardroom-quality report in PDF, and from the same report generate interchangeable data for business-to-business applications. An example would be a healthcare application, where you produce weekly reports of the number of patients and their diagnosis in PDF format for the hospital management, while the same report is generated in XML format for further processing and record-keeping by the hospital vendors.

Oracle Reports now gives you the freedom to generate output from paper layout reports to files that can be directly opened with Microsoft Excel 2000. This output format preserves the rich formatting, like background and text color, graphs, images, and font styles defined in your report. This feature is extremely helpful to those
business users who would like to use Microsoft Excel to further dissect and analyze the data.

Figure 4: Output to spreadsheet format is Microsoft-Excel compatible, and thus allows easy analysis of data by end-users

The PDF generated by Oracle Reports supports the use of multibyte fonts, such as simplified and traditional Chinese, Korean, and Japanese. In conjunction with Adobe Asian Font Pack you can easily produce reports for multibyte users.

Figure 5: Oracle Reports supports multibyte reporting

To produce client-independent PDF files, Oracle Reports supports font embedding and font subsetting, which enables you to include the font definitions of all fonts used in the report. The resulting PDF document can be viewed in any PDF viewer, regardless of whether the used fonts are installed or not. In addition, special fonts that define your corporate identity can be included in the PDF file, so your customer does not need to install those specific fonts in order to view the document correctly.

To optimize the download time, Oracle Reports supports PDF compression, which allows you to minimize the size of your PDF document. Implementing the PDF 1.4
standard for tagging PDF files adds accessibility to the generated PDF document. It contains information that allows screen readers, such as Freedom Scientific’s JAWS, to read the PDF document’s content. Oracle Reports also allows you to add document metadata like the Document title, Author name, and Search keywords, which are extremely helpful in cataloging the generated PDF documents.

**Publishing Enterprise Reports as Dynamic Web Pages**

Today’s IT environments are all about online services, and most of them are based on Web technology focused on browser-based delivery of information. Though you can publish your paper reports as PDF or HTML documents, often you require the reports to be published as true Web pages that blend into your corporate Web site by inheriting the look and feel of the other Web pages.

Reports that need to be published as Web pages have distinctly different requirements than paper-based reports. For example, in paper-based reports you need to strictly control the page dimensions and margin boundaries, while a Web page has no traditional page boundaries. A Web page inherently needs to be dynamic with the use of hyperlinks, advanced animation, images, and JavaScript, and needs to be able to inherit the same style sheet as the other pages on the Web site. In a typical Web-publishing scenario, the basic look and feel of the Web page is created by a Web designer in any HTML-authoring tool and then handed to the different contributors to put content into the provided framework.

Using Oracle Reports’ revolutionary reporting paradigm of Java Server Pages (JSP) based Web source, you can cater to all the needs of dynamic Web publishing. Based on the industry-standard JSP technology, Oracle Reports allows you to inject dynamic report content into any surrounding structure. This surrounding structure could be an existing HTML Web page created by the Web designer, or any other modern format like WML for wireless browsers.

Using custom JSP tags, JavaBeans or regular Java code, you add programmatic elements in existing Web pages. At runtime, those elements fetch data from the data sources defined inside the report, and format and publish the data exactly as dictated by the Web page.

![Figure 6: You can create a true Web page, containing dynamic report content, using the JSP Web source of Oracle Reports](image)

Though, as we have seen, Oracle Reports exposes specialized technologies suited to paper-based and Web reporting, you can store both the Web source and paper layout in a single report definition file.
The paper layout and Web layout share the data model and program unit objects defined as part of the report, yet can be completely independent of each other as far as formatting is concerned. In essence, this means that the data model and business logic need to be created once, and can be leveraged to create both paper as well as Web output. Web designers can design the Web page itself and the data component can be incorporated into the page using Oracle Reports JSP tags. In addition, you may expose the same data in the paper layout with entirely different formatting characteristics more suitable for a paper report.

![Image](image.png)

**Figure 7: Web and paper output generated out of a single report definition file**

Reports Builder is now capable of opening and saving various formats. The RDF, JSP, and XML output formats will all store the data model, as well as the Web source and paper layout. The JSP format provides you with the maximum flexibility of the develop once, deploy anywhere principle of Oracle Reports. The JSP format can be executed in the application server’s JSP engine to produce the Web output and at the same time, can be used with Oracle Reports Services to produce the paper output.

JSP-based Web reports offer the following advantages:

- Separation of dynamic content (Java) and static content (HTML)
- Support for scripting and tags
- Reuse of components and tags
- Portable, powerful, and easy to use
- Accepted, industry-standard way of building dynamic Web pages
- Seamless integration in J2EE applications
- Compiled for permanent execution
- JSP reports deployed to produce both paper and Web output

**UNLIMITED PUBLISHING CAPABILITIES – WHEREVER YOU WANT YOUR INFORMATION**

Oracle Reports is all about publishing data. Publishing your data wherever you need it. To bring flexibility to publishing, Oracle Reports offers a number of features that allow you to bring the published data exactly where you need it. Out-of-the-box, Oracle Reports supports the following destinations: browser, file, email, printer, Oracle Portal, FTP Server, and WebDAV.

Additionally, these destinations are written against a Java-based API that also allows you to create and plug in your custom destination. For example, you can use the Java API to create a destination that sends the report output to the database as a Binary Large Object (BLOB), or implement post-processing steps like compressing the file output.
Several samples created by our customers are available on the Oracle Technology Network (OTN) Plugin Exchange.

Figure 8: Distribute your report to any kind of destination (for example, printer, file, and Web) or create your own using the Java API

Deployment made Simple

Oracle Reports Services allows you to easily deploy your reports on the Oracle Application Server. To deploy paper-based reports, you simply copy the report definition file to a location accessible to the Oracle Reports Server. To deploy JSP-based Web reports, you can either copy the file to the J2EE application server’s deployment directory, or deploy it as part of an Enterprise Archive (EAR) file.

Powerful Bursting and Distribution

With enterprise reporting, you are often required to run the report on the complete data set, however, only the relevant subset of information needs to be sent to respective recipients. For example, you might want to run a pre-defined report on the key performance indicators for all your suppliers, but you want to send only the relevant portion of the report to each supplier. By using a sophisticated feature of Oracle Reports called bursting, you can run a report once to generate multiple files, each file containing the information each supplier needs to analyze its own performance. You can choose the granularity at which you need to burst the report output, for example, bursting the main section, while retaining common header and trailer sections for all recipients.

Using another very useful feature called distribution, the result of this bursting could then be distributed wherever you need it. You could send the generated PDF files to your corporate Web site that uses Oracle Portal, and, at the same time, email the reports to the contact person for each supplier. The email destination allows you to assemble your email however you want it. You can decide if you want the report output as attachment or body, and add static files as attachments as well.

Figure 9: Bursting and distributing report sections to different recipients in a single run of the report
Report Customization and Personalization Using XML

Though modern analysis and design techniques aim to meet the requirements of the entire user base as closely as possible, it is rare that a new report module will meet the needs of different users in quite the same manner. For example, the amount of information displayed may be insufficient for a given user, superfluous, or simply in the wrong format. As such, it is often the case that the base report module is further customized for each unique need, resulting in a plethora of reports, each of which differs slightly from the original report definition.

The problem is further compounded when a new version of the base report is released, as any custom modification would need to be rolled forward into the new version. This can result in a significant effort on the part of the application developers, and, in particular, greatly affects vendors of ERP style applications, where the modules are often heavily modified for each customer site in order to meet their own corporate standards (for example, logo, and look and feel).

Oracle Reports answers this need by allowing the modifications to be externalized into a separate file, rather than having to create a unique version of the report. Creating and applying different customization files can tailor the report output for each user or group without changing the original report definition.

Defined using XML, the customization file allows for both the modification of current objects in the report and also the creation of new components. Using these XML tags it is possible to build a report definition that will then serve as either a customization file or even a completely self-contained report.

The ability to externalize modifications greatly simplifies the upgrade process, as well as the need to make an application site specific. By performing a batch update to the application’s existing reports, it is possible to quickly update or upgrade a large number of modules without the need to open each file in the Reports Developer to manually make the changes. Through the use of XML-based customization, gross changes of this nature can be made to the entire application in a single step.

AN INTEGRATED ENTERPRISE-REPORTING SOLUTION

Oracle Reports is tightly integrated with other components of Oracle Application Server, such as Oracle Portal, Oracle Forms, and Oracle Discoverer, to provide you with a single-vendor solution that satisfies all your enterprise reporting needs. Your system administrator can easily monitor and manage the entire Oracle environment using the browser-based Oracle Enterprise Manager.
Integrated Approach to BI

Every organization has a spectrum of business intelligence (BI) requirements ranging from complex MIS written operational reports to end user ad-hoc queries and advanced analytical tasks like forecasting and what if analysis. However, in general the insight gained from corporate data may be simplified to three basic questions:

1. How is my business doing?
2. What influenced this and what factors were involved?
3. Based on certain trends where will my business go?

The job functions of those tasked with answering these questions has often resulted in the use of different reporting tools, that is, traditional structured reports to answer question 1, drill and pivot ad-hoc query tools to answer question 2, and advanced analytical engines to answer question 3.

As a result, to build a BI system for the enterprise, IT professionals would purchase point solutions piecemeal. Unfortunately, such piecemeal solutions result in proliferating complexity and escalating maintenance costs. For example, when multiple disparate vendors upgrade their respective products they rarely account for any impact on the other products that are part of the overall solution. More importantly, there can be a real business impact for un-integrated systems beyond just the maintenance costs. With various tools using different copies of metadata, you could have multiple users viewing the same data but arriving at separate conclusions.

Oracle offers an integrated BI solution that provides the business user with a complete picture across the entire organization. With an integrated solution from a single vendor, customers who implement Oracle BI benefit from the ability to:

- Make the right decisions faster.
- Enable more users with the information they need.
- Improve information quality.

Oracle Reports is the well integrated enterprise reporting component of Oracle BI. You can import worksheets created in Oracle Discoverer, Oracle BI’s ad-hoc query and analysis tool, and create reports directly from these worksheets. In order to allow users to answer typical on-line analytical processing (OLAP) questions, Oracle BI’s OLAP query tool is available inside Oracle Reports. Using this query tool, you can access analytical data and leverage the powerful publishing capabilities of Oracle Reports to make this information available to all authorized users.

You can use the scalable and dynamic Oracle Portal as the single interface to secure and publish all your reports.

SECURING AND MANAGING THE ENVIRONMENT

Security is one of the biggest concerns of CIOs today. Even while all unauthorized access should be blocked, authorized users should be provided with a simple and easy way to access the information they need. Oracle Application Server provides the security infrastructure as well as the security features for flexibility and security across the enterprise. Using the Oracle Portal user interface, you can secure your reports, Reports Server, and other resources, like printers, by registering them with the Oracle Application Server security framework. You can define which users or groups are authorized to access, view, or manage the resources, and you can further restrict access to these resources by defining when they can and cannot be accessed. Using Oracle Single Sign-On, authorized users can access reports, portal pages, and databases, all based on a single username and password.
Figure 11: Logging into your environment with and without Oracle Single Sign-On (SSO)

Monitoring and managing the environment is critical for the smooth running of the enterprise reporting environment. You can manage your entire Oracle infrastructure including Oracle Database and Oracle Application Server via OracleAS Control and Oracle Grid Control. Oracle Reports' integration with OracleAS Control provides you mechanisms to monitor performance, view and manage job queues, view diagnostic trace information, and configure the Reports Server and Engine. OracleAS Control provides the administrator a single window for keeping tabs on the health of Oracle Reports, and for managing the environment.

Figure 12: Using OracleAS Control you can easily manage and monitor your entire enterprise reporting environment

RELIABILITY

Today's IT environments are highly demanding about the quality of service and availability of applications. Over the years, high availability has shifted from a mission-critical requirement to a general requisite that affects all types of deployments. An enterprise reporting application must deliver high availability to ensure uninterrupted availability of information to an enterprise, its customers, and its partners.

Oracle Application Server High Availability provides the industry's most reliable, resilient, and fault-tolerant application server platform. Oracle Reports' integration with OracleAS High Availability makes sure that your enterprise reporting environment is extremely reliable and fault tolerant.
Figure 13: Oracle Reports, a part of the Business Intelligence component, is tightly integrated with other components of Oracle Application Server to provide security, manageability, and reliability, among other benefits.

ADVANCED MECHANISMS

Advanced Scheduling

In an enterprise reporting scenario, you often need to schedule the reports to specify either a delayed execution or a repeated execution. For example, the production manager might want a pre-defined raw material inventory report as well as a finished goods inventory report to be run every Friday at 5 pm. Oracle Reports’ flexible scheduling mechanism allows you to not only schedule the reports but also specify additional options like how many times should the request be resubmitted in case it fails.

Figure 14: Use the powerful and flexible scheduling mechanism to schedule reports for either delayed execution or repeated execution

Reporting as an Integral Part of Your Business Processes

Integration with Oracle Workflow allows you to execute reports and get status as Workflow activities in your Business Process. For example, you can create your Sales Order business process such that as soon as the sales representative books an order, a report is executed and sent to the accounts department.

Multiple Ways to Access Reports Server

The Reports Server, written 100% in Java, provides access mechanisms to submit jobs via HTTP (Reports Servlet), PL/SQL, or command line (Reports thin-client). Oracle AS Reports Services can be exposed as a Web Service. Your application, whether it is written in Java or any other language, can access the Reports Services in a standard fashion.
Notification

Using built in email notification and the open Java notification API, you can integrate the Reports Server into your existing business systems in a bi-directional manner. After submitting a job, you have access to the server queue information in XML format. You can easily track your job from within an application and have a notification sent when the job has finished.

![Figure 15: Using pluggable notification the administrator gets notified instantly when, for example, a report fails](image)

EXTENSIBILITY

No matter how powerful and flexible a reporting tool might be, today's world of specialization means that it cannot fit every user's specific requirements exactly. Keeping this in mind, Oracle Reports provides you with well-documented Java APIs with which you can extend and customize Oracle Reports to satisfy all unique needs. You can plug in your own data sources, security mechanism, engines, destinations, caching algorithm, and notification methods.

As an example, you can use the pluggable security API to plug in your XML-based security implementation. Or you could use the pluggable caching API to plug in your customized caching algorithm. With the pluggable engine, you can even use the Oracle Reports Services infrastructure to perform additional tasks (for example, execute an operating system command) and leverage the other services of the server, such as scheduling, security, and distribution of the output.

CONCLUSION

In a modern IT environment, reporting is no longer just about simple representation of data; reporting is also about how and where the data is presented. High fidelity, boardroom-quality reports that are meant to be printed stand against the growing area of online data publishing in a Web browser. Oracle Reports provides you with specialized technologies for creating pixel-perfect paper reports and Web reports.

By virtue of being an integral component of Oracle Application Server, Oracle Reports offers you a complete enterprise reporting environment, not merely a great tool. It leverages the industry-leading security, identity management, and high availability capabilities provided by Oracle Application Server to provide you with a secure, absolutely reliable, and extremely scalable enterprise reporting environment.

By implementing the extensive and well-documented Oracle Reports APIs, you can even extend reports functionality by adding data sources, destinations, or other components to the Oracle Reports framework. You can thus be sure that Oracle Reports will fulfill all your unique needs not only today but in the future as your needs grow more specialized.
Oracle today provides the technology foundation for building a complete BI solution. This gives you the ability to acquire both enterprise reporting and analysis technology from a single vendor. Oracle BI thus gives you the breadth of solution that, when fully exploited, clearly arms you for success. You then have the capability to deliver the right information to the right person at the right time, at the right price.