Reviewer’s Guide for Crystal Reports XI Developer Edition and Crystal Reports Server XI

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Introduction

An application is only as powerful as its ability to handle data in a meaningful way. Each year, application developers write hundreds of thousands of lines of code with the primary purpose of storing and retrieving data. What do application users do with this data? Many simply look at it, but a growing number of users want to do more than see the data. They want to interact with it. They want to slice and dice the data to fit their individual interests.

An application can have a beautiful user interface but if it can't provide the information people need in the format they want, it has failed. To take this one step further, as applications become more complex, data presentation needs become more complex as well. Creating this level of reporting from scratch is a time consuming and difficult task.

How can developers address these needs without devoting all of their time to creating reports? The answer: they don't have to. 3rd parties have already invested time and energy to produce products that solve these problems and present data in a clear and concise format and provide data consumers a myriad of customization and formatting options. Crystal Reports XI from Business Objects is at the top of this list.

The History of Crystal Reports

Crystal Reports, developed by Crystal Decisions in the early 90s, arrived as the world's first Microsoft Windows report writer in 1992. In 1993, Microsoft bundled Crystal Reports in Microsoft Visual Basic. The initial version consisted of a designer, the Crystal Reports API and the Crystal Reports control. Crystal Reports quickly became the de facto tool for developing reports with Visual Basic.

In 2002, Microsoft bundled Crystal Reports with Visual Studio .NET. Business Objects, the market leader in the business intelligence industry, acquired Crystal Decisions in December 2003. This union of two industry leaders gave Business Intelligence (BI) users their first clear standard for managing, analyzing, and reporting on data. Their strategy of constant innovation has led to the development of products that are acknowledged by companies as best-of-breed solutions. Business Objects leads the market in reporting, analysis and information delivery and will provide innovative products and services not only today, but well into the future.

If you've already invested in Crystal Reports as a bundled product in Visual Studio .NET, Borland C# Builder, or Borland Delphi you should know that the full version of Crystal Reports XI is an easy and feature rich upgrade. The full version of Crystal Reports XI supports advanced web browser printing and exporting, additional data connectivity, additional export formats, reports for mobile devices, customizable report preview, and many other additional features.

For every application, there are 3 audiences that will find Crystal Reports extremely useful. Information Consumers are the primary end users of all reports. This group includes the decision makers who will view the reports and use them for their daily work. Report Designers are responsible for taking the needs of the Information Consumers and translating them in to usable reports. Application Developers design applications which include reporting and build the reporting interfaces as defined by Report Designers.

What are the criteria one should use when deciding whether to use a 3rd party tool? If one does decide to use a 3rd party tool, what considerations are there in making the final decision on the actual products?

Decision Making Criteria

There are a minimum of 5 criteria which should be considered when choosing a reporting tool:

Using the tool, how easy is it for application developers or report designers to create reports?

Can information display be controlled where necessary?
How easy is it to incorporate reports created with the tool into existing applications?
How easy is it to deploy, scale, and maintain reports created with the tool?
How usable are the presentation controls for the Information Consumer?

The first question is how easy is it for application developers or report designers to create reports using the tool? In order to maximize the capabilities of a team, a manager must choose a tool that empowers his or her developers and report designers. Secondly, the tool must allow easy development of feature rich, powerful, and accurate reports. In order to maintain accuracy and consistency, the tool should also allow tight control over the display of information where necessary.

Thirdly, how easy is it to incorporate reports created with the tool into existing applications? Reports have the most value when they are readily available and easily accessible from the systems with which users are accustomed. The right tool will allow easy integration of reports in to these applications regardless of the underlying technology. In a similar vein, how easy is it to deploy new or updated reports? A reporting tool should make distribution simple and error free. Reports only have value when users have ready access to the latest versions.

Once the report is developed and distributed, the final criterion to consider is the usability of presentation controls for the Information Consumer. End users should be able to manipulate how the data is displayed to make it the most usable for them while maintaining accuracy and consistency.

Application Developers

Professional software developers are one of the primary audiences for Crystal Reports and as such stand with the most to gain from its use. Application Developers are the members of your team who write the code and build the databases which make up your application. They are most familiar with the details of the data and the difficulties of developing reports. Application Developers, along with Report Designers will often build many of the reports included in an application. Developers are often tasked with determining whether to buy or build a reporting solution.

Buy vs. Build

A significant amount of time and effort can be spent designing and writing code to display complex data cleanly and efficiently. Even more time and effort can be spent implementing functions that enable application users to customize data views to suit their individual tastes. This presentation, which most development tools and frameworks typically limit to the static projection of query results onto a Web page or the binding of data to a grid on an application form, misses the mark. Ease of use features such as grouping, sorting and filtering and presentation features such as color coding or graphing are often difficult to implement. Crystal Reports includes all of these features and much more.

Developers often think they can build an application that is just as good as a third party tool. However, when compared to the built-in functionality of Crystal Reports XI, a custom-built solution would require a tremendous amount of time, effort and code to achieve even a fraction of the functionality. Developers will prefer Crystal Reports XI to a custom-built solution because, out of the box, Crystal Reports XI offers an easy to use designer, a report viewer control which can be dragged and dropped onto a Windows Form or Web Form, drivers for dozens of popular databases, and the ability to export data to popular file formats such as PDF, Excel and editable RTF.

In terms of flexibility, not only can Crystal Reports XI build a “banded” report that lists repeating data, but it can also be used in ways that aren’t typically associated with a report writer. For example, with Crystal Reports XI, a developer can easily create a report containing a chart or

graph. Application users can view data represented graphically and drill down on charts and graphs to view data details.

Another useful example is form letters. Developers can use Crystal's report designer to create a form letter template and pull customer information from a variety of databases. Generated form letters can be printed and mailed to customers. Yet another example of Crystal Report's broad range of use includes formatting a report as an invoice. Invoices for a specific date range or a particular set of customers can be produced and exported as a .pdf file with minimal effort and almost no coding.

Secondarily, Crystal Reports allows the developer to focus on building the business logic necessary for a report without being forced to reinvent the wheel. Because Crystal Reports includes an extensive object model, developers can focus on using the tools to meet customer needs instead of building those tools.

Basics

Creating a new report in Crystal Reports is as easy as creating a new document in your favorite text editor. There are two ways to create a new report: through one of the report wizards or as a blank report. (Figure 1)

Creating a report

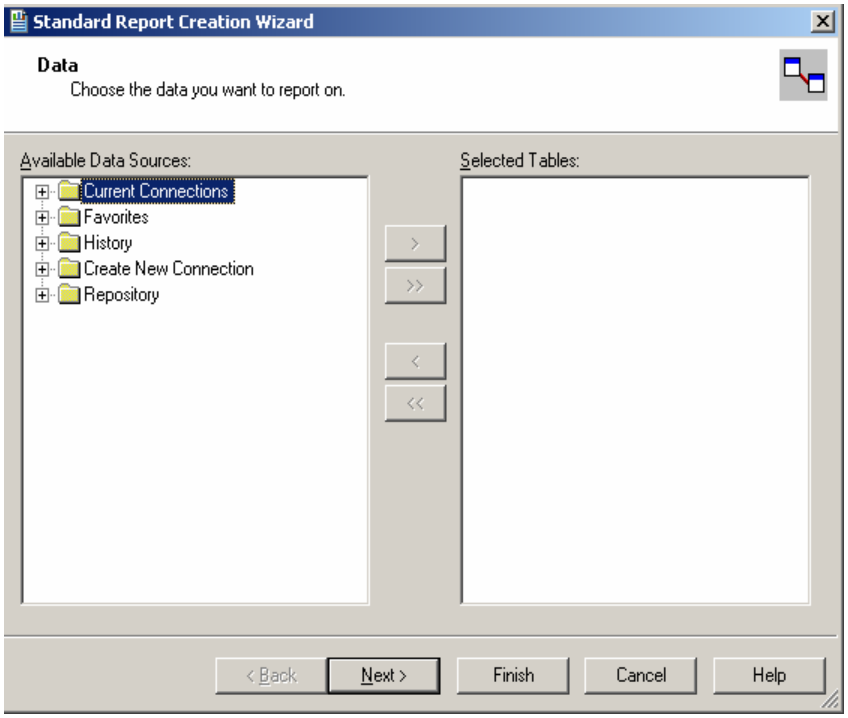

Figure 1

Selecting the Report Wizard option starts the Report Creation Wizard data selector. The Report Wizard guides the developer through all of the steps necessary to create a report: selecting a data source, selecting which fields will appear on the report, grouping options, summary values, the number of records to display, whether a chart should be included on the report, selection criteria and the style of the report. The Report Wizard generates a Report file based on the selected items. The result: a tailor-made and professional looking report (Figure 2) - all without writing a single line of code.

Clarity Sales Venture Report by Department

Year	Month	Department	Profit
2003	January	East Coast	$620
2003	January	International	$490
2003	January	Midwest	$475
2003	January	West Coast	$850
2003	February	East Coast	$550
2003	February	International	$610
2003	February	Midwest	$250
2003	February	West Coast	$340
2003	March	East Coast	$570
2003	March	International	$750
2003	March	Midwest	$610
2003	March	West Coast	$190
2004	January	East Coast	$-50
2004	January	International	$400
2004	January	Midwest	$315
2004	January	West Coast	$200
2004	February	East Coast	$100
2004	February	International	$500
2004	February	Midwest	$-100
2004	February	West Coast	$400
2004	March	East Coast	$300
2004	March	International	$800
2004	March	Midwest	$200
2004	March	West Coast	$200

Figure 2

The second option, creating a report as a blank report, displays a blank Report file (Figure 3) in the Crystal Reports Designer with the header, details and footer sections displayed. The data source and other fields can be edited through the Field Explorer window. From the Field Explorer window fields can be dragged and dropped onto the report in the Crystal Reports Designer. Again – a complete report can be created without writing a single line of code!

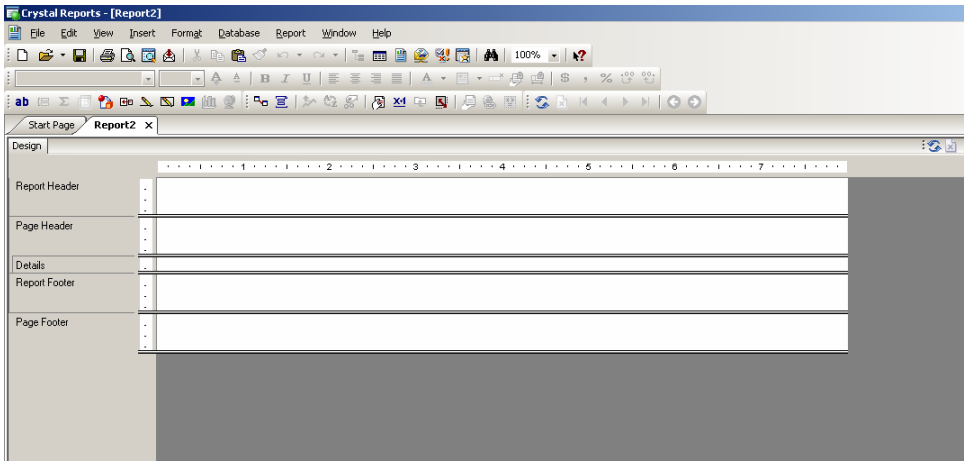

Figure 3

Presentation

Once a report has been created, the next step is to incorporate it in to an application. Crystal Reports offers two viewer controls - one for the web and one for Windows Forms applications. Developers can drag and drop these controls on to either application type and initialize the report at either design time or execution time. For instance, a developer might include multiple buttons on a form which display different reports in the same area. When a user clicks on a button, the code will set up the display area and set all necessary properties. Figure 4 is an example of a Windows Form based report. Figure 5 is the same report but presented on the web.

Crystal Reports XI also includes a custom JSP tag library which greatly simplifies the task of integrating reports in Java applications. For instance, Crystal Reports can be added as project items in most Java IDE's and managed as project resources. Built-in wizards handle the tedious aspects of this process so that almost no code is required. These resources can also be created as report templates to further ease the work required to create new .jsp pages.

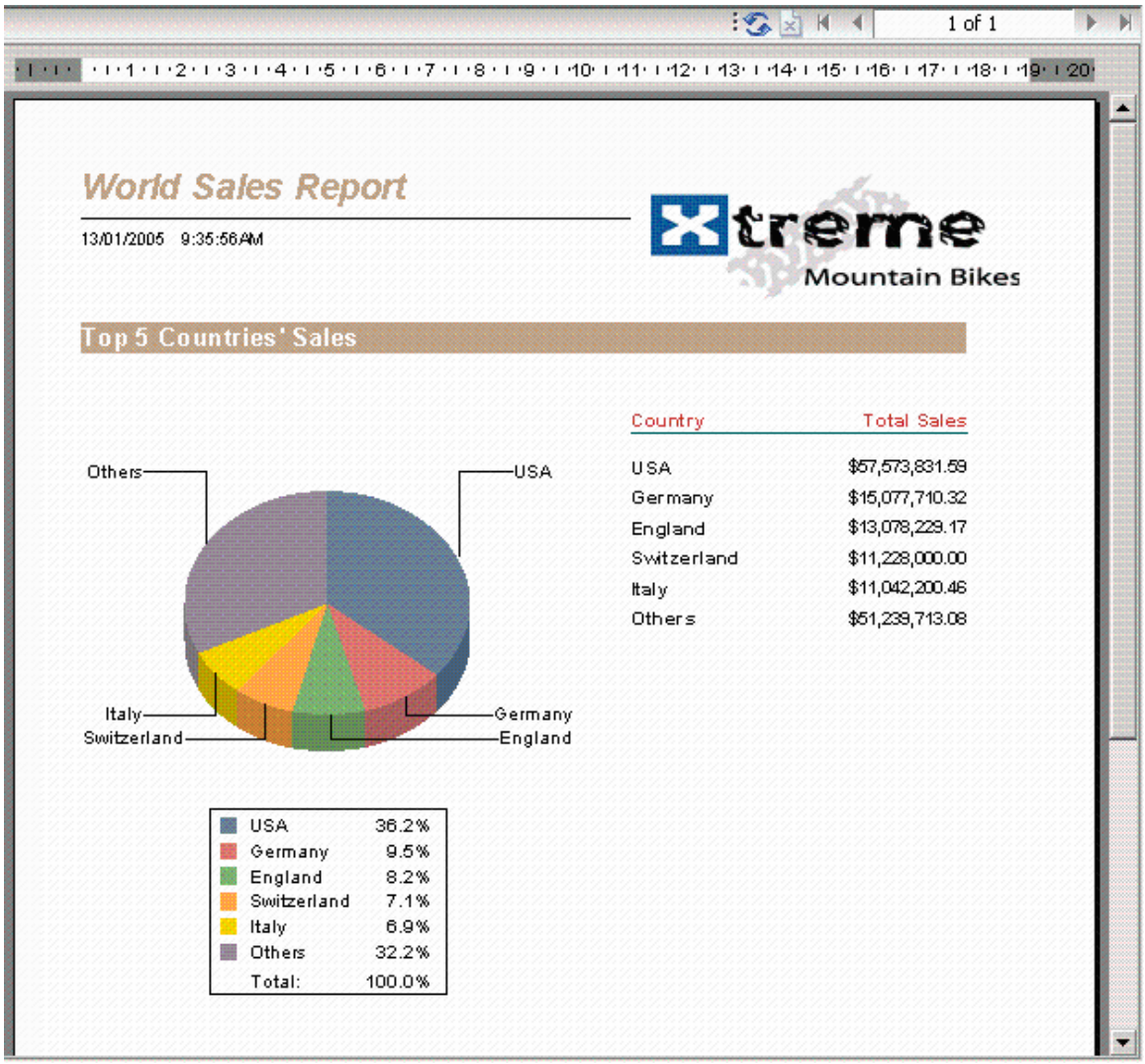

Figure 4

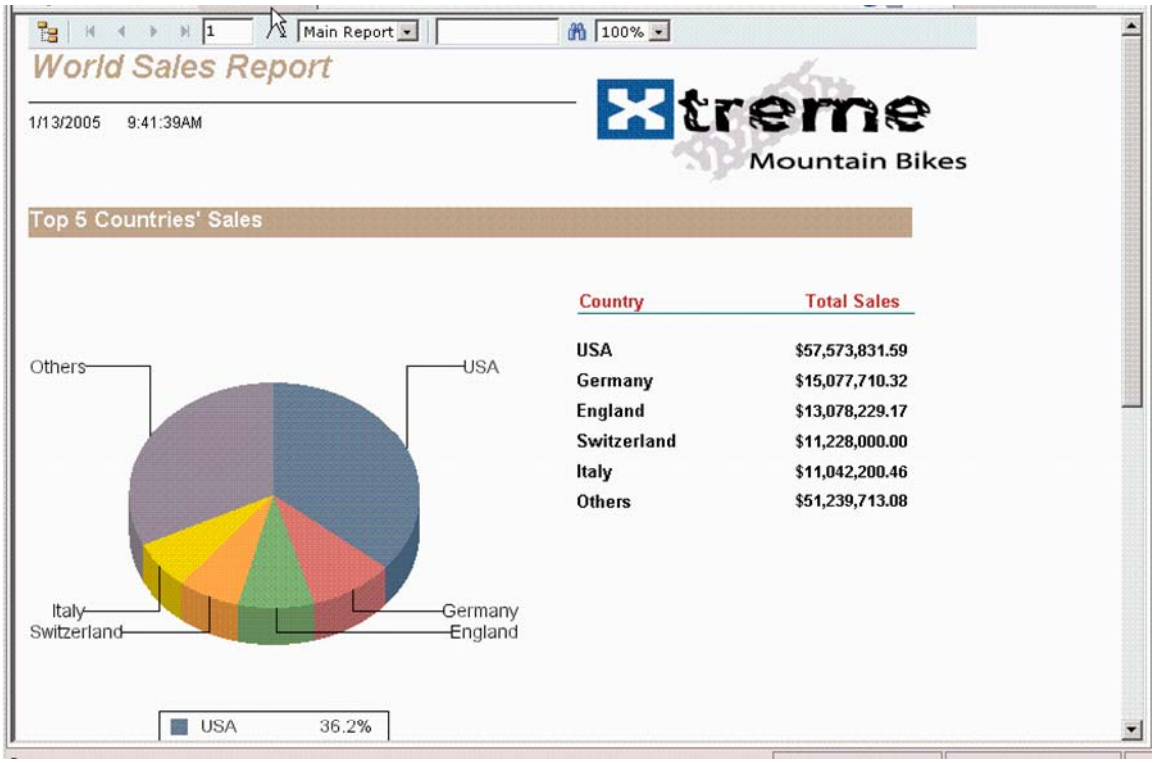

Figure 5

Drill Downs

If a report has groups defined then double-clicking (or single-clicking in the case of a Web Form) on a group header or group footer section in the main report will open a new page with only the selected group's data displayed. For example clicking on South section of the pie chart on the report will open a new page within the Report Viewer control with only data from the Southern United States (Figure 6 and Figure 7).

The ability to drill down is important because it allows one report to accommodate a multitude of audience preferences for data detail. For instance, an administrator who wishes to see statistics for all regions across the country can use the same report as a local person who wants to view details of only their region. Crystal makes this extremely easy and requires no code.

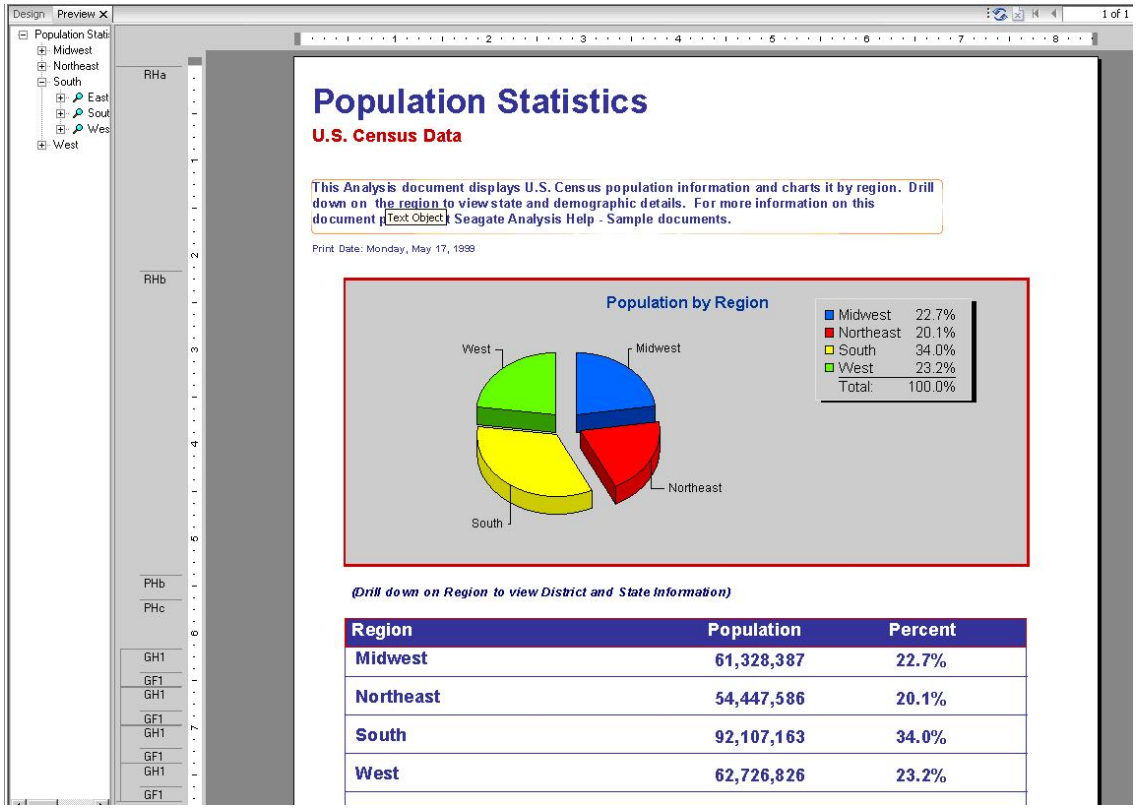

Figure 6

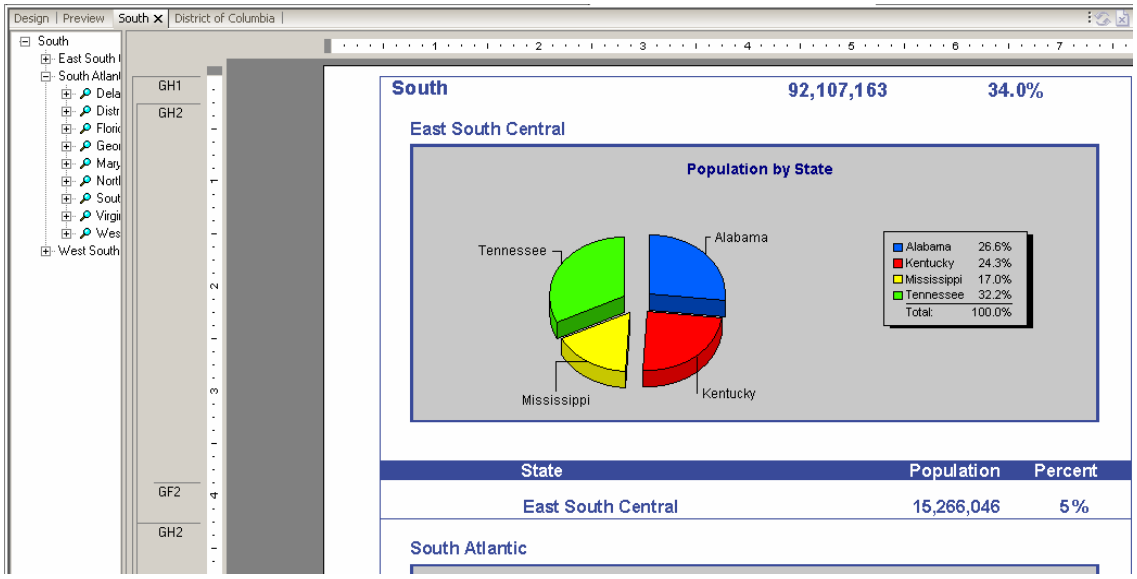

Figure 7

Cross platform support

Crystal Reports XI sees the enhancement of the 100% Java Reporting Component, which was first introduced in Crystal Reports 10. The component takes full advantage of Java including portability across operating systems and hardware platforms. Completely developed in Java, this new reporting component provides a fast, code-free way for developers to connect to data and design dynamic, high-fidelity presentation layers for J2EE applications. The engine supports core Crystal Reports functions such as grouping, sorting, filtering, expressions, basic formatting, and charting, as well as PDF and Word exporting. It also enables integration with leading Java integrated development environments including Borland® JBuilder™ and BEA WebLogic Workshop™ and IBM® Rational® Application Developer for WebSphere® software.

For the .NET developer, Crystal Reports is integrated into Microsoft® Visual Studio .NET., Borland® C# Builder and Borland® Delphi .NET

By upgrading your application to use Business Objects Enterprise or Crystal Reports Server applications can take advantage of off-loaded report processing, report scheduling and security, programmatic report creation and modification, and many other features.

Report Parts

Report objects displayed by themselves within a viewer—independent of other elements of a report page—are referred to as Report Parts. More precisely, Report Parts are objects that use hyperlinks to point from a home report object to a destination object.

Report Parts work with the DHTML viewer subset of the Crystal Report Viewers to expand the navigation possibilities within and between reports. Report Part hyperlinks can link to other objects in the current report or to objects in any other report. This linking lets you create a guided path through your reports that shows only specific information at each stop.

Viewing Report Parts instead of an entire report is a powerful feature that allows you to seamlessly integrate reports into portal and wireless applications.

Report Part Viewer

The Report Part Viewer is a viewer that lets you display Report Parts independent of other elements that typically comprise a report page. You can integrate this viewer into web applications so that users see only specific report objects without having to view an entire report. The viewer is useful in situations where screen real estate is constrained.

For the most part, you set up the Report Part hyperlinks in the Report Designer, but you take advantage of their functionality in the report viewers.

Mobile Support

Since mobile phone usage and capabilities are increasing dramatically, Crystal Reports now includes a Mobile Part Viewer that greatly simplifies delivering Crystal Reports to mobile devices. This tool works with the Microsoft Mobile Internet Toolkit to provide a seamless means of formatting data for the mobile platform.

Performance

All developers are concerned with performance. It is an important aspect of report development; others will evaluate a report's performance as a positive or negative aspect of that report. If a report takes too long to load, the audience will be reluctant to use the report. The report components that come with Crystal Reports XI Developer edition can be installed across multiple servers within an organization, but cannot be offloaded to a separate server from the web application. The components are therefore ideal for servicing a small community with simple to moderate reporting requirements.

Given that reporting can be very resource intensive, being able to offload report processing should be a major consideration for customers with medium to large scale report processing requirements. They should therefore consider a Crystal Reports Server or a BusinessObjects Enterprise solution which both offer substantially more than maximized performance.

Crystal Reports Server is new to the Crystal Reports family with the release of XI. Five named user licenses are included in the Crystal Reports Developer edition.

Scheduling

Crystal Reports Server includes a scheduling engine that allows you to run reports based on events, calendars or specific points in time. So for example, after a system event occurs such as a database backup has completed or an OLAP cube has repopulated. Or a report could be created and mailed after a system crash to provide information about the machine's status before and after the crash. The scheduling engine also allows you to process large reports during off-hours to avoid unnecessary database hits at inopportune times or to create reports after particular events happen.

Scalability

The reporting components in Crystal Reports Developer edition can be installed on multiple servers within an organization, but are designed for simple reporting needs. In order to support heavy loads, the Crystal Reports Server lets you tightly integrate reporting in to custom web applications and offload the intensive reporting to a separate dedicated server. If your reporting or business intelligence needs outgrow Crystal Reports Server, it's as simple as a key-code change to move to an Enterprise solution.

Caching

One important aspect of performance, especially for web based reports, is the ability to cache frequently requested information. Caching is the process of taking information and storing it in memory improving the ease and speed of access. This can greatly increase the performance of a report. Crystal Reports Server automatically takes care of the plumbing required to make this happen whenever a web report is incorporated in to a web application.

Security

Once your organization's data is available in feature rich reports which are extremely fast and highly customized, you must take steps to secure it. Security is an integral and necessary part of any reporting application.

To meet this need, Crystal Reports Server provides complete support for a group, user, and data level security model to help protect sensitive reports. The security model can also be used to provide an individualized user experience. Once a user has been authenticated the report writer has access to many Special Fields (See the section on Special Fields for more information).

External Authentication

The Crystal Reports Server also allows integration of any 3rd party NT or LDAP authentication mode allowing developers to leverage existing security systems. This might include hooking in to existing domain authentication or to a separate authentication system.

Single Sign-on

Single Sign-On is now available so that a report created in Crystal can be integrated in to an existing security infrastructure. Using this capability, developers can pass security credentials from their application through to the secure database used by the report eliminating the need for

users to be repeatedly prompted for credentials each time they run a report and improving the user experience.

Programmability

Static, canned reports are often insufficient to meet the demands of information consumers. To address this issue, Crystal Reports includes interfaces and development kits which provide developers access to all aspects of reports at runtime enabling fine-grained control over a report's appearance and functionality.

Integration

One of the primary aspects of programmability is the ability to integrate reports into applications. URL-based report integration has been re-implemented as ASP, ASPX, and JSP pages that are fully backward compatible with the old viewrpt.cwr technology. This easy and popular method of report integration will continue to be supported on standard application-server platforms.

SDK

Despite the flexibility and customizability of Crystal Reports, the "out of the box" tools may occasionally fall short of an organization's needs. For those situations, Crystal Reports provides an SDK that contains two object models and allows developers even more control over reports. For developers that require an even finer level of control over report output, appearance and functionality, the SDK can be expanded (through additional licensing) to expose a total of four object models.

The controls for the report viewer provide the entry point into the SDK. This is because the report viewer displays reports by binding to a report object; all object models in the SDK expose and manipulate report objects.

The simplest object model is the CrystalReportViewer. The CrystalReportViewer control in the Web or Windows Form has an underlying class of the same name. This CrystalReportViewer class exposes properties and methods for modifying the control's display functionality, and for interacting with classes that manage database logons, parameters, and selection formulas. The CrystalReportViewer class exists in two different forms: one in a Windows namespace and one in a Web namespace. Therefore, many elements of this object model are duplicated in both namespaces, with some variations to support the differences in the Windows and Web platforms.

A more extensive object model is found in the ReportDocument class. The ReportDocument class is a gateway to a set of classes in the Engine namespace, including Database, DataDefinition, ExportOptions, PrintOptions, ReportDefinition, ReportOptions, and SummaryInfo. This is an extensive set of classes that provide more powerful customization and interaction capability with the report.

Two additional object models, ReportClientDocument and InfoObject, are available with additional licensing through the purchase of Crystal Reports Server XI and Business Objects Enterprise XI.

ReportClientDocument is provided with the Crystal Report Server license. This class functions as a gateway to a much larger object model that is made up of many classes across several namespaces. It exposes the entire report structure through the SDK enabling a developer to create or modify every aspect of a report programmatically at runtime.

InfoObject, an extensive object model for interacting with the enterprise-level functions of Business Objects Enterprise, is provided with the Business Objects Enterprise license. This class functions as a gateway to the full Enterprise object model of Business Objects Enterprise and is out of the scope of this document.

Infoview

Business users throughout your organization need quick-and-easy access to documents and information, in order to make timely and accurate decisions. Crystal Reports Server XI delivers an all-new, fully customizable, end-user business intelligence (BI) portal interface—BusinessObjects InfoView—a single web interface that accesses and interacts with Crystal reports. (See Figure 8)

BusinessObjects InfoView is a central web environment that allows end users to easily find the reports they need. Users can navigate using an integrated search facility as well as with a folder navigation tree. In addition, users can personalize their experience by customizing the folder or document they want to view when they login, choose their preferred language, and the level of interaction for different information.

Documents are often meaningless without contextual information. Threaded discussions—a fully-integrated feature of the InfoView environment—help users understand the business context of information in the report for better insight, leading to greater confidence in decisions.

InfoView is built to support Java and Microsoft based web servers, to easily fit within your organization's IT infrastructure.

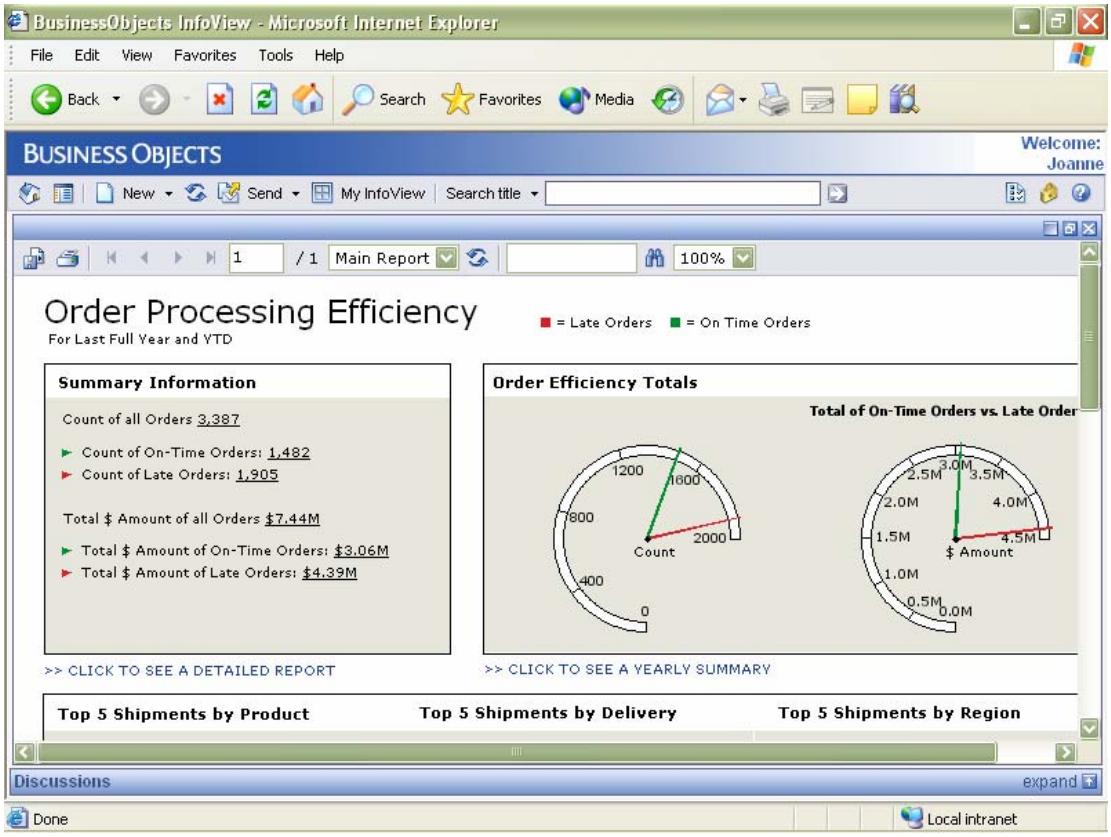

Figure 8

Report Formatting

Developers have the same fine-grained control over the report format as they do within the Crystal Reports designer.

Server Side printing and Sub-reports configuration

New and improved cross-platform application programming interfaces include server-side printing as well as the ability to configure Sub-reports as if they were complete Crystal reports. Sub-reports can now be retrieved, modified, and created as if they were a “main” report. This also includes support for dynamic sub-reports links and fetching rowset values from sub-reports.

Developer Documentation

Crystal Reports XI offers enhanced developer documentation that provides coverage for the most common reporting use cases, and has been significantly enhanced with the XI release.

Report Designer Component (RDC)

The new features in version XI of the RDC are primarily focused on format compatibility with reports created in Crystal Reports 10 and earlier. This focus includes maintaining compatibility with applications created in previous versions of the RDC. Enhancements include new APIs, enhanced deployment options, and an improved ActiveX viewer.

.NET specifics

Crystal Reports XI for .NET developers contains many exciting new features including Dynamic and Cascading Prompting, Editable RTF export format, single-sign on support, and dynamic image location support.

Java Developers

Crystal Reports continues to expand its support for Java with XI. Enhancements include Java User Function Libraries, JavaServer Faces, full support for data export, full support for Web Services and HTML as datasources using a new XML data source, new APIs and improved functionality for Java Reporting Component.

Java User Function Libraries

Java User Function Libraries (UFLs) allow Java developers to extend the already rich set of functions available in the Formula Workshop (located within the Crystal Reports designer). This means that users of Crystal Reports designer can add custom user functions into their reports. Java UFLs are supported on the Java Reporting Component and in the Crystal Reports designer.

JavaServer Faces

The JavaServer Faces (JSF) Crystal Reports Viewer enables Java developers to easily integrate a Crystal Reports viewer into any J2EE web application that is implemented using the JSF framework. The new viewer provides the same level of functionality as the DHTML report page viewer and is supported on the Java Reporting Component, Report Application Server and Page Server. It includes a custom set of JSF tags so the viewer can be easily added into JavaServer Pages (JSP).

Report Data Access

Reports need to be able to access multiple data sources. Gone are the days when corporations stored all of their data in a single data store or format. Today, companies store information in flat-files, relational database, worksheets, and a variety of other places. It’s important that a reporting technology be able to retrieve data from all of these sources.

The data used in a Crystal Report can reside in dozens of locations. A report’s data source can be any database with an ODBC driver or OLE DB Provider, Microsoft Access databases, Microsoft Excel workbooks, an ADO.NET DataSet, an ADO recordset, a CDO (Crystal Data Object) recordset, a DAO recordset, an RDO recordset and even an XML file. (See Figure 9)

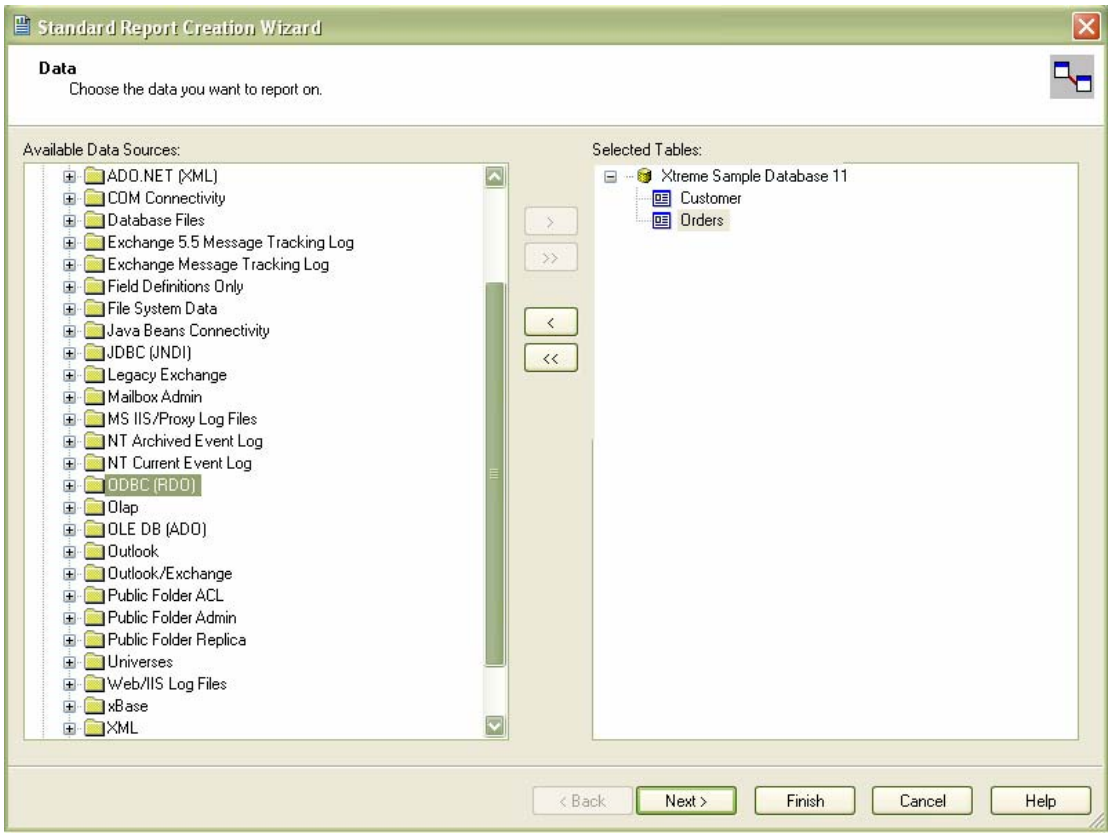

Figure 9

In Crystal Reports, XML is both a data source and an export format. You can create a Crystal report from an XML data source turning raw XML data into report information. You can also take a Crystal report and export it to XML allowing you to transform the data to HTML, WML, and so on.

Developers can build reports based on data stored in virtually any database from SQL Server to Oracle.

Once a data source is associated with a report all of the available tables and corresponding data fields are displayed in the Database Fields list in the Field Explorer window (Figure 10). To add a field to a report, the field is dragged and dropped from the Database Fields list within the Field Explorer window onto the report. Once a field has been added to a report, a check mark appears next to the field's name.

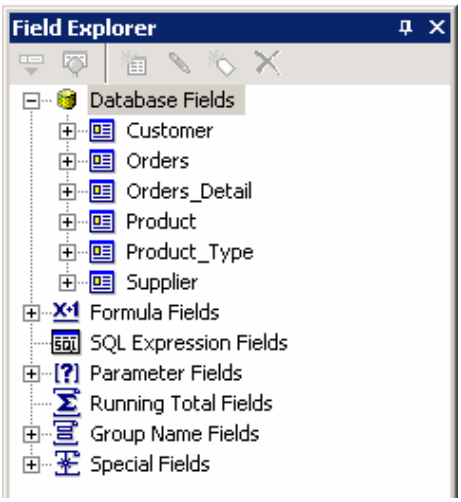

Figure 10

Crystal Reports can access data in almost any common database format, as well as many less common formats.

ODBC

Open Database Connectivity (ODBC) is an open connectivity standard developed by the Microsoft Corporation through which many different types of data can be accessed through a single API. An application need only communicate with one set of files (ODBC) to be able to work with any source of data that can be accessed by ODBC.

There are hundreds of Database Management Systems (DBMS) available for personal computers, and thousands of applications that access DBMS data. Normally, a company that designs an application that accesses data, such as Crystal Reports, must develop a means for the application to communicate with every type of data that a customer might want to use. To access ten different DBMSs, a software vendor would have to create ten distinct data access mechanisms.

On the other hand, if a DBMS provides a means to access data via the ODBC API, called an ODBC driver, the DBMS becomes an ODBC data source. A single application (such as Crystal Reports) can utilize ODBC to access any ODBC data source. With ODBC drivers available for most common DBMS products, the range of data types that Crystal Reports can use is almost unlimited.

ODBC data sources also provide the advantage of being interchangeable. Because they are all accessed through a common API, the underlying database architecture is unimportant. Once a report has been created using ODBC-compliant DBMS as its data source, the report can be "pointed" at a new ODBC-compliant data source, without modification, and work smoothly.

Native providers

Crystal Reports can access many of the most common PC database formats using the DBMS's native API. In other words, Crystal has the built-in capability to directly open database files and tables built in dBASE, FoxPro, Clipper, Pervasive, Paradox, and Microsoft Access, and a host of others.

In terms of performance, this is the fastest and simplest method of accessing data. There are no intermediate files necessary as is the case with ODBC. As such, data can be retrieved in the fastest means possible and that functions specific to that a database provider are fully supported.

The disadvantage of this approach is that a report is tied directly to a single data source format. Unlike ODBC, the means of accessing the data is completely dependent on the data source chosen. If a new data source must be used a new report must be created. But since Crystal Reports offers both native and ODBC drivers, the choice is yours.

OLE DB

OLE DB is a database connectivity protocol similar to ODBC. This technology is fully supported by Crystal Reports but does not enjoy wide industry support. In most circumstances developers will want to use ODBC or native data source providers.

ADO

Crystal Reports can be used to report based on any ActiveX data source including ActiveX Data Objects (ADO), Remote Data Objects (RDO), and Data Access Objects (DAO). These data objects are particularly useful in Visual Basic where Crystal Data Objects (CDO) are also available. Crystal Data Objects are sets of relational data created at runtime using Visual Basic Arrays.

ADO.NET

Crystal Reports XI features full support for DataSets built using ADO.NET. This includes support for strongly typed DataSets which greatly reduce the work required to identify and assign data items to reports. One advantage of the DataSet approach is that the same DataSet which is used for display in view or edit mode in an application can be used to create the necessary report.

OLAP

Although relational databases such as SQL servers and PC databases are the most common sources of data, Online Analytical Processing (OLAP) and Multi-Dimensional Data are rapidly becoming the popular data-storage and analysis formats. Crystal Reports provides the same access and reporting features for OLAP data sources that it provides for relational data.

Web Services and HTTP

Crystal Reports XI now includes an XML database driver which enables reports to use Web Services and http connections as data sources.

Deployment

Distributing an application is a necessary but often dreaded task. Applications are notorious for having many different, independent but related parts which must be set up exactly right in order to work. They are also known for being sensitive to upgrades and changes in other applications. Crystal Reports takes these headaches into account and provides a solution and eliminates many of the common issues. Including a report in an application for deployment is a simple process with only a few steps.

There are 3 options for distributing a report: embedding a report in to an application's files, maintaining the reports as separate files to be distributed with the application, or by publishing the report to a web service.

In addition, Crystal Reports XI Developer Edition includes a new runtime licensing model. An organization can now freely install the reporting components on any number of servers within their organization without incurring additional licensing charges.

Embedded

When a report is embedded in an application, it is written directly into an application's binary source files. This has the advantage that no additional files must be included when distributing the application. However, this tightly couples a report to a compiled application. If changes are made to the report, the entire application must be recompiled and redistributed.

Non-embedded (.rpt files)

A second option is to distribute report files separate from the application itself. This makes all report files independent of the application's .exe and libraries. As such, updating the report does not require that an application be recompiled. The down side to this approach is an increase in the number of files one must distribute and maintain.

Web Services

When a report is generated as a web report, the report engine automatically creates an xml file to describe the report's public functions, input and output, and data types. Additionally, the engine publishes the files to a web server and makes the report data available as a web service. At run time, report data is retrieved from the web service and displayed in the appropriate control. An example for this scenario would be a company creating a report that shows its current unfilled orders. If this report is exposed as a Web service, vendors could reference this Report Web Service from their own applications and view pending orders real-time. Vendors would instantly see any updates to data or the report's format. The report data can be consumed by any application capable of accessing a web service.

Retrieving data

To provide the most data access flexibility to developers, the database drivers included with Crystal Reports XI are designed to support both a "pull" and a "push" model. When using the pull model, the database driver will connect to the underlying data store and pull data on demand. Both the connection to the database and the SQL command used to retrieve data are handled by Crystal Reports and do not require any additional coding by a developer. The pull model is used by default.

Sometimes, database resources are at a premium and special attention must be paid when connecting to the database or retrieving data. When using the push model, a developer writes code to connect to the database and execute a SQL command to create a recordset or dataset that holds the fields used in the report. A developer also writes a few lines of code to pass the data in the recordset or dataset to a report as a parameter. This process enables developers to customize the data retrieval mechanism and build features like connection-sharing, caching, and data-filtering before Crystal Reports receives it. The result: a highly-scalable, highly-flexible reporting application with minimal coding.

The Formula Workshop

The Formula Workshop (Figure 11) is yet another example of Crystal Report's out-of-the-box functionality that aids in the creation of highly customizable reports. The Formula Workshop contains four main windows: the Report Fields window, the Functions window, the Operators window, and the Formula text window. Together, these windows make creating even complex formulas simple. Developers create formulas by combining report fields, functions and operators. Any field in the Report Fields, Functions and Operators windows can be dragged and dropped into the Formula text window. Developers can also construct formulas manually if they prefer. The Formula Workshop also allows a developer to verify the syntax of the formula by simply clicking a button.

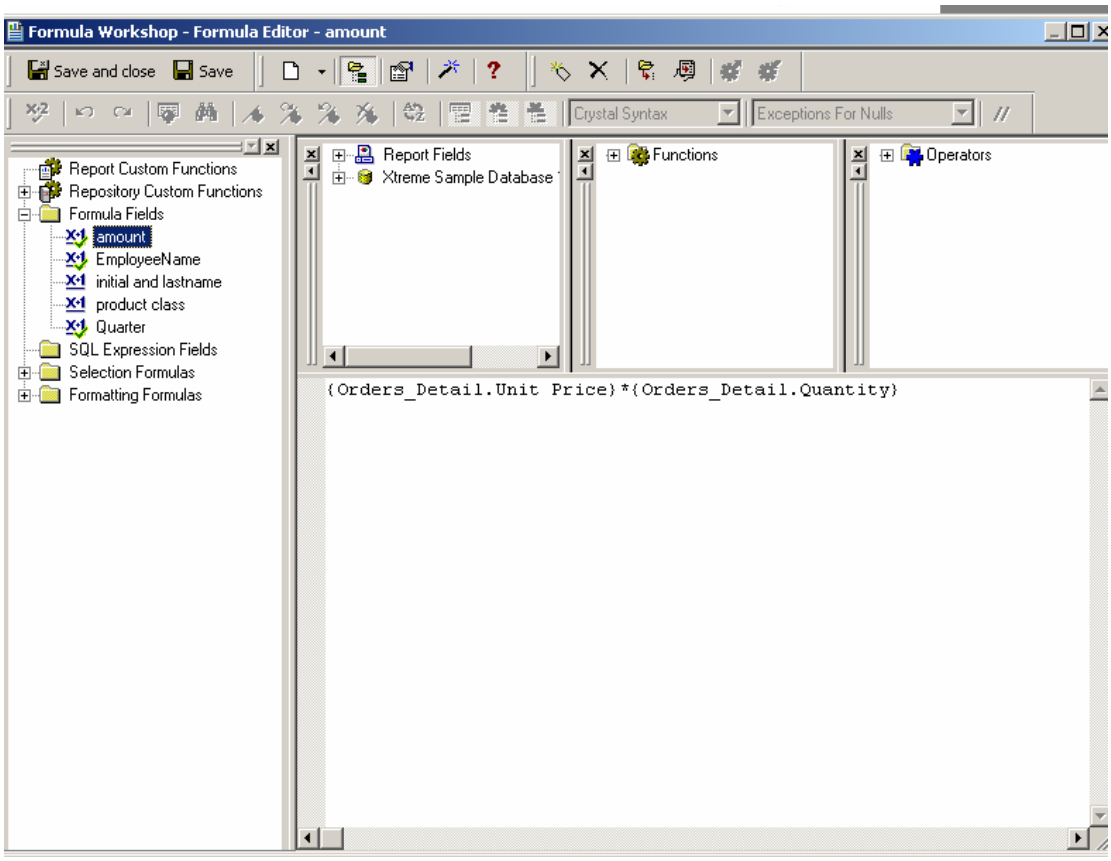

Figure 11

Using the Formula Workshop for Additional Fields

Another common use of the Formula Workshop is to create customized fields for a report. If the data source does not contain all of the information users want to see, developers can create Formula Fields to represent the missing data. For example, if a report's data source contains monthly and yearly totals for an item, a Formula Field called MonthlyPercentage can be created which is the monthly total divided by the yearly total. The MonthlyPercentage field can be added to a report and displayed along with the monthly and yearly totals.

Built-In Formulas

In addition to using customized numerical formulas, common mathematical functionality - like subtotals, grand totals, percentages, and averages - can also be added within the Report Designer. When right clicking on a numeric field the context menu displays the following options: Insert Subtotal, Insert Grand Total, Insert Summary, and Insert Running Total. When a formula is selected, the corresponding calculated fields will be displayed in the appropriate section(s) of the report without writing a single line of code.

Automatic Updates

This new feature is similar to Windows Update in that it is an optional service that allows you to stay current with the latest updates to Crystal Reports. This significantly reduces deployment and maintenance costs as IT no longer needs to visit individual desktops or servers to install Crystal Reports patches.

Report Designers

Report Designers commonly fill the gap between Application Developers and Information Consumers. They take requirements from the Information Consumer and, using the system built by Application Developers, create customized reports. Crystal Reports XI brings many powerful tools for creating, organizing, and maintaining these reports.

Report Sections

A Report File (Figure 12) is divided into the following sections: a Report Header, a Page Header, optional Group Header section(s), a Details section, optional Group Footer Section(s), a Report Footer and a Page Footer. Developers can control the presentation of the report by placing fields in the appropriate sections. This provides tremendous flexibility.

Fields in the Report Header section are displayed only on the first page of a report; items such as a report's title might appear in this section. Fields in the Page Header section are displayed at the top of every page of a report; items such as the field headers for columns in a report would appear in this section. If the report was designed with groups, a corresponding Group Header section will appear above the Details section and a corresponding Group Footer section will appear below the Details for each group defined. Items like the group name would appear in the Group Header section, while any summary information for the group would appear in the Group Footer section.

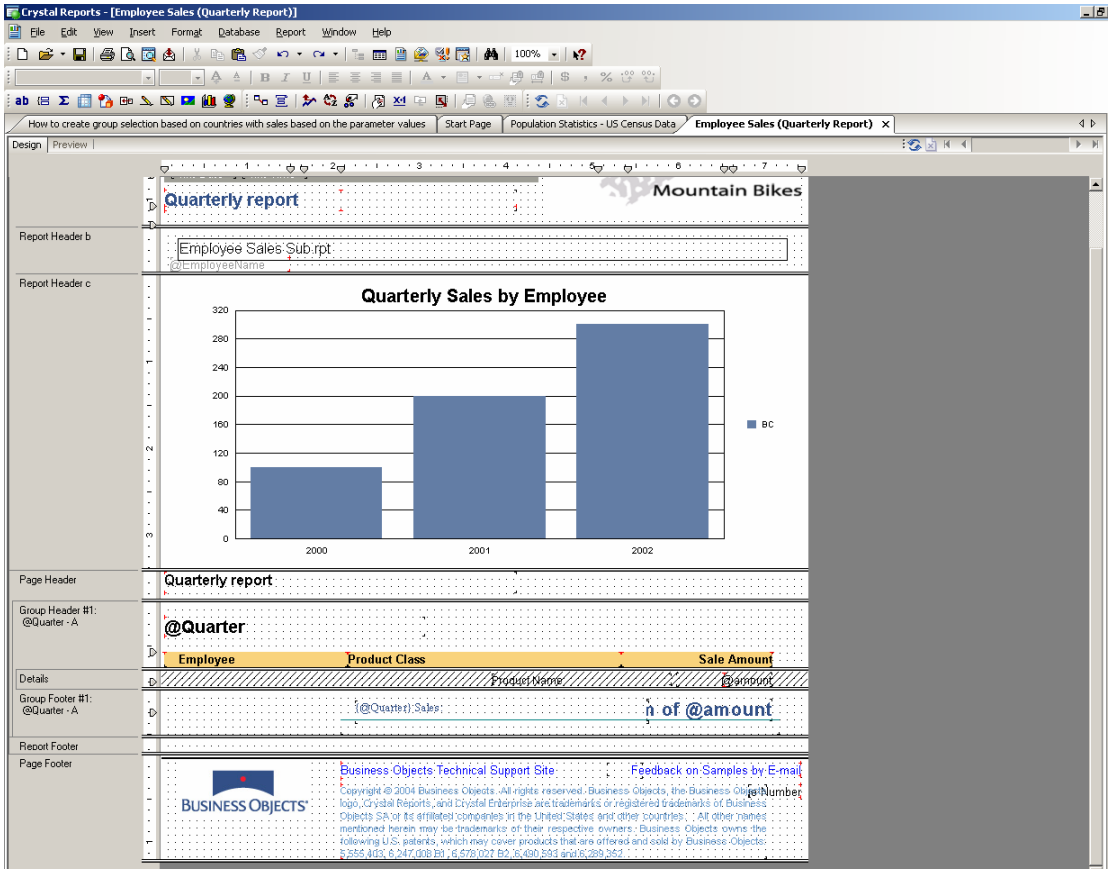

Figure 12

The Details section of a report contains the report's detail data. Fields in the Report Footer section are displayed only on the last page of a report; items such as a grand total might appear in this section. Fields in the Page Footer section are displayed at the bottom of every page of a report; fields like the printed date of a report or the current page number would most likely appear in this section. See Special Fields later in this document for more information about fields commonly used in the footer.

Formatting

Formatting refers to changes you can make to the layout and design of a report as well as the appearance of text, objects, or entire report sections. You can use formatting to do many things, including:

- Dividing sections of a report.
- Calling attention to certain data.
- Changing the presentation of dates, numbers, Boolean values, currency values, and text strings.
- Hiding unwanted sections.
- Giving the report a professional appearance.

The following topics describe the types of formatting made possible by Crystal Reports

Format Painter

Similar to Microsoft Office's Format Painter, this new feature in Crystal Reports XI enables the copying of full formatting options between objects through a single click. A report designer simply selects a formatted object and clicks on any other objects that require the same formatting, thereby greatly reducing the amount of time spent in object formatting.

Absolute Formatting

Absolute formatting is formatting that applies under any condition. This type of formatting property always follows a select, then apply procedure. For example, you select what it is that you want to format (object or section) and apply the formatting to the selection using property settings.

You can use the following dialog boxes to format your reports:

- Format Editor to format field values.
- Section Expert to format entire sections.
- Highlighting Expert to conditionally format all types of fields.

Each of these dialog boxes contains several formatting properties as well as the tools necessary for turning the properties on and off and specifying attributes.

Conditional Formatting

Conditional formatting is formatting that applies under specified conditions. For example, in a report you may want:

- Customer balances printed in red if they are past due.
- Dates to appear in Day, Month, Year format if the customer is Canadian.
- A background color to appear on every other line.

Crystal Reports makes it easy to apply conditional formatting in these and hundreds of other scenarios.

With absolute formatting, you follow the select, then apply procedure. For conditional formatting, you follow the same general procedure but go one step further and set up conditions that

determine whether or not the formatting will be applied. You specify these conditions using simple formulas. When a conditional formatting formula is set up, the formula overrides any fixed settings specified in the Format Editor. For example, if you select the *Suppress* option, then set up a conditional formula for the *Suppress* option, the property will apply only if the condition in the conditional formula is met.

Crystal Reports enables you to set both on and off properties and attribute properties conditionally. However, each requires a different kind of formula. For example, a Report Designer can create a formula that changes the font color of a field to red if the field's value is less than zero with the following line of code:

```
if (Sales.Profit) < 0 then crRed else crBlack
```

Another use of conditional formatting is to highlight the high points and low points of a report. For instance, all sales below $100k could be highlighted in red to attract scrutiny while all those above $500k could be highlighted in a different color to aide recognition.

Templates

A template is an existing report file whose formatting can be added to a new report. At the same time, the formatting of the template report's fields and report objects are applied to the new report. Use templates to give any number of reports a consistent look without having to format each one individually.

Templates make formatting easier since formatting can be done once and applied across many reports. Out of the box, your reports will have a much more consistent look and feel.

Templates are an important aspect of report design since they can be used to enforce a company standard or look and feel as well as maintain consistency for legal subject matters. For instance, a company could create a public report template that forces the report to have the correct copyright and trademark information.

Grouping

Grouped data is data which is sorted and organized into defined and meaningful clusters. For instance, in a list of products, one might group products by price range, less than $15, $15-$30, and greater than $30.

One of the primary purposes for dividing data into groups in a report is to run calculations on each group of records instead of running a calculation for all records in a report. Once data is grouped it may also be sorted in one of four ways.

- Ascending from least to greatest
- Descending from greatest to least
- A user-defined ordering
- The order in which the data was originally stored

Crystal Reports can also infer data groupings that don't explicitly exist in the data's source. For example, all data for a specific month and year can be grouped on a report even if the underlying data source does not have the data grouped by month and year.

Crystal Reports reporting technology automatically summarizes data, sorts data, breaks it into groups, and summarizes the values in each group. Summary information, like totals or averages, can be calculated for each defined group in addition to calculating values such as grand totals which include all records in a report. This satisfies the needs of users who want to see data

summarized across many levels but also want the ability to see the detailed report data used to compute summary numbers.

Dynamic Graphics

Images can be added and updated dynamically at report runtime. This feature allows developers and report designers to insert pictures based on a link in a database instead of storing the actual image. (See Figure 13) This enables images to be stored on a web server and allows load distribution across multiple image servers.

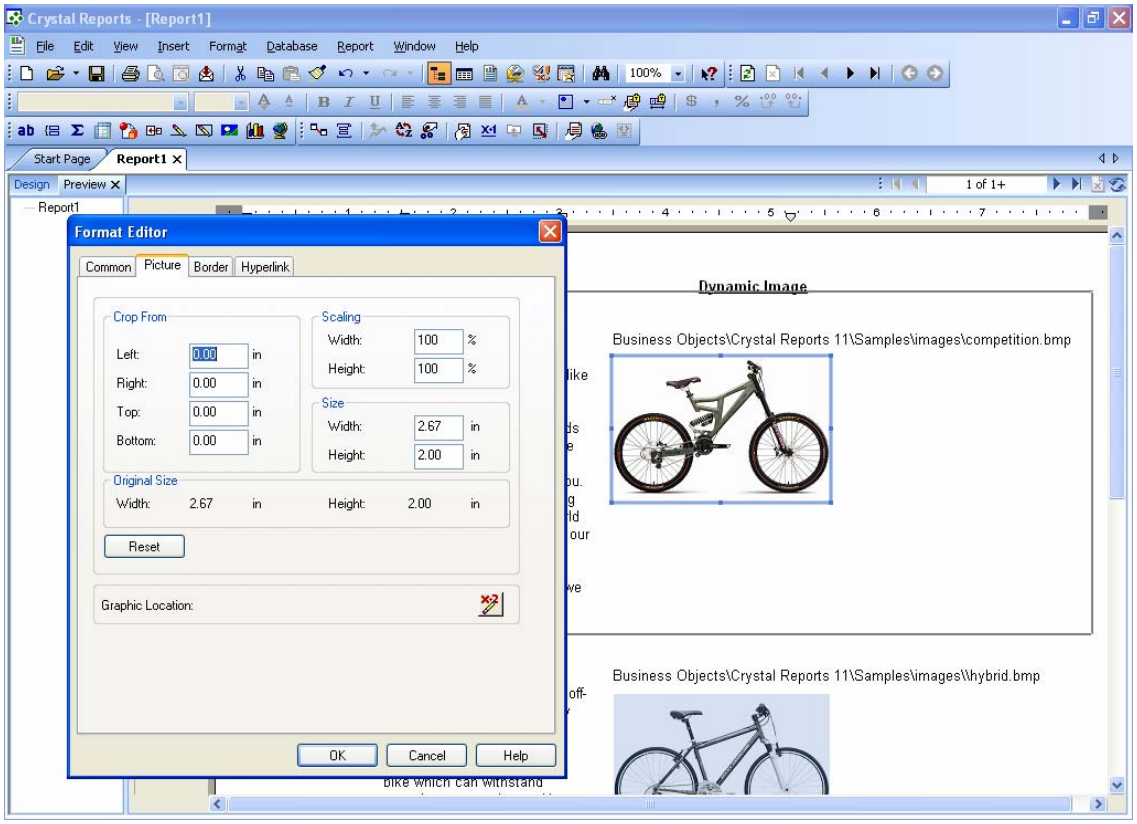

Figure 13

Parameterized Sorting

Group sort order and top or bottom N reports can now have their sort values driven by a formula. This new feature means that you can now use parameters to control sort order and the N value of a top or bottom N report. The result is a single, more flexible report that can meet the needs of multiple users and reduce the total number of reports for you to create and support.

Special Fields

Crystal Reports allows Report Designers to insert a multitude of special fields through the Field Explorer (Figure 14). These fields represent data external to the report but dependent on the current user. For instance, one can add the current user's ID and name as well as the date to a footer to make clear who printed a report and when. Page numbers can be added which are calculated taking in to account the current user's view such as filtering, sorting, etc.

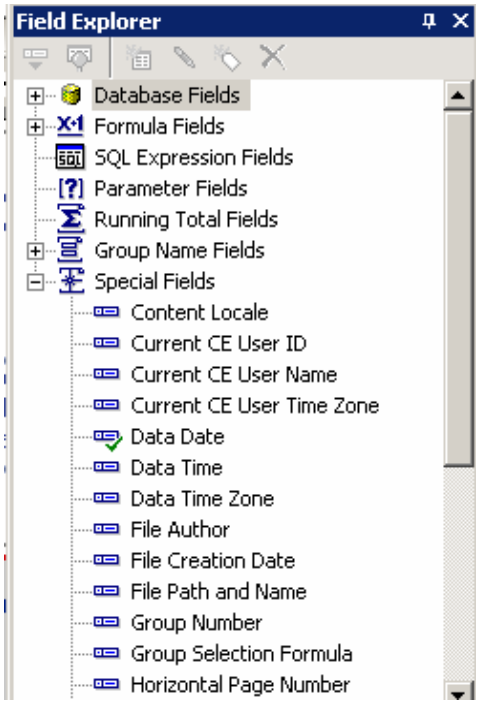

Figure 14

Hyperlinks

Links to web pages, email addresses, files, or report objects can be created as hyperlinks within reports. When a user clicks on a link they are taken to the location specified by the link whether it's a web page, file or secondary report object. Email hyperlinks create a new email using the user's default email program. The user can edit the email before sending.

Charts

Charts are a graphical way to present data to a user. Crystal Reports not only allows developers to easily represent data as charts but also allows users to drill down on a chart for detailed information on the data. The list of supported chart types includes: bar/3D bar, pie/doughnut, line, gantt, gauge, funnel, XY scatter, ranged map dot density map and more,

Crystal Reports XI also includes intelligent charting where the best chart style is automatically selected based upon the data in the report. Chart design is faster and easier because charts will be automatically updated when new variables are added .

When a chart is added to a Report file, it appears in the Report Designer with sample data. Properties such as the Title, XAxisTitle and YAxisTitle are editable in the Properties window. Figure 15 shows an example of a Report file with a Bar chart in the Report Header c section. The Bar chart displays the totals for the details section at that group level.

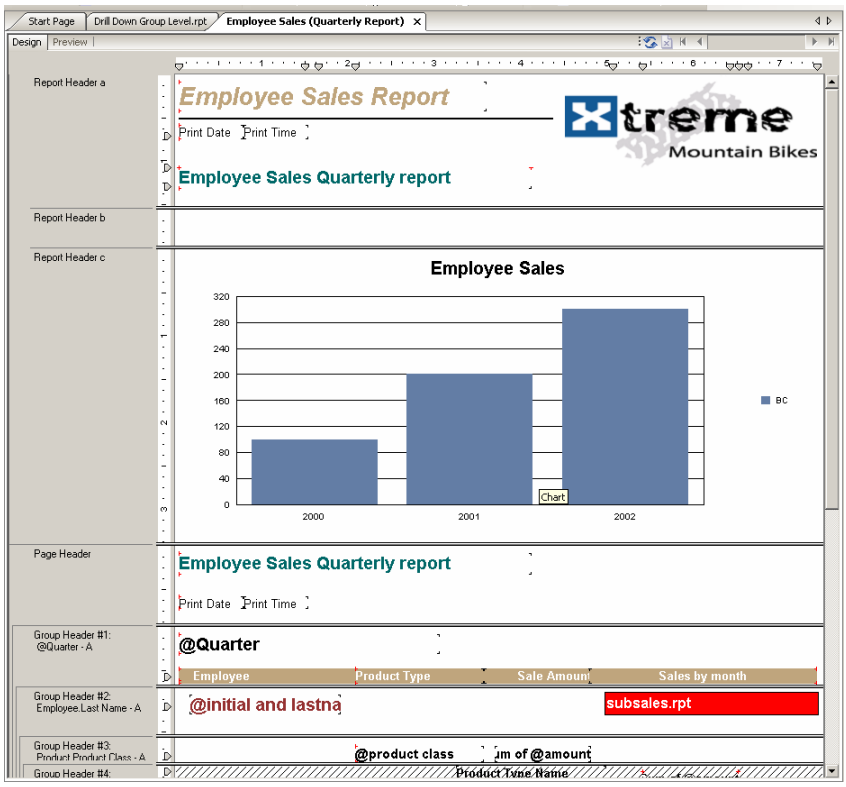

Figure 15

Funnel Charts

A key requirement for many Customer Relationship Management applications, the funnel chart type, is now available in Crystal Reports XI. Similar to pie charts, a funnel chart provides an interesting way to display data that adds up to a 100% total. This chart type is particularly useful in conducting pipeline analysis for sales forecasts. (Figure 16)

4/02	
M of ders	Percentage of Orders
,503.43	29.43 %
,432.65	7.05 %
,838.45	10.24 %
774.53	**46.72 %**
,964.09	6.42 %
,253.51	3.15 %
,196.14	2.11 %
,584.45	1.18 %
998.19	**12.85 %**
,661.53	3.77 %
,484.03	2.95 %
,001.00	2.06 %
,132.00	1.58 %
278.56	**10.35 %**
,121.72	10.83 %
375.06	8.58 %

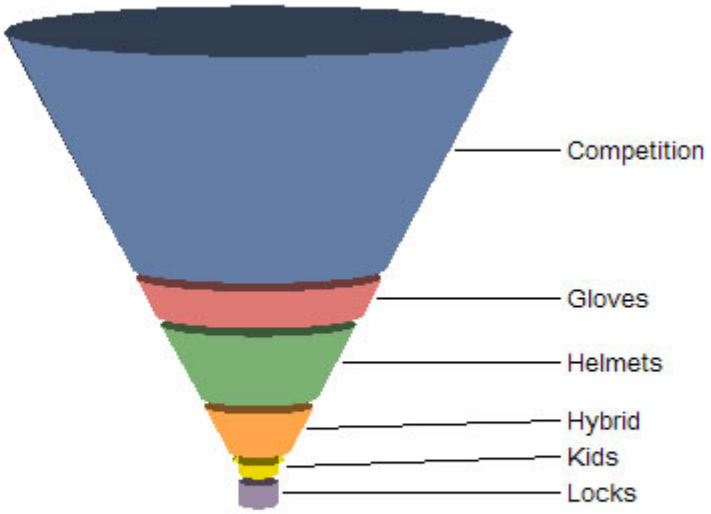

Figure 16

Gantt Charts

Gantt charts were reintroduced in version 9 and have been improved in version XI. A Gantt chart is a horizontal bar chart often used to provide a graphical illustration of a schedule. The horizontal axis shows a time span, while the vertical axis shows a series of tasks or events. Horizontal bars on the chart represent event sequences and time spans for each item on the vertical axis. You should use only date fields when creating a Gantt chart. The field you choose for the data axis should be set to "For Each Record," and the start and end-date fields should be added to the "Show value(s)" area of the Chart Expert's Data tab.

Histogram Charts

A histogram is a type of bar chart used to depict how measurements vary from the mean value. It can help to identify the cause of problems in a process by the shape of the distribution as well as the width (deviation) of the distribution. In a histogram, the frequency is represented by the area of a bar rather than the height of the bar.

Maps

Crystal Reports allows developers to include customized geographical maps in reports. Maps make data analysis and trend identification easier through visualization and correlation. For instance, one could map the occurrence and location of accidents in a city as related to the location and direction of one-way streets. There are 5 map types which may be used in version XI:

Ranged
Dot Density
Graduated
Pie
Bar

Ranged

A Ranged map breaks the data into ranges, assigns a specific color to each range and color codes each geographic area on the map to correspond with a range. For example, you could create a map that displays Last Year's Sales by Region. If you have sales ranging from zero to 100,000, you might give the map five ranges with equal intervals of 20,000 each. You could use shades of red (going from dark to light red) to color code each region according to those sales figures. Then you could use this map to see where sales are the highest.

With equal intervals, you might end up with all your regions ranging between zero and 20,000, except perhaps one region (for example, California) that might have exceptionally high sales (such as 98,000). This map would be a distorted representation of the data. A more useful map would have ranges like 0-5000, 5000-10000, 10000-15000, 15000-20000, and over 20000. It is important to carefully define your ranges. (Figure 17)

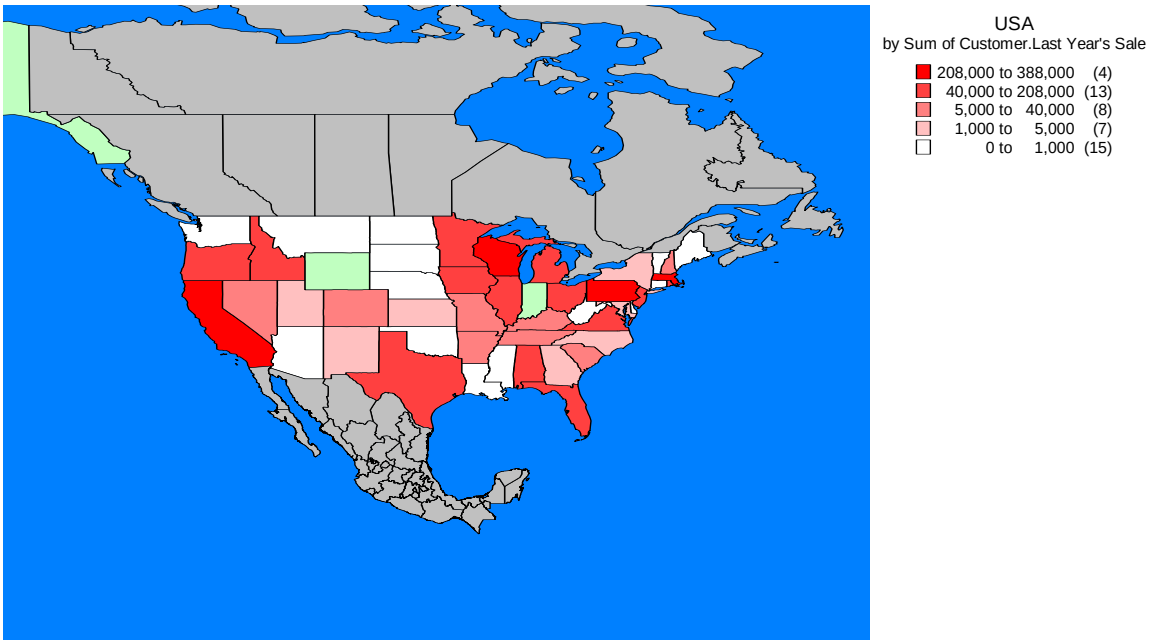

Figure 17

Dot Density

A Dot Density map displays a dot for each occurrence of a specified item. For example, you might create a United States map that shows one dot for each shipbuilder in the nation. In states like Tennessee, there would be no dots. However, in some coastal states, such as South Carolina, you might be able to count the dots on the map, since their dispersal would be fairly wide.

The purpose of a Dot Density map is to provide an overall impression of the distribution of the specified item. A Dot Density map is much like a nighttime satellite photo of the United States, where you can see the lights of all the cities. Such a map is not a very accurate means of communicating information (particularly if you have a large number of items), but it is a good way to give an overview of the distribution.

Graduated

A Graduated map is much like a Ranged map; it shows one symbol per instance of a specified item. This symbol is a circle by default, but you can choose a different symbol if you prefer. Each symbol is proportional in size to the value of the item it represents (within a range of three sizes).

A Graduated map communicates the same information as the Ranged map, but you would usually create a Ranged map for a case in which the geographic areas have distinct geographic boundaries (as in the case of Regions), while you would use a Graduated map for displaying data that is linked to points rather than precise areas (as in the case of Cities).

For example, a map of an individual region could use graduated circles to represent the sales for each office. The size of each circle would be proportional to the sales (or to the sales range) of the office it represents. On this map, an office with a sales figure of $70,000 might have a large circle, and an office with a sales figure of $20,000 might have a small circle. So, a Graduated map provides a more efficient representation of point data (e.g. Cities) than a Ranged map does, and it uses sized symbols rather than colors to distinguish variations in the values of the items it represents.

Pie Chart

A Pie Chart map displays a pie chart over each geographic area. The pie charts represent data items that make up a whole. Each slice of the pie represents an individual data item and shows that item's percentage in the whole. For example, you could create a Pie Chart map showing heating fuel types by region. You might have four types of heating fuel (four slices in each pie): electricity, gas, wood, and solar. Each region would then have a pie chart showing the breakdown of heating fuel types within that region. Washington state would probably use a high percentage (a large slice of the pie) of electricity because of the hydropower in that region while Idaho would probably use a high percentage (a large slice of the pie) of natural gas.

You can use this map type to compare the distribution of several items within a particular region. You can also specify that the pie charts be sized proportionately so that, as with the symbols in a Graduated map, the pie charts will appear in various sizes, depending on the underlying data values. This will allow you to compare the totals between regions.

Bar Chart

A Bar Chart map works like a Pie Chart map but may be more useful for certain sets of data. Typically, you would use a Bar Chart map for items that do not total 100%; that is, for data items that do not make a whole or for data items that are unrelated. For example, you could create a Bar Chart map that displays use of heating fuel by region. You might choose to analyze use of three types of fuel: electricity, gas, and solar. Each bar chart on the map could contain individual bars for each of these types. In this example, the data items (electricity, gas, and solar) do not comprise a whole. There may be other types of fuel used in these regions, such as wood, but this map only focuses on three of them. Also, the purpose of the map is to compare each region's use of each fuel type with that of every other region. In a Pie Chart map, you could show these three fuel types as percentages of the entire fuel use within each region, and though you could compare the percentages for each region, you would probably not be able to compare the actual values for each region because each region would have the same total value (100%).

Cross-Tabs

Cross-tab objects are grids with columns and rows whose intersections show a summary of the data at that point based on the selection criteria. (Figure 18)

	1/00		10/00		1/01		4/01	
	SUM of Orders	Percentage of Orders	SUM of Orders	Percentage of Orders	SUM of Orders	Percentage of Orders	SUM of Orders	Percentage of Orders
Descent	$23,612.06	21.30%	$96,033.66	35.82%	$370,455.4	37.56%	$526,097.7	40.79%
Endorphin	$3,651.08	3.29%	$12,416.79	4.63%	$74,866.88	7.59%	$110,469.9	8.57%
Mozzie	$28,861.68	26.03%	$33,873.64	12.63%	$115,256.5	11.69%	$157,437.8	12.21%
Competition	$56,124.82	50.63%	$142,324.0	53.09%	$560,578.8	56.83%	$794,005.5	61.57%
Active Outdoors	$308.00	0.28%	$9,762.67	3.64%	$13,482.96	1.37%	$43,837.98	3.40%
Active Outdoors	$1,266.15	1.14%	$6,403.89	2.39%	$58,214.00	5.90%	$39,097.59	3.03%
InFlux Crochet Glov	$0.00	0.00%	$1,202.05	0.45%	$11,608.25	1.18%	$3,537.35	0.27%
InFlux Lycra Glove	$8,531.10	7.70%	$3,934.32	1.47%	$4,025.16	0.41%	$7,932.17	0.62%
Gloves	$10,105.25	9.12%	$21,302.93	7.95%	$87,330.37	8.85%	$94,405.09	7.32%
Triumph Pro	$5,557.82	5.01%	$12,581.04	4.69%	$60,305.85	6.11%	$35,421.33	2.75%
Triumph Vertigo	$4,119.91	3.72%	$5,686.48	2.12%	$94,144.03	9.54%	$75,294.64	5.84%
Xtreme Adult	$3,134.73	2.83%	$11,722.02	4.37%	$26,252.68	2.66%	$71,009.43	5.51%
Xtreme Youth	$1,111.80	1.00%	$564.92	0.21%	$7,292.23	0.74%	$16,010.99	1.24%
Helmets	$13,924.26	12.56%	$30,554.46	11.40%	$187,994.7	19.06%	$197,736.3	15.33%
Romeo	$12,235.80	11.04%	$10,956.78	4.09%	$39,660.85	4.02%	$79,950.09	6.20%
Wheeler	$9,515.10	8.58%	$6,480.43	2.42%	$36,608.21	3.71%	$27,763.39	2.15%
Hybrid	$21,750.90	19.62%	$17,437.21	6.50%	$76,269.06	7.73%	$107,713.4	8.35%
Micro Nicros	$0.00	0.00%	$15,272.64	5.70%	$5,651.36	0.57%	$13,701.12	1.06%
Mini Nicros	$7,300.90	6.59%	$29,836.97	11.13%	$25,277.15	2.56%	$17,495.78	1.36%
Kids	$7,300.90	6.59%	$45,109.61	16.83%	$30,928.51	3.14%	$31,196.90	2.42%
Guardian "U" Lock	$0.00	0.00%	$35.00	0.01%	$6,105.66	0.62%	$6,774.00	0.53%
Guardian ATB Lock	$0.00	0.00%	$2,362.97	0.88%	$3,135.00	0.32%	$6,562.34	0.51%
Guardian Chain	$0.00	0.00%	$157.30	0.06%	$5,905.56	0.60%	$1,288.45	0.10%
Guardian Mini Lock	$149.50	0.13%	$4,933.86	1.84%	$3,795.34	0.38%	$13,180.41	1.02%
Guardian XL "U"	$0.00	0.00%	$19.90	0.01%	$2,366.92	0.24%	$14,216.18	1.10%
Xtreme Mtn Lock	$1,505.10	1.36%	$71.43	0.03%	$1,164.91	0.12%	$19,106.33	1.48%
Xtreme Rhino Lock	$0.00	0.00%	$3,790.02	1.41%	$8,543.61	0.87%	$1,082.93	0.08%
Xtreme Titan Lock	$0.00	0.00%	$0.00	0.00%	$12,212.61	1.24%	$2,348.70	0.18%
Locks	$1,654.60	1.49%	$11,370.48	4.24%	$43,229.61	4.38%	$64,559.34	5.01%
Total	$110,860.7	100.00%	$268,098.7	100.00%	$986,331.1	100.00%	$1,289,616.	100.00%

Figure 18

Cross-tabs may also include totals and sub-totals at the ends of either columns or rows. The intersection of the total row and the total column represents the grand total of all items measured.

Report Alerts

Report alerts are customized messages which appear when particular conditions are met. Report Alerts are created from formulas that evaluate conditions you specify. If the condition is true, the alert is triggered and its message is displayed. Messages can be text strings or formulas that combine text and report fields.

Once a Report Alert is triggered, it's not evaluated again until you refresh your report's data.

Because Report Alerts are specific to each report, you decide when to use them and when not to. They can be useful to point out important information such as sales that fall above or below a limit. And the message is created by you (the developer), so it can include information specific to your data.

Sub-reports

A sub-report is a report within a report. Sub-reports have most of the same characteristics of a report. Sub-report differs from a report in the following ways:

It may not stand on its own; it is inserted in to a report

When placed within a report section, the entire sub-report will print in that section
It cannot contain Sub-reports
It does not have page headers or footers

There are 4 scenarios in which Sub-reports are typically used. These include:

Combining unrelated reports in to a single report
Coordinating unlinked data
Presenting different views of the same data within a report
Performing one to many from a field that is not indexed on the lookup field

Parameters

With many toolkits, reports are tied to a specific range of data. Developers create reports for a date range - the fourth-quarter sales report, for example - or a specific geographic region – the Midwest district's revenues. When someone needs third-quarter sales data or data for the Pacific Rim region, a developer creates a new report.

Parameters allow a report designer to prompt the report consumer for information and use that information to create a customized report. This prompt usually comes in the form of a question which the user must answer. The answer to the question drives the content of the report. For example, a sales report may ask the consumer on which product line to report. The report would display the data specific to that product line instead of displaying data for all product lines.

In Crystal Reports, there are two ways to set the value of a Parameter Field. The report can prompt a user to supply a value for a parameter just before the report is displayed or a user can set a parameter value from another control and the value of the Parameter Field will be assigned at run time before the report is bound to a Viewer control. Parameter fields support the following data types:

Boolean (which requires a yes/no or true/false answer)
Currency (which requires a dollar amount)
Date (which requires a date value)
DateTime (which requires both date and time)
Number (which requires a numeric value)
String (which requires a text answer)
Time (which requires a value with a time format)

Additionally, parameter fields can be used in formulas, the group or record selection criteria, or displayed as a field in the report itself.

If a developer chooses to let the Crystal Report prompt the user for a value, the developer can create a pick list from which a user can select a parameter value rather than requiring a user to manually enter one. The text that prompts a user for a Parameter Field value is also customizable.

Parameters allow for flexibility so that when user requirements or display needs change reports can easily be modified to match. For instance, parameters could be used to choose the appropriate data source at run time or to switch from one data source to another.

Dynamic and Cascading Prompts

Dynamic and cascading prompts are a new type of parameter now available in Crystal Reports. This new feature allows you to populate prompt values from values in a database. Prompts can be arranged in a cascade where one value in the prompt constrains values in subsequent pick lists. Report designers no longer need to maintain static prompt lists in individual reports. A single

prompt definition can be stored in a repository and shared among multiple reports improving both runtime scalability and design-time productivity.

Repository

The report repository is the central location for the storage and management of report objects. Data definitions such as custom functions and custom SQL commands can be stored in the repository. Objects stored in the repository are accessible to users and report developers for use in new reports. This feature is part of Crystal Reports Server.

By maintaining a shared repository of report objects, you can modify a particular object and update all reports containing that object the next time they are opened for use. A central location for report objects also helps with you manage your data—an important benefit in maximizing productivity and minimizing costs at your company.

Repository Explorer

The Repository Explorer displays the contents of the report repository as a tree with folders and subfolders. (Figure 19) You can add and rename folders as you like. The new Repository Explorer makes it easier to navigate within the repository system and share reporting components with other users.

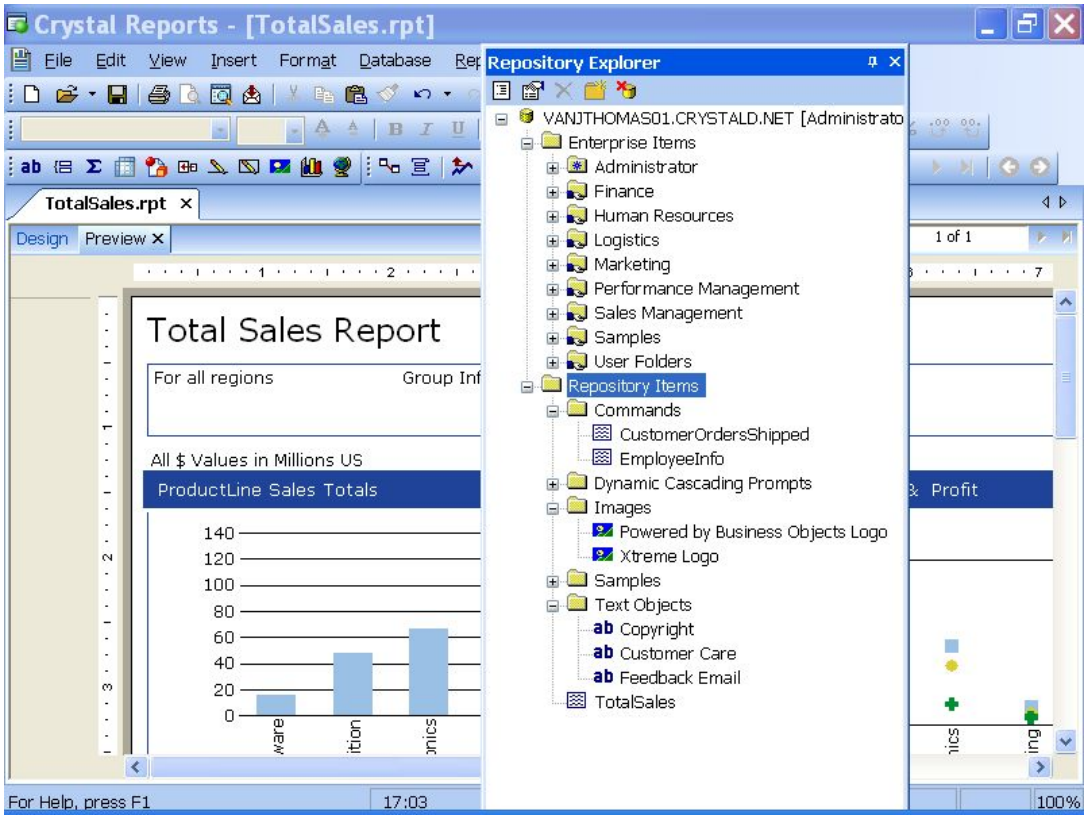

Figure 19

Workbench

Using the Workbench, you can create projects that contain one or more reports. The Workbench lets you keep projects organized and allows you to group reports in folders according to your preference. You can reorganize the files in a folder or folders by dragging and dropping them where you want them to appear. You can also drag report files from Windows Explorer and drop

them into the folder of your choice in the Workbench. The Workbench also allows you to publish a group of reports individually or combined into a single object package.

Export

Finished reports can be exported to a number of popular formats such as spreadsheet, word processor, HTML, ODBC, and common data interchange formats. (See Figure 20) This makes the distribution of information easier. For example, you may want to use a report's data to project trends in a spreadsheet package or to enhance the presentation of data in a desktop publishing package.

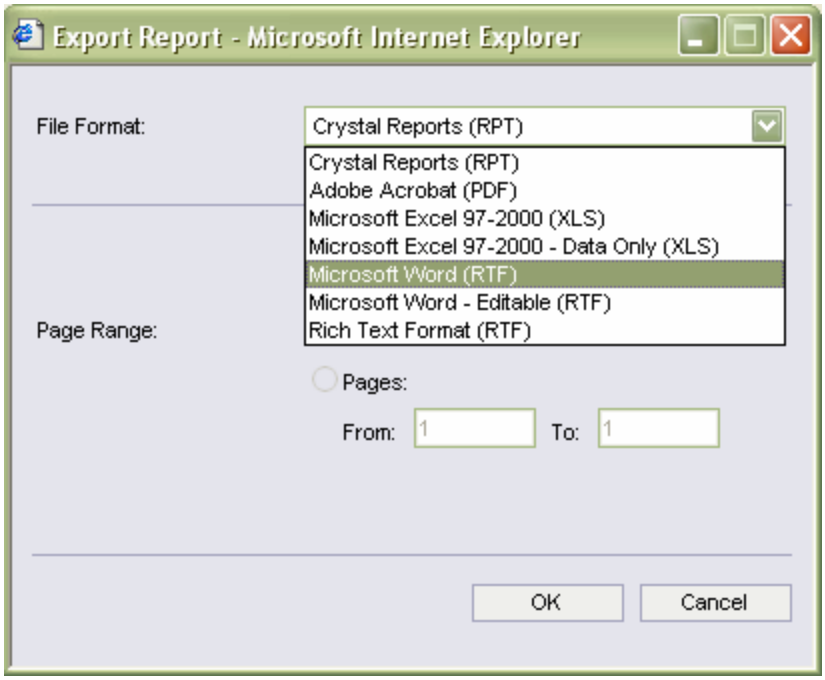

Figure 20

Editable RTF

A new RTF Export format is available. This new format is optimized for ease of editing the files it generates. This feature complements the existing RTF export in that it is optimized for accuracy and forms processing. The result is that you can now choose from two different RTF export formats depending on whether you require the ability to edit the output.

Dependency Checker

Crystal Reports XI includes the dependency checker which will analyze all links in a report to validate that they are working. (Figure 21) The dependency checker will look for report part hyperlink errors, repository object errors, and formula compilation errors. Double clicking on any error will open the target report object so that you can fix the problem.

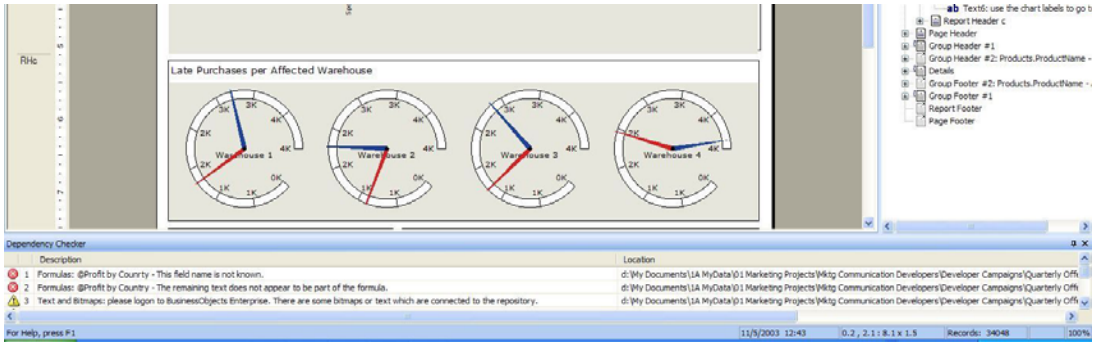
Late Purchases per Affected Warehouse
Warehouse 1
Warehouse 2
Warehouse 3
Warehouse 4
Report Header
Page Header
Group Header #1
Group Header #2: Products.ProductName
Details
Group Footer #2: Products.ProductName
Group Footer #1
Report Footer
Page Footer
Dependency Checker
Description
Location
1 Formulas: @Profit by Country - This field name is not known.
2 Formulas: @Profit by Country - The remaining text does not appear to be part of the formula.
3 Text and Bitmaps: please logon to BusinessObjects Enterprise. There are some bitmaps or text which are connected to the repository.
For Help, press F1
11/5/2003 12:43
Records: 34048

Figure 21

Information Consumers

Information Consumers are most interested in the ease and speed with which they can access the information that they need. Information Consumers are not interested in technology for technology's sake but in how it can help them accomplish their jobs.

One of the primary needs for Information Consumers is the ability to alter the display of reports. Once the data has been initially returned, how can the Information Consumer sort, group, subtotal, etc. the data in meaningful ways? Crystal Reports offers a rich interface for Information Consumers for data display navigation and manipulation.

Navigation

Report navigation is an area of primary importance for IC's. Crystal Reports offers a variety of techniques for navigating data including grouping trees, drill-down, and zooming. Much of this functionality is found in the Report Viewer toolbar. The toolbar appears different in a Windows Form or on the web but the functionality is the same. Users can page forward or backward one record at a time or to the beginning or end of the data set, alter the zoom level, find records, email the report, or refresh the current view.

Group Tree

If a report includes groups, the GroupTree displays the report's group names in a hierarchical list. This highly useful feature allows users to navigate to a specific group within a report without paging through the report to find the particular group. The group nodes are similar to visual bookmarks that are assigned to sections of a report. Clicking on a group node within a Group Tree instantly displays the page that contains the selected group. Crystal Reports XI takes care of presenting this view in both a web format and a Windows Forms format. See Figure 22 and Figure 23 for examples of both.

Figure 22 (Web)

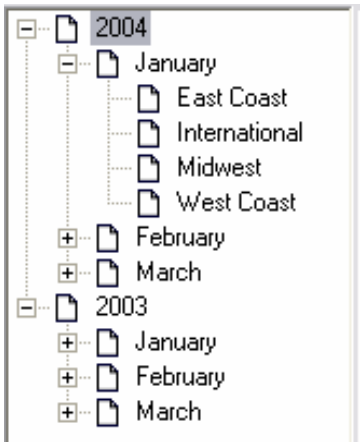

Figure 23 (Windows Form)

Search

Search functionality in Crystal Reports is built around the concept of an expert (Figure 24). Just like a human with an expertise in a subject, a Crystal Reports expert progressively helps you find answers through a series of questions. An expert is a single window built with a tab interface which allows one to progressively take advantage of the expert by progressing from left to right across the tabs. In the case of search, as you progress across the tabs you can refine your search criteria. On the first tab one might select all products whose name starts with A.

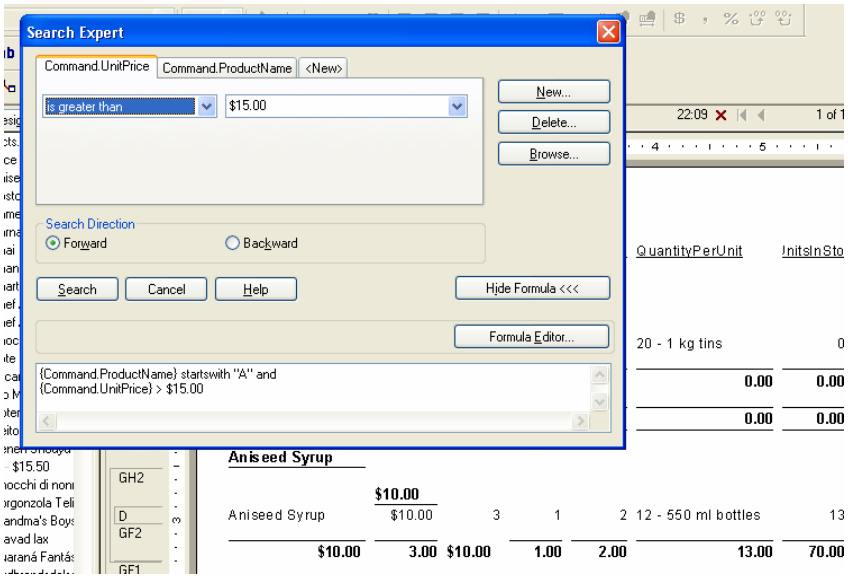

Figure 24

If that isn't specific enough one could add criteria to select only products that start with A with a unit price greater than $15. This can continue until the necessary data is found.

Formula Workshop

Another important feature in reporting is a tool's ability to create formulas: calculations that don't exist in the underlying data source. To facilitate and simplify the creation of formulas, Crystal Reports provides the Formula Workshop (Figure 25).

The Formula Workshop is yet another example of Crystal Report's out-of-the-box functionality that aids in the creation of highly customizable reports. The Formula Workshop contains four main windows: the Report Fields window, the Functions window, the Operators window, and the Formula text window. Together, these windows make creating even complex formulas simple. Developers create formulas by combining report fields, functions and operators. Any field in the Report Fields, Functions and Operators windows can be dragged and dropped into the Formula text window. Information Consumers can also construct formulas manually if they prefer. The Formula Workshop also allows an information consumer to verify the syntax of the formula by simply clicking a button.

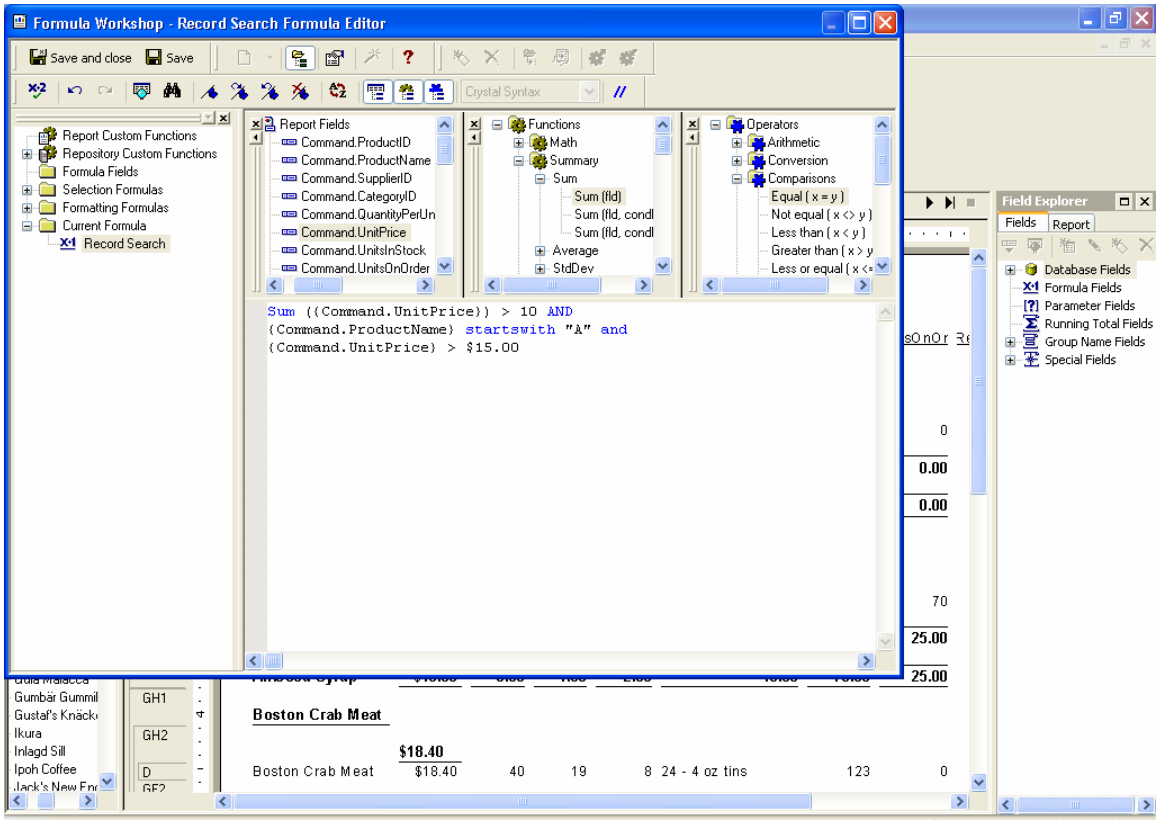

Figure 25

Data Export

Often data must be exported to other systems or alternate formats. Crystal Reports includes the ability to export to many different formats including:

- Adobe Acrobat (PDF)
- Crystal Reports (RPT)
- HTML 3.2
- HTML 4.0
- Excel 97-2000 (with formatting)
- Excel 97-2000 (data only)
- MS Word
- Any ODBC data source
- Record Style (columns, no spaces)

- Record Style (Columns with spaces)
- Report Definition
- Rich Text Format (RTF)
- Editable Rich Text Format
- Tab Separated text
- Text
- XML

Data can also be exported to many different destinations. These include:

- Application
- Disk File
- Exchange Folder
- Lotus Domino
- Lotus Domino Mail
- MAPI

Using built-in functionality, a sales team could export a report to Microsoft Excel and run an analysis against the data; an office administrator could export the exact same report as an Adobe Acrobat file and email it to company officers.

HTML Preview

Crystal Reports XI offers a new HTML preview that lets you see how your reports will look when published to the web. This feature is found in the familiar Crystal Reports design environment as an additional view tab. This feature saves time by eliminating the repetitive task of publishing a report-in-progress to the web solely to determine how it will appear.

Summary

Crystal Reports XI is the definitive “out of the box” reporting technology for use in Windows and Web applications. It allows developers to create rich, dynamic applications and delivers highly-interactive, professional-looking reports to the end-user. It does all of this and requires developers to write little or no additional code. Crystal Reports supplies developers with access to heterogeneous systems through a wide array of data source options.

With the introduction of Crystal Reports Server, developers also gain “out of the box” access to report scheduling, management and security, and can off-load the report processing to a separate server from their web application. Crystal Reports Server can also be easily migrated to Business Objects Enterprise making this an excellent initial step for organizations who may have more advanced reporting needs in the future.

The Industry Standard

Crystal Reports is the industry standard for embedded reporting. There are over one million registered Crystal Reports developers. Numerous third-party applications and major enterprise applications like PeopleSoft, SAP and Baan integrate the Crystal Reports reporting technology. It is the embedded reporting technology of choice for hundreds of Independent Software Vendors (ISVs), including Microsoft Customer Relationship Manager (CRM) – Microsoft’s first .NET business application – and SAP Business Warehouse (BW) – SAP’s strategic BI platform. Crystal Reports is also directly embedded into leading integrated development environments for both .NET and Java, such as Microsoft Visual Studio (including the upcoming 2005 release), Borland Delphi, IBM Rational Application Developer for WebSphere, Borland JBuilder and BEA WebLogic Workshop, The Crystal Reports community is strong and provides a great support network. Web sites like Developer Zone, newsgroups, and numerous publications offer great reference materials for developers of all technologies.

Additional Information

For more information on Crystal Reports for XI, including conceptual information and tutorials, check out the following link:

http://www.businessobjects.com/products/reporting/crystalreports/