IBM TRIRIGA Application Platform
Version 3 Release 5.1

Connector for SAP Business Objects User Guide

Note
Before using this information and the product it supports, read the information in “Notices” on page 55.

This edition applies to version 3, release 5, modification 1 of IBM® TRIRIGA® Application Platform and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

About This Guide

This guide describes the process for setting up your IBM® TRIRIGA® Application Platform environment to work with SAP Crystal Reports. For more information about installation, go to the IBM TRIRIGA Application Platform 3 Knowledge Center and select *Installing IBM TRIRIGA Application Platform*. For more general information about reports, see the *IBM TRIRIGA Application Platform 3 Reporting User Guide*.

Conventions

This document uses the following conventions to ensure that it is as easy to read and understand as possible:

Note – A Note provides important information that you should know in addition to the standard details. Often, notes are used to make you aware of the results of actions.

Tip – A Tip adds insightful information that may help you use the system better.

Attention – An Attention notice indicates the possibility of damage to a program, device, system, or data.

Intended Audience

This guide is for users of IBM TRIRIGA Application Platform who develop or maintain SAP Crystal Reports.

Prerequisites

This guide assumes the reader has a basic understanding of the IBM TRIRIGA Application Platform.

To use SAP Crystal Reports with the IBM TRIRIGA application, you must purchase and install the correct version.

Support

IBM Software Support provides assistance with product defects, answering FAQs, and performing rediscovery. View the IBM Software Support site at www.ibm.com/support.

1. Overview

IBM TRIRIGA can run reports using an external report generator named SAP Crystal Reports. SAP Crystal Reports is a popular report generator used by many organizations. SAP Crystal Reports offers the ability to generate many kinds of reports that are not possible using the IBM TRIRIGA Report Manager. SAP Crystal Reports also offers many formatting possibilities that are not available with the IBM TRIRIGA Report Manager.

Why use SAP Crystal Reports?

- Popular reporting tool and market leader in reporting technology
- Quick and rapid report development
- Integrates well with many applications
- Connects to most databases available in the market, including XML (eXtensible Markup Language)
- Has robust formatting capability
- Allows exporting to a variety of popular formats

Server configuration

SAP Crystal Reports runs on a server computer. It can be running on the same server as the platform or on a separate server.

The Tools Server runs the SAP Crystal Reports Server (RAS) engine. It communicates with the Application Server and the Process Server via TCP/IP and with the Database Server via JDBC. The Tools Server does not communicate directly with users and is kept isolated from HTTP requests.

The SAP Crystal Reports Application Server (RAS) is used to run SAP Crystal Reports from the IBM TRIRIGA Application Platform.

For additional information about the hardware configuration of the IBM TRIRIGA Application Platform, go to the IBM TRIRIGA Application Platform 3 Knowledge Center and select *Installing IBM TRIRIGA Application Platform*.

URL providers

For WebSphere configuration, you will need the Name, JNDI name, and Specification to enter as URL providers. Instead of {config_path}, use the actual path to the `config` directory of the IBM TRIRIGA installation, for example `C:/Tririga`.

Name	TRIRIGACRYSTAL
JNDI name	url/TRIRIGAProperties/TRIRIGACRYSTAL
Specification	file:/ {config_path}/config/TRIRIGACRYSTAL.properties

2. Installing and configuring

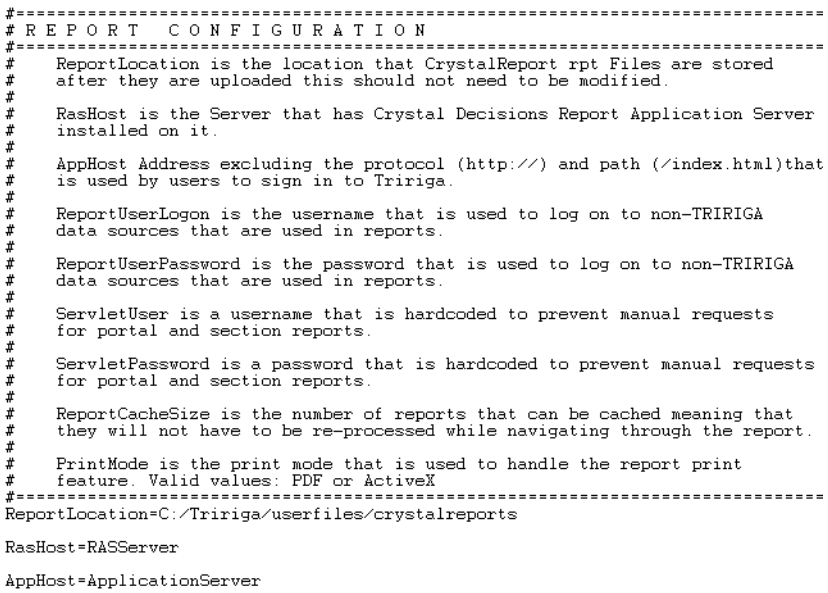
IBM TRIRIGA provides integration with SAP Crystal Reports by allowing reports created using the SAP Crystal Report designer to be accessed directly from within IBM TRIRIGA applications.

This integration involves the IBM TRIRIGA Application Server and the SAP Crystal Reports Application Server and includes several phases:

- Configure `TRIRIGACRYSTAL.properties`
- Install the SAP Crystal Report Viewer files
- Install SAP BusinessObjects Enterprise XI and configure the SAP Crystal Reports Server
- Optionally, enable Crystal support on WebSphere 8.

Configure TRIRIGACRYSTAL.properties

Locate your copy of the `TRIRIGACRYSTAL.properties` file. Look in the `config` folder in your IBM TRIRIGA installation folder. A typical path is `C:\Tririga\config\TRIRIGACRYSTAL.properties`.

Step		
1.	Edit `TRIRIGACRYSTAL.properties`.	
2.	Review the information in the comments at the top of the file.	
3.	Change any values as appropriate for your installation. Additional information can be found in the `TRIRIGACRYSTAL.properties` section.	
4.	Save your changes to `TRIRIGACRYSTAL.properties`.	

```
#==============================================================================
# R E P O R T   C O N F I G U R A T I O N
#==============================================================================
#    ReportLocation is the location that CrystalReport rpt Files are stored
#    after they are uploaded this should not need to be modified.
#
#    RasHost is the Server that has Crystal Decisions Report Application Server
#    installed on it.
#
#    AppHost Address excluding the protocol (http://) and path (/index.html)that
#    is used by users to sign in to Tririga.
#
#    ReportUserLogon is the username that is used to log on to non-TRIRIGA
#    data sources that are used in reports.
#
#    ReportUserPassword is the password that is used to log on to non-TRIRIGA
#    data sources that are used in reports.
#
#    ServletUser is a username that is hardcoded to prevent manual requests
#    for portal and section reports.
#
#    ServletPassword is a password that is hardcoded to prevent manual requests
#    for portal and section reports.
#
#    ReportCacheSize is the number of reports that can be cached meaning that
#    they will not have to be re-processed while navigating through the report.
#
#    PrintMode is the print mode that is used to handle the report print
#    feature. Valid values: PDF or ActiveX
#==============================================================================
ReportLocation=C:/Tririga/userfiles/crystalreports

RasHost=RASServer

AppHost=ApplicationServer
```

Install SAP Crystal Report Viewer files

You must install the SAP Crystal Reports 2013 `.jar` files and the SAP Crystal Report Viewer files.

NOTE: If your IBM TRIRIGA server is running on a UNIX operating system, the file names are case sensitive. Make sure that the name and case of the JAR files and Viewer files that are downloaded match the names shown in the steps.

Step

1. Select the following jar files in the `DirectoryWhereCrystalServerIsInstalled\sap_bobj\enterprise_xi40\java\lib` directory on your Crystal Server:

   ```
   CrystalReportsSDK.jar
   logging.jar
   webreporting.jar
   webreporting-jsf.jar
   sap.com~tc~sec~csi.jar
   ```

   And copy them to the `DirectoryWhereTRIRIGAInstalled\userfiles\crystalreports\reports\CrystalSdkRasClassLoader` directory. Create any directories that are not yet created.

2. Select the following directories and files in the `DirectoryWhereCrystalReportsIsInstalled\SAP\BusinessObject\CrystalReports\crystalreportsviewers` directory:

   Directories:

   ```
   ActiveXControls
   css
   html
   images
   js
   prompting
   urlreporting
   ```

   Files:

   ```
   allInOne.js
   allStrings_en.js
   api-min.js
   crsmarttag.jsp
   parameterUIController-compressed.js
   preview.jsp
   processindicator.js
   promptengine-compressed.js
   ViewSeed.js
   ```

   And copy the selected directories and files to the `DirectoryWhereTRIRIGAInstalled\userfiles\crystalreports` directory.

3. Go to http://www.sap.com/solution/sme/software/analytics/crystal-reports-eclipse/index.html, click **Get Started - access your free SAP Crystal Reports version for Eclipse download**, provide SAP registration credentials if needed and click **Download Now**.

Step	
4.	Select the SAP Crystal Reports for Java runtime components - Java Reporting Component (JRC) (45 MB) link to download the ZIP file named: crjava-runtime_12.2.217.zip or similar.

5.	In the lib directory located at the root of the .zip file, select the following .jar files:
	`com.azalea.ufl.barcode.1.0.jar`
	`commons-configuration-1.2.jar`
	`CrystalCommon2.jar`
	`CrystalReportsRuntime.jar`
	`cvom.jar`
	`DatabaseConnectors.jar`
	`icu4j.jar`
	`jai_imageio.jar`
	`JDBInterface.jar`
	`jrcerom.jar`
	`keycodeDecoder.jar`
	`logging.jar`
	`pfjgraphics.jar`
	`QueryBuilder.jar`
	`webreporting.jar`
	`webreporting-jsf.jar`
	`xpp3.jar`
	
	And copy them to the `DirectoryWhereTRIRIGAInstalled\userfiles\crystalreports\reports\CrystalSdkEmbeddedClassLoader` directory.

6.	From the `crystalreportviewers` directory found at the root of the ZIP, select the following files and directories:
	Directories:
	`ActiveXControls`
	`css`
	`html`
	`images`
	`js`
	`prompting`
	
	Files:
	`allInOne.js`
	`allStrings_en.js`
	`processindicator.js`
	
	And copy them to the `DirectoryWhereTRIRIGAInstalled\userfiles\crystalreports\jrc` directory.

Step	

7.	Locate the following JAR files, which are part of Apache Xalan version 2.7.1, in a ZIP file that can be downloaded from the following location: http://www.apache.org/dyn/closer.cgi/xml/xalan-j
	
	On this site, choose a mirrored site from which to download the ZIP file. Select the link titled `XML/Xalan java archive`. Select the download link labeled `xalan-j_2_7_1-bin.zip`. The JAR files can be found in a directory named **xalan-j_2_7_1** at the root of the ZIP file.
	
	`serializer.jar`
	`xalan.jar`
	`xerceslmpl.jar`
	
	Place these JAR files in the following location:
	`DirectoryWhereTRIRIGAInstalled\userfiles\crystalreports\reports\CrystalSdkEmbeddedClassLoader`

8.	Restart the IBM TRIRIGA application server.

Install SAP BusinessObjects Enterprise XI 4.0 (BOE) / Crystal Server 2013

There are two steps:

1. Install SAP BusinessObjects Enterprise XI 4.0 (BOE).

   As of IBM TRIRIGA Application Platform 3.2, IBM TRIRIGA no longer provides the Crystal BOE installer. Customers can use what they already have or can contact SAP to get access to the Crystal BOE installer. New customers or customers that do not already have Crystal or BOE licenses must use BIRT unless they acquire their own Crystal or BOE license.

2. Configure the SAP Crystal Report Server.

Configure the SAP Crystal Report Server.

The configuration of the SAP Crystal Report Server depends on whether you are using Windows or Linux. This section first describes the configuration for Windows, then for Linux.

Configure the SAP Crystal Report Server on Windows

The IBM TRIRIGA Java data source must reside on the SAP Crystal Report Server. If it does not, many reports will fail to run and will display a message similar to the following error:

```
Could not open Report Client Document. Caused by:
com.crystaldecisions.sdk.occa.report.lib.ReportSDKServerException:
Failed to open the connection.
```

To configure the SAP Crystal Report Server, make the following changes:

Step

1. Navigate to the `/tools/Crystal` folder in the IBM TRIRIGA installation folder.

For example: `C:\Tririga\tools\Crystal`

2. Copy `rowset.jar` and `TririgaCrystalClient.jar` and paste them into `DirectoryWhereCrystalReportServerInstalled\SAP BusinessObjects\SAP BusinessObjects Enterprise XI 4.0\dataAccess\connectionServer\java` folder.

3. On the SAP Crystal Reports Server, navigate to the SAP Crystal Reports installation directory, then to the `\common\4.0\java` folder.

   For example: `C:\Program Files\Business Objects\common\4.0\java`.

4. Edit `CRConfig.xml` to include `TririgaCrystalClient.jar` and `rowset.jar` in the `JavaBeansClassPath`, as shown in the following example. Replace {install_path} with your actual BusinessObjects Enterprise install path.

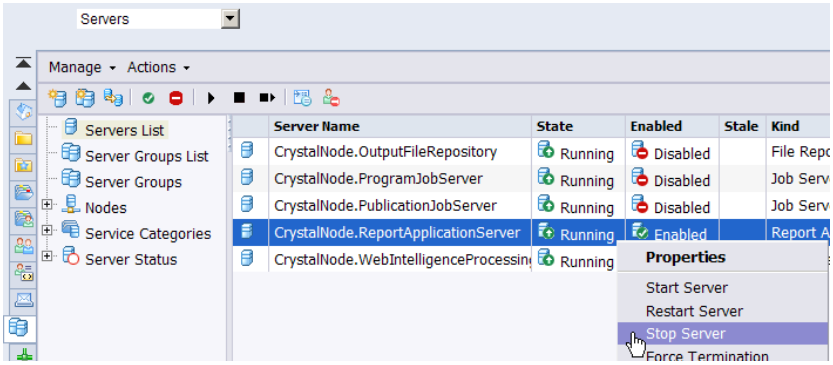
```
<JavaBeans>
  <CacheRowSetSize>100</CacheRowSetSize>
  <JavaBeansClassPath>
{install_path}\SAP BusinessObjects\SAP BusinessObjects Enterprise XI
4.0\dataAccess\connectionServer\java\TririgaCrystalClient.jar;
{install_path}\SAP BusinessObjects\SAP BusinessObjects Enterprise XI
4.0\dataAccess\connectionServer\java\rowset.jar
</JavaBeansClassPath>
  <CallBackFunction>CrystalReportsLogoff</CallBackFunction>
</JavaBeans>
```

NOTE: Make sure the text starting with <JavaBeansClassPath> and ending with </JavaBeansClassPath> is on one line.

5. Start the Central Management Console. The default URL is `http://localhost:8080/BOE/CMC`. The *User Name* is `Administrator` and the *Password* is what you set during installation.

Step

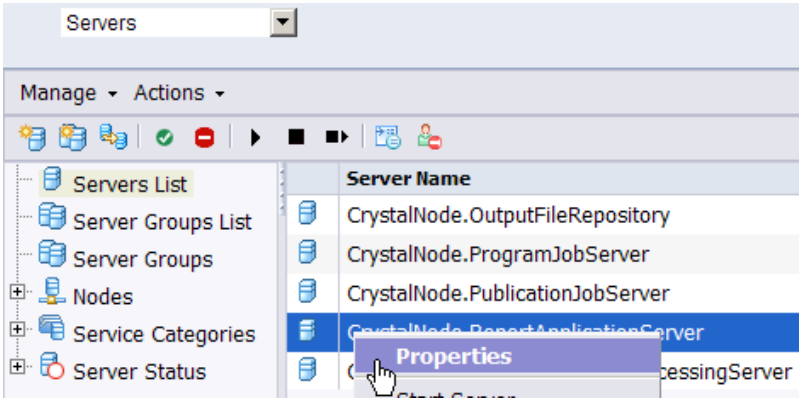
6. Navigate to Servers -> Servers List -> Report Application Server.



☑ **TIP:** The Report Application Server is on the second page of servers.

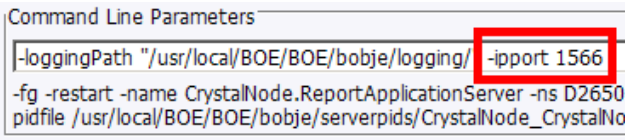
7. Right click and stop the server.

8. Right click and select Properties.



In Command Line Parameters,

9. Specify the "`-ipport <port #>`" for the server. Add it to the end of the Command Line Parameters.

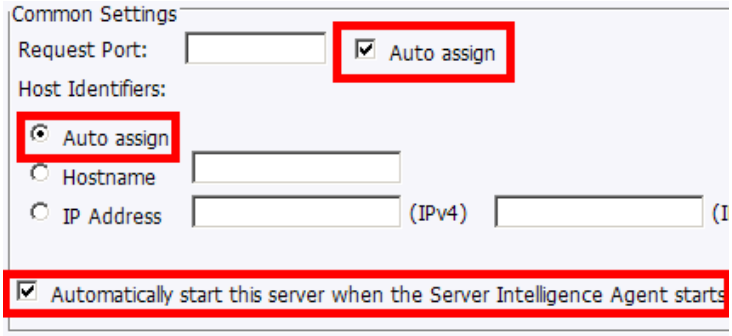


The default port is `1566`.

Step

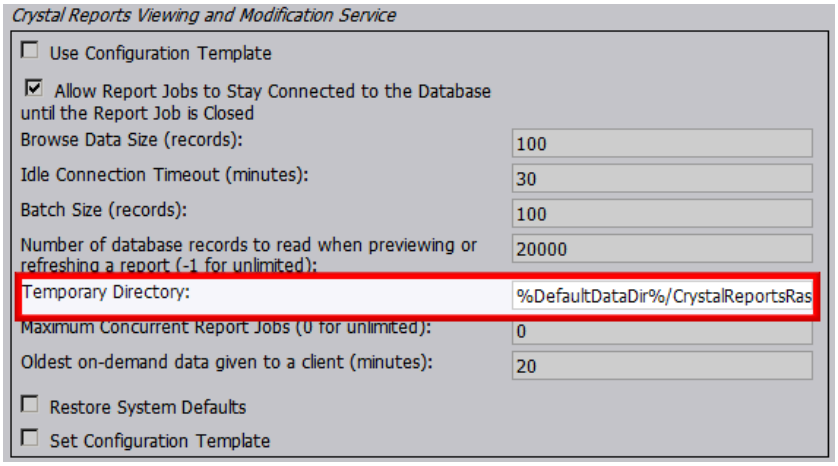
In Common Settings,

10. In Request Port, select the *Auto assign* check box.
11. In Host Identifiers, select the *Auto assign* radio button.
12. Select the *Automatically start this server when the Server Intelligence Agent starts* check box.

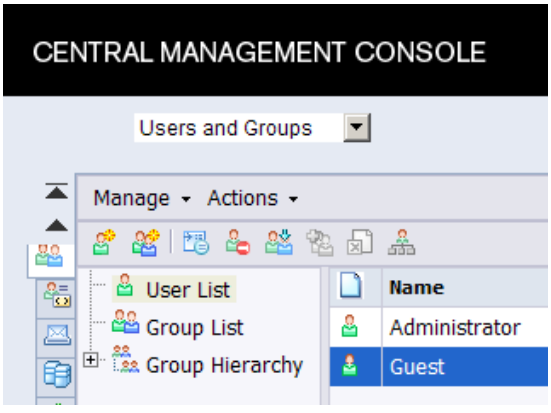


In SAP Crystal Reports Viewing and Modification Service,

13. In *Temporary Directory*, if there is a value, make sure the path is valid.

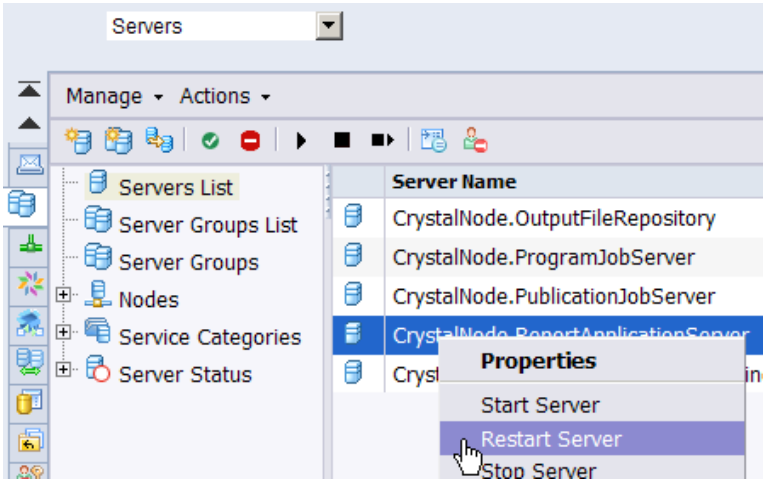


14. Enable the Guest account in Users and Groups -> User List.



Step

15. When you have finished making configuration changes, restart the Report Application Server.



☑ **TIP:** The Report Application Server is on the second page of servers.

Configure the SAP Crystal Report Server on Linux

The IBM TRIRIGA Java data source must reside on the SAP Crystal Report Server. If it does not, many reports will fail to run and will display a message similar to the following error:

```
Could not open Report Client Document. Caused by:
com.crystaldecisions.sdk.occa.report.lib.ReportSDKServerException:
Failed to open the connection.
```

You must have the following available to configure the SAP Crystal Report Server for Linux:

- Oracle Client for Linux 11g - `linux_x86_11gR1_client.zip` (from Oracle)
- unixODBC packages (`yum install unixODBC*` from RedHat)
- Crystal Data Direct 6.0 Drivers for Linux

To configure the SAP Crystal Report Server, make the following changes:

Step

1. Using a remote copy tool, such as `WinSCP`, navigate to the `/tools/Crystal` folder in the IBM TRIRIGA installation folder.

   For example: `C:\Tririga\tools\Crystal`

2. Copy `rowset.jar` and `TririgaCrystalClient.jar` to the following folder: `DirectoryWhereCrystalInstalled/sap_bobj/enterprise_xi40/dataAccess/connectionServer/beans`.

   For example, into `{install_path}/sap_bobj/enterprise_xi40/dataAccess/connectionServer/beans`

Step

3. On the SAP Crystal Reports Server, navigate to the SAP Crystal Reports installation directory, then to the `/sap_bobj/enterprise_xi40/java` folder.

4. Edit `CRConfig.xml` to include `TririgaCrystalClient.jar` and `rowset.jar` in the classpath, as shown in the following example. Replace {install_path} with your actual BusinessObjects Enterprise install path.

```
<JavaBeans>
    <CacheRowSetSize>100</CacheRowSetSize>
   <JavaBeansClassPath>{install_path}/enterprise_xi40/dataAccess/connectionServ
er/beans/TririgaCrystalClient.jar:{install_path}/enterprise_xi40/dataAccess
/connectionServer/beans/rowset.jar</JavaBeansClassPath>
   <CallBackFunction>CrystalReportsLogoff</CallBackFunction>
</JavaBeans>
```

NOTE: Make sure the text starting with `<JavaBeansClassPath>` and ending with `</JavaBeansClassPath>` is on one line.

NOTE: Skip the next step if you are not using Oracle.

5. Add the following lines to `.bash_profile` of your Crystal user. Replace {install_path} with the true path to the Crystal install dir

```
export ORACLE_HOME=/usr/local/oracle/app/oracle/product/11.1.0/client_1/

export
LD_LIBRARY_PATH=/usr/local/oracle/app/oracle/product/11.1.0/client_1/lib:
{install_path}/sap_bobj/enterprise_xi40/linux_x86/odbc/lib

export
TNS_ADMIN=/usr/local/oracle/app/oracle/product/11.1.0/client_1/network/admi
n/

export ODBCINI={install_path}/sap_bobj/enterprise_xi40/odbc.ini
```

NOTE: Make sure each of the export statements is on one line. It is the format of this guide that splits them into more than one line. For example, the second export statement above should start: `export LD_LIBRARY_PATH=/usr/local/or….`

NOTE: Skip the next step if you are not using Microsoft SQL Server.

6. In the Crystal user `.bash_profile`, add/modify the following environment variables and source the profile. Replace {install_path} with the true path to the Crystal install dir.

NOTE: IBM TRIRIGA only certifies BOE on Linux_x86.

```
export BOBJEDIR={install_path}/sap_bobj
```

Step

```
export ODBC_HOME={install_path}/sap_bobj/enterprise_xi40/linux_x86/odbc

export ODBCINI={install_path}/sap_bobj/enterprise_xi40/odbc.ini

export LD_LIBRARY_PATH={{install_path}
/home/tririga/sap_bobj/enterprise_xi40/dataAccess/connectionServer:$ODBC_
HOME/lib:$LD_LIBRARY_PATH
```

NOTE: You must set/export the above env variables in the same order as shown.

NOTE: Make sure each of the export statements is on one line. It is the format of this guide that splits them into more than one line.

●L1●

NOTE: Skip the next step if you are not using Oracle.

7. Modify the {install_path}/sap_bobj/enterprise_xi40/odbc.ini to add the following:

```
[TRIRIGAIBS]
QEWSD=40442
Driver={install_path}/sap_bobj/enterprise_xi40/linux_x86/odbc/lib/CRora24.so
Description=DataDirect 6.0 Oracle Wire Protocol
HostName=oracleserverhost
ServiceName=orcl
PortNumber=1521
LogonID=tridata
Password=password
```

NOTE: If you use a DSN name other than TRIRIGAIBS, it must match the TRIRIGAIBS_ODBC value in TRIRIGACRYSTAL.properties on the Application and Process servers.

NOTE: Skip the next step if you are not using Microsoft SQL Server.

8. Modify the {install_path}/sap_bobj/enterprise_xi40/odbc.ini to add the following:

```
[TRIRIGAIBS]
QWESD=40442
Driver={install_path}/sap_bobj/enterprise_xi40/linux_x86/odbc/lib/CRsqls24.so
Description=DataDirect 6.0 SQLServer Native Wire Protocol
HostName=sqlserver,1433
Database=tridata
LogonID=tridata
Password=password
```

Step

```
EnableQuotedIdentifiers=1
AnsiNPW=0
```

NOTE: If you use a DSN name other than `TRIRIGAIBS`, it must match the `TRIRIGAIBS_ODBC` value in `TRIRIGACRYSTAL.properties` on the Application and Process servers.

●L1●

DataDirect provides both NON-OEM drivers and OEM drivers. The drivers provided by BOE XI are OEM drivers. By default the Connection Server is set to use NON-OEM drivers. You must edit the Connection Server to allow the use of the OEM branded DataDirect driver. The steps are as follows:

9. Make a backup copy of {install_path}/sap_bobj/enterprise_xi40/dataAccess/connectionServer/odbc/sqlsrv.sbo

10. Change the following parameter from No to Yes: `<Parameter Name="Use DataDirect OEM Driver" Platform="Unix">Yes</Parameter>`

●L1●

11. Stop all BOE XI servers, `./stopservers`, log out completely from your UNIX shell, and log back in (to make sure new env variables are set up). Start all BOE XI servers.

You should be able to run Crystal, Webi, or Deski reports using the DataDirect ODBC driver.

After installing a Service Pack, the connection may hang on Webi without any errors. This is because Service Packs may overwrite the `sqlsrv.sbo`, which means that the parameters have been reset to the default.

NOTE: Skip the next two steps if you are not using Microsoft SQL Server with named instances.

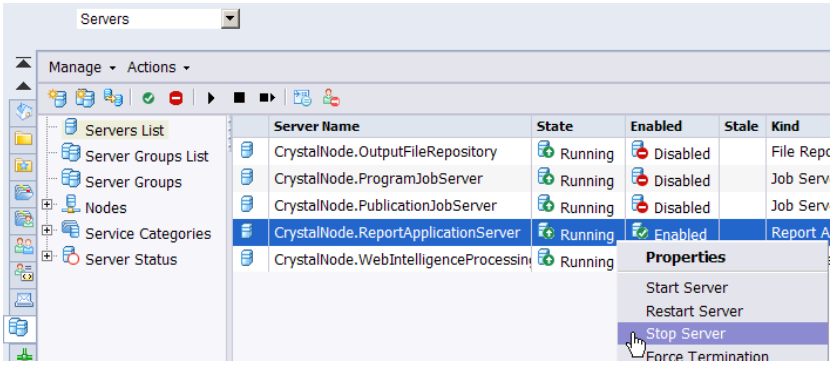
12. For a named instance of SQL Server, use the following format: `server_name\instance_name`. If only a server name is specified with no instance name, the driver connects to the server and uses the default named instance on the server.

13. In the `Universe.sbo` file, make sure to define the correct version of Microsoft SQL Server for the connection.

14. Start the Central Management Console. The default URL is `http://localhost:8080/BOE/CMC`. The *User Name* is `Administrator` and the *Password* is what you set during installation.

Step

15. Navigate to Servers -> Servers List -> Report Application Server.

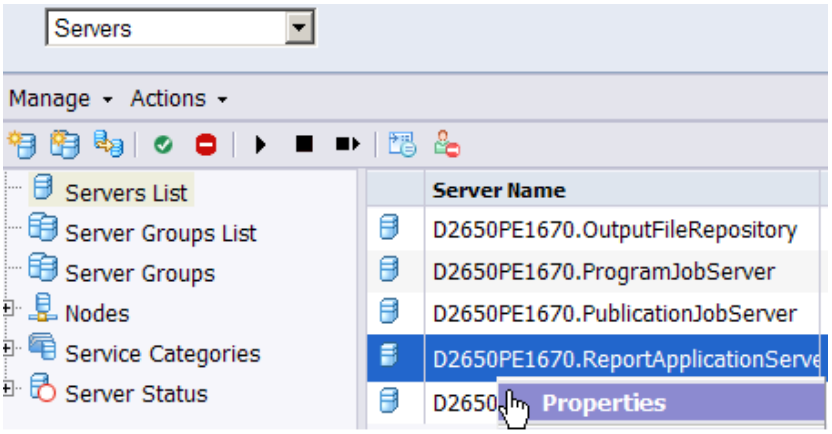


☑ **TIP:** The Report Application Server is on the second page of servers.

16. Right click and enable the server.

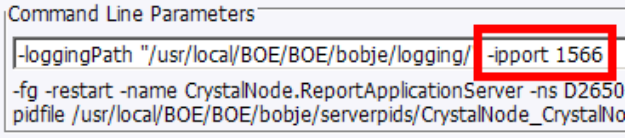
17. Right click and stop the server.

18. Right click and select Properties.



In Command Line Parameters,

19. Specify the "`-ipport <port #>`" for the server. Add it to the end of the Command Line Parameters.

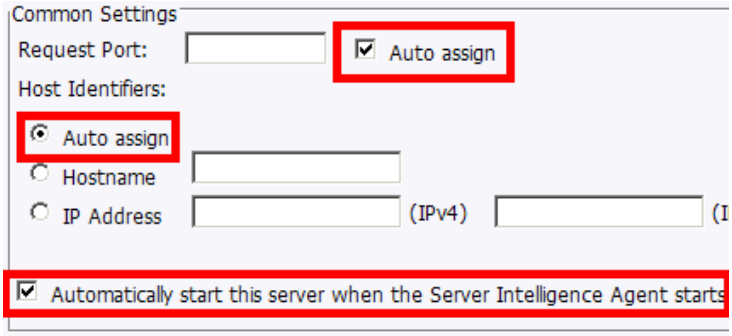


The default port is `1566`.

Step

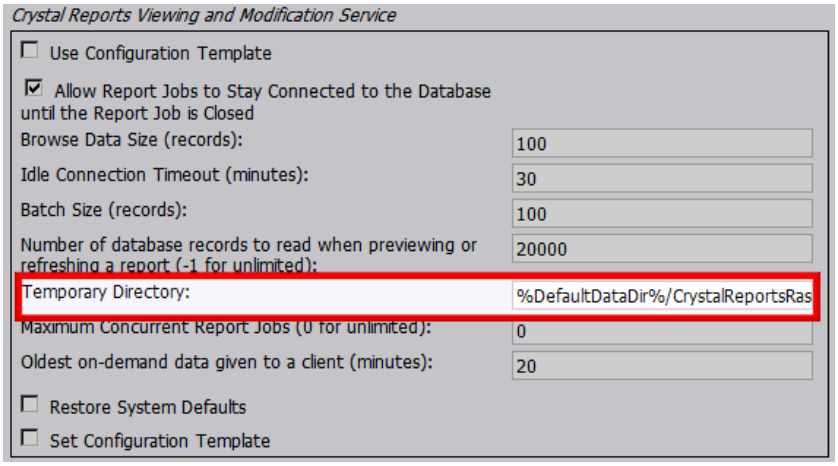
In Common Settings,

20. In Request Port, select the *Auto assign* check box.
21. In Host Identifiers, select the *Auto assign* radio button.
22. Select the *Automatically start this server when the Server Intelligence Agent starts* check box.

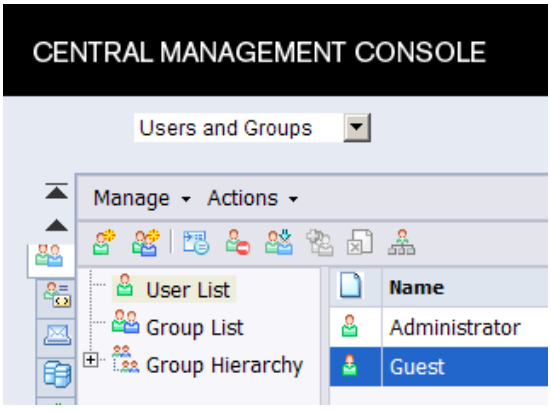


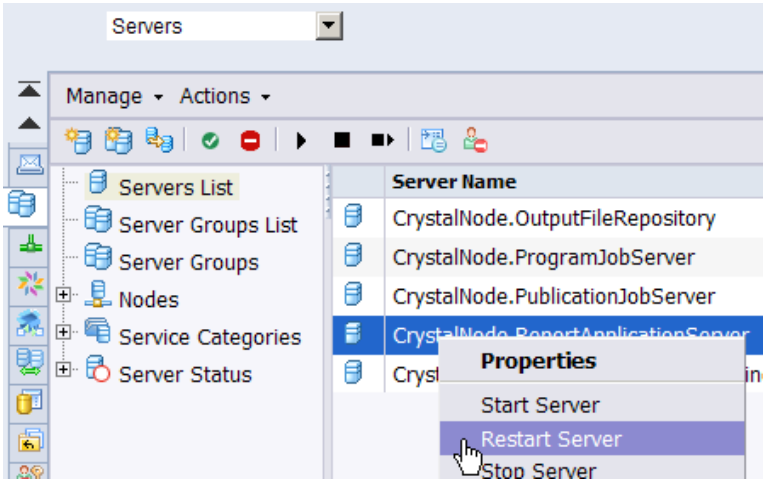
In SAP Crystal Reports Viewing and Modification Service,

23. In *Temporary Directory*, if there is a value, make sure the path is valid.



24. Enable the Guest account in Users and Groups -> User List.



Step	
25. When you have finished making configuration changes, restart the Report Application Server. ☑ **TIP:** The Report Application Server is on the second page of servers.	

Enabling Crystal support on WebSphere 8

For Crystal support on WebSphere 8, the IBM TRIRIGA application needs to point to IBM ICU version 4.8.1.1. To enable this, you must create a new shared library.

To create the new shared library:

Step
1. Go to **Environment** > **Shared Libraries**.
2. Select the server scope and click the **New…** button.
3. For this new Shared Library, enter the name “TRIRIGA_IBM_ICU4_8_1_1”.
4. Enter the classpath to the “icu4j-4_8_1_1.jar” file, which is located in the **tools/lib** directory of the IBM TRIRIGA installation.
5. Select the check box for **Use an isolated class loader for this shared library**.
6. Click **OK**.
7. Click **Save**.
8. To go to the IBM TRIRIGA application, go to **Application Types** > **WebSphere Enterprise Applications**.

Step
9. Select the IBM TRIRIGA application.
10. Under **References** in the **Configuration** tab, click **Shared library references**.
11. Select the check box for the IBM TRIRIGA application and click the **Reference shared libraries** button.
12. Select “TRIRIGA_IBM_ICU4_8_1_1” from the list of available Shared Libraries and click the arrow pointing to the right. This will places the “TRIRIGA_IBM_ICU4_8_1_1” Shared Library into the “Selected” list.
13. Click **OK**.
14. Confirm that the “TRIRIGA_IBM_ICU4_8_1_1” Shared Library appears as a referenced Shared Library for the “tririga-ibs” application and click **OK.**
15. Click **Save**.

3. Verifying Installation

This chapter provides information that you can use to help confirm that your system is running properly. The tips below are not intended to substitute for your company's testing and validation procedures.

Installation Verification Tips
Review the `ant.log`. The `ant.log` is located in the root installation directory, for example `C:\Tririga\ant.log`. This file contains information about every step taken during the install. A line toward the end of the file indicates whether the installation succeeded or failed.
Sign in as the system user. The default User Name is `system` and the default Password is `admin`. The complete portal should display and all colors and fonts should be readable.
Login to the Administrator Console. The default login is `system` and the default Password is `admin`. In the Agent Manager, start at least the following agents in the Process Server: CleanupAgent, ExtendedFormulaAgent, FormulaRecalcAgent, SchedulerAgent, WFAgent, and WFNotificationAgent. Logout of the Administrator Console. For more information about the Administrator Console, read the *IBM TRIRIGA Application Platform 3 Administrator Console User Guide*.
As the system user, create a non-admin Employee. Make them an IBM TRIRIGA user. Give them some, but not all, user groups. Give them some, but not all, user licenses.
Sign in as the user you created. Check that the user has access to everything they should have access to with the security groups and licenses given.
Check that a user can create and revise records, especially People and Location records.
Open a record and select the Associations tab. Verify that the Association Tree loads.
In the Workflow Builder, (as delivered, it is under Tools > Builder Tools), open and revise an existing workflow. Navigate to see if it loads completely.
In the Data Modeler (as delivered, it is under Tools > Builder Tools), verify that the state transition loads. Publish a test business object to verify that SMTP e-mail notification works.
As either the system user or a user with rights, open the Document Manager (as delivered, it is under the Tools menu item). Upload a new document (txt, html, or jpg are good tests). Upload a new document with the MultiFile applet. View the document by clicking the icon in the V column. Check In / Check Out a document.

Installation Verification Tips

If Brava! has been installed, upload a CAD document in DXF and view the CAD document by clicking the icon in the V column.

If SAP Crystal Reports has been installed, test the operation of the Crystal integration.

Open an Employee record, select the Reports tab, and click **Submit**.

Open a Building record, select the Reports tab, choose `Building Report`, and click **Submit**.

In the My Reports menu item, select the Community tab. Enter `Location` in the Module filter, choose `Crystal` from the Display Type filter, and click **Apply Filters**. Select the Run Report icon  next to a report.

Test functions dependent on the X Window System (X).

SAP Crystal Reports: In the My Reports menu item, select the Community tab. Enter `Capital Project` in the Business Object filter, choose `All` from the Display Type filter, and click **Apply Filters**. Select the Run Report icon  next to a report.

Open or create a new Capital Project. In the Schedule tab, Add or test a Schedule Task in the Project Tasks section. In the Schedule Task line item, change one of Planned Start, Planned End, or Planned Working Hours. The other fields should adjust accordingly.

If CAD Integrator will be used, select the following options:

Sign in as a user with a CI license.

Sync a drawing with CI.

Verify that the `server.log` exists and is being written to. The `server.log` is located in the `log` directory of the IBM TRIRIGA install, for example `C:\Tririga\log\server.log`.

Check the `server.log` for any major exceptions on first startup.

If the environment being verified is a performance environment like Production, check `TRIRIGAWEB.properties` to make sure `ProductionMode=Y` instead of the default value of `N`.

A day or so after the install, verify in the Process Server `server.log` that the Cleanup process completed successfully. Verify this on a regular basis.

4. IBM TRIRIGA Software Configurations

This guide provides details about some of the key areas that need to be configured for the IBM TRIRIGA Application Platform and the applications that run on it to work properly. Although the installer provides most of the configurations necessary, it is important to understand what the various configurations are and where changes can be made to optimize your environment.

Properties Files

The IBM TRIRIGA properties files are located in the `config` directory of your IBM TRIRIGA installation, for example, `C:\tririga\config`.

The properties files use the concept of "name-value pairs" where a variable name is followed by an equals sign (=) and then the defined value. Lines in the properties files that begin with a pound sign (#) are comments and not read by the system. Name-value pairs are case sensitive.

Some properties need to be set only when they apply to your company implementation of IBM TRIRIGA.

☑ **TIP:** The variables and settings in IBM TRIRIGA properties files may change from one version to the next. Before upgrading from a prior version of IBM TRIRIGA software, save your old properties files. After completing your upgrade install, carefully review each newly installed properties file and adjust values as appropriate for your implementation.

Information about the IBM TRIRIGA properties files for Crystal is included here. For more information about the IBM TRIRIGA properties files, go to the IBM TRIRIGA Application Platform 3 Knowledge Center and select *Installing IBM TRIRIGA Application Platform*.

TRIRIGACRYSTAL.properties

Variable Name	Acceptable Values	Description of Use
ReportLocation	Valid path	Where the SAP Crystal Reports rpt files are stored when uploaded into Document Management. This should be the install `/userfiles/crystalreports` directory. For example: `C:/Tririga/userfiles/crystalreports`
RasHost	Host name	The Crystal Decisions Report Application Server.
AppHost	String	The URL used to view an offline SAP Crystal Report. The value must be a valid host name (not `localhost`, not

Variable Name	Acceptable Values	Description of Use
		12.34.56.78). Include the port number if the Application Server is not using port 80 (e.g., term4.ibm.com:8001). Do not include the protocol (http://) or the path (/index.html).
TRIRIGAIBS_ODBC	String	Any Crystal report that runs direct SQL against an IBM TRIRIGA database must have a data source named TRIRIGAIBS. This refers to an ODBC entry that resides on the Crystal RAS server. A single RAS server can service any number of IBM TRIRIGA database servers. Do not use this for a production RAS server, but it can be useful in other environments, such as development. The TRIRIGAIBS_ODBC property configures which ODBC entry on the Crystal RAS server the reports will use. Begin by creating ODBC entries on the RAS server, one for each database hosting an IBM TRIRIGA instance to be supported by the RAS server. In the IBM TRIRIGA application server, configure the TRIRIGAIBS_ODBC property to indicate which ODBC entry should be used for reports run from that server. At runtime, the TRIRIGAIBS data source is replaced in the report with the name of the ODBC entry specified in the TRIRIGAIBS_ODBC property. If a value is specified in the TRIRIGAIBS_ODBC property, the TRIRIGAIBS value in a Crystal report will be replaced with that value. If the property is left blank, the TRIRIGAIBS data source will remain in the report.
ReportUserLogon	String	The username used to logon to non-IBM TRIRIGA data sources that are used in reports. **NOTE:** This value can be plain text or encrypted. See the *IBM TRIRIGA Application Platform 3 Administrator Console User Guide* for information about the encryption tool.

Variable Name	Acceptable Values	Description of Use
ReportUserPassword	String	The password for the logon to non-IBM TRIRIGA data sources used in reports. **NOTE:** This value can be plain text or encrypted. See the *IBM TRIRIGA Application Platform 3 Administrator Console User Guide* for information about the encryption tool.
CRYSTAL_MEMORY_USAGE_LIMIT	0 – 100 Blank	The maximum percentage of available server memory that can be used while assembling query results for a Crystal report. If this percentage is exceeded, the query errors out due to insufficient memory. If this is caused by an interactive Crystal report, the following error message is displayed: “Error Occurred. There are not enough resources available to run the report at this time. – [MID-xxxxx]”, where xxxxx is the message ID of the log entry in the server.log. Before the report actually fails, the platform attempts to reclaim unused memory by doing a garbage collection. This garbage collection has the potential to momentarily slow other activity on the system. Any attempt to reclaim unused memory will have an INFO-level log entry in the server.log. If you see a “There are not enough resources available to run the report” error for a query, it is likely that the query was the cause of the error; however, it also is possible that other concurrent processes could have consumed memory while the query was assembling its results. Valid values are between `0` and `100`. Values of `0` and `100` essentially disable any limit being enforced. Do not use either value because a single query initiated by a single user could run the server out of memory. An empty value or an invalid value is treated as a default value. The default value is `35`.

Variable Name	Acceptable Values	Description of Use
CRYSTAL_REQUEST_SERVER_PORT	Number	A Crystal Request Server resides within the IBM TRIRIGA Application Server. When present, this property specifies the listening port on the IBM TRIRIGA server that handles Crystal RAS Query Requests. If no port is specified, the system selects an available port.
ServletUser	String	The username that is hard coded to prevent manual requests for portal and section reports. **NOTE:** This value can be plain text or encrypted. See the *IBM TRIRIGA Application Platform 3 Administrator Console User Guide* for information about the encryption tool.
ServletPassword	String	The password that is hard coded to prevent manual requests for portal and section reports. **NOTE**: This value can be plain text or encrypted. See the *IBM TRIRIGA Application Platform 3 Administrator Console User Guide* for information about the encryption tool.
ReportCacheSize	Number	The number of reports that can be cached, meaning that they will not have to be reprocessed while navigating through the report.
OwnPage	true false	The default value is `true`.
DisplayLogo	true false	If set to true, the Crystal Business Objects/SAP logo is displayed in the viewer. The default value is `false`.
EnableDrillDown	true false	If set to true, drill down is enabled. The default value is `true`.
ExportButton	true	If set to true, the Export Button is displayed.

Variable Name	Acceptable Values	Description of Use
	false	The default value is `true`.
GotoPageButton	true false	If set to true, the Goto Page button is displayed and the HTML returned includes a text box into which the user can type a page number to navigate to a specific page in the report. If set to false, the HTML returned displays the current page but does not allow the user to navigate by page number. The default value is `true`.
ToolPanelViewType	GroupTree ParameterPanel None	The default value is `None`.
GroupTreeToggle	true false	If set to true, the group tree toggle button is displayed. The default value is `true`.
ParameterPanelToggle	true false	If set to true, the parameter panel toggle button is displayed. The default value is `true`
MultiplePages	true false	If set to true, the report is displayed as multiple pages. If set to false, the report is displayed as one long page. The default value is `true`.
PageNavigation	true false	If set to true, the page navigation buttons (Next/Previous) are displayed. The default value is `true`.
PrintButton	true false	If set to true, the Print button is displayed. The default value is `true`.
PrintMode	ActiveX PDF	Controls the report print feature. If set to `ActiveX`, users print a report from their browser using ActiveX control. The client Web browser must support ActiveX

Variable Name	Acceptable Values	Description of Use
		control. If set to `PDF`, users save a report as a PDF file and print it from Adobe Reader. The default value is `ActiveX`.
RefreshButton	true false	If set to true, the Refresh button is displayed. The default value is `true`.
SearchButton	true false	If set to true, the Search button is displayed. The default value is `true`.
Toolbar	true false	If set to true, the toolbar is displayed. The default value is `true`.
ZoomFactorList	true false	If set to true, a zoom factor list is displayed. The default value is `true`.
DrillDownTabs	true false	If set to true, drill down tabs are displayed. The default value is `true`.
ToolPanelWidthUnit	Pixel	The unit of measure for the tool panel width. The default value is `pixel`.
ToolPanelWidth	Number	The width of the tool panel in the units specified in ToolPanelWidthUnit. The default value is `200`.
StartPage	Number	The page number of the beginning of a report. The default value is `1`.
ZoomFactor	Number	Sets the zoom factor for displaying a report. The default value is `100`.

Variable Name	Acceptable Values	Description of Use
ViewerTitle	String	The title displayed at the top of the viewer. The default is `IBM TRIRIGA Report Viewer`.
HyperLinkTarget	_self _parent _top _blank	The hyperlink target for displaying the HTML. `_self` displays the HTML in the same frame `_parent` displays the HTML in the same frame or window that contains the current frameset `_top` displays the HTML in the entire browser window `_blank` displays the HTML in a new browser window The default value is `_blank`.
StyleSheetLocation	Name	The name of the style sheet. The default value is `tririga.css`.
ReportLifeSpan	Number	How long a report generated by the Report Queue Agent should exist on the disk after it has been created. The default value is `15`.
ReportCleanTime	0 – 23	The hour at which the reports that have passed the ReportLifeSpan limit are deleted, in 24-hour time. The default value is `2`.

TRIRIGAWEB.properties

Variable Name	Acceptable Values	Description of Use
ReportQueueAgentLoad	Number	The number of threads in proportion to the number of connections (e.g., `100.0`)

Variable Name	Acceptable Values	Description of Use
ReportQueueAgentMaxThreads	Number	The maximum number of threads that can be used to run queued reports. If there is no upper limit, set to `0`.

5. Working with SAP Crystal Reports

Setup for Data Sources

There are two different types of Crystal reports: form reports and query reports. Form reports are used most often to display the contents of a single record. Form reports generated by SAP Crystal Reports contain data from one top-level record. They may contain data from one or more associated records and are used to create reports users can select on the Reports tab of a record or when a user clicks **Form** for a single record. Query reports are used most often to display multi-record reports. Query reports may contain data from any number of top-level records and multiple levels of detail that are accessible through associated business objects and records.

You can use SAP Crystal Reports to create form reports as well as query reports.

IBM TRIRIGA is a web-based application and its data structure is defined in the Data Modeler. The data schema for IBM TRIRIGA business objects is available through ADO XML. You can connect to IBM TRIRIGA data either through ADO XML or by direct database access. The following chart summarizes the pros and cons of each approach. This chapter assumes your choice is the ADO XML approach.

Connection Method	Pro	Con
ADO XML	▪ Report development is easier ▪ Each field of a business object (including smart section field) is available in the XML ▪ Naming conventions used by XML make it easy to locate any field (Section Name_Field Name) ▪ IBM TRIRIGA security is enforced on the data that is being accessed ▪ Can take advantage of associations ▪ Can use IBM TRIRIGA filters	▪ Performance is slower than through directly accessing the data from the tables ▪ During development, report has to be uploaded into Document Manager each time to test the report
Direct connection to IBM TRIRIGA database	▪ Performance is better, since you are directly connected to database ▪ Testing can be done, by saving the RPT and running it directly from the local machine ▪ RPT file can be uploaded into Document Manager only once	▪ Developer needs to be familiar with the IBM TRIRIGA database schema, naming convention, and the like ▪ Unlike XML, explicit joins need to be made from one table to another ▪ Bypasses IBM TRIRIGA security rules ▪ If the database schema changes, the reports may need to be

Connection Method	Pro	Con
		updated

An ADO XML data source needs to be set up on any machine that will be used to develop Crystal reports. This allows the Crystal Designer to retrieve the data structure information defined by the form (for a form report) or query (for a multi-record report) ADO XML files.

If you are familiar with Microsoft Corporation's .NET technology, you may be aware that ADO.NET can use ADO XML files as a data source. The files that the IBM TRIRIGA Application Platform generates are not intended to be used as true data sources. They are intended to be used with SAP Crystal Reports to design reports. They only contain a single row of metadata information representing the IBM TRIRIGA object data structure to help you lay out a report.

You only need to set up for data sources once on a Crystal report developer's computer. Begin establishing the Crystal data sources you will need to create form reports and query reports by creating the following directory structure on a computer that will be used for designing Crystal reports.

- First, create a folder named `XML_Data_Source`.
- Create a folder within `XML_Data_Source` named `Forms`.
- Create another folder within `XML_Data_Source` named `Queries`.

Form Reports

Form reports are used in a record's Reports tab or when a user clicks the **Form** action for a single record. Before creating a Crystal report for a form report, review the information displayed automatically by the system when the user clicks the Print Preview link. Form reports generated by SAP Crystal Reports contain data from one top-level record. They also may contain data from one or more associated records contained within query sections on the top-level record's form.

You only need to create a data source for form reports once on a Crystal report designer's computer.

If you wish to include associated records that are contained within query sections of the top-level record's form you do not need to create a separate query-based ADO XML data source. The `Forms` ADO XML files will contain the top-level business object definition as well as business object definitions for all associated objects represented within query sections on the top-level record's form. When a form Crystal report runs, the IBM TRIRIGA Application Platform returns the top-level record and only those associated records contained within the top-level record's query sections. No joins need to be defined within the Crystal report as all data is pre-filtered for inclusion on the report.

The remaining steps in this section are the same for each form report you wish to create:

- Use the Form Builder to create the ADO XML
- Design and create the Crystal report

- Put the report file into the Document Manager
- Add the report to the form

The examples in this section use a report that list an employee's information.

Create a Data Source

You only need to create a data source for form reports once on a Crystal report designer's computer. Follow these steps to create the data source for the report.

Step
1. Click **Start** > **Settings** > **Control Panel**.
2. Select **Administrative Tools**.
3. Select **Data Sources (ODBC)**.
4. Select the **System DSN** tab.
5. Click **Add**.
6. Select **CR XML ODBC Driver 6.0**.
7. Click **Finish**.
8. Enter `TririgaFormsXML` in *Data Source Name*. No other name should be used for this value.
9. Click **Add** to add a location.
Add a location named `Forms` to the `TririgaFormsXML` data source using the `Forms` directory as the source: 10. Enter `Forms` in *Location Name*. 11. Select the `Folder` radio button in *Location Type*. 12. Click the  box and find the `XML_Data_Source\Forms` directory you created earlier. 13. Click **Apply**.
14. Select the Advanced tab.

Step
15. In *Table Creation*, select the `ADO Format` radio button. The data source location then uses ADO format.
16. Click **Apply**.

To finish,

17. Click **Close**.
18. Click **OK**.
19. Click **OK**.

Use the Form Builder to Create the ADO XML

The ADO XML files contain information about the data in the IBM TRIRIGA system that the report will run against.

You will find naming conventions for reports in Naming Conventions in this user guide.

Step
1. Select the Form Builder option from the Application Builder portal section.
2. Scroll the Module panel and select the module for the report (in this example, `triPeople`).
3. Select the form in the right panel by selecting the radio button (in this example, `triEmployee`).
4. There are two ways to select the ADO XML: Either, (1) Click the **ADO XML v2** action on the section bar. **Note** – The **ADO XML v1** action is for legacy reports created prior to TRIRIGA Application Platform 2.7.0.
Or, (2) If the form is published, open the form and click the **ADO XML v2** action on the Layout tab. **Note** – The **ADO XML v1** action is for legacy reports created prior to TRIRIGA Application Platform 2.7.0.

Step
The platform generates a zip file that contains the ADO XML files SAP Crystal Reports will use.
5. Click **Save**.
6. Save the zip file in the `XML_Data_Source\Forms` directory created in Setup for Data Sources.
7. Extract the contents of the zip file into the `Forms` directory.

Tip - See ADO XML v2 Formats for an explanation of the name format.

Note – For form query sections, the platform only pulls the Display Columns, the field labels, and the UOM fields from the backing query of the query section.

Attention - Do not rename the XML files.

Tip - After you finish creating a report, open the `XML_Data_Source \Forms` folder and delete the files. When you do so, the next time you create a report you only will be working with the XML files for the new report.

Design and Create the SAP Crystal Report

Explaining how to use SAP Crystal Reports to design a report is beyond the scope of this user guide. Any good book on designing reports for SAP Crystal Reports should be helpful.

Note – For information about form reports when you have selected the ADO XML v1 action, go to ADO XML v1.

An important detail you should be aware of when you are designing a form report: For every field in the report there will be two fields available in SAP Crystal Reports. One field will have the same name as the field. The other field will have the name of the field followed by `_Label`.

For example, the General section of an Employee record has a field named `triNameTX`. In a form report, SAP Crystal Reports will see a field named `triPeople_triEmployee__triNameTX` that contains the value of the `triNameTX` field. SAP Crystal Reports also will see a field named `triPeople_triEmployee__triNameTX_Label` that contains the label for the `triNameTX` field. When you put a label in a report, use the field name ending with `_Label` instead of a text object. This ensures the label for the field stays consistent with the label specified for the field in the form. If the field label is changed in the form, the field label will show the new value the next time the report is run.

Another benefit of using the field name ending with `_Label` instead of a text object is that it allows the report to take advantage of the IBM TRIRIGA Application Platform's internationalization support for labels. If configured to do so, the platform can supply labels in the language preferred by the user. For more information, go to the IBM TRIRIGA Application Platform 3 Knowledge Center and select *Administering IBM TRIRIGA Application Platform* > *Localizing applications*.

The following example uses the XML extracted in the previous section and the Standard Report Creation Wizard to show some of the steps in designing and creating a Crystal form report:

Step
1. In the *Available Data Sources* panel, expand the Create New Connection folder.
2. Click the + next to *ODBC (RDO)*.
3. Select `TririgaFormsXML` in the *Data Source Name* list.
4. Click **Finish**.
5. In the *Available Data Sources* panel, expand the `XML` node under `ODBC (RDO)\TririgaFormsXML`.
6. Select the table with the same name as the module your report belongs to (in this example, `[v2BO]triPeople_triPeople`). **Tip -** See ADO XML v2 Formats for an explanation of the name format.
7. Click the right facing arrow to move the table to the *Selected Tables* panel.
8. Click **Next**.
9. In the *Available Fields* panel, select the fields you want on your report and use the right facing arrow to move them to the *Fields to Display* panel. **Tip -** See ADO XML v2 Formats for an explanation of the name format. **Note** - As described above, there are two fields for each field in the database. The one ending `_Label` is the field label from the form.
10. Click **Next** three times to bypass the Grouping and Record Selection options.
11. Click **Finish** to close the wizard.
12. Select the File menu and make sure the *Save Data with Report* option is **NOT checked**.

Step
13. Arrange the fields as desired.
14. Save the report as a .rpt file.  **Tip** - Note the location where you save the file.

Put the Report File into the Document Manager

For detailed instructions on how to use the Document Manager, see the *IBM TRIRIGA 10 Document Management User Guide*.

Step
1. Select the Document Manager from Tools menu item in the first level of the menu bar.
2. Expand the IBM TRIRIGA folder.
3. Select the folder corresponding to the module of the report (in our example, `People`).  **Tip** - Some companies prefer to create new folders for customized reports or folders for individuals.
4. Click **New Document**.
5. Click **Browse**… and select the rpt file you created.
6. Enter a *Document Name*.
7. Enter other fields per your company's policies and procedures.
8. Click **Upload**.
9. Click **OK** when the upload process completes. The report now shows in the list in the Document Manager.

Add the Report to the Form

Step
1. Return to the Form Builder.

Step
2. Open and **Revise** the form for which you developed the form report (in our example, `triEmployee`). **Tip** - If you want this report to appear in the Reports tab, ensure the *Show Reports* property is selected on the Layout tab.
3. Select the Includes/Forms tab.
4. Click **Add** on the Forms section bar.
5. Search for and select the document you uploaded into the Document Manager.
6. Click **OK**.
7. Return to the Layout tab and **Publish** the form.

To Make Changes to a Form Report

If changes need to be made to a form report, you will need to check out the report from the Document Manager, make your changes, and check in the report. The *IBM TRIRIGA 10 Document Management User Guide* describes this process in detail.

Step
1. To check out the file, locate the file in the Document Manager and click the Check Out icon  .
2. Enter an appropriate *Comment*.
3. Click **Check Out**.

Select the option that best matches your requirement:

4. Click **Open** to create a temporary file named `<filename>[1].rpt` that opens in Crystal.

5. Click **Save** if you do not have a copy of the .rpt file or if you are not sure that the file you have is the most current.

6. Click **Cancel** if you have been working on the report in Crystal. This changes the status in the Document Manager without copying the file anywhere.

7. Make your changes to the report and save the file.
8. Upload the new version by checking the file back in to the Document Manager. Start by selecting the Check In icon  .

Query Reports

Query reports may contain data from any number of top-level records. They also may contain multiple levels of detail that are accessible through associated business objects and records. Most often query reports are used to display multi-record reports.

You only need to create a data source for query reports once on a Crystal report designer's computer.

You do not need to create a data source for queries if you are designing a form report for a record that contains query sections.

The steps are the same for each query report you wish to create:

- Use the Report Manager to create a source query and the ADO XML
- Design and create the Crystal report
- Put the report file into the Document Manager
- Create an External IBM TRIRIGA report in the Report Manager to link to the Crystal report (.rpt) file
- View the report from the manager

The examples in this Query Reports section use a report that lists employees.

Create a Data Source

You only need to create a data source for query reports once on a Crystal report designer's computer. Follow these steps to create the data source for the report.

Step
1. Click **Start** > **Settings** > **Control Panel**.
2. Select **Administrative Tools**.
3. Select **Data Sources (ODBC)**.
4. Select the **System DSN** tab.
5. Click **Add**.

Note - The `TririgaIBS` data source is defined on the Crystal server.

Step
6. Select **CR XML ODBC Driver 6.0**.
7. Click **Finish**.
8. Enter `TririgaQueriesXML` in *Data Source Name*. No other name should be used for this value.
9. Click **Add** to add a location.
Add a location named `Queries` to the `TririgaQueriesXML` data source using the `Queries` directory as the source: 10. Enter `Queries` in *Location Name*. 11. Select the `Folder` radio button in *Location Type*. 12. Click the  box and find the `XML_Data_Source\Queries` directory you created earlier. 13. Click **Apply**.
14. Select the Advanced tab. 15. In *Table Creation*, select the `ADO Format` radio button. The data source location then uses ADO format. 16. Click **Apply**.
To finish, 17. Click **Close**. 18. Click **OK**. 19. Click **OK**.

Use the Report Manager to Create a Source Query and the ADO XML

The following steps create a new query that will provide the Crystal report with the data structure needed to design the report and the data for the report runtime.

The ADO XML file contains the information about the data in the IBM TRIRIGA system that the report will run against.

If you have questions about how to use the Report Manager, see the IBM TRIRIGA Report Building chapter in this user guide. You will find naming conventions for queries in Naming Conventions.

Step

1. Select the System Reports tab on the My Reports menu item.
2. Click **New**.
3. Complete the General tab. The *Type* must be `Query`.

Note – Do NOT choose Type = `External` for the source query.

4. Select the fields in the Columns tab.
5. Select the Group By and Order By values in the Order & Group tab.
6. Add any filters in the Filters tab.

Tip - Always filter the data as much as possible in the IBM TRIRIGA source query.

7. In the Advanced tab, click **ADO XML v2**.

Note – The **ADO XML v1** action is for legacy reports created prior to TRIRIGA Application Platform 2.7.0.

The platform generates an XML file containing the ADO XML information SAP Crystal Reports will use.

8. Click **Save**.
9. Save the XML file in the `XML_Data_Source\Queries` directory created in Setup for Data Sources.

Attention - Do not change the file name.

Tip - After you finish creating a report, open the `XML_Data_Source \Queries` folder and delete the file. When you do so, the next time you create a report you only will be working with the XML file for the new report.

Design and Create the Crystal Report

Explaining how to use SAP Crystal Reports to design a report is beyond the scope of this user guide. Any good book on designing reports for SAP Crystal Reports should be helpful.

Note - For information about query reports when you have selected the ADO XML v1 action, go to ADO XML v1.

The following example uses the XML extracted in the previous section and the Standard Report Creation Wizard to show some of the steps in designing and creating a Crystal query report:

Step
To create a connection to the XML file,
1. In the *Available Data Sources* panel, expand the Create New Connection folder.
2. Click the + next to *ODBC (RDO)*.
3. Select `TririgaQueriesXML` in the *Data Source Name* list.
4. Click **Finish**.
5. In the *Available Data Sources* panel, expand the `XML` node under `ODBC (RDO)\TririgaQueriesXML`.
6. Select the table with the same name as the XML file (in this example, `[v2QRY]triPeople_triPeople…`). **Tip** - See ADO XML v2 Formats for an explanation of the name format.
7. Click the right facing arrow to move the table to the *Selected Tables* panel.
8. Click **Finish**. **Tip** - Click **File > Options**. Select the Layout tab. Turn off the *Insert Detail Field Headings* field option. Also, on the Database tab, select *Sort Fields Alphabetically*.
9. Add fields to the report. **Tip** - See ADO XML v2 Formats for an explanation of the name format.
10. Select the File menu and make sure the *Save Data with Report* option is **NOT checked**.
11. Save and exit the report.

Put the Report File into the Document Manager

For detailed instructions on how to use the Document Manager, see the *IBM TRIRIGA 10 Document Management User Guide*.

Step

To find the Document Manager, select the Tools menu item on the first level of the menu bar, then select Document Manager on the second level of the menu bar.

1. Expand the IBM TRIRIGA folder.
2. Select the folder corresponding to the module of the report (in our example, `People`).

Tip - Some companies prefer to create new folders for customized reports or folders for individuals.

3. Click **New Document**.
4. Click **Browse…** and select the rpt file you created.
5. Enter a *Document Name*.
6. Enter other fields per your company's policies and procedures.
7. Click **Upload**.
8. Click **OK** when the upload process completes. The report now shows in the list in the Document Manager.

Create a Crystal IBM TRIRIGA Report in the Report Manager

This creates a new IBM TRIRIGA query as an `External` query. This query will act as a link to the Crystal .rpt file in the Document Manager.

If you have questions about how to use the Report Manager, see the *IBM TRIRIGA Application Platform 3 Reporting User Guide*.

Step

1. Select the System Reports tab on the My Reports menu item.
2. Click **New**.

Step

In the General tab, the *Type* must be `External`.

3. In the Business Objects sub-tab, for *Business Object*, specify where users will be able to see this Crystal report. This value does not define the data that is available to the Crystal report (that was done above), rather it specifies where a user can access the Crystal report.

Tip - To select multiple items, hold the Ctrl or Shift key and click your selections.

In the Options sub-tab,

4. Select the Search icon next to *Document*.

5. In the IBM TRIRIGA Data Search form, point the query to the Crystal report you put into the Document Manager and click **Accept**.

Tip - In the IBM TRIRIGA Data Search form, use the % character as a wild card to widen your search from the first word to any word in the name. For example, type `%Employee` to find a report with the word `Employee` anywhere in the name.

The *Queued* check box is available only when the report Type is `External`. Selecting the Queued check box indicates the report is to be run in a queued manner.

If a queued report has runtime filters and/or Crystal filters, they are presented to the user before the report is queued, just like they are for a non-queued report.

Queued Crystal reports may be launched from and/or are accessible from the following places: My Reports, Manager query lists, Report Manager, and query sections.

The following access points are not supported for queued reports: Portal Sections (if a queued report is attached to a portal section, the system launches it in a non-queued manner) and form actions.

Note – When a queued report finishes processing, the system sends a notification to the user's Notifications portal section. The user can access the report by clicking the hyperlinked Subject.

Attention - A queued Crystal report attached to a workflow notification executes along with the notification. However, if the report contains filters that do not have a default value, the report generation may error out because there is no user to provide the values. Set the default values for all filters when you define such a report.

6. If appropriate, select the *Queued* check box.

View the Report

In this example, the Crystal report is in the Community tab.

Step
1. Select the Run Report icon  . The system generates the report and displays it in a separate window.

To Make Changes to a Query Report

If changes need to be made to a query report, you will need to check out the report from the Document Manager, make your changes, and check in the report. The *IBM TRIRIGA 10 Document Management User Guide* describes this process in detail.

Step
1. To check out the file, locate the file in the Document Manager and click the Check Out icon  .
2. Enter an appropriate *Comment* and click **Check Out**.

Select the option that matches your requirement:

3. Click **Open** to create a temporary file named `<filename>[1].rpt` that opens in Crystal.
4. Click **Save** if you do not have a copy of the .rpt file or if you are not sure that the file you have is the most current.
5. Click **Cancel** if you have been working on the report in Crystal. This changes the status in the Document Manager without copying the file anywhere.

6. Make your changes to the report and save the file.
7. Upload the new version by checking the file back in to the Document Manager. Start by clicking the Check In icon  .

Printing Crystal Reports

IBM TRIRIGA offers two modes for printing Crystal reports. One uses ActiveX control to send a report directly to the printer. The other exports a report to a PDF file that can be printed from Adobe Reader. For the ActiveX mode, the client Web browser must support ActiveX control.

Step
1. The `PrintMode` property in the `TRIRIGACRYSTAL.properties` file determines which mode your users experience. The default is `ActiveX`, which sends a report directly to the printer. To export a PDF file, set the property to `PDF`. Additional information about setting the `PrintMode` property in the `TRIRIGACRYSTAL.properties` file can be found in the `TRIRIGACRYSTAL.properties` section.

Naming Conventions

IBM TRIRIGA follows a set of naming conventions in its applications and in custom development that it does on behalf of its customers. Follow these naming conventions to reduce unexpected interactions between IBM TRIRIGA's applications and applications created by others and to help ensure that future upgrades go more smoothly.

Element	Naming Convention
Name Prefix	A three character customer prefix is assigned to all implementations, typically `cst`. For IBM TRIRIGA applications, the prefix is `tri`.
Report or Query	`cst`+"–" + Form Name (or Business Object Name or Module Name if Report/Graph) - Keyword - Context There are no spaces between the `cst–` and the `tri` object name. For example: `cst-triPurchaseOrder – Workflow – POs for Current Year` If the query references a new or customized object: Form Name (or Business Object Name or Module Name) - Keyword - Context For example: `cstEmployee – Crystal – Employee Contact Details` Keywords are: Crystal – Query with linked Crystal rpt document Debug – Query to help isolate data issues Display – Query to display data in query sections Filter – Query to filter data for other queries via Association filters

Element	Naming Convention	
	Find	Query for Find action of a locator or section
	Formula	Query to provide input values for extended formulas
	Graph	Graph reports intended for end users
	Graphics	Graphics Editor report
	GUIMetric	Query for metric in a form
	HGrid	Hierarchical query for nesting queries
	Patch	Query used in patch helpers
	Portal	Query for portal section
	Report	Report intended for end users
	Reserve	Calendar/Reserve-based query of data associated with record
	Summary	Summary Report intended for end users
	Subquery	For the bottom level of an HGrid query structure
	Workflow	Query for workflow Query task

Context should include filters to states, data filters, association filters, if editable, and the like. For queries tied to a `$$RECORDID$$` or other platform key, make sure to include the type of context record in the context part of the name.

The ID of the report should be `CUSTOM`, or use your company's numbering standards for reports. `SYSTEM` is reserved for IBM TRIRIGA delivered reports.

Naming Convention for Labels:

Form Label (or Business Object Label or Module Label) – Context

Context should describe what the report displays to the user.

For example: `Employees – All Associated Active Employees`

Crystal Reports Tips

Topic	Tip
`$$DATEFORMAT$$`	Return the `$$DATEFORMAT$$` variable to a Crystal report to indicate which date format is preferred by a user. This way the report design can account for the different options present in your user

Topic	Tip
	community.
Add A Field	If the field was selected in the original design, modify the Crystal report and check the updated version into the Document Manager. If the field was not in the original design, • For a form report, recreate the ADO XML and update the Crystal report. • For a query report, open the query and add the field. After applying your changes, recreate the ADO XML file. Update the Crystal report. In Crystal you will need to select **Database** > **Verify Database** to refresh the dataset with the new field that was added to the IBM TRIRIGA query.
Bulk Printing	Follow these steps to bulk print Crystal reports: 1. Go to the Data Modeler and verify that the `triRecordIdSY` field exists on the business object of the records you will be printing. If not, find the field and add it to the business object's General section. 2. Create a query for the business object you will be printing to return only the `triRecordIdSY` field. You can add static field filters and/or association filters to modify result set. For example, if the records to be printed will be determined by the user selecting them in a query section, you might use an association filter to filter using the `$$RECORDID$$` record (i.e., the record containing the query section) for the selected records. 3. On the Advanced tab of the query, click the ADO XML v2 action. Click Save when prompted and copy the name of the ADO XML file given without the `[v2QRY]` prefix and without the `.xml` extension. Cancel out of the download prompt. There is no need to save the XML document as you only need the name. You will need this name later to build the URL to send to Crystal. 4. In the Document Manager, find the report you want to print in bulk. Open it and copy either the File Path value, or get the `documentId` by right-clicking on the link used to open the document record, going to properties and copying the `docId` from the Address (URL) path there. The address will be something like `javascript:openDocument(4054908);` Copy the number from within the parentheses. 5. The URL that is built takes either `parameter("reportPath"` or

Topic	Tip
	"docId"), but not both. By using the docId as an attribute in the RepBuilder.jsp URL (see example below), you have the ability to move the report around in the Document Manager without having to go back to the bulk printing URL later and change the path. The docId will always remain the same. 6. Now that you have everything set, you can build your URL. Take the name of the ADO XML file you copied earlier (omitting the [v2QRY] prefix and the .xml at the end of it). This is what your queryName will be. For this explanation, we'll just call it "theQueryName". The real name will be long and may resemble something like this: triItem__triMoveRequestLineItem__triMoveRequestLineItem_BulkPrint The URL takes exactly 4 parameters: 1. source (which is always "bulk") 2. version (which is always "2") 3. queryName (equal to "theQueryName") 4. then one of the following: a. docId (which is the docId of the report you want to bulk print) OR b. reportPath (which is the path of the report you want to bulk print) Your final URL will look something like the following: /html/en/default/common/RepBuilder.jsp?source=bulk&version=2&queryName=theQueryName&docId=1234 OR /html/en/default/common/RepBuilder.jsp?source=bulk&version=2&queryName=theQueryName&reportPath=\ROOT\Report1.rpt Depending on which of the optional parameters you use.

Topic	Tip
	For example: `/html/en/default/common/RepBuilder.jsp?source=bulk&version=2&queryName=triTask__triInspectionTask__triInspectionTask_Selected_Tasks_Bulk_Print&docId=1488586` 7. Now that you have your URL, you will need to place it anywhere in the system that can take a custom URL, or you can simply cut and paste the URL into the address bar of your browser, as long as you still have a valid session open. For example, you can place a link in a smart section and put the above URL as the hyperlink. If you decide to do this, and you chose to use the File Path as your last parameter, you will need to escape or `URLEncode` the path backslashes. Otherwise it will not work because the hyperlink is passed using JavaScript and the non-encoded characters will break the JavaScript code. 8. Click the link you created in the previous step. The system runs the query you set up in step 2 to return only the business object Record Ids. It uses the data from all of those records in the Crystal report identified in step 4. In Crystal, you may want to modify the report to group and/or page the data by a field such as `triRecordIdSY`, thus giving you a bulk printing solution.
Cleanup	After you finish creating a report, delete the files from the `XML_Data_Source\Forms` or `XML_Data_Source\Queries` folder. When you do so, the next time you create a report you only will be working with the XML files for that report.
Could not get metadata for report Error System cannot find the file specified Error	An error like this indicates either the Report Directory or Temp Directory is invalid. In most situations, the invalid path is left behind by a previous version of RAS server. Make sure the paths are valid. In order to work with IBM TRIRIGA, the Crystal RAS server needs each of these values to be populated with a valid directory path. The IBM TRIRIGA Application Platform does not require any specific structure for these directories, and they can be the same path.
Crystal Selections	Can be used in the same report as IBM TRIRIGA filters. Whenever possible use IBM TRIRIGA filters on the IBM TRIRIGA query to minimize the size of the XML file. Use Crystal selections to further limit records after the join. Use Crystal parameters to further select data.

Topic	Tip
Currency	To ensure that null or blank currency values display as $0.00 when generating reports, take the following steps: • Open the report in Crystal. • Select File > Report Options... • Select the check box labeled "Convert Database NULL Values to Default". • Select the check box labeled "Convert Other NULL Values to Default". • Click OK. • Save the report.

Filters	When adding a filter to a report:
	• IBM TRIRIGA filters – Use IBM TRIRIGA filters if possible. IBM TRIRIGA filters select the data before it goes to the XML file. The smaller the XML file, the better.
	  ○ Adding IBM TRIRIGA filters does not affect the Crystal report code.
	  ○ You do not have to check in / check out of the Document Manager.
	• Crystal filters – Use Record Select, Group Select, or Parameters.

IndexOutOfBoundsException	An error like this is a JRC-specific issue. The exception occurs because the parameter used by the Command table is being renamed. This technique works for reports run in a RAS server; however, JRC throws an IndexOutOfBoundsException. The workaround is to make sure the parameter used by the Command table matches the one defined in Parameter Fields, as illustrated below:
Java Reporting Component	Java Reporting Component (JRC) is a self-contained set of reporting libraries that run inside an IBM TRIRIGA application server. When a report runs using JRC, the report executes and renders without making calls to the report server. Because of the JRC architecture, it executes and renders reports faster than the traditional report server. JRC is best suited for smaller data sets; run larger data sets on a dedicated report server. By default, all form reports run through JRC. If a particular report should be run via the report server instead, the report can be configured to use the report server by putting `::DISABLE_CRYSTAL_EMBEDDED_ENGINE::` in the Comments

Topic	Tip
	section in the SAP Crystal Report property.
Maximum Processing Limit	When you run a Crystal report that returns a lot of data, you may get an error on the page stating that the Crystal server has reached its maximum processing limit. By default, Crystal installs with the maximum at 20000. You can change this value in the properties of your Crystal server. Modify the *Number of database records to read when previewing or refreshing a report* property either to something larger or to -1 for unlimited.
Memory Management	No single Crystal report can consume more than a specified amount of the server's available memory. This specified amount is configured in the `CRYSTAL_MEMORY_USAGE_LIMIT` property in `TRIRIGACRYSTAL.properties`. If, while running a Crystal report, the platform detects that the configured threshold has been reached, it throws an exception. In the case of an interactive Crystal report, a message stating this information displays to the user. The message says, "Error Occurred. There are not enough resources available to run the report at this time. – [MID – 32343]", where the MID refers to the message ID of a log entry in the server log. The entry in the log file has additional information about the amount of memory available at the beginning of the query execution and how much was consumed before the query threw the error.
Multi-Query Joins	For query reports, a query is created for each table. Note that a query can contain data from many business objects, similar to doing a join prior to the Crystal join. The fewer the queries, the more efficient the report. The queries must have fields that can be joined in Crystal. The standard join types supported by Crystal are: • Inner Join – Displays only those records from both tables that have matching values for the linked fields. Inner Joins are used frequently when there is a one-to-one relationship between the left and right tables. Be careful when using Inner Joins on multi-record reports since data from the tables will be omitted if there are no matching values in the linked fields. • Left Outer Join – Displays all records from the left table and only those records from the right table that have matching values for the linked fields. Left Outer Joins are used commonly for multi-record reports when joining multiple tables. • Right Outer Join – Displays all records from the right table and only those records from the left table that have matching values for the linked fields. Right Outer Join is not always available. • Full Outer Join – Displays all data from both tables, but joins the data on the same row if there are matching values for the linked fields. Full Outer Join is not always available.

Topic	Tip
Streaming	The data from non-form reports that do not contain sub-reports stream from the IBM TRIRIGA server to the Crystal RAS server.

To Display Logos	To display logos in Crystal, you must have direct access to the database. You must connect with access to the data schema.
	1. Select Database Expert on the SAP Crystal Report.
	2. Create a new ODBC connection with `TririgaIBS` as the DSN. Supply the User ID and Password. Select Add Command.
	3. In the parameter list, create a new parameter called `$$COMPANYLOGO$$` as a numeric field. The default value should be blank.
	4. In the SQL section, enter the query below.
	`Select content from dm content where content_id =`
	With your cursor immediately to the right of the = in the SQL statement, double-click the `$$COMPANYLOGO$$` parameter to insert the parameter into the SQL statement. The resulting statement should read:
	`Select content from dm_content where content_id = {?$$COMPANYLOGO$$}.`
	5. Exit the Database Expert.
	6. From the Field Explorer, Expand Database Fields > Command. Select the Content command that holds the logo and insert it into the Page Header section.
	7. Right-click the Content field in the page header and select Format Graphic.
	8. Click the Picture tab and change the Scaling Width to `183%`, and Height to `48%`.
	9. When this report is uploaded into the Document Manager, the logo should be visible.
	The logo will not appear until the report is run from within IBM TRIRIGA.

ADO XML v1

The ADO XML v1 action is for legacy reports created prior to TRIRIGA Application Platform 2.7.0. Use the ADO XML v2 action whenever possible.

ADO XML v1 does not support a query that contains multiple associated business objects.

The field name format for ADO XML v1 is `SectionName_FieldName`. For example, `RecordInformation_triNameTX`, `triRealEstateLeaseContract_triNameTX`.

With ADO XML v1, the ADO XML generated for a query section in a form for a form report takes all fields from the primary business object.

ADO XML v2 Formats

ADO XML v2 Field Name Format

ADO XML v2 uses the following format to identify fields:

```
ModuleName_BusinessObjectName_SectionName_FieldName[_Index]
```

where:

Element	Description
`ModuleName`	The module of the business object for the field.
`BusinessObjectName`	The business object for the field.
`SectionName`	The section for the field. The platform does not include “General” section names (e.g., General, RecordInformation). If omitted, you will still see the `_`. For example, `triProject_triProject__triNameTX`.
`FieldName`	The field name.
`Index`	In cases where there is a duplicate field name, for example from a multi-business object source, the platform adds `Index` to ensure field uniqueness in the ADO XML. `Index` is an incremental positive integer. It is used first with the first duplicate occurrence. For example, the first time the `ModuleName…FieldName` occurs, there is no `Index`. The second and subsequent times the same `ModuleName…FieldName` occurs, the platform adds `_2`, `_3`, and so on.

Note – If you change the sequence of fields with duplicate names in the Columns tab, your Crystal report will not be correct. If you change the definition in the Report Manager in any way, you also must change the Crystal report.

If the `ModuleName_BusinessObjectName_SectionName_FieldName[_Index]` includes a special character, the platform uses the following encoding/decoding characters:

Special Character	Platform Changes To
: (colon)	:| (colon-pipe)
_ (underscore)	:: (colon-colon)

For example, if module = `triPeople`, business object = `triPeople`, section = `ReportsTo`, and field = `triFirst_Name`, the field name is encoded to `triPeople_triPeople_ReportsTo_triFirst::Name`.

ADO XML v2 Data Source Encoding

ADO XML v2 file names are prefixed with a data source tag. The data source tag identifies the data source type that the XML file contains, and it is in the format `[v2<datasourcetag>]`.

Form reports are used in a record's Reports tab or when a user clicks the **Form** action on a record. For form reports, the ADO XML v2 output is made up of the organization, project, top-level business object, and the business object's sections' ADO XML files. The following table lists the data sources for a form report:

Prefix	Description
`[v2SYS]`	The ADO XML output for Organization and Project. These files are of the form `[v2SYS]+BusinessObjectName` For example, `[v2SYS]Organization`
`[v2BO]`	The ADO XML output for the top-level business object. These files are of the form `[v2BO]+ModuleName_BusinessObjectName` For example, `[v2BO]triPeople_triPeople`
`[v2SS]`	The ADO XML output for smart sections. These files are of the form `[v2SS]+ModuleName_BusinessObjectName_SmartSectionName` For example, `[v2SS]triPeople_triPeople_triCalendar`

Prefix	Description
[v2QS]	The ADO XML output for form query sections. These files are of the form [v2QS]+ModuleName_BusinessObjectName_FormSectionName For example, [v2QS]triPeople_triPeople_triPhone
[v2CS]	The ADO XML output for smart sections that reference a Link business object. These files are of the form [v2CS]+ModuleName_BusinessObjectName_SectionName For example, [v2CS]triPeople_triPeople_triTestSection

Query reports may contain data from any number of top-level records. They also may contain multiple levels of detail that are accessible through associated business objects and records. Most often query reports are used to display multi-record reports. The following table lists the data sources for a query report:

Prefix	Description
[v2QRY]	The ADO XML output for query report. These files are of the form [v2QRY]+ModuleName_BusinessObjectName_QueryName For example, [v2QRY]triPeople_triPeople_triPeople---+--Reports-To---+--Manager

ADO XML v2 Table Name Format

If the ADO XML v2 table name includes a special character, the platform uses the following encoding/decoding characters:

Special Character	Platform Changes To
“ ” (space)	-- (hyphen-hyphen)
- (hyphen)	-| (hyphen-pipe)
_ (underscore)	-~ (hyphen-tilde)

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