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Address: BMC SOFTWARE INC
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USA

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Fax: 713 918 8000

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  - Product name
  - Product version (release number)
  - License number and password (trial or permanent)
- Operating system and environment information
  - Machine type
  - Operating system type, version, and service pack
  - System hardware configuration
  - Serial numbers
  - Related software (database, application, and communication) including type, version, and service pack or maintenance level
- Sequence of events leading to the problem
- Commands and options that you used
- Messages received (and the time and date that you received them)
  - Product error messages
  - Messages from the operating system, such as file system full
  - Messages from related software
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- E-mail customer_support@bmc.com. (In the Subject line, enter SupID:<yourSupportContractID>, such as SupID:12345.)

- In the United States and Canada, call 800 537 1813. Outside the United States and Canada, contact your local support center for assistance.

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**Preface**

**IMPORTANT**

The compatibility information listed in the product documentation is subject to change. See the compatibility matrix at [http://www.bmc.com/support](http://www.bmc.com/support) for the latest, most complete information about what is officially supported.

Carefully read the system requirements for your particular operating system, especially the necessary patch requirements.

**Audience**

This guide is written for administrators who are responsible for setting up and maintaining web services, web reporting, and web applications built on the BMC Remedy Action Request System (AR System).

**AR System documents**

The following table lists documentation available for AR System products.

Unless otherwise noted, online documentation in Adobe Acrobat (PDF) format is available on AR System product installation DVDs, on the Customer Support website ([http://www.bmc.com/support](http://www.bmc.com/support)), or both.

You can access product help through each product’s Help menu or by clicking Help links.

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<tr>
<td>Installation Guide</td>
<td>Instructions for installing AR System.</td>
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<tr>
<td>Introduction to Application Development with BMC Remedy Developer Studio</td>
<td>Information about the development of AR System applications, including an introduction to using BMC Remedy Developer Studio.</td>
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<td><strong>Workflow Objects Guide</strong></td>
<td>Information about the AR System workflow objects (active links, filters, and escalations) and how to use them to create processes that enforce business rules.</td>
<td>Developers</td>
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<tr>
<td><strong>Configuration Guide</strong></td>
<td>Information about configuring AR System servers and clients, localizing, importing and exporting data, and archiving data.</td>
<td>Administrators</td>
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<td><strong>BMC Remedy Mid Tier Guide</strong></td>
<td>Information about configuring the mid tier, setting up applications for the mid tier, and using applications in browsers.</td>
<td>Administrators</td>
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<td><strong>Integration Guide</strong></td>
<td>Instructions for integrating AR System with external systems by using web services, plug-ins, and other products, including LDAP, OLE, and ARDBC.</td>
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<td>Information about AR System data structures, C API function calls, and OLE support.</td>
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<td>Information about Oracle® Java classes, methods, and variables that integrate with AR System. For the location of the JAR file containing this online documentation, see the information about the Java API in the Integration Guide.</td>
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<td>BMC Remedy Mid Tier Configuration Tool Help</td>
<td>Instructions for configuring BMC Remedy Mid Tier.</td>
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1 The full title of each guide includes **BMC Remedy Action Request System 7.6.02** (for example, **BMC Remedy Action Request System 7.6.02 Concepts Guide**).
2 Application developers who use BMC Remedy Developer Studio.
3 C and Java programmers who write plug-ins and clients for AR System.
Chapter 1

Configuring the mid tier

Use the BMC Remedy Mid Tier Configuration Tool to configure the BMC Remedy Mid Tier.

The following topics are provided:

- About the mid tier (page 16)
- Configuring the BMC Remedy Mid Tier through a firewall (page 16)
- Allocating enough memory for your application and the mid tier (page 18)
- Accessing the Mid Tier Configuration Tool (page 18)
- Configuration settings (page 20)
- General settings (page 22)
- AR Server settings (page 26)
- Cache settings (page 29)
- Report settings (page 42)
- Web service settings (page 44)
- Connection settings (page 45)
- Log settings (page 48)
- Change password (page 51)
- HTTP tracing in the mid tier (page 52)
- Setting user preferences (page 52)
About the mid tier

BMC Remedy Mid Tier serves as a client of the AR System server and as a server to the browser. The mid tier enables you to view AR System applications on the web and access the AR System server from a web server. It also provides instructions to the browser in the form of document markup and downloadable scripts.

These instructions describe how to present application data and how to interact with the user. For more information about the AR System architecture, see the Configuration Guide, “AR System architecture overview,” page 18.

Configuring the BMC Remedy Mid Tier through a firewall

Figure 1-1 illustrates the typical connections required to connect web clients to an AR System server through the mid tier.

Figure 1-1: Transmitting through a firewall

---

**IMPORTANT**

Firewall configurations vary from manufacturer to manufacturer. Ask the network and security professionals at your company for more information.
Configuring the external firewall

As shown in Figure 1-1, the web client connects to the mid tier server through a standard HTTP connection. If the web server (on the mid tier server) is configured on a certain port—the default for most web servers is 80—then you would need to open that port for HTTP on this firewall. The web client request would then use this port in its requesting URL. For example, if your web server is configured on port 8080, you would use the following example URL request:

http://webServer:8080/arsys/home

The firewall would need port 8080 open for HTTP. No mid-tier-specific configurations are needed for this connection through the external firewall.

Configuring the internal firewall

The mid tier server connects to the AR System server using a TCP connection. If there is a firewall between the mid tier and the AR System server, you must allow traffic through the firewall on the TCP port on which AR System listens.

To enable these connections through the firewall, you must configure the AR System server and the mid tier to communicate on the proper ports, as described in the following steps:

**Step 1** In the Ports and Queues tab of the AR System Administration: Server Information form, set the AR System server to use a specific TCP port.

Because you are configuring the mid tier to use a specific port, registering the server with portmapper is optional.

For more information about the AR System Administration: Server Information form, see the *Configuration Guide*, “Configuring AR System servers,” page 122.

**Step 2** Ask your network administrator to open the port on which the AR System server is listening on the internal firewall for TCP.

For more information about assigning a specific port number in the Server TCP/IP Port field on the Ports and Queues tab, see the *Configuration Guide*, “Server Information—Ports and Queues tab,” page 157.

**Step 3** In the Mid Tier Configuration Tool, select AR Server Settings, and then set the Port# field to the AR System configuration.

These settings allow the mid tier to connect to the AR System server, using the port specified.
Allocating enough memory for your application and the mid tier

If there is not enough memory allocated to your application server to run your AR System application on the mid tier, the application server will produce “out-of-memory” exceptions. (You can see this in the application server log file.)

➤ To avoid “out-of-memory” exceptions

1. Shut down your application server.
2. Allocate enough memory to the application server.
3. Restart the application server.
4. If the Enable Cache Persistence check box is select in the BMC Remedy Mid Tier Configuration Tool, flush the cache.

For more information, see “Cache settings” on page 29.

Accessing the Mid Tier Configuration Tool

The Mid Tier Configuration Tool enables you to configure mid tier settings from a browser. For example, you can add or modify AR System server information; add, delete, or change the configuration password; update cache policy information; and specify user authentication for web services.

You can access the Mid Tier Configuration Tool in any of the following ways:

- Open a browser and enter the following URL:
  http://hostName:port/contextPath/shared/config/config.jsp
  - **hostName** is the name of the host computer for the mid tier.
  - **port** is an optional port number; it is required if the web server is not using the default port (port 80).
  - **contextPath** is the path to the location of the mid tier in the Oracle JSP engine (arsys by default).
- If the mid tier is installed on the local computer using the default context path, enter the following URL in your browser:
  http://localhost/arsys/shared/config/config.jsp
  For this the URL to work, localhost must be correctly entered in the hosts file.
- On a Windows computer where the mid tier is installed on the local computer, choose Start > Programs > BMC Software > AR System > BMC Remedy Mid Tier > Configure ARSYSTEM on Localhost.
When the Login page appears, enter the login password for the Mid Tier Configuration Tool, and click Login. If you have not changed the password from the default, enter arsystem.

After you log in, the Mid Tier Configuration Tool Overview page appears. It displays the current settings for your installation. Use the navigation pane at the left to select configuration tasks.

**Using the Mid Tier Configuration Tool with a load balancer**

If you are using the Mid Tier Configuration Tool with a load balancer, you must use the web server's real IP address, not a virtual IP address, to open the Mid Tier Configuration Tool. Explicitly configure each mid tier instance directly, not through the load balancer's virtual IP. The Mid Tier Configuration Tool will not function as expected if you use a virtual server to open it.

Each web server must have its own mid tier. You must configure each mid tier individually, and you must configure each mid tier identically.

BMC recommends configuring the load balancer without using a “sticky bit” (session affinity) to allow sessions from any mid tier server to be distributed to any AR System server on the fly. For more information, see “Connection settings” on page 45.

A persistent session allows login content to be maintained. Session migration between JSP engine instances is not supported.

**MIME types**

If you have an application that requires mapping to another application to view it, you can set multipurpose internet mail extensions (MIME) types in the JSP engine configuration, typically by using the graphical user interface. You can also set MIME types manually by adding them to the web.xml file.
Configuration settings

This section explains the settings that you can specify and update using the Mid Tier Configuration Tool. To access the pages for these settings, click the appropriate links in the navigation pane.

The Overview page displays information about mid tier system settings.

Figure 1-2: Mid Tier Configuration Tool—Overview page

Table 1-1: Overview settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mid tier system information</strong></td>
<td></td>
</tr>
<tr>
<td>Mid Tier Version</td>
<td>The version of the mid tier that is installed.</td>
</tr>
<tr>
<td>Installation Directory</td>
<td>The directory path being used for your mid tier installation.</td>
</tr>
<tr>
<td>Web Server Information</td>
<td>The product name of the web server being used with this installation of the mid tier (for example, Microsoft IIS) and the product name of the Java servlet engine being used with this installation of mid tier (for example, Apache Tomcat).</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong>: In some web configurations, only the servlet engine details are shown.</td>
</tr>
<tr>
<td>Operating System Name</td>
<td>The operating system used on your computer (for example, Oracle Solaris 10 or Windows 2003 Server).</td>
</tr>
<tr>
<td>Java Version</td>
<td>The version of the Java Software Development Kit (SDK) that is installed on your computer (for example, 1.5.0).</td>
</tr>
</tbody>
</table>
### Table 1-1: Overview settings (Continued)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current configuration settings</strong></td>
<td></td>
</tr>
<tr>
<td>AR Servers</td>
<td>The AR System servers currently used with the mid tier.</td>
</tr>
<tr>
<td>Preference Servers</td>
<td>The servers currently designated as preference servers. You can add or delete servers from the General Settings page. See the Configuration Guide, “Setting user preferences,” page 81.</td>
</tr>
<tr>
<td>Data Visualization Module Servers</td>
<td>The AR System server that contains the data visualization module.</td>
</tr>
<tr>
<td>Homepage Server</td>
<td>The AR System server for the mid tier on which the home page resides.</td>
</tr>
<tr>
<td>Log Directory</td>
<td>The directory path in which session-related information, such as logs and temporary files, is stored.</td>
</tr>
<tr>
<td>Definition Change Check Interval (seconds)</td>
<td>The interval (in seconds) at which information in the cache is updated. The default value is 3600 seconds. You can change this value on the Cache Settings page.</td>
</tr>
<tr>
<td>Session Timeout (minutes)</td>
<td>The number of minutes after which a session expires. When the system has exceeded this amount without any activity, the user must log in again. The default value is 90 minutes You can change this value on the General Settings page.</td>
</tr>
</tbody>
</table>
General settings

Click the General Settings link in the navigation pane to access the General Settings page. Use this page to update configuration settings, such as session timeout intervals, preference servers, Home page server, and reporting information. A bold label with an asterisk indicates a required field.

Figure 1-3: Mid Tier Configuration Tool—General Settings page
### Table 1-2: General settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
</table>
| Session Timeout (Minutes)        | The number of minutes after which the current session will expire. When the system has exceeded this amount without any activity, you must log in again.  
A session timeout clock in the status bar appears in the web browser of each user session. The clock shows how much time is left before an HTTP session will time out. If a user is logged in and performs any activity in an application on the mid tier, the clock’s timer starts over.  
The session timeout clock has an update granularity of 1 minute. At each 60-second interval, the Oracle JavaScript controlling the session timeout clock is executed to update the clock with the amount of time available before the HTTP session times out. For example, if 1 minute and 32 seconds remains, the display time will read 2 minutes.  
**Note:** If the form is viewed in a Firefox browser and the form includes a view, dashboard, or data visualization field, the session timeout clock might not appear.  
If a user is entering data in a form, that data might be lost if the session times out before the user submits the data. To prevent possible data loss after a timeout, the user should leave the data visible in the form and use the same login ID to open a new instance of the browser window. In the new browser, the user should then navigate to the form, copy the data, and paste it into the new form.  
If users experience frequent timeouts, increase the session timeout interval. The default value is 90 minutes; there is no upper or lower limit.  
The entry in the Session Timeout in Minutes field of the AR System User Preference form (Web tab) will override this setting for a specific user.                                                                                                                                                                                                                           |
| License Release Timeout ([30 - 300] Seconds)* | The number of seconds before the mid tier releases an AR System user license associated with a user if that user does not log out of the mid tier properly. To log out properly, the user must close the last browser window associated with the current HTTP session or navigate away from the mid tier. The default delay is 60 seconds.  
The mid tier initiates a delay timer when the user closes the last browser window associated with the established HTTP session. When the delay timer expires, the user’s license is released, and the HTTP session terminated.  
If the user navigates back to the mid-tier URL before the delay time expires, the delay timer is cancelled, and the current HTTP session is resumed.                                                                                                                                                                                                                           |
Table 1-2: General settings (Continued)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preference Servers</td>
<td>The name of the AR System server designated as a preference server. You can specify more than one server if you need multiple preference servers to support different departments or business units. If you enter more than one preference server, the system searches the list until it finds the first preference server that matches the user name and uses that server as the preference server. To add or update preference servers, enter the name of each server that you want to designate as a preference server. If you are adding more than one server, separate each name with a comma (for example, mars, jupiter, saturn). A fully qualified server name is not valid in this field. <strong>Note:</strong> All servers designed as preference servers must be included in the AR System Server list on the AR Server Settings page. For more information, see “AR Server settings” on page 26.</td>
</tr>
<tr>
<td>Data Visualization Module</td>
<td>The name of the AR System server designated as a data visualization module server. You can specify more than one server if you need to copy the modules to another server as a backup in case the first module server goes down. To add or update module servers, enter the name of each server that you want to designate as a module server. If you are adding more than one server, separate each name with a comma (for example, mars, jupiter, saturn). A fully qualified server name is not valid in this field. <strong>Note:</strong> All servers designed as module servers must be included in the AR System Server list on the AR Server Settings page. For information, see the Integration Guide, “Data visualization fields,” page 167.</td>
</tr>
</tbody>
</table>
### Homepage Server

The server that contains the home page that you want to open in the browser when the user logs in.

The home page URL is:

```
http://midTierServer/contextPath/home
```

The home page server must already in the list of AR System servers on the AR Server Settings page. For information, see “AR Server settings” on page 26.

The mid tier searches this server for the designated or default home page. This server is used globally if you have not selected a home page server in the AR System User Preference form. A home page server specified in the AR System User Preferences form takes precedence over the server set here.

The form used for the home page has the following precedence on a specific server:

1. A form designated in the AR System User Preference form.
3. The default home page installed with AR System.

For more information, see the Configuration Guide, “Home Page tab,” page 104.

### Authentication Server

The server that the mid tier uses to authenticate the user.

If an authentication server is specified, the mid tier authenticates with the specified server only. The server specified here must already be in the list of AR System servers on the AR Server Settings page. For more information, see “AR Server settings” on page 26.

If an authentication server is not specified, the mid tier behaves as follows:

1. Logs the user in with the preference server, if one is specified.
2. If there is no preference server, logs the user in to the first server listed in the AR Server list.
3. If that login is not successful, logs the user in to the next server on the list. (A guest login is considered a successful login.)

### Prefer Standard/Windows Views

One of the settings evaluated when the system is progressing through the view selection algorithm; it indicates whether you want a standard view or a web view to be the default for the view type selection.

If no view is selected and the check box is:

- **Selected**—The browser displays the standard view of the form.
- **Cleared** (default)—The browser displays the web view of the form, if one is available. If no web view is available, the standard view is displayed.

For more information, see

- “How a view is selected” on page 89
- Form and Application Objects Guide, “How a form view is selected for the user,” page 394

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homepage Server</td>
<td>The server that contains the home page that you want to open in the browser when the user logs in. The home page URL is: <code>http://midTierServer/contextPath/home</code> The home page server must already in the list of AR System servers on the AR Server Settings page. For information, see “AR Server settings” on page 26. The mid tier searches this server for the designated or default home page. This server is used globally if you have not selected a home page server in the AR System User Preference form. A home page server specified in the AR System User Preferences form takes precedence over the server set here. The form used for the home page has the following precedence on a specific server: 1. A form designated in the AR System User Preference form. 2. A default home page designated in the AR System Administration: Server Information form. 3. The default home page installed with AR System. For more information, see the Configuration Guide, “Home Page tab,” page 104.</td>
</tr>
<tr>
<td>Authentication Server</td>
<td>The server that the mid tier uses to authenticate the user. If an authentication server is specified, the mid tier authenticates with the specified server only. The server specified here must already be in the list of AR System servers on the AR Server Settings page. For more information, see “AR Server settings” on page 26. If an authentication server is not specified, the mid tier behaves as follows: 1. Logs the user in with the preference server, if one is specified. 2. If there is no preference server, logs the user in to the first server listed in the AR Server list. 3. If that login is not successful, logs the user in to the next server on the list. (A guest login is considered a successful login.)</td>
</tr>
<tr>
<td>Prefer Standard/Windows Views</td>
<td>One of the settings evaluated when the system is progressing through the view selection algorithm; it indicates whether you want a standard view or a web view to be the default for the view type selection. If no view is selected and the check box is: 1. <strong>Selected</strong>—The browser displays the standard view of the form. 2. <strong>Cleared</strong> (default)—The browser displays the web view of the form, if one is available. If no web view is available, the standard view is displayed. For more information, see “How a view is selected” on page 89 and Form and Application Objects Guide, “How a form view is selected for the user,” page 394</td>
</tr>
</tbody>
</table>
AR Server settings

Click the AR Server Settings link in the left navigation pane to open the AR Server Settings page, where you can add, delete, or modify information about servers that the mid tier uses. A bold label with an asterisk indicates a required field.

Table 1-2: General settings (Continued)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Object List</td>
<td>Indicates whether you want to enable the AR System Object List that displays all the forms and applications that the mid tier can access. If the check box is:</td>
</tr>
<tr>
<td></td>
<td><strong>Selected</strong>—The Object List is displayed automatically when the system cannot determine the specific form to load because an incomplete URL is entered into the browser or an application does not define a primary form.</td>
</tr>
<tr>
<td></td>
<td><strong>Cleared</strong> (default)—The AR System Object List is not enabled and is not displayed when the system cannot determine which form to load. For more information, see “Using the Object List” on page 87.</td>
</tr>
<tr>
<td>Enable Skins</td>
<td>Indicates whether skins are enabled for form views. If the check box is:</td>
</tr>
<tr>
<td></td>
<td><strong>Selected</strong>—Skins are enabled for form views.</td>
</tr>
<tr>
<td></td>
<td><strong>Cleared</strong> (default)—Skins are not enabled for form views, and are not visible when a form is displayed.</td>
</tr>
</tbody>
</table>
To add a new server

1. In the Mid Tier Configuration Tool, click AR Server Settings.
2. Click Add Server to open the New Server page.
3. Enter the server name (required).
If you want to use the subset reserved field (ID 1576) in your workflow and use fully qualified domain names with relative host names, add all the variations of server names in the Server Name field, and the IP address, if it is used.

For example:

myserver
myserver.bmc.com
myserver.labs.bmc.com
1.160.11.240

For more information about reserved fields and their use, see the *Form and Application Objects Guide*, “Reserved fields,” page 477.

4 Enter an administrator password, port number, and RPC number for the new server.

5 If you want to validate the password for the server, select the Validate Password check box.

If you select the check box and you enter the correct password, the server is added to the list of servers that the mid tier uses. If you enter the wrong password, you cannot edit the server.

6 To preload forms to the system’s memory, select the Pre-Load check box.

7 Click Add Server.

To edit server properties

1 In the Mid Tier Configuration Tool, click AR Server Settings.

2 In the Delete/Edit column of the AR Server Settings page, select the check box next to the server whose properties that you want to edit.

   **NOTE**

   You cannot edit the server name. To change the name of a server, delete the server and add it again with the new name.

   Although the interface appears to allow it, you cannot edit multiple servers at the same time.

3 Click Edit to open the Edit AR Server page.

4 In the Admin Password, Port#, or RPC# fields, make the appropriate changes.

5 If you want to validate the password for the server, select the Validate Password check box.

   If you select the check box and you enter the correct password, the server is added to the list of servers that the mid tier uses. If you enter the wrong password, you cannot edit the server.

6 To preload forms to the system’s memory, select the Pre-Load check box.

7 Click Save AR Server.
To delete one or more servers

1. In the Mid Tier Configuration Tool, click AR Server Settings.
2. In the Delete/Edit column of the AR Server Settings page, select the check boxes next to the servers that you want to delete.
   To select all servers, click the Select All link.
3. Click Delete.

**NOTE**
If a server that you have selected for deletion is being used as a preference server or a home page server, you must delete it from the General Settings page before you can delete it from this list. For more information, see “General settings” on page 22.

### Cache settings

Click the Cache Settings link in the left navigation pane to open the Cache Settings page. Make the necessary changes, and click Save Changes. To restore the previous settings, click Restore Defaults, and then Save Changes.

**Figure 1-5: Mid Tier Configuration Tool—Cache Settings page**
### Table 1-4: Cache settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
</table>
| Definition Change Check Interval (Seconds)   | The interval (in seconds) at which cache information is automatically updated. The default value is 3600 seconds.  
To change the interval, enter the new number of seconds in this field.  
For Development cache mode, the value must be 0.  
For Production cache mode, the value must be greater than 0.  
If you do not want the cache to be updated, clear the Perform Check check box.  

**Note:** In Development cache mode, application-level changes are not automatically updated in the mid tier cache. For example, if you change an application’s primary form and then reload the page, the old primary form is displayed. To display the new primary form on reload, you must click the Flush Cache button.  
For information about Development and Production modes, see the Configuration Guide, “Configuring a server’s cache mode,” page 168. |
| Perform Check                                | Indicates whether you want the cache to be updated automatically.  
You can still update the cache manually by clicking the Flush Cache button.  
If the check box is:  
- **Selected**—The cache will be updated automatically at the interval that you specify in the Definition Change Check Interval field.  
- **Cleared**—The cache will not be updated automatically. If the system is in the process of flushing the cache when you clear the check box, the current cache flush will continue until that session is completed. |
| Update Flashboard Definition Interval (Seconds) | The interval (in seconds) at which the server updates the Flashboards cache information. Set this value to 0 to disable caching.  
The default value is 0.  
See the BMC Remedy Flashboards Guide. |
| Resource Check Interval (Seconds)            | The time limit (in seconds) for which resources (such as images, .css files, and JavaScript files) can be used. The default is 300 seconds.  
If a user closes a form and opens it again within the specified expiry time, the image is cached and is not downloaded again. This helps increase the mid tier’s performance. |
| Enable Cache Persistence                     | Specifies whether forms cached in memory are written to files for faster retrieval.  
If the check box is:  
- **Selected**—Forms cached in memory are written to files. This option enables faster retrieval of forms when the server is restarted.  
- **Cleared**—Forms cached in memory are not written to files.  
AR System forms can be stored on disk only after Enable Cache Persistence is selected. AR System forms loaded before the Enable Cache Persistence is selected are not saved to disk.  
For more information, see “Persistent Cache option” on page 33. |
### Cache table

The cache table (below the prefetch configuration text box) shows the following information about different cached objects and how they change:

- **Object name**—The type of object in the cache.
- **Object count**—The number of objects in the cache.
- **Hit count**—The number of times an object is found in the cache.
- **Miss count**—The number of times an object is not found in the cache.
- **Last flush**—The time that particular type of object was last flushed from the cache and the reason for the flush.

This table is useful for monitoring your application’s performance. If objects are being flushed due to server definition changes, serious performance degradation can occur.

### Sync cache option

To enable faster previewing of changes to forms and applications in a browser, and to enable users to see updated information more quickly, you can use the Sync Cache option for the available servers. Selecting this option for a server clears only those objects that have changed on that server since the last time the cache was cleared.

The Sync Cache operation synchronizes any of the following objects, if the changed timestamp on AR Server is more recent than the cached item in the mid tier cache:

- **Forms**
- **Active links**
- **Containers (guides, applications, web services)**
- **Menus (character menus)**

Sync Cache completely removes and rebuilds the following cache items since the performance hit is minimal:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flush Cache</td>
<td>Removes all items from the caches that the mid tier maintains. The next time the mid tier needs those objects, the most up-to-date versions are retrieved from the AR System server.</td>
</tr>
<tr>
<td>Sync Cache</td>
<td>For the selected servers, clears the cache only for the objects that have been changed. For more information, see “Sync cache option” on page 31.</td>
</tr>
<tr>
<td>Prefetch Configuration</td>
<td>A text area where you can update the contents of the <em>prefetchConfig.xml</em> file. You can also edit a copy of this file directly. It is in the WEB-INF/classes subdirectory. For more information, see “Editing the PrefetchConfig.xml file” on page 40.</td>
</tr>
</tbody>
</table>
The Sync Cache feature is not available in pre 7.5, patch 004 versions.

The Definition Change Check Interval value defines the cache mode as follows:

- When the Definition Change Check Interval value is set to 0, the system is working in development cache mode. In this mode, the Synch Cache option should not be used. If a sync is triggered in this mode, an error is thrown and syncing does not occur.

- When the Definition Change Check Interval value is set to 1, the system is working in production cache mode. In this mode, the Synch Cache option can be used to synchronize the mid tier cache with AR Server.

For more information about configuring cache modes see, BMC Remedy Action Request System 7.6.04, Configuration Guide “Configuring a server’s cache mode” on page 168.
Persistent Cache option

Since AR System 7.1.00, forms currently cached in memory can be serialized (written to) to one or more files, which enables the forms to be retrieved faster.

Background

When a user opens an AR System on a form for the first time, the mid tier must download the form and its workflow objects. It must then construct a Java object from these items. This object is used to generate the Dynamic HTML needed to display the form in a browser. The initial construction of this Java object is time-consuming, but after it is built, the mid tier caches it in memory and accesses it for all users who open the same form from that point on.

Serializing Java objects to a file

In AR System 7.1.00, the mid tier can serialize the constructed Java objects that represent AR System forms present in memory and write them to a file when the form is loaded. The mid tier detects the file, reads it, and reconstructs the Java objects serialized in it. This prevents the system from having to repeat the time-consuming construction process.

You can activate serialization from the cache page of the Mid Tier Configuration Tool by selecting the Enable Cache Persistence option.

**NOTE**

If the application server hosting the mid tier shuts down *unexpectedly*, the mid tier reloads all forms specified in the prefetch configuration from the AR System server when the application server is restarted.

Tomcat configuration settings

Because the time required to serialize forms can vary depending on their size and complexity, you might need to increase the Tomcat shutdown time and thread stack sizes to enable the efficient serialization of your forms. For example, if you are using the version of Tomcat that was bundled with your Windows AR System installation, the service might fail to restart if the timeout setting is too low and you have cached many forms.

Perform the following steps to increase the timeout for shutdown, and the thread stack sizes, in Tomcat.

**NOTE**

You must use the Tomcat configuration tool to configure these settings and restart Tomcat.

You do not need to adjust the shutdown time when running Tomcat from the command line.
To increase the shutdown timeout in the Tomcat configuration tool
1 Choose Start > All Programs > Apache Tomcat > Configure Tomcat.
2 Click the Shutdown tab.
3 In the Timeout field, enter a value that is appropriate for the number of forms you have cached. The more forms you have cached, the larger this number should be. A value of 60 seconds is recommended. Use a higher value if you will be caching a large number of forms.
4 Click the General tab.
5 Click Start.
6 Click OK.

To increase the JVM memory allocation and thread stack size in the Tomcat configuration tool
1 Choose Start > All Programs > Apache Tomcat > Configure Tomcat.
2 Click the Java tab.
3 Enter the following recommended values:
   - Initial memory pool—1024 MB
   - Maximum memory pool—1024 MB
   - Thread stack size—Leave this field empty
4 Click the General tab.
5 Click Start.
6 Click OK.

To increase the JVM memory allocation and thread stack size for Tomcat from the command line
1 Open the file catalina.bat (TomcatInstallDirectory/bin/catalina.bat).
2 Add the following line:
   ```bash
   set JAVA_OPTS=%JAVA_OPTS% -Xms1024m -Xmx1024m
   ```
   where:
   - Xms is the initial (start) memory pool
   - Xmx is the maximum memory pool
   - Xss is the thread stack size
How the prefetch process retrieves forms after Tomcat is started or restarted

When Tomcat is started or restarted, the system retrieves specified forms as follows:

- The prefetch process retrieves an entry for a form from the prefetchConfig.xml file, and checks the timestamp on the AR System server.
- If the timestamp indicated on the AR System server is identical (that is, if the form has not been changed on the server), the prefetch process requests the specified form from the cache manager.
- If the timestamp indicated on the AR System server is newer, the prefetch process retrieves all forms specified in the prefetchConfig.xml file from the AR System server.

**NOTE**

If Tomcat starts when the AR System server is not running, prefetch does not occur. To make sure forms are correctly prefetched, verify that the AR System server is running before starting or restarting Tomcat.

Open source cache manager and settings in config.properties file

The mid tier includes an open-source cache manager, ehcache. The following properties are available in the config.properties file to enable advanced administrators to customize the cache behavior.

- **arsystem.resource_expiry_interval**—Sets the cache expiry time (in seconds) after which the browser checks the mid tier for updated resources such as images and JavaScript files. The default value is 3600.
- **arsystem.ehcache.maxElementsInMemory**—Sets the maximum number of objects that will be maintained in the memory cache. If set to 0, the number of objects is unlimited. The default value is 2147483647.
- **arsystem.ehcache.eternal**—Sets whether elements are eternal. If eternal, timeouts are ignored and the element is never expired. The default value is true.
- **arsystem.ehcache.timeToIdleSeconds**—Sets the maximum amount of time between accesses before an element expires. This setting is used only if the element is not eternal (arsystem.ehcache.eternal=false). A value of 0 means that an element can idle for infinity. The default value is 0.
- **arsystem.ehcache.timeToLiveSeconds**—Sets the maximum time between creation time and when an element expires. This setting is used only if the element is not eternal (arsystem.ehcache.eternal=false). A value of 0 means that an element can live for infinity. The default value is 0.
- **arsystem.ehcache.overflowToDisk**—Sets whether the disk store persists to disk between restarts of the Java Virtual Machine. The default value is false. If the Enable Cache Persistence option is selected in the Mid Tier Configuration Tool, the value is set to true.

- **arsystem.ehcache.maxElementsOnDisk**—Sets the maximum number of objects that will be maintained in the DiskStore. The default value is 0 (unlimited).

- **arsystem.ehcache.diskExpiryThreadIntervalSeconds**—Sets the number of seconds between runs of the disk expiry thread. The default value is 600.

- **arsystem.ehcache.memoryStoreEvictionPolicy**—Sets the memory policy. The policy would be enforced upon reaching the `maxElementsInMemory` limit. The default policy is Least Recently Used (LRU). Other policies include First In First Out (FIFO) and Least Frequently Used (LFU).

- **arsystem.ehcache.referenceMaxElementsInMemory**—The maximum number of elements in memory for each cache maintained by the mid tier. Because caches grow at different rates, this value is used as a base value, which is then multiplied by a cache-specific weight value.

  This property is used in conjunction with the `arsystem.ehcache.referenceMaxElementsInMemoryWeight.cacheType` to determine the maximum number of elements in memory allowed for a given cache. After the maximum has been reached for a given cache, elements are split over to disk using an LRU policy if disk persistence has been enabled. By changing this value, you can adjust the maximum sizes for all caches and maintain the appropriate weightings for each cache. If this property is specified, then `arsystem.ehcache.maxElementsInMemory` is no longer in effect. If the property is not specified, then `arsystem.ehcache.maxElementsInMemory` behaves as before. There is no specified default value.

  The value in each of the following properties is multiplied with the value specified by the `arsystem.ehcache.referenceMaxElementsInMemory` property to determine the maximum number of elements in memory allowed for the specified cache. After the maximum has been reached, elements are spilled over to disk using the policy specified by the property `arsystem.ecache.memoryStoreEvictionPolicy`, if disk persistence has been enabled.

- **arsystem.ehcache.referenceMaxElementsInMemoryWeight.formImages**—The maximum elements in memory weight for the AR System form images cache. The default value is 0.104.

- **arsystem.ehcache.referenceMaxElementsInMemoryWeight.activeLinks**—The maximum elements in memory weight for the AR System active links cache. The default value is 4.904.

- **arsystem.ehcache.referenceMaxElementsInMemoryWeight.groups**—The maximum elements in memory weight for the AR System groups cache. The default value is 0.025.
- `arsystem.ehcache.referenceMaxElementsInMemoryWeight.roles`—The maximum elements in memory weight for the AR System roles cache. The default value is 0.036.

- `arsystem.ehcache.referenceMaxElementsInMemoryWeight.js`—The maximum elements in memory weight for the JavaScript cache. The default value is 0.195.

- `arsystem.ehcache.referenceMaxElementsInMemoryWeight.displayedFields`—The maximum elements in memory weight for the display fields cache. The default value is 0.157.

- `arsystem.ehcache.referenceMaxElementsInMemoryWeight.fieldMaps`—The maximum elements in memory weight for the AR System field maps cache. The default value is 0.323.

- `arsystem.ehcache.referenceMaxElementsInMemoryWeight.sysdata`—The maximum elements in memory weight for the system data cache. The default value is 1.202.

- `arsystem.ehcache.referenceMaxElementsInMemoryWeight.compiledForms`—The maximum elements in memory weight for the compiled AR System forms cache. The default value is 1.14.

- `arsystem.ehcache.referenceMaxElementsInMemoryWeight.forms`—The maximum elements in memory weight for the AR System forms cache. The default value is 0.235.

- `arsystem.ehcache.referenceMaxElementsInMemoryWeight.html`—The maximum elements in memory weight for the HTML cache. The default value is 0.195.

- `arsystem.ehcache.referenceMaxElementsInMemoryWeight.formFields`—The maximum elements in memory weight for the AR System form fields cache. The default value is 28.577.

- `arsystem.ehcache.overflowToDiskTemp`—Whether to allow cache items to overflow from memory to disk temporarily. The overflow behavior follows the policy specified by the property `arsystem.ehcache.memoryStoreEvictionPolicy`. The cache items are not preserved between Java Virtual Machine (JVM) restarts. This property can be set to true along with `arsystem.ehcache.overflowToDisk` being set to true, but might result in duplicate storage of the same cache item on disk, wasting disk space. This property honors the values for `arsystem.ehcache.maxElementsOnDisk` and `arsystem.ehcache.diskcache.maxElementsInMemory`. The default value is false.

- `arsystem.ehcache.midTierCacheTempDir`—Specifies the directory where overflow elements from the caches are stored if temporary disk persistence is enabled. This property is in effect only if `arsystem.ehcache.overflowToDiskTemp` is set to true. The default value is `midTierRootDirectory/cachetemp`. 
Cache configuration examples

The following sections provide examples of property values for cache persistence.

Temporary disk persistence enabled (out-of-box configuration)

arsystem.ehcache.overflowToDiskTemp=true
arsystem.ehcache.midTierCacheTempDir=

Setting the above two properties will allow cache elements to spill over to disk temporarily. The spilled-over cache elements are stored in the directory midTierRootDirectory/cachetemp.

Maximum elements in memory (out-of-the-box configuration)

arsystem.ehcache.referenceMaxElementsInMemory=1250
arsystem.ehcache.referenceMaxElementsInMemory.formImages=0.104
arsystem.ehcache.referenceMaxElementsInMemory.activeLinks=4.904
arsystem.ehcache.referenceMaxElementsInMemory.groups=0.025
arsystem.ehcache.referenceMaxElementsInMemory.roles=0.036
arsystem.ehcache.referenceMaxElementsInMemory.js=0.195
arsystem.ehcache.referenceMaxElementsInMemory.displayedFields=0.157
arsystem.ehcache.referenceMaxElementsInMemory.fieldMaps=0.323
arsystem.ehcache.referenceMaxElementsInMemory.sysdata=1.202
arsystem.ehcache.referenceMaxElementsInMemory.compiledForms=1.14
arsystem.ehcache.referenceMaxElementsInMemory.forms=0.400
arsystem.ehcache.referenceMaxElementsInMemory.html=0.195
arsystem.ehcache.referenceMaxElementsInMemory.formFields=8.577
arsystem.ehcache.referenceMaxElementsInMemory.actorViews=0.32
arsystem.ehcache.referenceMaxElementsInMemory.actorViewsMapping=0.32

Setting these properties specify the maximum number of elements for each cache as noted in Table 1-5.

<table>
<thead>
<tr>
<th>Cache type</th>
<th>Calculation</th>
<th>Maximum number of elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form images</td>
<td>1250 * 0.104</td>
<td>130</td>
</tr>
<tr>
<td>Active links</td>
<td>1250 * 4.904</td>
<td>5118</td>
</tr>
<tr>
<td>Groups</td>
<td>1250 * 0.025</td>
<td>31</td>
</tr>
<tr>
<td>Roles</td>
<td>1250 * 0.36</td>
<td>450</td>
</tr>
<tr>
<td>JavaScript</td>
<td>1250 * 0.195</td>
<td>244</td>
</tr>
<tr>
<td>Display fields</td>
<td>1250 * 0.157</td>
<td>196</td>
</tr>
<tr>
<td>Field maps</td>
<td>1250 * 0.323</td>
<td>404</td>
</tr>
<tr>
<td>System data</td>
<td>1250 * 1.202</td>
<td>1502</td>
</tr>
<tr>
<td>Compiled forms</td>
<td>1250 * 1.14</td>
<td>1425</td>
</tr>
<tr>
<td>Forms</td>
<td>1250 * 0.400</td>
<td>500</td>
</tr>
<tr>
<td>HTML</td>
<td>1250 * 0.195</td>
<td>244</td>
</tr>
<tr>
<td>Form fields</td>
<td>1250 * 8.577</td>
<td>10721</td>
</tr>
</tbody>
</table>
Prefetching specified forms

In previous versions of AR System, the ability to gather forms and workflow for preloading on a server—called prefetching—required editing a file called `prefetchConfig.xml`, which was installed with the mid tier. Each of the items to be preloaded had to be added to the file manually; there was no automated process by which forms and workflow could be preloaded.

AR System can now preload active links and menus, and in turn detect and preload the associated forms. This preloading can be enabled by selecting an option in the General Settings page of the Mid Tier Configuration Tool.

In addition, form views are preloaded based on usage statistics gathered by the mid tier.

Administrators can configure the mid tier to preload (prefetch) forms into the system’s memory so that forms can be loaded faster when they are opened in a browser. This capability is especially useful for larger forms that otherwise might take several seconds to load.

Prefetching processes

Prefetching is triggered whenever the mid tier is restarted, or when the cache is flushed. Prefetching includes these processes:

1. Forms with active links and menus are preloaded into the system’s memory.
2. If a `prefetchConfig.xml` file exists (from a previous release of AR System), all of the forms and views specified in that file are preloaded.
3. Views are preloaded according to usage statistics gathered by the mid tier server.

The first prefetching process can be enabled by checking the Enable Preload option in the From the General Settings page of the BMC Remedy Mid Tier Configuration Tool.

Specifying multiple threads for prefetching

You can specify the number of prefetch threads in the `config.properties` file by editing the `arsystem.max_number_of_pretch_threads` flag.

Specifying forms to prefetch using the `prefetchConfig.xml` file

The `prefetchConfig.xml` file is not required to prefetch forms or views, but a file from the previous version of AR System can be edited to specify forms to prefetch.
The Cache Settings page in the Configuration Tool includes a text box that shows the content of the `prefetchConfig.xml` file. By default, this content is commented out. By removing the comment tags, you can edit the content, using the appropriate XML tags to enter the users, servers, locales, and forms to which prefetching should apply. Multiple users or forms can be specified.

Each form is prefetched according to the specified user’s permissions for that form and its fields. For example, if you select a form that has 75 fields, and specify a user who has permission to view only 20 fields on that form, the prefetch process can fetch and cache the form with only the 20 fields for which the use has access.

**Editing the PrefetchConfig.xml file**

You can also edit the `prefetchConfig.xml` file directly using any text editor. This file is available in the `web-inf/classes` subdirectory.

Any changes you make to the file also appear in the Prefetch text box the next time you open the Configuration Tool.

**Example: Settings in prefetchConfig.xml file**

In the following example, the `prefetchConfig.xml` file instructs the mid tier to prefetch forms Home Page, Sample:Cities, and Sample:Enrollments from the server jiwu-w2k3 with the user Demo.

```
<?xml version="1.0" encoding="UTF-8"?>
<midtier-prefetch-config xmlns="http://www.bmc.com/remedy/midtier">
  <prefetch-user>
    <user-name>Demo</user-name>
    <locale>en_US</locale>
    <prefetch-server>
      <server-name>jiwu-w2k3</server-name>
      <prefetch-form>
        <form-name>Home Page</form-name>
      </prefetch-form>
      <prefetch-form>
        <form-name>Sample:Cities</form-name>
      </prefetch-form>
      <prefetch-form>
        <form-name>Sample:Enrollments</form-name>
      </prefetch-form>
    </prefetch-server>
  </prefetch-user>
</midtier-prefetch-config>
```

You can also click the XSD file link on the Cache page to display a copy of the XSD file, which shows the syntax used for the prefetch information.
User and group permissions for prefetching

You do not need to specify a prefetch for every user in the system. The mid tier caches certain types of objects, such as compiled forms, HTML, and JavaScript relative to a set of permission groups. For some sets of groups, access to objects (for example, an active link or a field) might not be granted and as a result, a compiled form for one user can differ from that for another user. When using prefetching, you must specify a user who serves as a representative of a unique set of permissions for which you want to prefetch a form. Any subsequent user with the same set of permissions who accesses the form can take advantage of prefetching.

For example, suppose you have two groups, Group A and Group B, and two users, User 1 and User 2. Group A includes both users; Group B includes only User 2. User 1 has a permission set for Groups A and B; User 2 has a permission set for Group B only.

Even though both users belong to Group B, their unique permission sets differ. The mid tier will have a different set of compiled forms, HTML, and JavaScript for each user.

Prefetching is made easier if users are assigned a set of permission groups that perform the same function.

Additional notes

Remember the following conditions when working with the prefetchConfig.xml file directly or in the Mid Tier Configuration Tool:

- The prefetchConfig.xml file must be specified as UTF-8. When editing the file, do not alter the UTF-8 information.
- Do not change the name of the prefetchConfig.xml file.
- If you flush the cache in the Mid Tier Configuration Tool, any prefetched forms you previously specified are flushed from the memory cache. The prefetch process is performed again for these forms the next time the web server is restarted.
- If you specified an invalid form name (for example, if a form name is misspelled or a form does not exist on the specified server), that form will not be prefetched. The mid tier log notes the names of forms that were not prefetched.
Report settings

The Report Settings page appears in the Mid Tier Configuration Tool and the AR Web ReportViewer Configuration Tool. It enables you to configure report settings for the mid tier and the AR Web ReportViewer. The mid tier uses the Reporting Working Directory option for all report types, but the other settings on this page apply only to Crystal reports.

The Report Settings page displays different options, depending on your installed configuration:

- If the AR Web ReportViewer is installed with the mid tier, additional settings specific to BusinessObjects Enterprise and Crystal Reports Server appear on the Report Settings page in the Mid Tier Configuration Tool.
- If the AR Web ReportViewer is installed without the mid tier, the AR Web ReportViewer Configuration Tool is also installed. It is a subset of the Mid Tier Configuration Tool that contains only those settings needed to configure the AR Web ReportViewer.

This section describes all the possible settings on the Report Settings page. For additional information about the AR Web ReportViewer and using the mid tier with Crystal reports, see “Using Crystal reports with AR System” on page 115.

If the AR Web ReportViewer is installed without the mid tier, you can access the AR Web ReportViewer Configuration Tool from the BMC Software entry in the Windows Programs menu, or by using the URL to configreport.jsp, for example, http://ARWebReportViewerHost/arreports/shared/config/configreport.jsp.

Figure 1-7: Report Settings page with AR Web ReportViewer installed (all options)
## Table 1-6: Report settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Crystal/BO Report Engine Deployment** (Mid Tier Configuration Tool only) | How you are deploying your BOXI or Crystal Reports report engine:  
  - No Report Engine  
  - Select this if you are not using Crystal reports.  
  - BOXI/Crystal Report Server on this machine  
  - This selection appears only when the mid tier is installed on the Crystal reports server.  
  - BOXI/Crystal Report Server on a different machine without a mid tier but with AR Web ReportViewer installed.  
  - BOXI/Crystal Report Server on a different machine with a mid tier. |
| **Reporting Working Directory** | The working directory where the mid tier deposits report definitions to be picked up by the relevant report engine (Web, AR System, or BOXI/Crystal). Enter the complete (absolute) path for this directory, for example:  
  `ARSSystemInstallDir\midtier\reports`  
  If this directory is not under the web server’s root document directory, configure your web server with a virtual directory to point to this directory. |
| **BOXI/Crystal Reports Server Location** (Mid Tier Configuration Tool only) | The URL prefix, including the host name and port number, if any, used to access the mid tier or AR Web ReportViewer on the BOXI or Crystal Reports server.  
  For example, if the URL for the mid tier on the BOXI or Crystal Reports server machine is `http://hostName:8080/arsys/`, enter  
  `http://hostName:8080`  
  If the context path is not `arsys`, then include the context path:  
  `http://hostName/contextPath`  
  or  
  `http://hostName:portNumber/contextPath` |
| **CMS Machine Name** | Host name of the computer where the Crystal Reports Management server resides. Do not include the port number. |
| **CMS Machine Connection Details** | The Crystal reports product you are using:  
  - BusinessObjects Enterprise  
  - Crystal Reports Server  
  Select one of these products, and then enter the following information:  
  - **AR System ODBC Data Source Name**—The name of the system DSN.  
    If this field is blank, the default system DSN, `AR System ODBC Data Source`, is used. This is the recommended configuration. (The ODBC driver is installed on the Crystal reports server when the mid tier or AR Web ReportViewer is installed.)  
  - **CMS Folder Name**—(BusinessObjects Enterprise only) The name of the folder where the Crystal reports are published.  
  - **CMS User Name and CMS Password**—(BusinessObjects Enterprise only) The user name and password of a user with full administrator rights in the CMS. The mid tier uses this user information to log in to the CMS and publish the reports. |
Web service settings

The Web Service Settings page enables you to enter a user name and password for authentication when accessing web services. If the AR System server allows guests, you do not need to provide an Anonymous User Name or Password.

For published web services used by AR System, user information such as user name, password, and domain name are passed to the service through Simple Object Access Protocol (SOAP) headers. If a user name and password cannot be found in the SOAP headers, the name and password specified in these fields are used to connect to the server where the needed web service resides. There is no default value for these fields.

Figure 1-8: Mid Tier Configuration Tool—Web Service Settings page

For more information, see the Integration Guide, “Web services,” page 61.
Chapter 1 Configuring the mid tier

Connection settings

Click the Connection Settings link in the left navigation pane to open the Connection Settings page. It enables you to configure the load balancer between the mid tier servers and the AR System servers without a “sticky bit.”

BMC recommends configuring a load balancer between the mid tier servers and the AR System servers without using a “sticky bit” (session affinity). If your system uses a hardware load balancer between the mid tier and AR System servers, make sure the Enable Lifespan check box is selected on the Connection Settings page. This configuration allows sessions from any mid tier server to be distributed to any AR System server on the fly, and enables the system to rebalance in a timely manner if a server is added to or removed from the system. This top group of settings facilitates load rebalancing within a server group.

The settings on the Connection Settings page enable you to limit the number of proxy connections and specify how long proxy connections can stay open. Whether the Connection Lifespan or Connection Timeout setting is met first determines the number of current idle connections, which is displayed in the Idle column in the Connection Pool Status area.

For more information, see the Using a Hardware Load Balancer with AR System 7.6.04 white paper, available on the BMC Customer Support website.

This section describes all the possible settings on the Connection Settings page.

Figure 1-9: Mid Tier Configuration Tool—Connection Settings page
Settings to support load balancers between Mid-tier and Server group without sticky bit

Table 1-7: Connection settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Lifespan</td>
<td>Specifies whether to enable the rebalancing of connection loads between the mid tier group and the server group.</td>
</tr>
<tr>
<td></td>
<td>If the check box is:</td>
</tr>
<tr>
<td></td>
<td>■ Selected—any connection session open longer than the Connection Lifespan parameter value will be reopened with a rebalanced load within the server group.</td>
</tr>
<tr>
<td></td>
<td>■ Cleared—load balancing will not be enabled.</td>
</tr>
<tr>
<td>Connection Lifespan (Minutes)</td>
<td>The amount of time (in minutes) that a connection will be load balanced after it is created.</td>
</tr>
<tr>
<td></td>
<td>To prevent any load balancing on the connection, keep this parameter at its default value of 0.</td>
</tr>
<tr>
<td></td>
<td>Whether the Connection Lifespan or Connection Timeout setting is met first determines the number of current idle connections.</td>
</tr>
</tbody>
</table>

Connection Pool Settings

Table 1-8: Connection Pool settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Connections per Server</td>
<td>The maximum number of proxy connections that a connection pool can contain per server. If the number of existing connections for the requested server does not exceed this value, a connection is allocated to that server. The default value is 80.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This setting is usually not changed from its default value, because it represents a pool of connections and not the number of users who can connect to an AR System server.</td>
</tr>
<tr>
<td>Connection Timeout (Minutes)</td>
<td>The amount of time (in minutes) that the pooled connections exceeding theIdle Connections per Server can be idle before being terminated. This time limit makes sure that active pools routinely clean up their excess idle connections.</td>
</tr>
<tr>
<td></td>
<td>To prevent any idle pooled connections from terminating before the client shuts down, set this parameter to 0.</td>
</tr>
<tr>
<td></td>
<td>Whether the Connection Lifespan or Connection Timeout setting is met first determines the number of current idle connections.</td>
</tr>
<tr>
<td>Idle Connections per Server</td>
<td>The maximum number of idle connections per server that are not subject to the Connection Timeout. These connections are always available after they are established. The default value is 5.</td>
</tr>
<tr>
<td></td>
<td>If the Idle Connections per Server is set to 0, then the connection pool will be closed when all connections are closed.</td>
</tr>
</tbody>
</table>
## Connection Pool Status

Table 1-9: Connection Pool Status settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool Name</td>
<td>The host name and port number for the server hosting the connection pool.</td>
</tr>
<tr>
<td>In Use</td>
<td>The number of pooled proxy connections in use.</td>
</tr>
<tr>
<td>Idle</td>
<td>The number of established connections that are available in the connection pool.</td>
</tr>
<tr>
<td>Max Available</td>
<td>The maximum number of pooled proxy connections for this pool.</td>
</tr>
<tr>
<td>High Water Mark</td>
<td>The largest reached pool size.</td>
</tr>
<tr>
<td>Last Used</td>
<td>The datetime stamp when the pool was last used.</td>
</tr>
<tr>
<td>Created</td>
<td>The datetime stamp when the pool was created.</td>
</tr>
</tbody>
</table>
Log settings

Use the Log Settings page to update logging configuration settings. A bold label with an asterisk indicates a required field.

Figure 1-10: Mid Tier Configuration Tool—Log Settings page
## Log settings

### Table 1-10: Log settings (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Log Categories</strong></td>
<td>The type of information to be stored in the log file:</td>
</tr>
<tr>
<td><em>Reporting</em></td>
<td>Messages related to reporting.</td>
</tr>
<tr>
<td><em>Cache</em></td>
<td>Messages related to definitions, such as forms and active links in the cache.</td>
</tr>
<tr>
<td><em>Session Management</em></td>
<td>Messages related to user session construction and expiration, such as login, logout, or timeout.</td>
</tr>
<tr>
<td><em>Configuration</em></td>
<td>Messages related to the <code>config.properties</code> file, such as when it is loaded and changed.</td>
</tr>
<tr>
<td><em>Flashboards</em></td>
<td>Messages related to Flashboards.</td>
</tr>
<tr>
<td><em>Web Services</em></td>
<td>Messages related to web services.</td>
</tr>
<tr>
<td><em>Field</em></td>
<td>Messages related to fields.</td>
</tr>
<tr>
<td><em>Workflow</em></td>
<td>Messages related to compilation of workflow (primarily active link actions), such as invalid active links.</td>
</tr>
<tr>
<td><em>Performance</em></td>
<td>Messages related to performance, including duration of operations.</td>
</tr>
<tr>
<td><em>Qualifications and Expressions</em></td>
<td>Messages related to parsing and compilation of expressions, for example, in active links.</td>
</tr>
<tr>
<td><em>Servlet</em></td>
<td>Messages related to servlet handling of http requests, primarily for reporting results of back-channel requests.</td>
</tr>
<tr>
<td><em>Internal</em></td>
<td>Internal logging messages.</td>
</tr>
<tr>
<td>ARServer (API/Filter/Database)</td>
<td>Messages related to APIs, filters, and databases.</td>
</tr>
<tr>
<td>Data Visualization Module</td>
<td>Messages related to the data visualization module.</td>
</tr>
</tbody>
</table>

Categories selected by default are Reporting, Cache, Session Management, Performance, and Servlet.

<table>
<thead>
<tr>
<th>Filter Log by User Name</th>
<th>The statements relating to the user who is logged in with only this user name are recorded.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>After you enter the user name and save changes, a new log file is started. For log messages displayed on the screen, the filter applies only to new entries. Older entries that existed before the user name was changed will still be displayed on the screen, up to the limit set in the View Logs setting.</td>
</tr>
<tr>
<td></td>
<td>If the field is left blank, all logs related to the current session are stored, regardless of who is logged in. You can enter only one name in this field.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Log Directory</th>
<th>The directory in which log files are stored, for example, <code>ARSystemInstallDir/Logs</code>.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To change the log directory, enter the absolute (complete) path for the new directory. You cannot change the log file name.</td>
</tr>
</tbody>
</table>

| Maximum Log File Size (kb)       | The maximum size (in kilobytes) a file can reach before a backup copy is automatically made. The default size is 1024 KB. The backup copy is made with the same file name (the default is `armidtier.log`) and an incremental number (for example, `armidtierN.log`). |

---

**Chapter 1  Configuring the mid tier**
Table 1-10: Log settings (Continued) (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Number of Log Files</td>
<td>The maximum number of backup files that the system will generate when the log file size exceeds the limit specified in the Maximum Log File Size. The default is 10 backups.</td>
</tr>
<tr>
<td>Log Level</td>
<td>The level of detail for logging information:</td>
</tr>
<tr>
<td></td>
<td>■ <strong>Fine</strong>—The highest level of detail, including the client’s IP address.</td>
</tr>
<tr>
<td></td>
<td>■ <strong>Info</strong>—Less detail than Fine, but includes the client’s IP address.</td>
</tr>
<tr>
<td></td>
<td>■ <strong>Warning</strong>—A moderate level of detail (the default setting). Warnings plus those errors included in the Severe level are logged.</td>
</tr>
<tr>
<td></td>
<td>■ <strong>Severe</strong>—The lowest level of detail; only server start time and error messages are logged.</td>
</tr>
<tr>
<td>Log Viewer</td>
<td>The method by which you want to view log files:</td>
</tr>
<tr>
<td></td>
<td>■ <strong>Console</strong>—The log entries are directed to the <code>stderr (System.err)</code> of your servlet engine.</td>
</tr>
<tr>
<td></td>
<td>■ <strong>File</strong>—Data is saved to a file in the specified log directory.</td>
</tr>
<tr>
<td></td>
<td>The default value is File.</td>
</tr>
<tr>
<td>Log Format</td>
<td>The log output is generated using the standard Java 1.5 logging API, including Simple and XML formatting:</td>
</tr>
<tr>
<td></td>
<td>■ <strong>Simple Text</strong> (the default)—A basic text file for faster performance. It does not include stack trace information except in the case of Severe log messages.</td>
</tr>
<tr>
<td></td>
<td>■ <strong>Detailed Text</strong>—A text file containing details such as Java class names and methods.</td>
</tr>
<tr>
<td></td>
<td>■ <strong>XML</strong>—A file in XML format.</td>
</tr>
</tbody>
</table>

**Mid-Tier Profiler**

Turn on the Mid-Tier Profiler to gather performance information about the client side (JavaScript) code on the mid tier. The profiler shows how much time was spent on a particular method (such as a table refresh).

When the profiler is turned on, Show Profile and Clear Profile buttons appear in the mid tier toolbar (if enabled) when forms are viewed in the browser. Click Show Profile to display all the profiled data up to that point. Click Clear Profile to clear all profiled data from memory.

---

**WARNING**

The Mid-Tier Profiling option is normally used during development of an application because when you turn on the profiler, all users have access to the profile.
**Activate profiling**

Set the value to True to activate profiling. Set the value to false to deactivate profiling.

- **Mid-Tier Profiler**
  - Mid-Tier Profiling (requires restart)
    - True
    - False

Click Save Changes, to save the selected value. Click Reset Defaults to change the value to the default of True.

**IMPORTANT**

Changing this value requires that you restart the web server.

**View logs**

You can view the log files that record the activity of the mid tier. If you have no log files generated, it might be because the Log Viewer setting is set to Console. Change this setting to Files to generate mid tier log files.

**Table 1-11: Log file view settings**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Last</td>
<td>The number of lines that you want to view from the most recent entries in the log. The default is 25.</td>
</tr>
<tr>
<td>View Log File</td>
<td>Click to view the log file.</td>
</tr>
</tbody>
</table>

**Change password**

You can change the password used to access the Mid Tier Configuration Tool. The password must contain more than 5 and less than 20 characters; do not include double-byte characters.

**Figure 1-11: Mid Tier Configuration Tool—Change Password page**
To verify that the new configuration password is in effect, log out of the Mid Tier Configuration Tool and log in again.

**HTTP tracing in the mid tier**

HTTP TRACE request method returns HTTP header information, which you can use to debug code. By default, the HTTP TRACE function is disabled on the mid tier. To enable the function, add the following line to the `config.properties` file:

```
arsystem.enableHttpTrace=true
```

--- **WARNING**

The mid tier has no control over the host application server. If the host server is not configured to have HTTP TRACE disabled, then the information that the host discloses still exists.

**Setting user preferences**

Centralized preferences help users who want to have the same settings and customizations available when they use multiple computers. Users logging in to web clients must use centralized preferences to store preferences, and any changes that are made take effect immediately.

The administrator or browser users can set preferences by updating the AR System User Preference form, which is available at the following case-sensitive URL:

```
http://midTierServer/arsys/forms/ARSystemServer/AR System User Preference
```

The mid tier does not use the operating system locale settings. It uses the preference records created in the AR System User Preference form if the AR System server on which the form resides is enabled as a preference server. (See “General settings” on page 22. For details about the fields on each tab in this form, see the Configuration Guide, “AR System User Preference form,” page 87.) If a user does not have a preference record, the default Java settings for the operating system’s locale are used.

Conversely, BMC Remedy User honors operating system locale settings when the user is not using a preference server and when no locale is set in the Options dialog box in BMC Remedy User. The following field types use the operating system’s locale information when parsing:

- Date/Time field
- Date field
- Time field
- Currency field
- Real Number field
- Decimal Number field
- Diary field and the date and time stamp for each entry

**NOTE**

Users who log in to BMC Remedy User can choose to use local or centralized preferences. (Local preferences are used when no preference server is designated or available.) Regardless of whether centralized or local preferences are used, multiple users can use the same client computer with individual preferences and customizations. See the *Configuration Guide*, “Setting user preferences,” page 81.
You can customize AR System forms and applications by using customized cascading style sheets (CSS).

The following topics are provided:

- Cascading style sheets in AR System (page 56)
- Overview of CSS rules (page 56)
- Default style sheets provided with AR System (page 58)
- Customizing style sheets in AR System (page 59)
- Changing font styles (page 63)
Cascading style sheets in AR System

Cascading style sheets (CSS) define the styles of AR System elements in browsers. CSS provides a means for web authors to separate the appearance of web pages from their content. With CSS, you can create a consistent look across web pages by referencing the same CSS file in all of the pages. CSS also allows you to control display attributes that you cannot set using BMC Remedy Developer Studio. For example, BMC Remedy Developer Studio does not offer a way to change the background color of a character field, but CSS does.

Overview of CSS rules

This section assumes that you are familiar with HTML and CSS. Keep in mind that not all attributes work with every browser. Before using a CSS attribute, verify that it works for your browser.

TIP

To change the appearance of a component (such as a panel, a character fields or a table) on a view of an AR System form, see the Form and Application Objects Guide, “Applying skins to form views” on page 426.

CSS rule syntax

Each CSS rule consists of a selector, followed by properties and values enclosed in braces:

```
selector {property: value; property: value;}
```

Each property/value pair is separated by a semicolon.

A selector can be an HTML tag (such as `body`, `p`, or `td`), a unique class, such as `btn3d`, an ID such as `#toolbar`, or a combination of these and other selector types.

Specificity

You can combine selectors to apply styles to an element. For example, the following three selectors are increasingly specific:

- `.note`
- `a.note` (more specific)
- `a.note div` (more specific)
- `a.note[name=bentley] div` (most specific)

In AR System, each element’s style is controlled by CSS rules, which are defined in one or more CSS files. The system CSS files are located under the Resources directory of the BMC Remedy Mid Tier.
## Order of precedence

The style that you ultimately see for an element is created dynamically by the mid tier and the browser, based on a hierarchy of multiple style sheets, plus any inline styles.

Styles are applied in downward order from the top of the diagram in Figure 2-1. Inline styles always override other CSS rules, and application-specific styles override system styles. The standard style sheet usually contains rules for all elements with properties that work for all browsers. The other style sheets might repeat or add a rule with different or unique properties specific to a browser client, application, locale, or user.

### Figure 2-1: Order of precedence for applying styles

<table>
<thead>
<tr>
<th>System, standard</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>System, browser-specific</td>
<td></td>
</tr>
<tr>
<td>Application, standard</td>
<td>Combined</td>
</tr>
<tr>
<td>Application, browser-specific</td>
<td></td>
</tr>
<tr>
<td>Locale-specific</td>
<td></td>
</tr>
<tr>
<td>User’s CSS (through browser options)</td>
<td></td>
</tr>
<tr>
<td>In-line styles (through field properties)</td>
<td></td>
</tr>
</tbody>
</table>

Properties that are not redeclared in succeeding style sheets are applied from the previous declarations. For example, suppose you have a style rule called `input.text` that is declared in the first four source files:

- **System style sheet:**
  ```css
  input.text {background-color: red; color: black;}
  ```

- **System, browser-specific style sheet:**
  ```css
  input.text {border: 1px solid green}
  ```

- **Application, standard style sheet:**
  ```css
  input.text {font-family: Arial, sans-serif; color: blue;}
  ```

- **Application, browser-specific style sheet:**
  ```css
  input.text {font-size: 8px; border: 2px;}
  ```
The resulting rule is:

```plaintext
input.text {
    background-color: red;
    color: blue;
    border: 2px solid green;
    font-family: Arial, sans-serif;
    font-size: 8px;
}
```

In this example, the style declarations from the application style sheets take precedence over those from the system style sheets. For instance, the `color: blue` declaration from the standard application style “wins” over the `color: black` declaration from the system style sheet.

The mid tier might assign multiple CSS rules to an HTML element; for example:

```html
<textarea class="text sr f9 dat"/>
```

Style rules take precedence in right-to-left order. Rules to the right take precedence over rules to the left. Properties that are not declared are carried over and reapplied to succeeding style sheets.

## Default style sheets provided with AR System

The following table lists the CSS files available and their directory locations within `midTierInstallDir` on Windows and `/opt/bmc/ARSystem/midtier` on UNIX®.

<table>
<thead>
<tr>
<th>Style sheet name</th>
<th>Description</th>
<th>Default directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>config.css</td>
<td>Styles for the BMC Remedy Mid Tier Configuration Tool. You cannot specify browser or application-specific versions of this style sheet.</td>
<td><code>midTierInstallDir\shared\config\</code></td>
</tr>
<tr>
<td>rwebhelp.css</td>
<td>Styles for BMC Remedy Mid Tier Configuration Tool help. You cannot specify browser or application-specific versions of this style sheet.</td>
<td><code>midTierInstallDir\shared\doc\config\locale</code></td>
</tr>
<tr>
<td>flashboards.css</td>
<td>Styles specific to BMC Remedy Flashboards user customization controls. You cannot specify browser or application-specific versions of this style sheet.</td>
<td><code>midTierInstallDir\resources\standard\stylesheets\</code></td>
</tr>
</tbody>
</table>
Customizing style sheets in AR System

The following methods are recommended for customizing your style sheets in AR System:

- To customize styles for all applications and forms in a mid tier, modify the .css files that are installed with AR System, described in Table 2-1. By default, these files are stored in the Resources directory on your local computer. Back up the original files and make a copy of your changes when using this method. If you need to restore an original .css file, restart the web server to apply the restored file.

- To customize styles for a specific application, add a CSS file to that application as a support file. You can make a separate copy of one of the installed CSS files, such as ARSystem.css, or create and associate your own style sheet. See “Using customized style sheets” on page 60.

- To customize styles for a specific form, create a CSS file and then add a link to the style sheet in the Web Header Content form property. See “To associate a style sheet to a specific form only” on page 62.

Table 2-1: Style sheets used in AR System (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Style sheet name</th>
<th>Description</th>
<th>Default directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARSystemHelp.css</td>
<td>Styles for dynamically generated help created for forms and fields. You cannot specify browser or application-specific versions of this style sheet.</td>
<td>midTierInstallDir\resources\standard\stylesheets\</td>
</tr>
<tr>
<td>ARSystem.css (generic)</td>
<td>Styles for AR System forms that are properly interpreted or ignored by all browsers.</td>
<td>midTierInstallDir\resources\standard\stylesheets\</td>
</tr>
<tr>
<td>ARSystem.css (IE)</td>
<td>Styles specifically for Internet Explorer browsers.</td>
<td>midTierInstallDir\resources\ie\stylesheets\</td>
</tr>
<tr>
<td>ARSystem.css (Mozilla)</td>
<td>Styles specifically for Mozilla browsers.</td>
<td>midTierInstallDir\resources\moz\stylesheets\</td>
</tr>
<tr>
<td>ARSystem_locale.css</td>
<td>Locale-specific styles.</td>
<td>midTierInstallDir\resources\standard\stylesheets\</td>
</tr>
<tr>
<td>ARSystemAcc.css</td>
<td>508 accessibility styles.</td>
<td>midTierInstallDir\resources\standard\stylesheets\</td>
</tr>
<tr>
<td>ARSystemRTL.css</td>
<td>Right to left (RTL) styles.</td>
<td>midTierInstallDir\resources\standard\stylesheets\</td>
</tr>
</tbody>
</table>
Using customized style sheets

You can add your own style sheet to override the rules defined in system style sheets. A customized style sheet can change the appearance of the application in the browser, including fonts, labels, colors (including background, text, and link colors), menu styles, button styles, and trim lines. For example, if you want an application to include your corporate standard for colors and fonts, use a customized style sheet to reflect your corporate styles.

In the following example, the colors for trim link text and trim link hover text have been changed from their default values in the ARSystem.css style sheet.

```css
a.TrimLink {
  text-decoration:underline;
  color:navy;
}
a.TrimLink:hover {
  color:#cccccc;
}
```

If you modify the installed ARSystem.css files in the installed locations, (see Table 2-1), the changes are applied to all applications running on that mid tier.

To associate the customized style sheet with a specific application only, save the style sheet to a directory accessible to the mid tier, for example, in the `midTierInstallDir\resources` directory tree. Then use the following procedure to associate the style sheet to the application.

---

**TIP**

If you name the customized style sheet with a unique name, such as `mystyle.css`, you can save it in the default directory structure. This is helpful if you need to store different versions of your custom style sheet to accommodate browser-specific settings. If you want to use a customized style sheet named `ARSystem.css` but apply the changes to a specific application only, then you must create a parallel directory structure for the customized style sheet.

---

To apply a customized style sheet to a web application

1. Log in to BMC Remedy Developer Studio on the computer where the mid tier is installed.
2. Expand All Objects > Applications, and then open the application you want to work with.
3. Expand the Support Files panel for the application.
4. Select the `resources` directory level.
5. Click Create Directory and add the necessary directory levels to include the directory where your resources file is installed, as shown in Figure 2-2.

By default, Developer Studio does not display the existing `resources` directory structure. You must use Create Directory to select each level in the existing directory structure.
6 Once the directory structure has been added by using the Create Directory button, click Add.

7 Select the appropriate style sheet, and then click Open.

Repeat steps 5 through 7 as needed to add additional copies of the stylesheets, such as browser-specific copies from other resources subdirectories.

8 Save the application.

To see the changes, you might need to clear the browser cache (delete the browser’s temporary files) and refresh the page. If you need to edit a .css file later, delete the current file and add an edited one. Then clear the browser cache and refresh the page to see the changes.

**NOTE**

Some CSS rules are applied only to the browsers that support them and are safely ignored by all other browsers. Such properties do not need to be limited to a browser-specific style sheet, which means that you might be able to reduce the number of style sheets that you need to create.
To associate a style sheet to a specific form only

1. Open the form in Developer Studio.
2. In the form properties, expand the Appearance section and then select Web Header Content.
3. Add a link to style sheet in the web header content.
   For example, the following link would associate the `mystyle.css` file to the form:
   ```html
   <link rel="stylesheet" href="../../resources/stylesheets/mystyle.css"/>
   ```

Customizing styles for fields and other objects

You can specify styles for fields and other objects in a form by creating styles in the appropriate style sheet, and naming the styles in BMC Remedy Developer Studio. To use the same style for several fields, apply the same name to the properties of each field in BMC Remedy Developer Studio.

To apply a custom style

1. In the style sheet to which you want to apply the style, add the style, using the following syntax:
   ```css
   styleName { 
   property: value;
   }
   ```
   For example:
   ```css
   myRaisedBox { 
   border-bottom-color: #e9967a;
   border-right-color: #e9967a;
   }
   ```
2. In BMC Remedy Developer Studio, open the form that contains the field to which you want to apply the customized style.
3. Select the field.
4. In the Properties tab, select the Custom CSS Style property, and enter the name of the style from your style sheet (for example, `myRaisedBox`).
5. Save the form.
6. Open your browser and clear any temporary (cached) files.
7. Display the form to verify that the style has been applied to the object.

The following examples show customized styles applied to boxes and buttons.
Changing font styles

AR System uses fonts that are styled for browsers by CSS class rules. These rules are applied automatically to the data or label portion of a field. The following table outlines the style rules used for AR System fonts.

Table 2-2: Style rules used with AR System fonts (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Font name in BMC Remedy Developer Studio</th>
<th>CSS selector</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>*(asterisk)---A special rule that applies to all HTML elements, and that AR System uses to define basic font properties.</td>
</tr>
<tr>
<td>Header (I)</td>
<td>f2</td>
</tr>
<tr>
<td>Header (II)</td>
<td>f3</td>
</tr>
<tr>
<td>Header (III)</td>
<td>f4</td>
</tr>
<tr>
<td>Optional Field</td>
<td>f6</td>
</tr>
<tr>
<td>Required</td>
<td>f9</td>
</tr>
</tbody>
</table>
These classes include the specifications of such CSS properties as background color and font (which includes font family, weight, style, and size). These properties cannot be edited in BMC Remedy Developer Studio.

The default class for a field’s label and text is based on its entry mode (specified in the Database tab). If a field’s entry mode is Required, its default label class will be \( f9 \), in addition to \( label.label \). In the HTML, the label tag contains \( class="label f9" \). Otherwise, the label class will be \( f6 \) (for an optional field). For system-level fields such as Request ID, the default class is \( f10 \).

You can override the default class for the label or text of a field in BMC Remedy Developer Studio by making selections in the Color/Font tab of the Field Properties dialog box.

You can override the default color (usually black) of the label or text of a field if you clear the Default Label/Text Color check box and choose a color. Doing so adds inline styles to the field’s HTML code. These inline styles take precedence over the CSS rules in any linked style sheets.

**WARNING**

Do *not* increase the font size unless you also increase the size of the field’s bounding box in BMC Remedy Developer Studio. Because the scaling factor is tied to font sizes, your result might contain overlapping fields.

<table>
<thead>
<tr>
<th>Font name in BMC Remedy Developer Studio</th>
<th>CSS selector</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Field</td>
<td>f10</td>
</tr>
<tr>
<td>Edit Field</td>
<td>f1</td>
</tr>
<tr>
<td>Push Button</td>
<td>f7</td>
</tr>
<tr>
<td>Radio Button</td>
<td>f8</td>
</tr>
<tr>
<td>Note Text</td>
<td>f5</td>
</tr>
<tr>
<td>Detail Text</td>
<td>f0</td>
</tr>
</tbody>
</table>
Chapter 3  Working with applications that will be viewed in a browser

Working with AR System applications that will be viewed in a browser involves a few more steps than working with applications in BMC Remedy User.

The following topics are provided:

- Browser view of a form compared with BMC Remedy User view (page 66)
- Customizing views for forms in browsers (page 67)
- Managing resource files (page 74)
- URLs for forms and applications (page 76)
- Creating customized login pages (page 86)
- Using the Object List (page 87)
- Browser settings for scripting and ActiveX controls (page 88)
- How a view is selected (page 89)
- How locale is established (page 90)
- Setting up searches for your end users (page 90)
- Including parameters in saved or defined searches (page 91)
- Creating help for web applications (page 92)

Before reading this section, familiarize yourself with the information about defining applications and creating forms and views in the Form and Application Objects Guide.
Browser view of a form compared with BMC Remedy User view

Users can view any AR System form or application in a browser simply by entering URLs that you provide.

In most respects, the appearance and functionality of forms and applications on the Web is essentially the same as that in BMC Remedy User.

**NOTE**

BMC Remedy Developer Studio allows you to design a form based on non-standard font sizes, but the mid tier does not always support those sizes.

In a browser, toolbar buttons along the top of the form provide the equivalent functionality of menus and toolbars in the Standard (Windows) view. You can hide the entire toolbar by clicking the down arrow icon just above the first toolbar button. You can also configure the form to hide the toolbar when the form is viewed in a browser, and control individual button access using Menu Access view properties.

For more information about hiding the toolbar by default, see “Showing or hiding the web toolbar” on page 68.

The Advanced Search Bar (if enabled) appears as a pane at the bottom of the form.
Customizing views for forms in browsers

When you create forms, you can create views by selecting either Standard (Windows) view or Web-Alternate (fixed) view. For most forms, you can use the standard view, which can be displayed both in BMC Remedy User and in a browser.

If you are creating a new view of the same form (for example, if you are creating a Standard view and a separate web view), use a different label for the second view, so that the view name will be unique in the URL for the form. See the Form and Application Objects Guide, “Creating and managing form views,” page 393.

For more information about behavioral differences between BMC Remedy User and the web client, see the Behavioral differences between BMC Remedy User and the web client white paper, available on the BMC Customer Support website.
To customize a standard or web view

1. In BMC Remedy Developer Studio, open the form for which you want to customize a view.
2. Click the tab of the view you want to customize.
3. Make the necessary changes.

In the Properties tab for the view (click in an empty part of the form to see these properties), you can specify the visibility of the details pane, results pane, and toolbar when forms are viewed in a browser. You also can edit web header and footer content of any view.

- For detailed information creating views, see the Form and Application Objects Guide, “Creating and managing form views,” page 393.
- For information about pane banner visibility on the web, see “Showing or hiding the web toolbar.”
- For information about editing web header and footer content, see “Editing web header and footer content” on page 68.

Showing or hiding the web toolbar

You can specify whether the toolbar should be visible or hidden when a form is viewed in a browser (and when the form is not a dialog box).

To show or hide the web toolbar

1. In BMC Remedy Developer Studio, open the form for which you want to specify toolbar visibility.
2. Click the tab of the View that you want to customize.
3. Click in an empty part of the form to display the view properties.
4. In the Properties tab, select the Web Toolbar property, and select Hidden or Visible.
5. Save the form.

Editing web header and footer content

You can customize any view to add web-specific header and footer content. To be sure that header and footer text appears properly in your form, follow these guidelines:

- Allow enough room at the top of your form for the header text, especially if you will be using a banner graphic or if your header text will use a large type size. You might need to move some fields down on the form.
- Enclose all header or footer text within <div> tags. Then, use HTML tags and styles to format the text.
- Use absolute positioning so that the header and footer content is not hidden behind the fields in the form.
To add or edit web headers and footers

1. In BMC Remedy Developer Studio, open the form for which you want to include web header or footer text.

2. Click the tab of the web view for which you want to add or edit headers or footers.

3. In the Properties tab, modify values for the Web Footer Content and Web Header Content properties.

   Enclose all text within `<div>` tags, and specify the position for the header and footer text, as shown in the following example:

   ```html
   <div style="position: absolute; top: 50px; left: 30px; width:640px; height: 45px;">
       <h1 style="color: #ffffff;background-color: 003366; font-size: 24pt; font-style: italic; border-top: 2px solid #ffffff; border-bottom: 2px solid #ffffff; padding-top: 6px; padding-bottom: 6px;">ABC Enterprise Solutions</h1>
   </div>
   ```

   In this example, the header is positioned 50 pixels from the top of the form, and 30 pixels from the left edge, with a height of 45 pixels. The `<h1>` tag indicates a heading and specifies styles for the color, background color, font size and style, border, and padding around the text.

   **NOTE**

   Make sure that the CSS z-index of the header and footer is greater than that of the other elements on the page that overlap it. For example, if you add content to the top of the page, make sure that its z-index is greater than that of the FormContainer element (for instance, greater than 29999).

Figure 3-3: Example header in a web view of a form
4 Save the form.
5 Open the form in a browser to verify that the positioning and text are correct:
   http://midTierServer/arsys/forms/ARSystemServer/formName

Adding form action fields to a form

Although toolbar buttons can provide the functionality that you need in web applications, you can use form action fields to customize a view. Form action fields are the same as any other fields, except that they have reserved field IDs and predefined operations on the Web.

NOTE
Form action fields are not visible in some modes. For example, the Modify All button is not visible in New Search mode.

The form action fields that are displayed in a form are based on the selections that you make in the “Add New Form Action Fields in Web View” section on the Preferences window. (In BMC Remedy Developer Studio, choose Window > Preferences > BMC Remedy Developer Studio > Form.)

Figure 3-4: Form Action Fields selection in Preferences window

The following table lists and describes the available form action fields.

Table 3-1: Form Action fields (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Form Action Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit *</td>
<td>Sends the data on the form to the database. If any workflow is designed to execute on submit, it will be executed.</td>
</tr>
<tr>
<td>Query *</td>
<td>Executes the search on the current form. Because the results will be displayed in the results list field, you must select the Results List check box to include a results list field on the view when the Web Toolbar is disabled. If any workflow is designed to execute when a user performs a search operation, the workflow will be executed.</td>
</tr>
<tr>
<td>Modify *</td>
<td>Submits your changes to the database. If any workflow is designed to execute on modify, it will be executed.</td>
</tr>
<tr>
<td>Modify All</td>
<td>Performs a Modify action on fields in selected requests. This button is visible for the user in Modify mode only.</td>
</tr>
</tbody>
</table>

* This field is required on most forms.
You can set a preference for which form action fields are automatically included, and you can add form action fields manually to a form.

### Table 3-1: Form Action fields (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Form Action Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search Bar</td>
<td>Displays the advanced search bar, so that the user can perform advanced searches. When you create a Search Bar form action field, you must resize it to a field width of at least 650 and the number of rows should be modified to 4 so that all of the buttons appear when the form is viewed in a browser. See the <em>Form and Application Objects Guide, “Sizing fields,” page 414.</em></td>
</tr>
<tr>
<td>Form Help</td>
<td>Displays form-level help in a separate window.</td>
</tr>
<tr>
<td>Clear</td>
<td>Removes values from all fields on the form.</td>
</tr>
<tr>
<td>Home Page *</td>
<td>Opens the form configured to be your home page.</td>
</tr>
<tr>
<td>Set to Defaults</td>
<td>Sets the entries on the form to the defaults. If any workflow is designed to execute after setting defaults, it will be executed.</td>
</tr>
<tr>
<td>New Search *</td>
<td>Opens the form in Search mode so that the user can begin a new search.</td>
</tr>
<tr>
<td>New Request *</td>
<td>Opens the form in New mode so that the user can submit a new request.</td>
</tr>
<tr>
<td>Show Status History</td>
<td>Shows the progress that has been made on a request: the time that the entry was last changed to each of the states defined by the status field, and the name of the user who made the change. Users select the entry (request) from the results list field. When users click the Show Status History button, the form is searched, and the results are displayed in a new browser window. Show Status History is enabled only in Modify mode.</td>
</tr>
<tr>
<td>Results List</td>
<td>Adds a results list field to the form. If a form does not already have a results list, it will be added automatically in the Standard view.</td>
</tr>
</tbody>
</table>

Note: If you find that the number of search results is limited and you receive an out-of-memory error message, increase the Maximum Heap Size in the virtual machine settings of your servlet engine. The results list field is visible only in Modify, Modify All, and Display Only modes. It is hidden in New Search mode.

* This field is required on most forms.
To set a preference to automatically add form action fields
1 In BMC Remedy Developer Studio, choose Window > Preferences.
2 Open the BMC Remedy Developer Studio node.
3 Click Form.
4 Under “Add New Form Action Fields in Web View,” select the fields that you want to add.
5 Click OK.

To add form action fields manually to a view
1 In BMC Remedy Developer Studio, open a form view.
2 Place the cursor where you want to insert the form action field.
3 Choose Form > Form Action Fields.
The Form Action Controls dialog box appears.
4 Select the fields that you want included in the view, and clear the other check boxes.
5 Click OK to close the Form Action Controls dialog box and add your new fields.
6 Save your changes.

Modifying the wait cursor for your application
AR System provides two types of wait cursors for the web: one for actions such as Modify, Modify All, Search, and Table Refresh; the other for pages that are loading. The following procedures outline how to modify both types of wait cursors, and how to turn off the wait cursor.

To modify the wait cursor for actions
1 To change the image and message that is displayed:
   a In the midTierInstallationDir/webapps/shared/images folder, insert the new image.
   b In the config.properties file, add the following line:
      arsystem.waiting_cursor_innerhtml=<img src=imageContextPath/file name.gif></img>message
      For example:
      arsystem.waiting_cursor_innerhtml=<img src=imageContextPath/Progress_NonModal-circle.gif></img>Loading...
      In this example, the Progress_NonModal-circle.gif image is displayed with a message that says Loading...
Customizing views for forms in browsers

2 To localize the message for actions (such as, Submit, Modify, Modify All, Search, and Table Refresh), update the `LocalizedMessages_localeName.js` file, which is located in `midTierInstallationDir/resources/standard/javascript/`. Change the following line as needed:

```
"Loading..." : "Loading...",
```

"Loading" is taken from the line in the `config.properties` file that is discussed in step 1.

For example:

If you want to change the message to read Searching... and you want German language readers to view German, change the `config.properties` file’s line to:

```
arsystem.waiting_cursor_innerhtml=<img src=imageContextPath/Progress_NonModal-circle.gif></img>Searching
```

Then, change the line in `LocalizedMessages_localeName.js` file to:

```
"Searching..." = "Suchen...",
```

To modify the wait cursor for pages that are loading

1 To change the image and message that is displayed:

   a In the `midTierInstallationDir/webapps/shared/images` folder, insert the new image.

   b In the `midTierInstallationDir/shared/wait.jsp` file, search for `getLocalizedText`, and find the following code:

   ```
   <img src="<%=request.getContextPath()%>/shared/images/file_name.gif" alt="wait image"/>
   <%= MessageTranslation.getLocalizedText(locale, "Loading")%>
   ```

   c Change the image and message text in the code.

      For example:

      ```
      <img src="<%=request.getContextPath()%>/shared/images/Progress_NonModal-circle.gif" alt="wait image"/>
      <%= MessageTranslation.getLocalizedText(locale, "Loading")%>
      ```

      In this example, the `Progress_NonModal-circle.gif` image is displayed with the message Loading.

2 To localize the message for a specific locale when pages are loading a form, update the corresponding language file in the `midTierInstallationDir/webapps/arsys/WEB-INF/classes` folder.

Change the following line:

```
defaultMessage = localizedMessage
```

In the original installation, the line reads:

```
Loading = Loading
```

Loading is taken from the line in the `wait.jsp` file that is discussed in step 1.
Example

If you want to change the message to read *Searching*, and you want German language readers to view German, change the *wait.jsp* file’s line to:

```java
//arsystem.waiting_cursor_innerhtml=<img src=imageContextPath/Progress_NonModal-circle.gif></img>Searching
```

Then, change the line in the language file in `midTierInstallDir/WEB-INF/classes` to:

```
Searching = Suchen
```

▶ To remove (turn off) the wait cursor

1. **Change the `arsystem.show_waiting_cursor` line to 0 or 3 in the `config.properties` file:**

   ```
   arsystem.show_waiting_cursor=0
   ```

   The options are:
   
   - 0—Turn off the wait cursor, and turn on content-based caching.
   - 1—Turn on the wait cursor, and turn on content-based caching.
   - 2—Turn on the semi-wait cursor, and turn on content-based caching.
     
     A semi-wait cursor is a cursor that appears when the user is requesting forms but does not appear during a search or submit operation.
   - 3—Turn off the wait cursor, and turn off content-based caching.

2. **Restart the web server.**

Managing resource files

Resource files include files such as images or custom cascading style sheets. To add resource files to the web application, use the Support Files panel (in the Editor Area of an application in BMC Remedy Developer Studio).
Managing resource files

If you create or open forms within an application in BMC Remedy Developer Studio, resources added to form views are automatically added to the application’s Support Files panel. At the time the resource is added, the reference to that resource matches its location in the Support Files panel. However, AR System does not maintain these references (for example, if you change the directory structure for resources in the Support Files panel).

The Resources Directory Structure level represents the directory for your application in the mid tier. You can add support files directly under this level, or to other directories that you create. You cannot delete or change the name of the Resources Directory Structure level.

You can add or delete directories and files, or rename existing directories. You can also save the directory structure to an external disk.

#### To add files to support file directories

1. In BMC Remedy Developer Studio, open the application with which you want to work.
2. Click the Support Files panel.
3. Select the directory under which you want to add support files.
   - If you want to create a new directory:
     a. Select the directory under which you want to create a new directory.
     b. Click Create Directory.
        - A new directory appears under the directory you selected in step a.
     c. Enter a new name for the directory, and press ENTER.
4 Click Add.

5 In the Open dialog box, select the file that you want to add to the directory, and click Open.

   The file is added to the directory selected in step a.

6 Repeat steps 3a, 3b, and 3c for every file that you want to add to the directory.

   When you add support files to your application, you can access them through a URL. For more information, see “Accessing support files” on page 77.

### URLs for forms and applications

Users can access forms on the web through links on a home page or through URLs that you supply. This section provides the following information about providing URLs:

- “Opening forms and applications from a home page” on page 76
- “URLs for opening forms and applications” on page 76
- “Accessing support files” on page 77
- “Specifying parameters in URLs for direct access” on page 78
- “URL encoding” on page 80
- “Passing data to a field in a URL” on page 82
- “Creating URLs for login and logout” on page 82

#### Opening forms and applications from a home page

The simplest way to enable user access to your applications is to use a home page. The home page is a single point of access that includes all forms and guides that have been configured as entry points, and to which the user has access permissions. AR System generates all the entry points from all the servers in the AR Server Settings window in the BMC Remedy Mid Tier Configuration Tool, and displays them in the home page’s application list field.


#### URLs for opening forms and applications

If you do not use a Home Page form to display the entry points of your web applications, supply URLs for your users so that they can access applications and forms in a browser.

   Names of applications, forms, and views referenced in URLs use the actual database name of the object instead of web aliases.
As a form is loaded in the browser, the system appends a hexadecimal cache ID to the URL, such as ?cacheID=acbec68. This number represents parameters such as the user name, locale, view, application, and workflow logging. The purpose of the cache ID is to make the URL unique in the browser cache and to make sure that the correct view is displayed.

**NOTE**
The mid tier also provides an Object List that displays a list of forms and applications available on the mid tier. This list appears if the system cannot determine which form to load because of an incorrect or incomplete URL, or if the application does not have a primary form. The Object List must be enabled in the General Settings window of the Mid Tier Configuration Tool. For more information, see “Using the Object List” on page 87.

The following examples provide the URL formats to use for opening forms and applications in a browser. In the examples, arsys is used as the default context path.

- To open a form, enter:
  
  http://midTierServer/arsys/forms/ARSystemServer/formName

- To open a specific view of a form, enter:
  
  http://midTierServer/arsys/forms/ARSystemServer/formName/viewName

- To open an application and display its primary form, enter:
  
  http://midTierServer/arsys/apps/ARSystemServer/applicationName

- To open any form in an application, enter:
  
  http://midTierServer/arsys/apps/ARSystemServer/applicationName/formName/\[viewName\]

You can add URLs to forms views, view fields, text trim fields, and web pages to provide users access to forms, web pages, HTML documents, and images.

You can use the ${HOMEURL}$ keyword in workflow to reference the context path displayed in a browser. See the Workflow Objects Guide, “Keywords,” page 221.

**Accessing support files**

If you have added support files for your application, you can access them through a URL. If you have placed support files at the top level of the Resources Directory Structure, enter:

http://midTierServer/arsys/apps/ARSystemServer/applicationName/resources/fileName

**NOTE**

Lowercase the word resources at this level.
If you have placed support files under any subdirectories, they must be added to the URL. For example, if you have created an additional directory and a supporting file, enter:

http://midTierServer/arsys/apps/ARSystemServer/applicationName/resources/SubDirectoryName/fileName

**NOTE**
To access application support files, you must have a valid AR System login ID.

**Specifying parameters in URLs for direct access**

You can use the `ViewFormServlet` to open a specific form and pass parameters such as a user name or a qualification.

**NOTE**
When a user enters a URL from a previous version of AR System (a legacy URL), the system redirects the user to the proper form if the URL uses `ViewFormServlet`. If the URL does not use `ViewFormServlet`, users must enter the new URL.

At a minimum, you must supply the server name and form name. If more than one view of a form is available, the system selects a view based on certain criteria, as described in “How a view is selected” on page 89.

Values in URLs are case-sensitive. For example, `ViewFormServlet` and `viewformservlet` are not the same.

**Supported parameters in AR System**

A list of available views for the user is generated based on parameters specified in the URL. At a minimum, you must specify values for `form` and `server`. Include additional parameters as necessary, depending on the number of views available for the form and the requirements of the user.

The following table lists supported parameters, their descriptions, and possible values. All parameters and values are case sensitive.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Possible Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>form (required)</td>
<td>Name of the AR System form to be accessed.</td>
<td>URL-encoded string</td>
</tr>
<tr>
<td>view</td>
<td>View label for the preferred view. See “How a view is selected” on page 89 for information about how a list of possible views is generated for the user.</td>
<td>URL-encoded string</td>
</tr>
<tr>
<td>app</td>
<td>Application (container) name. If specified and valid, the file for the view is called from the application-specific directory.</td>
<td>URL-encoded string</td>
</tr>
</tbody>
</table>
### URLs with parameters for accessing forms and search results

The following examples show the URL syntax for accessing forms and search results. In these examples, `arsys` is used as the default context path.

**Example 1: URL that bypasses the Login window and displays the specified form**

```plaintext
http://midTierServer/arsys/servlet/ViewFormServlet?form=formName
&server=serverName&username=userName&pwd=password

**WARNING**

If you use the `pwd` parameter in a URL, passwords are exposed by the browser in the locator and in bookmarks or favorites. For URLs that include the `pwd` parameter, use `https://`.

**Example 2: URL that displays search results in the specified form**

```plaintext
http://midTierServer/arsys/servlet/ViewFormServlet?form=formName
&server=serverName&qual=%27Assigned+To%27%3D%22firstName+lastName%22+AND+%27Status%27%3D%22Fixed%22
```

After the user logs in, the system displays the form with results of the following search:

'Assigned To'="Firstname Lastname" AND 'Status'="Fixed"

---

**Table 3-2: Supported parameters (Sheet 2 of 2)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Possible Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>server</td>
<td>Name of the AR System server to be accessed. The server used must be an available server listed in the Mid Tier Configuration Tool.</td>
<td>URL-encoded string</td>
</tr>
<tr>
<td>mode</td>
<td>Mode in which the form will be opened. If not specified, <code>Search</code> will be used.</td>
<td><code>Search, Submit</code></td>
</tr>
<tr>
<td>eid</td>
<td>Request ID of a form entry. Provides direct access to a specific request on the form. If specified, the <code>qual</code> value is ignored.</td>
<td>URL-encoded string representing the request ID number</td>
</tr>
<tr>
<td>qual</td>
<td>Qualification criteria for a search operation. If specified, the <code>mode</code> value is ignored.</td>
<td>URL-encoded search string (size restricted by URL length)</td>
</tr>
<tr>
<td>username</td>
<td>User name used to log in to AR System.</td>
<td>URL-encoded string</td>
</tr>
<tr>
<td>pwd</td>
<td>Password used to log in to AR System.</td>
<td>URL-encoded string</td>
</tr>
<tr>
<td>auth</td>
<td>Authentication string for the user. See the Configuration Guide, “Setting up an authentication alias,” page 76.</td>
<td>URL-encoded string</td>
</tr>
</tbody>
</table>
URL encoding

If a URL includes characters that cannot be printed or transmitted safely, the URL must be encoded. Any unsafe or unprintable characters (such as single or double quotation marks, equal signs, or ampersands) are replaced with a percent sign (%), followed by the hexadecimal digits that correspond to the character’s value. For example, the string “Assigned To” would be encoded as %22Assigned+To%22.

The following table lists commonly encoded characters.

<table>
<thead>
<tr>
<th>Character</th>
<th>Encoding value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;space&gt;</td>
<td>+ (plus sign) or %20</td>
</tr>
<tr>
<td>&quot; (double quotation mark)</td>
<td>%22</td>
</tr>
<tr>
<td># (hash mark)</td>
<td>%23</td>
</tr>
<tr>
<td>$ (dollar sign)</td>
<td>%24</td>
</tr>
<tr>
<td>% (percent)</td>
<td>%25</td>
</tr>
<tr>
<td>&amp; (ampersand)</td>
<td>%26</td>
</tr>
<tr>
<td>+ (plus sign)</td>
<td>%2B</td>
</tr>
<tr>
<td>, (comma)</td>
<td>%2C</td>
</tr>
<tr>
<td>&lt; (less than sign)</td>
<td>%3C</td>
</tr>
<tr>
<td>= (equal sign)</td>
<td>%3D</td>
</tr>
<tr>
<td>&gt; (greater-than sign)</td>
<td>%3E</td>
</tr>
<tr>
<td>/ (forward slash)</td>
<td>%2F</td>
</tr>
<tr>
<td>: (colon)</td>
<td>%3A</td>
</tr>
<tr>
<td>? (question mark)</td>
<td>%3F</td>
</tr>
</tbody>
</table>

The AR System mid tier provides a URL encoder utility that enables you to convert nonalphanumeric characters to UTF-8 encoded values.
To convert nonalphanumeric characters to encoded values

1. Open the AR URL Encoder utility by using the following URL:
   
   ```
   http://midTierServer/contextPath/shared/ar_url_encoder.jsp
   arsys is the default context path.
   ```

2. In the Original String field, enter the individual character or string for which you want to find the correct encoding.
   You can encode parameter values, but do not code the entire URL.

3. Click Convert.
   The encoded values appear in the Encoded String field.

To configure Internet Explorer for automatic encoding

1. Choose Tools > Internet Options.
2. Click the Advanced Tab.
3. Select the Always send URLs as UTF-8 check box.
4. Restart the browser.
NOTE
Even when Internet Explorer is configured to encode automatically, certain ASCII characters, such as a forward slash (/), a question mark (?), an equal sign (=), a plus sign (+), or an ampersand (&), will not be URL encoded. If your form name or application name contains any of these characters, you must use the AR URL Encoder utility to encode.

Passing data to a field in a URL

You can pass values to fields in forms by including the field ID in the URL, as follows:

http://midTierServer/contextPath/forms/ARSystemServer/formName?F=fieldID=value

In the following example, a value of Web User is passed to the Creator field (field ID=2) of the User form stored on the AR System server mars, from the mid tier server saturn. The default context path is arsys.


Values with spaces or special characters must be properly encoded. In this example, the space between Web and User is encoded with %20.

NOTE
If you enter a value that does not exist for a radio button or drop-down list field on the specified form, the value is not set when the form is displayed in the browser.

Creating URLs for login and logout

You can use URLs to take users directly to a login or logout page. When you take users directly to a login page, you must specify a URL to which the user will go after logging in. You might also want users to access an alternate URL after logging out.

Parameters for login and logout

The following table shows the URL parameters that apply to login and logout. All parameters and values are case sensitive.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>login.jsp</th>
<th>LoginServlet</th>
<th>logout.jsp</th>
<th>LogoutServlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>goto</td>
<td>Required</td>
<td>Required</td>
<td>Not applicable</td>
<td>Optional</td>
</tr>
<tr>
<td>server</td>
<td>Required</td>
<td>Required</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>username</td>
<td>Not applicable</td>
<td>Required</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>pwd</td>
<td>Not applicable</td>
<td>Required</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>auth</td>
<td>Not applicable</td>
<td>Optional</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
The **goto** parameter redirects users to an alternate URL after login or logout. Any URL after a **goto** statement must be URL-encoded.

Use the **enc** parameter to specify the type of character encoding used in other parameters, such as UTF-8 or Shift_JIS.

When you use login and logout parameters in URLs, use the following guidelines:

- **To have users log in manually, specify** `login.jsp`.
- **To take users to the logout page only, specify** `logout.jsp` **or specify** `LogoutServlet` **without the goto parameter**.
- **To have users go directly to an alternate URL, specify** `LoginServlet` **or** `LogoutServlet` **and the goto parameter**.
- **When creating login and logout URLs, do not include quotation marks around parameter values**.

The following examples show how to use URLs for login and logout. In these examples, `midTierServer` is the name of the web server, `arsys` is the default context path, and `URL` is a valid URL. When creating login and logout URLs, do not include quotation marks around parameter values.

**Example 1: Login with default login page**

http://midTierServer/arsys/shared/login.jsp?goto=URL&server=serverName

The user logs in by using the default login page, and then goes to the specified URL.

**Example 2: Login with customized login page**

http://webServerName/contextPath/shared/customLoginFile.jsp?goto=URL=&server=ARSSystemServer

The user logs in by using a login page customized for an application, and then goes to the specified URL.

**Example 3: User logged in automatically**

http://midTierServer/arsys/servlet/LoginServlet?goto=URL&server=serverName&username=userName&p=assword

The user is logged in automatically and goes directly to the specified URL.

**Example 4: Logout**

http://midTierServer/arsys/servlet/LogoutServlet?goto=URL

The user logs out and goes directly to the specified URL.

**Creating login and logout buttons**

You can create a button field that users can click to log out, or a button form element that users can click to log in or log out.
To create a logout button

This procedure demonstrates how to associate a Run Process active link action with a Logout button. See the Workflow Objects Guide, “Run Process action,” page 124.

1 In BMC Remedy Developer Studio, open a form.

2 Disable the default Logout button in the View Properties tab.
   a In the form Properties tab, select Menu Access > Accessible Menu Items.
   b Click in the Value column to reveal the Ellipse button.
   c Click the Ellipse button.
   d In the Accessible Menu Items dialog, click to deactivate (remove checkmark) Logout.
   e Click OK to close the dialog.

3 Create a Logout button on the form.
   a Right-click the form, and choose Create a New Field > Button.
   b In the Properties tab, change the Name and the Button Label to Logout.

4 Save the form.

5 Repeat these steps for each view.
6 Create an active link that is associated with the form and has the following properties:

**Table 3-5: Button and menu commands for Execute On conditions**

<table>
<thead>
<tr>
<th>Execute On condition</th>
<th>Button/menu command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execute On field</td>
<td>Logout</td>
</tr>
<tr>
<td>If Action</td>
<td>Run Process</td>
</tr>
<tr>
<td>Command Line</td>
<td>PERFORM-ACTION-EXIT-APP</td>
</tr>
</tbody>
</table>

7 Save the active link.

**To create a login or logout form element button**

1 Open the web page in a text editor.

2 To create login and logout functionality, insert HTML code as shown in the following examples.

- For login functionality:
  
  ```html
  <form name="loginForm" method="post" action="http://midTierServer/arsys/shared/login.jsp?goto=URL&server=serverName"
  <p><INPUT type="submit" value="Login" name="login"></p>
  </form>
  ```

  *arsys* represents the default context path, *URL* is the URL to which the user will go after logging in, and *servername* is the name of the server to which the user needs to log in.

- For Logout functionality:

  ```html
  <form name="logoutForm" method="post" action="http://midTierServer/arsys/servlet/LogoutServlet?goto=URL">
  <p><INPUT type="submit" value="Logout" name="logout"></p>
  </form>
  ```

  *arsys* represents the default context path, and *URL* is the URL to which the user will go after logging out.

3 Save your changes.
Creating customized login pages

You can customize the login page of an application by creating a separate HTML file. When this file is properly configured, the mid tier will append it to the login.jsp file as an <iframe>.

To create a customized login page

1. Create a new HTML page with the text that you want to include in your customization.
2. Save this page as login.html. (Do not use any other name, and be sure that the extension is html instead of htm.)
3. In BMC Remedy Developer Studio, open the application for which you want the customized login page.
4. Click the Support Files panel.
6. Select this directory.
7. Click Add.
8. Browse to the login.html file that you created in step 1.
9. Add the file to the public directory.

Figure 3-8: public directory on Support Files panel

10. Save your application.
11. Log in to your application to verify that the customized text appears. (It will be displayed in an iframe just below the login fields.)
Using the Object List

Users can access forms and applications on the web through the AR System Object List, which lists all forms and applications available through your installed mid tier.

Figure 3-9: Object List example

Enabling the AR System Object List

To enable the AR System Object List to be displayed in a browser, you must first enable it.

For more information, see “Using the AR System Object List” on page 128.

To enable the AR System Object List

1. Open the Mid Tier Configuration Tool (http://midTierServer/shared/config/config.jsp).
2. On the AR Servers page, make sure that your home page server is included in the server list.
3. On the General Settings page:
   a. Verify that you have set a home page server.
   b. Select the Enable Object List check box.
4. Import the definition files to your home page server. (See “Importing the definition files” on page 88.)
Importing the definition files

Import the definition files into your home page server. Definition files of different locales are installed with the mid tier; the default location is:

```
midTierInstallDir\samples\ARSystemMidTierObjectList*.def
```

Import the `ARSystemMidTierObjectList.def` file to your home page server by using File > Import in BMC Remedy Developer Studio. This provides the default view and the related workflow in English. If you require only the English view of the form, import only this file.

For a localized views, import the appropriate localized `.def` files. Browse to the `samples` directory, and select the `.def` file for the locale that you require. The naming convention is:

```
ARSystemMidTierObjectList_locale.def
```

For example, for Japanese views, the file is called `ARSystemMidTierObjectList_ja.def`.

Displaying the Object List

After it is enabled, the AR System Object List appears automatically in the user’s browser if the system cannot determine which form to load because of an incomplete or incorrect URL, or if the URL specifies an application that does not have a primary form. (For more information about specifying a primary form in an application, see the *Form and Application Objects Guide*, “Defining applications,” page 85.)

You can also display the AR System Object List by using any of the following URLs:

- `http://midTierServer/arsys/forms`
- `http://midTierServer/arsys/forms/serverName`
- `http://midTierServer/arsys/apps`
- `http://midTierServer/arsys/apps/serverName`
- `http://midTierServer/arsys/apps/serverName/applicationName`

Browser settings for scripting and ActiveX controls

For the mid tier to work properly, the ActiveX settings for the XMLHTTP protocol between the browsers and mid tier must be set correctly.

Typically, if you use all the default scripting settings in Microsoft Internet Explorer and Mozilla Firefox browsers, you should not see any problems with the mid tier. Otherwise, enable the following ActiveX settings for your browser.
For the mid tier to open windows properly, users must configure their browser or pop-up window-blocking software to allow pop-up windows originating from the web server’s address.

**NOTE**

If your browser has a popup blocker enabled, you will be prompted to disable it when you log in to the mid tier. If you do not disable the popup blocker, the mid tier will fail to open a new window or a new dialog box, including expand boxes and currency dialog boxes.

**Internet Explorer browsers**

To access options in IE, choose Tools > Internet Options. Click the Security tab, and then click the Custom Level button.

Enable the options listed in Table 3-6.

**Table 3-6: Options to enable in IE browsers**

<table>
<thead>
<tr>
<th>Heading</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>ActiveX Control and Plug-ins</td>
<td>Run ActiveX Control and Plug-ins</td>
</tr>
<tr>
<td></td>
<td>Script ActiveX controls Marked Safe for Scripting</td>
</tr>
<tr>
<td>Scripting</td>
<td>Active Scripting</td>
</tr>
<tr>
<td>Downloads</td>
<td>Automatic prompting for file downloads</td>
</tr>
<tr>
<td></td>
<td>File download</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Submit nonencrypted form data (This option is not required if SSL is used.)</td>
</tr>
</tbody>
</table>

**Mozilla browsers**

For Mozilla browsers, choose Edit > Preferences > Advanced > Scripts & Plug-ins, and enable the Enable JavaScript for Navigator option.

**How a view is selected**

Normally, when determining a view for a user, the system offers a Web-Alternate (Fixed) view in preference to a Standard view. An option in the Mid Tier Configuration Tool allows you to reverse this default setting. For more information, see “Prefer Standard/Windows Views” on page 25.

The choice of view is based on the user’s application environment, language, and preference settings.
A view is determined as follows:

1. The system selects the view that the user has requested or by way of workflow. If no view is requested, or if the requested view does not exist, the default view is used.

2. The system selects a view that is appropriate for the client that the user is running. If the client is on the Web, the system selects a view according to the Prefer Standard/Windows View option in the Mid Tier Configuration Tool.

   See Chapter 1, “Configuring the mid tier,” and the Form and Application Objects Guide, “How a form view is selected for the user,” page 394.

3. The system selects a view that is appropriate for the user’s locale. If there is not an exact match, a fallback mechanism finds the closest possible locale to the one requested. The resulting view is then displayed for use.

## How locale is established

URLs do not contain locale information. The system determines the correct locale in the following ways:

- If the user is not logged in, the system uses the browser’s preferred locale list in prioritized order to try to match the closest locale. The World Wide Web Consortium (W3C) recommends this method for choosing a locale for a web page.

- If the user is logged in, the system uses the user’s preferences to set the locale. If no locale is set in the user preferences, then the system uses the browser-supplied list.

## Setting up searches for your end users

Three types of searches are available for browsers:

- **Saved searches**—Searches that users can create and save for a form. Saved searches are saved to a system form called AR System Searches Preference. Each search is an entry in this form. Users must have this form installed in their preference server to save searches on the web. If you do not have this form installed, import it by using BMC Remedy Developer Studio.

- **Recent searches**—A list of searches that a user has executed recently. When a user executes a new search, it is added to the list of recent searches. The number of recent searches is configured in the AR System User Preference form. If the maximum number of recent searches has been reached, the oldest of the recent searches is replaced by the newest search. These searches are also saved in the AR System Searches Preference form.

- **Defined searches**—Searches defined by the administrator. Each defined search is associated with a specific form view, and is stored as part of the properties for that view.
Including parameters in saved or defined searches

You can include parameters in a saved or defined search by specifying a value in the format \$parameter\$. When a user runs a parameterized search, a dialog box opens and prompts the user to enter a specific value for the parameter.

Parameterized searches are not saved in recent search menus.

**NOTE**
Parameterized searches cannot be executed in BMC Remedy User.

**To define a search with parameters**

1. In BMC Remedy Developer Studio, open the form for which you want to define a search.
2. Click the tab of the View that you want to customize.
3. In the Properties tab for the view (click in an empty part of the form to see these properties), click Defined Searches, and click the ellipsis (...) button.
4. Click Add.
5. Enter the appropriate information in the following fields:
   - **Name**—The administrator-defined name for the search.
   - **Description**—A short description of what the search does; for example, “Search for tickets by submitter.” If a description does not exist for a search, the name is used instead.
- **Qualification**—The criteria to be used for the search. To specify a parameter, use the following syntax:

  `field' operator "$parameter$`

  - `field` is the field on which to search.
  - `operator` is the operator type.
  - `parameter` is the label for the search parameter. The label can be any string that is not a keyword.

  For example, the search `Submitter' = "$Enter Submitter$" prompts the user to enter a submitter name.

**Figure 3-11: Parameters in a defined search**

6 Repeat step 4 and step 5 for each parameter.

7 Click OK.

8 Save the form.

**Creating help for web applications**

If you created help for your applications in BMC Remedy Developer Studio, users can view that help in a browser window by clicking the Help link in the form’s toolbar.
You can also provide access to help on the web by using a Form Action field.

**NOTE**

A small set of help files is available for you to use in your applications. The help files are created from the appendixes in this guide. A `BrowserHelp.zip` file includes the help files; this file is included with the AR System documentation files. To view the online help in a browser, open the `helpfile.htm` file first.

**To create help for a form in a browser by using a Form Action field**

1. Create help for the form and for each field as described in the *Introduction to Application Development with BMC Remedy Developer Studio*, “Providing help text,” page 54.

2. Create a Form Help field on the form.
   a. In BMC Remedy Developer Studio, open the form, and choose Form > Add Form Action Fields.
   b. Select the Form Help check box, and click OK.
   c. Set field properties for the Help button that appears. See the *Form and Application Objects Guide*, “Creating button fields,” page 210.
This chapter describes information administrators need to know to configure and manage Web reports and AR System reports for use on the web.

The following topics are provided:

- **About reporting in AR System** (page 96)
- **Managing reports with the Report form** (page 98)
- **Reporting using table fields and results list fields** (page 102)
- **Running a report by using an Open Window active link** (page 103)
- **Managing localized Crystal and Web reports** (page 105)
- **Defining report types** (page 109)
- **Setting limits on reports that users save** (page 113)
- **Backward compatibility** (page 113)

For information about how to create and run Web and AR System reports in the Report Console, see “For your end users: Creating reports in a browser” on page 155.

For information about configuring AR System to use Crystal reports, see Chapter 5, “Using Crystal reports with AR System.”
About reporting in AR System

The Report Console provides a central location for all reporting tasks. Users can create and run ad hoc reports based on user-specified criteria, and run existing reports that are defined by others or installed with BMC applications.

Figure 4-1: The Report Console

Using the Web report type, introduced in AR System release 7.6.02, browser users can create nicely formatted reports and save them in common formats such as Adobe PDF. The necessary components to support Web reports are automatically installed with the mid tier and do not require you to purchase or install any additional third-party components. The Web report type is added to the existing AR System and Crystal report types.

For an overview of each report type, see “Report types” on page 158. About the Report Console

The Report Console and related report forms

The Report Console is integrated with the reporting components that support Web reports and with other AR System reporting forms. Administrators should use the Report Console to design any new reports for browser users. All users can run reports of all types from the Report Console.

The Report Console is based on the AR System Report Console form and uses other supporting forms such as the AR System Report Designer form, the Report form, and the ReportType form.

The Report Console opens when you click the AR System Report Console link in the Quick Links section of the home page, or when you click the Report button that appears with search results in a browser.

When you create or edit a report, the AR System Report Designer form (Figure 4-2) opens as part of the Report Console. This form allows you to design, modify, and save reports. When you click Back on this screen, you return to the main Report Console.
Figure 4-2: Designing a report

About reporting in AR System

- **Report form**—Stores the report definition and metadata about the report. Administrators use this form to manage certain report settings. See “Managing reports with the Report form” on page 98.

- **ReportType form**—Stores the available report types. The Web, AR System, and Crystal report types are installed with AR System. Administrators can define additional report types.

**NOTE**
Two legacy reporting forms, ReportCreator and ReportSelection, are also installed with AR System. The ReportCreator form is used to edit the AR System report type. The ReportSelection form is used to display available reports in BMC Remedy User. For information about creating AR System type reports, see “Defining AR System reports” on page 177.
Report Console architecture

To use the Report Console the plug-in server, the mid tier and web server, and a JSP engine must be running. The Report Console is an ARDBC plug-in application that is installed with AR System. It works with the components that support Web reports, which are installed with the BMC Remedy Mid Tier, and with the installed JSP engine. By default, the Tomcat 6 JSP engine is installed with AR System, but you can use other compatible JSP engines.

For the most current information about supported web servers and JSP engines, see the **BMC Remedy AR System Compatibility Matrix**, available from the BMC Customer Support website at [http://www.bmc.com/support](http://www.bmc.com/support).

Web report limitations

Web reports do not support output directly to `.arx`, `.csv`, or AR System XML format. To generate output directly to these formats, you must use an AR System report.

---

**TIP**

To generate `.csv` output based on a Web report, save the report to Microsoft Excel format. Then open the report output in your spreadsheet application, remove the rows at the top and bottom of the report that do not contain field data, and then save it in `.csv` format.

BMC Remedy User does not support Web reports.

Managing reports with the Report form

The Report form stores report definitions and metadata about the report. This section describes most of the fields in the Report form. For information about using the locale field and localizing reports, see “Managing localized Crystal and Web reports” on page 105.

To appear in the Report Console or in the ReportSelection form, a report must have an entry in the Report form. This occurs automatically when you create and save a new Web or AR System report. For many reports, no further action is required. You should only make modifications directly in the Report form when you need to take one of the following actions:

- Change the group permissions for a report, or change the availability of the report.
- Modify the base qualification or control query override settings.
- Configure a localized copy of an existing report.
- Register report definition designed outside of AR System, such as a Crystal report, that you want to make available to AR System users.
Managing reports with the Report form

The Report form stores report definitions for all report types, including Web reports, AR System reports, and Crystal reports. It also stores metadata about the report, including the following information:

- The report name, report type, and description
- The associated form and the report definition file
- The report permission and availability settings
- An optional base qualification and query override controls
- Localization settings

**Report permissions and visibility**

When a new report is created, it is automatically available for any users who are members of the same groups as the user who created the report, except for Public. (If the user creating the report is a member only of Public, then the report is available to Public.) The groups that have permission to a report are listed in the Assignee Groups field of the Report form.

There are several settings you can change to control whether other users can see a report:

- **Mark the report private**—For Web reports, select the Private check box in the Report Designer. This removes all groups from the Assignee Groups field in the Report form when the report is saved. In this case, only the report creator can see the report. This is the default setting when a new report is created.

- **Set report permissions**—Add or remove groups in the Assignee Groups field in the Report form.

- **Mark the report invisible**—To prevent a report from appearing in the Report Console or the ReportSelection form, but still allow workflow to run the report, set the Visible in Console field in the Report form to No.

- **Set status to inactive or pending**—To prevent a report from appearing in the Report Console or ReportSelection forms, and prevent workflow from running the report, set the Status field to Inactive or Pending. You can use the Pending status to let reviewers know that the report is ready for review.

**Controlling query overrides**

When a user selects a report to run in the Report Console, the Override check box appears. If allowed, the user can determine whether a qualification added at runtime will override the query built into the report, or be added to the built-in query with an AND operator. The report creator or an administrator can configure settings in the Report form to control whether overrides are allowed.
NOTE
Overrides do not affect a base qualification. Users can override a query built into the report definition, but if there is a base qualification defined in the Report form, the base qualification is always included when the report runs, whether or not Override is selected.

Override behavior is managed by these fields in the Report form:

- **Override Query in Report?**—This field sets the default value of the Override option in the Report Console. If this is set to Yes, the Override check box is selected, and if it is set to No, the Override check box is blank. This field is automatically set to Yes for AR System reports and to No for Web reports.

- **Lock Override Option**—This field determines whether the Override check box is read-only in the Report Console. If this is set to Yes, the Override option is read-only and the user cannot select whether an added query will override the report query. If this is set to No, the user can change the Override option before running a report. The default value for this setting is No for both AR System and Web reports.

TIP
By setting Override Query in Report? to No and Lock Override Option to Yes, you lock in the query in the report definition, so that the user can only further refine the query, and cannot broaden it.

**Combining report queries**
Reports can include query definitions of the following types:

- **Query contained in the report definition**—This is any query in the report definition, for example, when you create an ad hoc report in the Report Console.

- **Base qualification**—The administrator can enter a base qualification using standard AR System syntax in the Base Qualification field of the Report form. This allows the administrator to add a query to an existing report, without modifying the report definition itself.

  In a base qualification, you must use the database field name and not the field label on the form.

- **Runtime qualification**—The user running the report can add additional qualifications to the query at runtime.

- **Active link query**—An active link that runs a report can include a qualification.

In any case where the Override option is not selected and the report includes more than one of these qualifications at runtime, the different queries are joined with an AND operator. Base qualifications are never overridden and are always joined to other qualifications with an AND operator.

Therefore, the effect of combining qualifications is to narrow the report to include only those entries that match all conditions of the combined queries.
Managing reports with the Report form

Report form fields used by applications

Some fields in the report form are used by reports installed with BMC Remedy applications, but not with ad hoc reports created in the Report Console. These include:

- **Category fields**—These cause reports to be filtered by the Category menu in the Report Console. They form a hierarchy with three levels. All three, or none, should be set. You can create your own categories by using these fields if you need to.

- **Date range fields**—These are used by BMC Remedy application reports only.

- **Report set name**—This field used by BMC Remedy application reports only. The combination of the report set name and locale must be unique.

Deleting report definitions

Only the administrator and the person who created a report can delete it. There are two possible ways to delete a report definition:

- Select the report in the Report Console, and then click Delete.
- Search the Report form for the report, and then select the entry in the results list, and click Delete.

**NOTE**

To make a report unavailable without deleting it, select Inactive or Pending in the Status field of the Report form, or set Visible in Console to No.

Report form entries for externally defined reports

If you create a report by some means outside of the Report Console, such as a Crystal report or a BMC Remedy User report definition, and you want it to appear in the Report Console or in the ReportSelection form, you must manually add an entry for the report to the Report form and attach the report definition file in the Report Definition File field.

If your server is a Unicode server, you cannot create a record in the Report form by attaching an .arr file created in BMC Remedy User. Instead, use the ReportCreator form to create reports on a Unicode server.
Reporting using table fields and results list fields

Table fields and results list fields provide a way to capture and display data from one or more requests. By default, these field types include a Report button when the form is opened in a browser. When the user clicks the Report button, the Report Console opens with a pre-selected set of criteria. The same is true if the user runs a quick report by selecting from the My Reports option in a results list.

When the user clicks the Report button on a table field or results list, or runs a report from the My Reports list, the Report Console only lists reports that are associated with the current form. In addition, if the user selected records in the table or results list before clicking Report, the IDs for the selected records are passed to the Report Console, and only those records are used when the report is run. If the Report Console opens as a result of the user selecting a report from the My Reports list, then there is a pre-defined qualification that is passed to the Report Console.

In these cases, the Report Console is opened by an Open Window active link action as a dialog window, dedicated to reporting on that form. The On Dialog Open Action field in the active link is populated to set the context form name and to pass that information, along with any selected records, into the Report Console.

You can change the label of the Report button by editing the value of the Report Button field property for the table field or results list field. If you set a blank label, the Report button does not appear on the table or results list field. For information about setting table properties, see the Form and Application Objects Guide, “Working with tables,” page 233.
Running a report by using an Open Window active link

The Open Window active link method of running a report is useful when you want to run a report as part of an application, or create your own interface for launching reports. Within the definition of the active link, you direct the report to a specific form, and also define which requests to include in the report. After defining the active link, attach it to a workflow trigger, such as a button field. When the user clicks the workflow trigger where the active link is attached, a new browser window opens to display the report.

The following procedure outlines the steps for creating an Open Window active link for web reporting. For general information about creating active links and related properties, see the Workflow Objects Guide.

To create an Open Window active link for web reporting

1. In BMC Remedy Developer Studio, create an active link.
2. On the Associate Forms panel, specify the form that you want to report on.
3. Add an Open Window action, and complete the fields as described in the following table.

Table 4-1: Open Window action fields (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Field</th>
<th>Selection</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window Type</td>
<td>Report</td>
<td></td>
</tr>
<tr>
<td>Target Location</td>
<td>New</td>
<td>Selecting New causes a new window to open for each report generated. If you select Current, the active link uses the existing open window from where the active link is initiated.</td>
</tr>
<tr>
<td>Data Source</td>
<td>SERVER</td>
<td></td>
</tr>
<tr>
<td>Server Name</td>
<td>Name of the AR System server on which the form being reported on is located</td>
<td></td>
</tr>
<tr>
<td>Form Name</td>
<td>Name of the form being reported on</td>
<td></td>
</tr>
<tr>
<td>Form View Name</td>
<td>Name of the form’s view</td>
<td></td>
</tr>
<tr>
<td>Report Type</td>
<td>The type of report</td>
<td>The menu’s data is read from the ReportType form on the AR System server being used for the Open Window action.</td>
</tr>
<tr>
<td>Report Location</td>
<td>Report Form (or Embedded)</td>
<td></td>
</tr>
<tr>
<td>Report Name</td>
<td>Name of the report as stored in the Report form (not the file name of the attachment)</td>
<td></td>
</tr>
<tr>
<td>Report Destination</td>
<td>Screen or File</td>
<td></td>
</tr>
</tbody>
</table>
4 Click Show Advanced, and complete the fields as described in the following table.

Table 4-2: Advanced fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Selection</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualification</td>
<td>A query string that determines which entries</td>
<td>If you want to use a string from a local field, use the EXTERNAL keyword, for example, EXTERNAL($QueryStringField$). If this string and the Entry IDs string are both left empty, all entries of the form being reported on are included in the report.</td>
</tr>
<tr>
<td></td>
<td>from the form to include in the report</td>
<td></td>
</tr>
<tr>
<td>If No Requests Match</td>
<td>Do Not Show Any Message</td>
<td></td>
</tr>
</tbody>
</table>

5 Save the active link.

To attach an Open Window active link to a form with a button field

1 In BMC Remedy Developer Studio, select a view of a form and create a new button field.

2 Attach the active link to the button field. See the Workflow Objects Guide, “Creating active links,” page 37.

3 Save the form.
Managing localized Crystal and Web reports

When you create an ad hoc report in the Report Console, it has the locale of the computer in use when the report was created. You cannot localize an ad hoc report.

Some Web reports installed with BMC Remedy applications are localized, and you can also add localized Crystal reports to AR System. In this case, entries in the Report form and Report Definition form (for Web reports) manage the localized report definitions.

**WARNING**

This section contains advanced details about the reporting infrastructure in AR System. You should not make changes as described in this section unless you have an in-depth understanding of advanced reporting using Web or Crystal reports.

**Localized Crystal reports**

For Crystal reports, you must provide a separate report definition file for each locale. Create an entry in the Report form for each locale. In particular, set the following fields:

- **Report Definition File**—Attach the localized report definition file in this attachment field.
- **Locale**—Enter the locale code, for example, FR for French.
- **Report Set Name**—Use the same report set name for localized versions of the same report. The combination of the report set name and locale must be unique.

**Localized Web reports**

This section describes how AR System manages locale settings for Web reports. It explains how to share ad hoc reports with users in other locales, and how preconfigured Web reports, such as those installed with the BMC Remedy applications or other reports created in the BIRT report tools, are configured for locale.

**Sharing ad hoc reports across locales**

When you create and save an ad hoc report, the Locale field of the report form entry is set by workflow in the following ways:

- If the locale of the computer you are using to create the report is set to English, the value in the Locale field is `$NULL$`.
- If the locale of the computer you are using to create the report is set to any language other than English, then the appropriate language code is set in the Locale field of the Report form entry, for example, `fr` for French.
Users can only see those Web reports for which the Locale field in the Report form entry matches the locale set on the user’s computer. ($\texttt{NULL}$ is interpreted as English.) This means that to share an ad hoc report with a user in another locale, you must make a copy of the report for the other locale.

**To make an ad hoc report available in another locale**

1. In the Report Console, open the original report for editing. See “Editing and deleting reports” on page 176.
2. Click Save As, and give the report a different name, such as My Report-Spanish.
3. Open the Report form, and then locate and open the record for the copied report.
4. In the Locale field, enter the two-character or four-character abbreviation for the locale where you want to share the report, such as `es` for all Spanish locales or `pt_BR` for Brazilian Portuguese.
5. Save the entry.

Users in the designated locale can now see the copy of the report that was configured for their locale. Once you have set the locale for the copy of the report, the copy no longer appears in the list of reports in your Report Console.

**NOTE**
The steps in this procedure do not cause the report headings and other metadata to be translated; the report definition remains in the original language. To create translated copies of ad hoc reports, you must create the report on a computer configured for the desired locale.

**Preconfigured localized reports**

Localized Web reports are installed by the BMC Remedy applications and you do not need to make changes. This section describes how they are configured.

To localize a Web report created outside of AR System with the BIRT report tools, you can either localize separate copies of the report definition file, or use a single report definition file and localize the related properties files.

**Separate localized report definition files**

Create an entry for the localized Web report in the Report form. In particular, set the following fields:

- **Report Definition File**—Attach the localized report definition file in this attachment field.
- **Locale**—Enter the locale code, for example, `fr` for French.
- **Report Set Name**—Use the same report set name for localized versions of the same report. The combination of the report set name and locale must be unique.

Do not enter anything in the Instance ID field.
When you save the entry, workflow stores the attachment in a new entry in the Report Definition form, and populates the Instance ID field (Report form) and Report Definition GUID field (Report Definition form) with a matching GUID. The matching GUID links different localized versions of the same report.

**Single report definition file with localized properties files**

To have a single report definition file with separate localized properties files, you must create a report library and add all the localized property files to the library. The library must then be compiled as a .zip file and added to the AR System Resource Definitions form, before creating the Report form entry.

> **To prepare a single Web report definition for multi-locale use**

1. Use the BIRT report tools and your localization tools to create a report library and localized property files for Web reports.

   The library file structure must adhere to the following guidelines:

   - Use a resource directory and make sure it has a unique name. For example, use the report name in the directory name.
   - Give the properties files unique names. For example, use the report name in the properties file names as well.
   - Make the names of the locale-specific properties files match the main properties file. For example, if the primary property file is named `messages.properties`, then the locale specific ones must be named `messages_language.properties`, for example, `messages_de.properties`, `messages_fr.properties`, and so on.

2. Add the library and property files to a .zip file. The .rptlibrary must be at the top level of the zip file, with the with the subdirectories containing properties files directly below it. For example:

   ```
   mylib.rptlibrary
   mylib_resources/
   mymessages.properties
   mymessages_de.properties
   mymessages_fr.properties
   ```

3. In the AR System Report Definitions form, create a new entry and attach the .zip file to it.

   - Set the type to BIRT Library
   - Leave the locale field blank

4. In the Report form, create and save an entry that contains the report definition file as an attachment.

   When you save this entry, workflow creates a corresponding entry in the Report Definition file and generates a GUID.
5 Create additional Report form entries for each locale. In particular, set the following fields:

- Use the same Report Set Name value as in the main Report form entry.
- Enter a unique value in the locale field to identify the locale.
- Copy the GUID from the Report Definition file entry that is associated with the main Report form entry.

Using exported data with BMC Remedy Data Import

If you plan to import data into an AR System form by using BMC Remedy Data Import, you must export the data in one of the following file formats.

Table 4-3: File formats used with BMC Remedy Import

<table>
<thead>
<tr>
<th>Data format</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR Export</td>
<td>.arx</td>
</tr>
<tr>
<td>AR XML</td>
<td>.xml</td>
</tr>
<tr>
<td>Comma-Separated Value (CSV)</td>
<td>.csv</td>
</tr>
<tr>
<td>ASCII</td>
<td>.asc</td>
</tr>
</tbody>
</table>

Figure 4-3: Report in XML format (partial view), displayed in browser
Defining report types

The ReportType form defines the environment that supports creating, editing, and running reports on the Web.

The following report types are defined in the ReportType form:

- AR System
- Crystal
- Web

You can create report type entries, but they should follow the syntax described in Table 4-4 on page 110. Only administrators can submit or modify entries to the ReportType form.

The recommended entries for AR System and Crystal report types are loaded automatically during AR System installation. Open the ReportType form in BMC Remedy User in Search mode to see these entries. Use the following procedure to define a new report type.

To define a report type

1. In a browser, open the ReportType form in New mode.
   
   http://host/contextPath/forms/serverName/ReportType

   ![Figure 4-4: ReportType form](image)

2. In the Report Type field, enter a name for the supporting report engine.
   AR System uses the following names. Do not use them as it would violate a unique index that has already been defined.

   - AR System
   - Crystal
   - Web
In the Query Converter Class field, enter the name of the Java class that converts an AR System query string into a query string format recognized in the web reporting interface.

AR System uses the `com.remedy.arsys.reporting.CrystalQueryConverter` to implement the `ReportQueryConverter` interface that converts queries to the Crystal report engine. Use this interface when writing your own query converter for other web-based report engines. You can find the `CrystalQueryConverter` and `queryConverter_ReadMe.txt` file in the `midTierInstallDir\samples` directory. The `queryConverter_ReadMe.txt` file provides a guide for creating your own query converter class.

In the Query Override Capability field, select Yes or No.

The Yes option gives this report type permission to override a query stored in a report. The No option denies this permission.

This field also is displayed on the ReportSelection form, with the selected value.

In the Run Command field, enter the URL that is used to connect a report to the report engine.

The Run command begins the processing of the selected report.

The recommended Run Command is a single-line entry with no spaces. The keyword portion of the URL corresponds to parameters that are passed to the web reporting environment.

The following table lists allowable URL keywords that can be used to build the Run command. These keywords listed are for reporting purposes only. They are not AR System keywords.

**Table 4-4: Run Command URL keywords and descriptions**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ARSERVER$</td>
<td>AR System server name for report data.</td>
</tr>
<tr>
<td>$ARAUTHENTICATION$</td>
<td>Authentication string used by the user.</td>
</tr>
<tr>
<td>$CRTLOC$</td>
<td>Location of any version of Crystal Reports.</td>
</tr>
<tr>
<td></td>
<td>This path is stored on the Report Settings page of the BMC Remedy Mid Tier Configuration Tool.</td>
</tr>
<tr>
<td>$CRTXILOC$</td>
<td>Location of BusinessObjects Enterprise XI.</td>
</tr>
<tr>
<td></td>
<td>This path is stored on the Report Settings page of the BMC Remedy Mid Tier Configuration Tool.</td>
</tr>
<tr>
<td>$USR$</td>
<td>User name.</td>
</tr>
<tr>
<td>$PWD$</td>
<td>User's password.</td>
</tr>
<tr>
<td>$RPTAPP$</td>
<td>Application that the form belongs to.</td>
</tr>
<tr>
<td>$RPTENC$</td>
<td>HTML charset encoding.</td>
</tr>
<tr>
<td>$RPTOP$</td>
<td>Operations (Run, Edit, Create).</td>
</tr>
<tr>
<td>$RPTFORM$</td>
<td>Form the report is being run against.</td>
</tr>
<tr>
<td>$RPTSVR$</td>
<td>Name of the server where the form is located.</td>
</tr>
<tr>
<td>$RPTNAME$</td>
<td>Name of the report.</td>
</tr>
</tbody>
</table>
Defining report types

NOTE

The Edit and Create commands are no longer supported.

Recommended entries

The following entries are recommended for the AR System and Crystal report types. The recommended entries for AR System and Crystal report types are loaded automatically during AR System installation.

Native AR System reports

- **Report Type**—AR System
  
  By default, the Report Type is AR System, but you can enter any name.

- **Query Converter Class**—*Leave blank*

- **Query Override Capability**—Yes

Edit Command—Leave blank (not supported)

Create Command—Leave blank (not supported)

Crystal Reports

Report Type—Crystal

By default, the Report Type is Crystal, but you can enter any name.

Query Converter Class—
com.remedy.arsys.reporting.CrystalQueryConverter

Query Override Capability—No

Run Command—Examples are:

BORemoteAPPURL=$CRTXILOC$/arreports/$RPTLOC$?init=$CRTVWR$&User0=$USR$;ARServer=$ARSERVER$;ARAuthentication=$ARAUTHENTICATION$;ARReportLocale=$LOC$;ARVUIType=1&Password0=$PWD$&SF=$RPTQUERY$

BOCurrentMidtierURL=$CRTXILOC$/arsys/$RPTLOC$?init=$CRTVWR$&User0=$USR$;ARServer=$ARSERVER$;ARAuthentication=$ARAUTHENTICATION$;ARReportLocale=$LOC$;ARVUIType=1&Password0=$PWD$&SF=$RPTQUERY$

BORemoteMidtierURL=$CRTXILOC$/arsys/$RPTLOC$?init=$CRTVWR$&User0=$USR$;ARServer=$ARSERVER$;ARAuthentication=$ARAUTHENTICATION$;ARReportLocale=$LOC$;ARVUIType=1&Password0=$PWD$&SF=$RPTQUERY$

The $RPTLOC$ parameter refers to a report file location relative to the directory specified as the Reporting Working Directory in the Mid Tier Configuration Tool. See “Configuring the mid tier for Crystal reports” on page 118 for information about configuration tool options. If the directory specified in the Mid Tier Configuration Tool is not the web server’s document root, you must include the web server’s path to the configured directory before the $RPTLOC$. In this example, arreports is a virtual directory configured on the web server to point to the parent of $RPTLOC$.

NOTE

If you are using Business Objects XI and your context path is not arsys, make sure you enter the context path in the BMC Remedy Mid Tier Configuration Tool as described in “Report settings” on page 42. Otherwise, your reports will fail.

Edit Command—Leave blank (not supported)

Create Command—Leave blank (not supported)
Setting limits on reports that users save

Users can create and save reports for forms in a browser with the My Reports toolbar button. (See “Using the My Reports toolbar button” on page 166.) The larger the number of forms and saved report sequences, the more memory is required on the mid tier.

To limit the number of forms and saved report sequences cached for faster user access, edit the `arsystem.myreport.report_cache_limit` property in the `config.properties` file. This property indicates the number of “My Reports” definitions to cache per form. For example, if you set the property to 20 (the default), a maximum of 20 “My Reports” definitions are saved in the cache for a given form. The cached definitions allow faster report generation but take up mid-tier memory for caching.

Backward compatibility

Macros stopped being supported in the AR System 5.x release. You can view reports created using run macro report actions with releases prior to AR System 5.x in BMC Remedy User, or on the Web, by converting them to an equivalent active link.

Macro conversion procedure

Running the conversion procedure for a run macro report action creates an equivalent active link, which you will be prompted to name. The report content and layout (definition) become automatically embedded within the active link during the conversion, and no additional entries are required. After the active link is created, it can then be attached to a workflow trigger, such as a button field, and placed on a form.

For details about the macro conversion procedure, see the Workflow Objects Guide, “Run Macro action,” page 123.

For instructions on attaching active links to a workflow trigger, such as a button field, see “To attach an Open Window active link to a form with a button field” on page 104.

For information about backward compatibility related to localization, see the “Backward compatibility” on page 113.

Localized reports created using macros

If you have language-specific reports created using Run Macro report actions with releases prior to AR System 5.x, perform the following steps to make them available to users:

1. Convert the run macro report action to an equivalent active link.
2 Attach the active link to a workflow trigger, such as a button field, and place it on a form.

3 Create an entry in the AR System Message Catalog.

For information about the AR System Message Catalog entry required for localized reports embedded in an active link, see the Form and Application Objects Guide, “Step 6: Localizing message components of a form view,” page 588.
This chapter describes how to configure AR System for use with BusinessObjects Enterprise or Crystal Reports Server, and how to make Crystal reports available for use with AR System.

The following topics are provided:

- About using Crystal reports with AR System (page 116)
- Mid tier installation options for Crystal reports (page 117)
- Configuring the Crystal reports integration (page 118)
- Report definitions for Crystal reports (page 121)
- Crystal Reports tips for the Web (page 122)

To display Crystal reports, you must install SAP BusinessObjects or Crystal Reports software in addition to AR System. For information about compatible versions, see the compatibility matrix at http://www.bmc.com/support.

**NOTE**

Beginning with release 7.6.02 of AR System, you can also create formatted reports for the web by using the AR System Report Console. See Appendix C, “For your end users: Creating reports in a browser” and (for administrators) Chapter 4, “Configuring AR System for Web and AR System reports.”
About using Crystal reports with AR System

By installing the appropriate SAP BusinessObjects or SAP Crystal Reports components (not included with AR System), you can create or use Crystal reports based on AR System data and make them available to AR System users.

To view Crystal reports designed for AR System on the Web, you must install one of the following products on a Windows computer:

- SAP BusinessObjects Enterprise (BOXI), for managed reports
- Crystal Reports Server, configured for unmanaged reports

“Managed” reports are cached with their data by the BusinessObjects Central Management Server (CMS). This allows you to take advantage of BusinessObjects server functionality such as scheduling reports. “Unmanaged” reports are generated on demand (at run time) and are then discarded.

For information about which versions of these products are supported with the current version of AR System, see the compatibility matrix at [http://www.bmc.com/support](http://www.bmc.com/support).

Architectural overview—the mid tier and Crystal reports

To make Crystal reports available to AR System Web users, the mid tier uses the AR Web ReportViewer to communicate with the Central Management Server (CMS). The AR Web ReportViewer passes the report query, user credentials, and other report information to the CMS for processing.

The CMS is the server component of BusinessObjects Enterprise and Crystal Reports Server. It listens for and executes report requests, using the AR System ODBC driver to retrieve the AR System data, publishes the report in the Crystal environment and renders it for display in the browser.

The AR Web ReportViewer is a component of the mid tier. It can be installed together with the mid tier or as a separate component, but it must reside on the same computer as the CMS.

Once the necessary components have been installed together and configured, any authorized AR System mid tier can direct requests for Crystal reports to the mid tier or AR Web ReportViewer on the Crystal reports server.

You must use one of the following configurations:

- Install BMC Remedy Mid Tier on the same Windows computer as the CMS. In this case the AR Web ReportViewer is installed as part of the mid tier.
- Install the mid tier on a separate computer (any supported platform), and install only the AR Web ReportViewer on the same Windows computer as the CMS.

BusinessObjects Enterprise or Crystal Reports Server and the AR Web ReportViewer must be installed on a Windows computer because the CMS uses the AR System ODBC Driver to contact the AR System server when retrieving report data.
**IMPORTANT**

In the AR System installer, the AR Web ReportViewer is called the “AR Crystal Web Application.”

The installer presents the AR Crystal Web Application option only when installing AR System on Windows, and only when the installer detects registry settings indicating that a supported version of BusinessObjects Enterprise or Crystal Reports Server is already installed.

**Figure 5-1: The AR Crystal Web Application installer selection installs the AR Web ReportViewer and AR System ODBC Driver**

You can select:

- Both Mid-Tier and AR Crystal Web Application—This installs the mid tier with the AR Web ReportViewer.
- AR Crystal Web Application only—This installs the AR Web ReportViewer only.
- Mid-Tier only—This installs the mid tier only. This selection is appropriate when you are installing the mid tier on a different computer from the CMS.

When you select AR Crystal Web Application, the AR System ODBC Driver (arodbcVerNum.dll) is also installed as a system DSN (Data Source Name). This allows the CMS to retrieve AR System data for the report.

**NOTE**

When file names are mentioned in the documentation, the placeholder `VerNum` represents the version number of the release as it appears in the file name. In some cases, this includes a build number. For example, in release 7.6.04, the AR System ODBC driver is named `arapi7604.dll` or `arapi7604_buildxxx.dll`. 
If you select AR Crystal Web Application, the installer prompts you for further information about Crystal reports settings. You can provide these settings at installation time or after installation. See “Configuring the Crystal reports integration” on page 118 and “Report settings” on page 42.

**NOTE**

To view Crystal reports in BMC Remedy User, select the client installer option for Crystal Reports. This installs the Crystal Reports XI reader libraries along with the BMC Remedy User.

### Configuring the Crystal reports integration

To complete the configuration, you must set the correct report settings for the mid tier and the AR Web ReportViewer, and certain configuration settings and directory permissions for BusinessObjects Enterprise or Crystal Reports Server.

### Configuring AR System settings for Crystal reports

Configure the AR System report settings for Crystal reports using the Report Settings page of the Mid Tier Configuration Tool or the AR Web ReportViewer Configuration Tool. For information about how to set the options in the Report Settings page, see “Report settings” on page 42.

Which tool you use depends upon where you have installed the mid tier and AR Web ReportViewer:

- If the mid tier and AR Web ReportViewer are installed together on the same computer as the BusinessObjects or Crystal Reports server, you use the Mid Tier Configuration tool to set the report settings.

- If the mid tier is installed on a different computer, then you use the AR Web ReportViewer Configuration tool to configure the AR Web ReportViewer, and the Mid Tier Configuration tool to configure the report settings for the mid tier.

You can access the Mid Tier Configuration tool at http://midTierHost/arsys/shared/config/config.jsp.

If the AR Web ReportViewer is installed separately, you can access the AR Web ReportViewer Configuration tool at http://ARWebReportViewerHost/arreports/shared/config/configreport.jsp.
Configuring BusinessObjects Enterprise (managed)

When you install the mid tier or AR Web ReportViewer with BusinessObjects Enterprise, you do not need to modify any BusinessObjects settings.

To ensure that BusinessObjects Enterprise is properly configured to work with AR System:

- Configure BusinessObjects Enterprise with sufficient named licenses. Consult the BusinessObjects Enterprise documentation for information about SAP licensing requirements.

- Make sure that all necessary services are running and enabled in the page of the BusinessObjects Central Configuration Manager and Central Management Console. See the BusinessObjects documentation for information about the necessary services and using these applications.

- Assign the directory defined as the Reports Working Directory (for example, ARInstallDir\midtier\reports) and the Windows Temp directory (for example C:\WINDOWS\Temp) permissions for the Windows user account that the web server uses.

- After running a Crystal report through the mid tier, verify that the report is published properly. To view a list of the published reports, open the ARReports folder in the Central Management Console. You can access the Central Management Console from the Windows Programs menu.

  (Optional) By default, the CMS is configured to limit the number of records returned when previewing or refreshing a report to 20,000. If you run large reports and see errors indicating you have hit this limit, you can change the setting in the BusinessObjects Central Management Console. This setting is a property of the CMS ReportApplicationServer service.

  **(Optional) To configure the Report Application Server service properties if necessary**

1. Log in to the Crystal Reports Server Central Management Console. You can access the Central Management Console from the Programs list in the Windows Start menu.

2. Open the Servers tab and locate the Report Application Server service in the Service Categories section.

3. Right-click the service and open the Properties dialog box.

4. To change the default number of records returned, locate the setting labelled “Number of database records to read when previewing or refreshing a report” and change the setting as needed.

5. Click Save & Close.

Configuring Crystal Reports Server (unmanaged)

Although Crystal Reports Server supports both managed and unmanaged reports, you must configure it for unmanaged reports for use with AR System.

To ensure that Crystal Reports Server is properly configured to work with AR System:

- Set the -ipport and -reportdirectory parameters in the properties of the Report Application Server service, as described in this section.
- Enable the Guest account, as described in this section.
- Configure Crystal Reports Server with sufficient concurrent licenses. Consult the BusinessObjects Enterprise documentation for information about SAP licensing requirements.
- Make sure that the necessary services are running and enabled in the Central Configuration Manager, Servers tab. This includes at least the Central Management Server (the CMS) in the Servers List section, and the Report Application Server in the Service Categories section.
- Make sure that the C:/WINNT/Temp folder has permissions for the user that the web server runs as, because reports are copied to this folder before they are published to the CMS.

To configure the Report Application Server service properties

1 Log in to the Crystal Reports Server Central Management Console.
   You can access the Central Management Console from the Programs list in the Windows Start menu.
2 Open the Servers tab and locate the Report Application Server service in the Service Categories section.
3 Right-click the service and open the Properties dialog box.
4 In the Command Line Parameters field, add the following settings to the end of the existing command line:
   -ipport 1566 -reportdirectory "ARInstallDir\midtier\reports"
   The value of the -reportdirectory parameter must match the path in the Reporting Working Directory, set in the Mid Tier Configuration Tool or AR Web ReportViewer Configuration Tool. See “Report settings” on page 42.
5 Click Save & Close.
6 Restart the Report Application Server service.

To enable the Guest account

1 Log in to the Crystal Reports Server Central Management Console.
   You can access the Central Management Console from the Programs list in the Windows Start menu.
2 Open the Users and Groups tab.
3 In the User List section, right-click Guest and open the Properties dialog box.
4 Deselect “Account is disabled.”
5 Click Save & Close.

Report definitions for Crystal reports

Crystal reports are created using the Crystal Reports designer application, which is a Windows application from SAP BusinessObjects. Report definition files created using the Crystal Report designer are saved with the file extension .rpt. After creating a Crystal report, you make the definition files available for web reporting by creating an entry to the Report form.

For specific information about designing Crystal Reports for AR System, see the Integration Guide, “Using Crystal Reports with AR System,” page 205.

**IMPORTANT**

To prevent user names and passwords from being embedded in data from Crystal reports, modify your System DSNs to remove the user name and password. For more information, see “Establishing a system data source name (DSN) for Crystal reports” on page 122 and “ODBC driver configuration for Crystal reports” on page 123.

Additionally, when saving, select the Save Without Data option and clear the Report Refresh on Open option to prevent the original data from being displayed each time a report is displayed.

If form fields are modified, especially fields on which a Crystal report is reporting, then you must update the Crystal report; otherwise, you will receive the following error message: Error detected by database DLL. [On Report Server: serverName].

**To update a Crystal report**

1 Open the report in Crystal Designer.
2 Choose Database > Verify Database.
   A message appears, notifying you whether the report is up to date.
3 Map your report fields to the updated report.
4 Save the report and reattach it to the corresponding entry in the Report form.

If you have report definition files created with BMC Remedy User reporting tools or the Crystal Report Designer application, create entries for the files in the Report form to make them available for web reporting.
Crystal Reports tips for the Web

To make sure that Crystal Reports will work properly, consider the following topics:

- “AR System and BusinessObjects display integration” on page 122
- “Establishing a system data source name (DSN) for Crystal reports” on page 122
- “ODBC driver configuration for Crystal reports” on page 123
- “Restricting the number of records retrieved” on page 125
- “Optimal formatting for all environments” on page 125
- “Saving a Crystal report” on page 126

AR System and BusinessObjects display integration

After the mid tier or AR Web ReportViewer executes its statements and the Crystal report is displayed, BusinessObjects code is responsible for the controls in the display. Therefore, you cannot use AR System settings to modify the display.

Establishing a system data source name (DSN) for Crystal reports

Every AR System server that a report references needs a System DSN (data source name). The recommended format of this name is `serverName_DSN`. For more information, see the Integration Guide, “Creating multiple data sources,” page 202.

If the Crystal Report Designer application is installed on a different system from the Crystal Web Component server, then the administrator must make sure that the System DSN on the Crystal Web Component server has the same name as the SystemDSN embedded in the report design. For example, if an application developer who is developing on Computer A has created a system DSN called `myServer_DSN`, and the Crystal Web Component server is on Computer B, then Computer B will also need to have a system DSN named `myServer_DSN`.

**IMPORTANT**

Crystal Designer and Crystal Reports use the user name and password in the System DSN to log in to AR System. When you create reports in Crystal Designer, you use a System DSN complete with a user name and a password. If Crystal Designer requests user information, do not provide it. The information in the System DSN should be sufficient. If not, provide the required information in the System DSN, not in Crystal Designer. Do not use a User DSN when you create or run Crystal Reports.

Before you run any reports, however, modify your System DSN to remove the user name and password. This causes Crystal Reports to use the user name and password of the user currently logged in. Failure to remove the user name and password from the System DSN might give you unexpected results when you run your report.
ODBC driver configuration for Crystal reports

Before creating a Crystal report, configure the ODBC settings on the computer you are using to create the report. These settings will prevent the user name, server name, and password from being embedded in the report.

For more information about using ODBC with Crystal Reports, see the Integration Guide, “Using Crystal Reports with AR System,” page 205.

▶ To configure ODBC settings for Crystal reports

1. Go to the Windows Control Panel, and select Administrative Tools.
2. Double-click Data Sources (ODBC).
   The ODBC Data Sources Administrator dialog box opens.
3. Click the System DSN tab.

   IMPORTANT
   Be sure to click the System DSN tab, not the User DSN tab. Never use the User registered version of the ODBC driver to create reports.

Figure 5-2: ODBC Data Sources Administrator dialog box

4. Select AR System ODBC Data Source, and click Add.
The Create New Data Source dialog box appears.

**Figure 5-3: Create New Data Source dialog box**


**Figure 5-4: ODBC Setup dialog box**

6. Specify the server name and user name to connect to the database.
   You do not need to fill in the password.

7. Select the Use Underscore check box in the ODBC dialog box.
   This will confirm that the ODBC driver translates special characters such as colons, spaces, and so on, into underscores.
Select the Use Labels check box to use field labels based on the locale you specify in the Report Locale field.

**NOTE**

It is recommended that you *deselect* the Verify On First Refresh report option in Crystal Reports. Then, you do not need to match the Use Labels option for the report to run correctly.

If the Verify On First Refresh option is selected, you must match the Use Labels option when you create the report and at runtime. For example, if you select the Use Labels option when you create the report, you must also select it when you run the report. Conversely, if you unselect the Use Labels option when you create the report, you must also unselect it when you run the report.

In the Report Locale field, enter the locale for the language in which you want to see the report.

**NOTE**

If you have installed two localized views (for example, German and French), and you are using the German localized view and the report locale setting is set to the French locale, the data returned will be in French, though the static report text will be in German.

Click OK to save the settings.

### Restricting the number of records retrieved

To restrict the number of records retrieved from the database when a report is run, Crystal Reports enables you to use a Selection Formula. A Selection Formula can be added in a Crystal report by choosing Report > Edit Selection Formula. (When the report is run from BMC Remedy User, however, these qualifications are not used.) Use the Run If Qualification panel in the Open Window Active Link action. The data can be enter through the data stored in a form or hard coded. When the report is run, this qualification is used to select data from the AR System forms specified in the report.

### Optimal formatting for all environments

When you create a report and align the fields in the designer, and then view it in the Crystal Designer and BMC Remedy User, it might appear to be well aligned, but when you view it on the Web, the fields might not be aligned. To address this issue, use horizontal and vertical “guide lines” in reports to align fields.

**To set up optimal formatting for all environments**

1. Right-click inside the designer and make sure the Snap to Grid option is *not* selected.
2. Select Show guide lines in design and Show guide lines in preview options from this menu.
3 Click on the top and left page margins to make vertical or horizontal lines appear in the designer.

4 Move the fields next to the guide lines to attach them to the guide lines. This way the column headings and the column content can be left aligned as well as top aligned.

**NOTE**

Guide lines are displayed only in the design mode and not when the report is actually viewed.

---

### Figure 5-5: Guide lines in Crystal Report Designer

[Image of guide lines in Crystal Report Designer]

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**Saving a Crystal report**

When saving a Crystal report, do not save the report with data. You will see this as one of the options in the Crystal Designer under the menu File > Save Data with Report, but do not select it.
You can provide user with tips for using applications in a browser.

The following topics are provided:

- Using the AR System Object List (page 128)
- Creating requests (page 129)
- Modifying requests (page 133)
- How the Back button behaves (page 135)
- Keyboard shortcuts (page 135)
Using the AR System Object List

If the AR System Object List is enabled, you can use it to access forms and applications in your browser.

Figure A-1: Object List example

Opening forms and applications from the Object List

To open a form, select the form name and click Open New or Open Search.

To open an application, select the application and click Open.

**NOTE**
The Show Hidden check box is visible to administrators only.

Searching for forms or applications in the Object List

By default, the Object List displays all available forms and applications for your mid tier. You can restrict the display to specific forms, applications, and servers by using any of the following methods:

- To find objects in a specific server, enter all or part of the server name in the Server field and click Search.
- To find an application, enter all or part of the application name in the Application field, and click Search.
- To find a form, enter all or part of the form name in the Name field and click Search.
Creating requests

A request is a record related to a specific task. For example, a request could be a description of a software problem or a purchase order from a customer.

When you create a request, you enter each piece of information about the request in a field. When you save the request, it is added to the database.

If you have permissions, you can open requests and modify them. Only administrators and subadministrators can delete requests.

To create a new request

1. Open the form.
2. Click New Request.
3. Fill in the appropriate fields in the form.
4. Click Save.
Editing fields with rich text formatting

If a field has a rich-text-formatting (RTF) icon ( ) next to it, you can format the text in the field. For example, you might want to make text bold or italic, or you might want to center the text.

Click the button to open a dialog box that contains more RTF functions. (See Figure A-2.)

Figure A-2: RTF dialog box

If RTF within the field is enabled, a reduced set of RTF functions appear when you click in the field. (See Figure A-3.)

Figure A-3: RTF functions in a field

Here are some tips for working in the RTF dialog box:

- To enable the buttons in the dialog box, type some text or select existing text. Then, you can format the selected text.
- To undo all of the text you entered and formatted in the RTF dialog box, click Cancel or press the ESC key.
**NOTE**

The rich-text-formatting (RTF) options provide a way for you to apply some basic styling of text and inclusion of images with their text. The options do not provide the level of functionality of a desktop-based word processor such as Microsoft Word.

Functionality will vary among browsers. Apple Safari browsers support the fewest number of features.

**RTF editor shortcut keys**

Table A-1 and Table A-2 list keyboard shortcuts you can use with rich-text formatting.

**Table A-1: General shortcuts**

<table>
<thead>
<tr>
<th>Shortcut</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTRL+A</td>
<td>Select all text</td>
</tr>
<tr>
<td>CTRL+SHIFT+W</td>
<td>Close inner dialog boxes</td>
</tr>
<tr>
<td>SHIFT+CTRL+[</td>
<td>Justify left</td>
</tr>
<tr>
<td>SHIFT+CTRL+]</td>
<td>Justify right</td>
</tr>
<tr>
<td>SHIFT+CTRL+\</td>
<td>Justify center</td>
</tr>
</tbody>
</table>

**Table A-2: Shortcuts that work after text is selected**

<table>
<thead>
<tr>
<th>Shortcut</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHIFT+CTRL+Up arrow</td>
<td>Increase font size</td>
</tr>
<tr>
<td>SHIFT+CTRL+Down arrow</td>
<td>Decrease font size</td>
</tr>
<tr>
<td>SHIFT+CTRL+L</td>
<td>Create a link</td>
</tr>
<tr>
<td>SHIFT+CTRL+B</td>
<td>Bold</td>
</tr>
<tr>
<td>SHIFT+CTRL+I</td>
<td>Italic</td>
</tr>
<tr>
<td>SHIFT+CTRL+U</td>
<td>Underline</td>
</tr>
</tbody>
</table>

**Adding a table to a character field**

Use the Table icon ( ) to insert a table in an RTF field or to modify the properties of a selected table. Table properties include:

- Size of the table
- Number of rows and columns
- Cell spacing and padding
- Table and cell borders
- Table caption
Use the Cell Properties icon ( ) to edit the properties of a cell in a table. Cell properties include:

- Cell border
- Horizontal and vertical alignment
- Cell background color

When adding a table, remember these tips:

- You can change the format of one cell at a time (not multiple cells).
- After you create a table, you cannot insert or delete rows or columns, so be sure to include enough rows and columns when you initially create the table.
- If you select a table that is larger than the RTF field, the bounding box anchors will appear outside of the field. This is an HTML limitation.
- If you change the size of a table or image by dragging the bounding box, the OK button in the RTF editor (or the Save button when an RTF field is modified) is not enabled. To enable it, modify the text in the RTF field. Then, click OK (or save the form).

Adding an image to a character field

If an image is accessible through a URL, you can add it to a character field if the field includes an RTF icon ( ).

▶ To add an image to a character field

1. Click the RTF icon ( ) next to the character field.
2. Click the image button ( ) to open the Image Options pop-up box (Figure A-4).

Figure A-4: Image Options pop-up box
Modifying requests

If you have permissions, you can modify requests.
You can modify individual requests or a group of requests. If you change several requests at once, fill in only the fields that you want updated on every request that you have selected.
Changes made to the Status field are recorded in the request’s status history. You can view a list of these changes in the Status History window (choose View > Status History).

The dialog box displays the default name of the field (Status), which can be changed by the administrator.

► **To modify a single request**

1. Open the form containing the request that you want to change.
2. If the form is not in Search mode, click New Search.
3. Search for the request.
   
   For more information, see “Running searches” on page 138.
   
   The Results pane lists the requests that match the search criteria. The first request appears in the Details pane, which is in Modify mode.
4. Click on the request that you want to change so that it appears in the Details pane.
5. Make the necessary modifications to the fields in the form.
6. Click Save.

► **To modify several requests at once**

1. Open the form containing the request that you want to change.
2. If the form is not in Search mode, click New Search.
3. Search for the requests.
   
   The Results pane lists the requests that match the search criteria.
4. Select the requests that you want to change.
   
   Use the CTRL or SHIFT key to select more than one request.
5. Click Modify all.
   
   The Details pane changes to Modify All mode, and a blank form is displayed.
6. Fill in the fields you want updated for every request.
   
   The data you enter in the fields will be applied to all the selected requests; therefore, fill in only the fields that you want updated on every request you have selected.
7. Click Save.
   
   A dialog box appears, listing the number of requests that will be modified and prompting you to confirm your modifications.
   
   — **WARNING**
   
   You cannot undo this action if you select Yes.
8. Click Yes to confirm.
How the Back button behaves

The Back button might not behave as you expect. If you view a form in a browser (in either New or Search mode), go to another web page, and then click the Back button, the browser will display the form in Search mode, and the form will be empty. Field properties, selections, and other values are not saved.

Opening a form in a new window

The AR System home page supports opening a form on the existing open window or opening a form on a new window. When you click on an entry point on the Application List field, the form opens on the same window, replacing the existing content. When you perform Shift+Click (press the Shift key on the keyboard and click the left mouse button) on an entry point present on the Application List field, the form opens on a new window.

**NOTE**
Depending on the browser, the form opens on a new window or a new tab.

Keyboard shortcuts

The following tables list keyboard shortcuts used in AR System. The term *focus* refers to *keyboard focus*, not to virtual cursor positions defined by certain assistive technologies.

Panel field shortcut keys

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEFT ARROW</td>
<td>If the focus is on a tab selector (an anchor link), sets focus to the next or previous tab selector without displaying it. Press ENTER to display the selector.</td>
</tr>
<tr>
<td>RIGHT ARROW</td>
<td></td>
</tr>
<tr>
<td>ENTER</td>
<td>If the focus is on a tab selector, displays the page.</td>
</tr>
</tbody>
</table>
Character field menu shortcut keys

In Section 508 accessibility mode, none of the following shortcut keys works. To access a character menu in 508 mode, you must be in Virtual PC Cursor (Non-Forms) mode. For more information, see the “Designing BMC Remedy applications for Section 508 compliance using AR System” white paper.

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP or DOWN ARROW</td>
<td>Moves focus through the menu items. Press ENTER to fill the field with the menu selection.</td>
</tr>
<tr>
<td>RIGHT ARROW</td>
<td>If the selected item is a submenu, opens and sets focus to the submenu.</td>
</tr>
<tr>
<td>LEFT ARROW</td>
<td>Dismisses the submenu and sets focus to the upper level menu. If focus is at the top level, no action occurs.</td>
</tr>
</tbody>
</table>

Form Action shortcut keys

These keys work only when the corresponding form action button is visible and enabled.

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTRL+ALT+F2</td>
<td>Switches to New Request mode</td>
</tr>
<tr>
<td>CTRL+ALT+F3</td>
<td>Switches to New Search mode</td>
</tr>
<tr>
<td>CTRL+ALT+ENTER</td>
<td>In New or Modify mode, saves the changes.</td>
</tr>
<tr>
<td></td>
<td>In Search mode, performs the search.</td>
</tr>
<tr>
<td>CTRL+ALT+L</td>
<td>Clears all field values.</td>
</tr>
<tr>
<td>CTRL+ALT+U</td>
<td>Sets default field values.</td>
</tr>
<tr>
<td>CTRL+ALT+H</td>
<td>Shows status history values.</td>
</tr>
<tr>
<td>CTRL+ALT+S</td>
<td>Sets focus to the Advanced Search Bar input field.</td>
</tr>
</tbody>
</table>

**NOTE**

In some browsers, the CTRL+ALT+F2 and CTRL+ALT+F3 shortcuts do not work. Alternatively, click the New Request and New Search buttons on the toolbar to switch modes. This is keyboard accessible because you can tab through the toolbar.
Appendix B
For your end users: Running and saving searches on the Web

This section describes how to save and run searches on the web.

The following topics are provided:

- Types of searches (page 138)
- Running searches (page 138)
- Finding a request by example (page 139)
- Using the advanced search bar (page 142)
- Saving searches (page 151)
- Running a saved, recent, or defined search (page 152)
- Loading search criteria without execution (page 153)
- Managing saved searches (page 153)
Types of searches

The following types of searches are available on the Web:

- **Saved searches**—Searches that you can create and save for a form.
- **Recent searches**—Searches that you have executed recently.
- **Defined searches**—Searches defined by your administrator.

Running searches

You can save searches in a browser and run them at any time by selecting Searches from a toolbar menu in a form. You can also make recent searches and defined searches available in a browser. You can load each type of search criteria into a form, and update the search criteria before you execute a search. You can run all searches across multiple sessions.

The Searches button opens a menu for you to save and open searches.

**Figure B-1: Searches button in toolbar**

You can run a search using any combination of the following methods:

- **Finding a request by example**—The easiest way to specify search criteria is to fill in fields and select choices and option buttons to match the requests that you want to find. You can specify values for more than one field. The more fields that you fill in, the more specific your search becomes. The system searches for requests that meet all the criteria and displays them in the Results pane. For more information, see “Finding a request by example” on page 139.

- **Advanced search bar**—You can use the advanced search bar to define a more complex set of search criteria. For example, you can search for all requests with two different values in the same field. You can use the search bar together with fields in a form to specify search criteria.

The advanced search bar appears at the bottom of the browser window when you click the Advanced Search button on the toolbar. For more information, see “Using the advanced search bar” on page 142.
Finding a request by example

Finding a request by example enables you to enter information directly into the form to use as a search.

1. In Search mode, open the form for which you want to find requests.
2. In the appropriate fields, specify the search criteria that the requests must match.
   - You cannot specify search criteria for attachment fields.
   - You can enter values for more than one field, creating a logical AND for the search criteria. The more fields that you fill in, the more specific your search becomes.
3. Click Search.

You can modify the requests, or you can run a report. For more information, see Appendix C, “For your end users: Creating reports in a browser.”

Search styles in character fields

Each character field on a form is assigned a specific search style that determines how it finds matching requests. Your administrator will set these for you. Three search styles are available:

- **Equal**—Searches for exactly what you entered in the field. For example, if you enter **Bob Smith** in the Created By field, you find all requests created by Bob Smith, but none created by Bob Smithe.

- **Leading**—Searches for the entered sequence of characters only at the beginning of the field, ignoring any subsequent characters. The search will return every request with this field that contains the first characters exactly as you entered plus any following characters.
For example, if you enter Bob in the Created By field, you find all requests created by Bob Smith, as well as those created by Bob Smithe and Bobby Jones. You will not find any created by Jill Bobbington. (The characters Bob in the name Jill Bobbington are not leading characters.)

- **Anywhere**—Searches for the entered sequence of characters anywhere in the field.

For example, if you enter Bob in the Created By field, you find all requests created by Bob Smith, as well as those created by Bob Smithe, Bobby Jones, and Jill Bobbington.

Equal and Leading searches are faster than Anywhere searches because Anywhere searches compare each character in the field while Equal and Leading searches do not.

**Overriding the predefined search style**

To override the default search style for a character field, enter exactly what you are searching for in the field, and include a relational operator or wildcard character.

For example, you can use an equal sign (=) to search for an exact match even if the field has a search style of Anywhere. Thus, if you enter =Bob Jones in the Created By field of a form, the search will find all the requests created by Bob Jones. The search will not find requests created by Bob Joneson.

You can also use the advanced search bar to override a field’s search style. For example, to override the Created By field in the previous example with a Leading search, you would specify the following criteria in the advanced search bar:

'Created By' LIKE "Bob Jones%"

**Using relational operators in a search**

Relational operators are useful in nontext fields (such as date and time fields) when you want to search for a value within a numerical range.

You can use the following relational operators as leading characters in fields in a form and in the advanced search bar.

**Table B-1: Relational operators**

<table>
<thead>
<tr>
<th>Operator</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td>Matches contents that are less than the value.</td>
</tr>
<tr>
<td>&gt;</td>
<td>Matches contents that are greater than the value.</td>
</tr>
<tr>
<td>&lt;=</td>
<td>Matches contents that are less than or equal to the value.</td>
</tr>
<tr>
<td>&gt;=</td>
<td>Matches contents that are greater than or equal to the value.</td>
</tr>
<tr>
<td>=</td>
<td>Matches contents that are exactly equal to the value.</td>
</tr>
<tr>
<td>!=</td>
<td>Matches contents that are not equal to the value.</td>
</tr>
</tbody>
</table>
Finding a request by example

For example, to search for all requests created after a certain date, use the greater than (>) relational operator and specify a date and time format. For example, > “July 5, 2008” in the Create Date field finds all requests created after July 5, 2008. (Leaving out the time defaults the search criteria to 0:00:00, the start of the day.)

Using wildcard symbols in a search

When you specify search criteria to find requests, you can use the following wildcard symbols anywhere in a form to indicate one or more characters.

NOTE

Square brackets and the symbols associated with them do not work with Oracle® or Informix databases.

Table B-2: Wildcard symbols for searches

<table>
<thead>
<tr>
<th>Wildcard</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>% (Percent)</td>
<td>Matches any string of 0 or more characters. For example: J%son matches Jackson, Johnson, Jason, and Json.</td>
</tr>
<tr>
<td>_ (Underscore)</td>
<td>Matches any single character. For example: _b matches Bab, Bob, and Bub.</td>
</tr>
<tr>
<td>- (Hyphen)</td>
<td>Indicates a range. Always use within square brackets ([ ]).</td>
</tr>
<tr>
<td>[ ] (Square brackets)</td>
<td>Matches any single character within a specified range or set.</td>
</tr>
<tr>
<td></td>
<td>For example, [a-f] matches the range of characters a through f, and [abc] matches the set of characters a, b, c, or f.</td>
</tr>
<tr>
<td>[^] (Square brackets with caret)</td>
<td>Matches any single character not within a specified range or set.</td>
</tr>
<tr>
<td></td>
<td>For example, [^a-f] matches all characters except the range a through f, and [^abc] matches all characters except a, b, c, or f.</td>
</tr>
</tbody>
</table>

Use the percent symbol (%) to include leading or trailing characters in your search. For example, to find all requests submitted by Jill Bobbington, Bobby Fenton, and Bob Comptonson with an Anywhere search, enter Bob%ton in the Submitter field. The search returns all requests for which the Submitter field contains the strings “Bob” and “ton” in that order with any number of characters leading, trailing, and in between.

When used in a form, the percent sign (%), underscore (_), and open bracket ([) symbols always function as wildcard symbols except as follows, where they function as explicit characters:

- When you specify a relational operator (for example, > or =).
- When the field’s default search style is Equal and you do not use a leading or trailing percent sign (%).
NOTE

You can override a field’s search style by using a leading percent sign. For example, if the field’s search style is Equal and you enter %Rob into the Submitter field, your search finds Robert Smith and Jim Robertson (not only equal matches to %Rob). However, if you use a leading percent sign, you lose any faster search times that would result from using the Equal or Leading search styles. See “Search styles in character fields” on page 139.

Using wildcard symbols as explicit characters in a form

To search for the actual characters that serve as wildcard symbols, you must force the system to interpret these wildcard characters as explicit characters. For example, you might need to search for all instances of the percent sign instead of using the percent sign as a wildcard symbol.

To search for the percent sign (%), underscore (_), or open bracket ([) as an explicit character, enclose the character in square brackets. For example, if you enter the percent sign in square brackets ([%]), the system searches for instances of the percent sign instead of using it as a wildcard character.

The close bracket (]) functions as a wildcard only when it is accompanied by an open bracket ([). The hyphen (-) functions as a wildcard character only when preceded by an open bracket ([) or an open bracket with a caret ([^]).

Using the advanced search bar

You can use the advanced search bar to define a more complex set of criteria than you can specify by using only fields in a form. For example, you can search for all requests with two different values in the same field. Thus, you could search for all requests that have a status of Fixed or Closed.

To show or hide the advanced search bar, click the Advanced Search button in a search window. When visible, it appears at the bottom of the browser window.

When you specify search criteria in the advanced search bar, you can use the same operators as in the form, and several more. See “Using relational operators in the advanced search bar” on page 147.

For more information, see “Examples of advanced search bar statements” on page 150.

NOTE

If you enter search criteria in the advanced search bar and then hide the advanced search bar, the criteria is still used to find matching requests. If you have entered criteria in the advanced search bar and then decide not to use it, you must clear the advanced search bar before you hide it.
To build an advanced search

1. Click the Advanced Search button in a search window.
2. Define a search statement in the Advanced Search bar.
   - If you use relational operators, observe the appropriate operator precedence. (See “Using relational operators in a search” on page 140.)
3. Click Search.

Advanced search bar conventions

The easiest way to build your search in the advanced search bar is to select the fields, status history fields, keywords, values, currency codes, currency field subvalues, and selection field values directly from the Fields menu to the right of the bar. When you choose items directly from this menu, the correct syntax is automatically entered.

You can also type the information directly into the advanced search bar. If you choose this option, observe the conventions listed in the following sections.

Fields

Enclose field labels in single quotation marks. For example:

'Short Description'

If a field name contains a single quotation mark (such as an apostrophe), add another single quotation mark next to it. For example, if the field is named Submitter’s Phone Number, enter it as 'Submitter''s Phone Number'.

To search on a field that does not have a label, see your administrator for the field ID. Use this ID instead of the name enclosed in single quotation marks.

NOTE

Instead of entering the field label and the quotation marks into the advanced search bar, click the field’s label in the form, or select the field from the Field List dialog box. The field name is automatically added, with the correct syntax, to the search statement.

Status history fields

Status history fields must have all of the following information enclosed within single quotation marks:

- The name or ID of the status history field followed by a period.
- The name or index of the status value that you want to match followed by a period.
- The keyword USER (for the user who changed the request to that status) or TIME (for the time last changed to that status).

The following example uses names:

'Status History.Fixed.TIME' < "07/01/08"
**Currency fields**

For currency fields, you must enclose one of the following items in single quotation marks:

- The name or ID of the currency field. For example:
  
  
  'Currency Field' = $NULL$

- The name of the currency field, followed by a period, followed by a specific portion of the currency field’s value, such as the date or a functional currency value. For example:
  
  'Currency Field.VALUE' < 5000

**Keywords**

You can use keywords anywhere that you can enter character values.

You can use the $NULL$ keyword to search for requests that have no value in a field. For example, to search for requests that have not been assigned (requests with no value in the Assigned to field), enter ‘Assigned to’ = $NULL$.

The most commonly used keywords are: $DATE$, $NULL$, $TIME$, $TIMESTAMP$, $USER$, and $WEEKDAY$.

**NOTE**

Keywords are case-sensitive. Use only UPPERCASE, as shown in the following table.

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Substituted value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$APPLICATION$</td>
<td>The application name if the application is running; $NULL$ when no application is running.</td>
</tr>
<tr>
<td>$BROWSER$</td>
<td>The browser (Internet Explorer or Netscape) being used in the current session. If the browser is anything other than Internet Explorer or Netscape, Netscape is returned. For BMC Remedy User, an empty string (&quot;&quot;) is returned.</td>
</tr>
<tr>
<td>$CLIENT-TYPE$</td>
<td>The client type of the API program. AR System administrators use this keyword.</td>
</tr>
<tr>
<td>$CURRENTWINID$</td>
<td>The window ID that uniquely identifies the current window in the client environment. AR System administrators use this keyword.</td>
</tr>
<tr>
<td>$DATABASE$</td>
<td>The name of the database on which the current form’s data is stored.</td>
</tr>
<tr>
<td>$DATE$</td>
<td>In a character field, the current date is displayed. In a date/time field, the time defaults to midnight (00:00:00).</td>
</tr>
<tr>
<td>$DEFAULT$</td>
<td>The default value for the associated field (used only when assigning a value to a field).</td>
</tr>
<tr>
<td>$ERRNO$</td>
<td>When an error is encountered, the number of the error that just occurred.</td>
</tr>
</tbody>
</table>
## Table B-3: Keywords (Sheet 2 of 3)

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Substituted value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ERRMSG$</td>
<td>The message for the error that just occurred.</td>
</tr>
<tr>
<td>$ERRAPPENDMSG$</td>
<td>The appended message, if any, for the error that just occurred.</td>
</tr>
<tr>
<td>$EVENTSRCWINID$</td>
<td>The window ID that uniquely identifies the event source window in the client environment. AR System administrators use this keyword.</td>
</tr>
<tr>
<td>$EVENTDATA$</td>
<td>The value that identifies the data of the event. AR System administrators use this keyword.</td>
</tr>
<tr>
<td>$EVENTTYPE$</td>
<td>The value that identifies the type of the event. AR System administrators use this keyword.</td>
</tr>
<tr>
<td>$FIELDHELP$</td>
<td>The field help text for the currently selected field.</td>
</tr>
<tr>
<td>$FIELDID$</td>
<td>The ID of the field that is currently selected. If the field is not selected, it returns NULL.</td>
</tr>
<tr>
<td>$FIELDLABEL$</td>
<td>The label of the field that is currently selected. If the field is not selected, it returns NULL.</td>
</tr>
<tr>
<td>$FILENAME$</td>
<td>The name of the field that is currently selected. If the field is not selected, it returns NULL.</td>
</tr>
<tr>
<td>$GROUPIDS$</td>
<td>The group IDs of which the current user is a member. If there are no groups, the keyword returns a value of NULL.</td>
</tr>
<tr>
<td>$GROUPS$</td>
<td>The groups to which the current user belongs.</td>
</tr>
<tr>
<td>$GUIDE$</td>
<td>The guide name if the guide is running; NULL if the guide is not running.</td>
</tr>
<tr>
<td>$GUIDETEXT$</td>
<td>Help text that provides instructions when a guide is running.</td>
</tr>
<tr>
<td>$HARDWARE$</td>
<td>The hardware platform on which the current process is running.</td>
</tr>
<tr>
<td>$HOMEURL$</td>
<td>The URL of the current page. This option is only valid on web pages. If it is used in BMC Remedy User, it will return a NULL value. AR System administrators use this keyword.</td>
</tr>
<tr>
<td>$INBULKTRANSACTION$</td>
<td>Indicates whether you are in a bulk transaction. This keyword is not supported and is reserved for future use.</td>
</tr>
<tr>
<td>$LASTCOUNT$</td>
<td>The number of matches found in the most recent search.</td>
</tr>
<tr>
<td>$LASTID$</td>
<td>The ID of the last successfully created request.</td>
</tr>
<tr>
<td>$LASTOPENEDWINID$</td>
<td>The Send Event keyword that resolves to the ID of the window that was last opened. AR System administrators use this keyword.</td>
</tr>
<tr>
<td>$LOCATIE$</td>
<td>The language and country code for the specified locale, in the format language_COUNTRYCODE, for example, en_US.</td>
</tr>
<tr>
<td>$NULL$</td>
<td>A null value.</td>
</tr>
<tr>
<td>Keyword</td>
<td>Substituted value</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>$OPERATION$</td>
<td>The current mode or operation being performed. One of the following values is returned:</td>
</tr>
<tr>
<td></td>
<td>CREATE—For a Create request operation.</td>
</tr>
<tr>
<td></td>
<td>DELETE—For a Delete operation.</td>
</tr>
<tr>
<td></td>
<td>DIALOG—When a form is opened as a dialog box.</td>
</tr>
<tr>
<td></td>
<td>GET—For a Get Entry operation.</td>
</tr>
<tr>
<td></td>
<td>MERGE—For a Merge operation.</td>
</tr>
<tr>
<td></td>
<td>QUERY—For a database search.</td>
</tr>
<tr>
<td></td>
<td>SET—For a Modify operation.</td>
</tr>
<tr>
<td></td>
<td>SET ALL—For a Modify All operation.</td>
</tr>
<tr>
<td>$OS$</td>
<td>The operating system under which the current process is running.</td>
</tr>
<tr>
<td>$ROLES$</td>
<td>For a deployable application, returns the list of roles that map to groups to which the current user belongs.</td>
</tr>
<tr>
<td>$ROWCHANGED$</td>
<td>Evaluates whether a row in a table field has changed in a table loop guide.</td>
</tr>
<tr>
<td></td>
<td>0 = Not changed</td>
</tr>
<tr>
<td></td>
<td>1 = Changed</td>
</tr>
<tr>
<td>$ROWSELECTED$</td>
<td>Evaluates whether a row in a table field is selected in a table loop guide.</td>
</tr>
<tr>
<td></td>
<td>0 = Not selected</td>
</tr>
<tr>
<td></td>
<td>1 = Highlighted as the secondary selection.</td>
</tr>
<tr>
<td></td>
<td>2 = Highlighted as the primary selection.</td>
</tr>
<tr>
<td>$SCHEMA$</td>
<td>The form on which you are currently operating.</td>
</tr>
<tr>
<td>$SCHEMA-ALIAS$</td>
<td>The singular alias used for a form.</td>
</tr>
<tr>
<td>$SERVER$</td>
<td>The AR System server on which the current form is defined.</td>
</tr>
<tr>
<td>$SERVERTIMESTAMP$</td>
<td>The current date, time, or both on the AR System server. The keyword is used with the following fields:</td>
</tr>
<tr>
<td></td>
<td>Date/Time</td>
</tr>
<tr>
<td></td>
<td>Time</td>
</tr>
<tr>
<td></td>
<td>Date</td>
</tr>
<tr>
<td>$TCPPORT$</td>
<td>The TCP/IP port of the local AR System server. AR System administrators use this keyword.</td>
</tr>
<tr>
<td>$TIME$</td>
<td>In a character field, the current time is displayed. In a date/time field, the date defaults to the current date.</td>
</tr>
<tr>
<td>$TIMESTAMP$</td>
<td>The current date/time stamp.</td>
</tr>
<tr>
<td>$USER$</td>
<td>The name of the user who is currently logged in.</td>
</tr>
<tr>
<td>$VERSION$</td>
<td>The version of BMC Remedy User. If the version includes a patch, it is also included.</td>
</tr>
<tr>
<td>$VUI$</td>
<td>The name of the view of the current active window.</td>
</tr>
<tr>
<td>$VUI-TYPE$</td>
<td>The views platform (such as Web or Windows).</td>
</tr>
<tr>
<td>$WEEKDAY$</td>
<td>The current day of the week.</td>
</tr>
</tbody>
</table>
Values

Enclose nonnumeric values (including time, selection, and currency values) in double quotation marks (for example, “07/01/08” for July 1, 2008).

Selection field values

Selection field values can be specified as text values in quotation marks or numeric values or indexes not in quotation marks. For example, if you have a Status field with the option buttons labeled Open, Fixed, and Verified, you can enter either “Open” or 0 to specify the value of Open, because Open is the first selection value in the selection field.

Currency field values

For currency fields, use the Currency Codes submenu to choose an available currency code. When you choose a currency code, the double quotation marks are automatically entered (such as “USD”). Add the currency value within the double quotation marks (for example, “100 USD”).

If you do not specify a currency code, the primary allowable currency type is assumed.

Using relational operators in the advanced search bar

Relational operators are useful especially in nontext fields (such as date and time fields) when you want to search for a value within a numerical range.

You can use the following relational operators only in the advanced search bar. You cannot use them in a form. See Using relational operators in a search.

Table B-4: Operators (Sheet 1 of 3)

<table>
<thead>
<tr>
<th>Operator</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>( )</td>
<td>Use parentheses to control the order in which the expression is carried out. Operations found within parentheses are executed together as a unit. For example, in the operation ‘Gross Income’ ñ (‘Unemployment Insurance’ + ‘Pension Plan Contributions’ + ‘Income Tax’), the items within the parentheses are added before they are subtracted from Gross Income.</td>
</tr>
<tr>
<td>AND &amp;&amp;</td>
<td>Logical AND of the result of two conditions. The result is true only if both conditions are true. For example, ‘Status’=”New” AND ‘Assigned to’=”Andy” finds all new requests assigned to Andy. You can use two ampersands (&amp;&amp;) instead of the word AND.</td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
</tbody>
</table>
### Table B-4: Operators (Sheet 2 of 3)

<table>
<thead>
<tr>
<th>Operator</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOT</strong> !</td>
<td>Negates the condition that follows. If the condition is false, the result is true. For example, NOT 'Status'=&quot;New&quot; finds all requests that are not new. You can use an exclamation point (!) instead of the word NOT.</td>
</tr>
<tr>
<td><strong>LIKE</strong></td>
<td>Performs a pattern search. For example, 'Submitter' LIKE “Bob%ton” finds all requests with a submitter name that begins with the letters Bob and ends with the letters ton—such as Bob Compton and Bobby Fenton. The LIKE operator is useful only with character and diary fields. Use square brackets and the LIKE operator for Sybase databases. Square brackets and the LIKE operator do not work with Oracle or Informix databases. See the Database Reference, “Using relational databases with AR System,” page 13, and the Workflow Objects Guide, “Operators,” page 216.</td>
</tr>
<tr>
<td><strong>+</strong></td>
<td>Adds two numerical values (integer, real values, or decimal). Adds an integer interval to a date/time value. Adds two character strings. For example, 'Create date' &gt; $DATE$ + (8<em>60</em>60) finds all requests that were created after 8:00 a.m. today. (8<em>60</em>60 is the number of seconds in 8 hours.)</td>
</tr>
<tr>
<td><strong>-</strong></td>
<td>Subtracts two numerical values (integer, real values, or decimal). Subtracts two date/time values (resulting in an integer). Subtracts an integer interval from a date/time value. For example, 'Create date' &gt; $TIMESTAMP$ - (7<em>24</em>60<em>60) finds all requests that were created within the past week. (7</em>24<em>60</em>60 is the number of seconds in one week.) This is useful to include in a custom report of all requests created in that week.</td>
</tr>
<tr>
<td>*****</td>
<td>Multiplies two numeric values. For example, 'Quantity' * 'Price' &gt; 50 finds all requests where the contents of the Quantity field multiplied by the contents of the Price field is over 50.</td>
</tr>
<tr>
<td><strong>/</strong></td>
<td>Divides two numeric values. For example, 'Total Expenses' / 'Total Income' = 2 finds all requests where the total amount spent for expenses is twice the total amount of income.</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>Modulo of two integer values (the remainder of a division of the values). Because a percent sign is also a valid wildcard symbol, the context determines how it is interpreted. When used as part of a search statement, it is interpreted as a wildcard symbol; when used in the expression where an operator is expected, it is interpreted as modulo. <strong>Note:</strong> Use the modulo operator only with fields whose data type is integer. If you use this operator with fields that have other data types, such as Date/Time, an error occurs.</td>
</tr>
<tr>
<td><strong>&lt;</strong></td>
<td>Matches contents that are less than the value. For example, 'Create date' &lt; ($TIMESTAMP$ - 24<em>60</em>60) finds all requests created more than 24 hours ago. ([24<em>60</em>60] or 86400, is the number of seconds in 24 hours.)</td>
</tr>
</tbody>
</table>
Using the advanced search bar

When you use multiple operators to construct qualification criteria, they are executed in the following order of precedence:

1 ( )
2 NOT (!) - (unary minus)
3 * / %
4 + -
5 < <= > >= = != LIKE
6 AND (&&)
7 OR (||)

If the qualification contains multiple operators of the same precedence value, they are executed in the order that they occur (from left to right). For example, in the expression A + (B*C), the multiplication takes first precedence because it occurs within parentheses, which are of a higher precedence than addition.

### Using wildcard symbols in the advanced search bar

When you specify search criteria to find requests, you can use wildcard symbols as shown in the following table to indicate one or more characters:

#### Table B-5: Wildcards (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Use this wildcard:</th>
<th>To match these characters:</th>
</tr>
</thead>
<tbody>
<tr>
<td>%  (Percent)</td>
<td>Matches any string of 0 or more characters. For example: J%s on matches Jackson, Johnson, Jason, and Json.</td>
</tr>
<tr>
<td>_  (Underscore)</td>
<td>Matches any single character. For example: B_b matches Bab, Bob, and Bub.</td>
</tr>
<tr>
<td>-  (Hyphen)</td>
<td>Indicates a range. Always use within square brackets ([[]).</td>
</tr>
</tbody>
</table>
In the advanced search bar, wildcard symbols are interpreted as wildcards only when used with the `LIKE` operator; otherwise, they are interpreted as explicit characters. You must use the percent symbol (`%`) when you want to include leading or trailing characters in your search. For example, if you want to find all requests submitted by Jill Bobbington, Bobby Fenton, and Bob Comptonson, enter the following text in the advanced search bar:

`Submitter` LIKE "%Bob%ton%"

**NOTE**

Square brackets and the symbols associated with them do not work with Oracle or Informix databases.

### Examples of advanced search bar statements

The following statements illustrate ways you can use the advanced search bar to build complex searches.

- **To find all requests that were created by someone other than the current user**

  Enter

  `Submitter' != $USER$

  This example uses the `not equal to` operator (`!=`) to find instances where the value in the `Submitter` field is not equal to the user who is currently logged in. Notice the use of the `$USER$` keyword.

- **To find all requests that were created after 10:00 a.m. on the current day**

  Enter

  `Create date' > “10:00:00”

  The example uses the `greater than` operator (`>` to find requests where the value of the `Create date` field is greater than the current day at 10:00 a.m.
To find all requests that have been created for any problem that involves printing

Enter

'Submitted Problem Type' LIKE "%print%"

The example uses the LIKE operator to perform a pattern search that finds requests with the word print anywhere in the Submitted Problem Type field.

To find all requests with a status of released

Enter

'Status' = "Released"

Notice the spaces after the word Status in the field specification. The spaces exist in the field label on the form being used. If you use the Field List dialog box by selecting the Fields button on the advanced search bar, the spaces (and single quotation marks) are added automatically.

NOTE

A search statement that includes a not equal to operator (!=) might return unexpected results because the advanced search bar complies with ANSI SQL standards. One of these standards distinguishes between fields that contain data and fields that have never contained data.

For example, the following statement does not return requests where CharacterField is empty:

'CharacterField' != "one"

To include requests where CharacterField is empty, enter the search statement like this:

'CharacterField' != "one" OR 'CharacterField' = $NULL$

Saving searches

The following procedures detail how to save and run searches from a form viewed in a browser.

NOTE

You must execute a search before you can save it.

To save a search that you have created

1 Run a search. (See “Running searches” on page 138.)
2 From the toolbar, choose Searches > Save Search.
   The Save or Redefine Search dialog box appears.
3 In the Search Name field, enter a name for the search, or select one from the list of existing saved searches. This is the name that will appear in the saved search list. If the name you enter already exists, the search criteria under the existing name will be overwritten.

4 Click OK.
The new and refined search will now be available in the list of saved searches.

Running a saved, recent, or defined search

To run a saved, recent, or defined search

1 From the toolbar, choose Searches > Run My Searches, Run Recent, or Run Defined.

Figure B-2: Searches menu

2 From the list of searches, choose a search to run.
The system executes the search and displays a results list.

Figure B-3: Search results
Loading search criteria without execution

You can load search criteria from saved, recent, or defined searches into a form without executing the search. You can then modify the search criteria, or execute the search as it is.

**To load search criteria into a form**

1. Open a form in Search mode.
2. From the toolbar, choose Searches > Load My Searches, Load Recent, or Load Defined.
3. From the list of searches, choose the search you want to load into the form.

The search criteria is loaded into the form. You can execute the search by choosing Search from the toolbar, or you can modify the search criteria.

Managing saved searches

You can enable, disable, or delete existing saved searches. Disabling a search removes it from the list of searches, but keeps the search data.

**To enable or disable a search**

1. From the toolbar, choose Searches > Manage My Searches.
2. In the Manage Search dialog box, select the search you want to enable or disable, and click the Enable/Disable button.

   If a search is not yet selected in the Manage Search dialog box, the default button label of Disable is displayed.

   The state of the search changes to either Enabled or Disabled, depending on your action. If the search is disabled, it no longer appears in the search menu on the toolbar, but the search data is still stored in the AR System Searches Preference form.

3. Click Save to save your changes.
To delete a search

1. Select the search you want to delete.
2. Click Delete.
3. Click Save.

The search is deleted from the list in the Manage Searches dialog box, from the search menu, and from the AR System Searches Preference form. To restore a deleted search, you must recreate and save it.
This chapter describes how AR System users create and run reports in a browser.

The following topics are provided:

- Reporting on AR System data (page 156)
- Running reports (page 159)
- Creating reports (page 167)
- Export file formats for AR System reports (page 183)
Reporting on AR System data

The AR System Report Console provides a single interface for all Web-based reporting functions. You can create and run ad hoc reports based on user-specified criteria, and can also run existing reports that are defined by others or installed with BMC applications.

To open the Report Console, click the AR System Report Console link in the Quick Links area of the home page, or click the Report button after running a form search in a browser. You can also open the Report Console by entering the correct URL to the AR System Report Console form. BMC Remedy applications provide additional links that open the Report Console.

About the AR System Report Console

The Report Console includes the report list, where you can select and run reports, and the report designer screen, where you can create and modify reports.

The links in the upper right part of the report list screen have the following functions:

<table>
<thead>
<tr>
<th>Link name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close</td>
<td>Close the Report Console and return to the previous browser window.</td>
</tr>
<tr>
<td>Help</td>
<td>Open the Report Console help.</td>
</tr>
<tr>
<td>Logout</td>
<td>Log out of AR System.</td>
</tr>
<tr>
<td>Refresh</td>
<td>Refresh the list of reports.</td>
</tr>
<tr>
<td>New</td>
<td>Create a new report. See “Creating reports” on page 167.</td>
</tr>
<tr>
<td>Delete</td>
<td>Delete the selected report.</td>
</tr>
</tbody>
</table>

For information about using the remaining options in the report list screen to work with reports, see

- “Finding reports” on page 159
- “Running reports and saving the output” on page 159
“Adding to or overriding a report query at runtime” on page 163

“Reporting based on a search” on page 165

The report designer screen allows you to create and edit Web reports. It displays the name of the current report in the upper left and indicates whether it is new or being edited.

The report designer screen includes the Report Definition area, where you define the report content, and the Filter By area, where you define an optional search query to select the records to be included in the report.

Figure C-2: The report designer screen of the Report Console

The buttons in the upper right of the report designer screen have the following functions:

<table>
<thead>
<tr>
<th>Button name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preview</td>
<td>Preview the report</td>
</tr>
<tr>
<td>Save</td>
<td>Save the report</td>
</tr>
<tr>
<td>Save As</td>
<td>Save the report with a different name (make a copy)</td>
</tr>
<tr>
<td>Back</td>
<td>Return to the report list screen of the Report Console</td>
</tr>
</tbody>
</table>
For information about using the options in the report designer screen, see
- “Defining a Web list report” on page 168
- “Defining a Web chart report” on page 170
- “Using a query in a Web report” on page 173
- “Editing and deleting reports” on page 176

Report types

The options available for creating, running, and saving reports vary based on the report type. AR System includes these report types:

- **Web reports**—The Web report type provides browser users the ability to create nicely formatted reports. Results can be returned in the form of a list, many styles of charts, or a list and chart together. Web reports can contain links that allow you to drill down from the report to open AR System records and view the data upon which the report is based. Web reports can be saved in several standard formats, including Adobe PDF and Postscript, and Microsoft Word, Excel, and PowerPoint formats.

  Web reports are suitable to use in presentations, documents, email, and printing, and can transfer data directly to spreadsheet format. Also, because each row in the report output contains a link to the underlying data in the form, you can use Web reports to work interactively with AR System data.

  Web reports are not available in BMC Remedy User.

- **AR System reports**—You can use AR System reports to generate output in several standard formats, including XML, .arx, and comma-separated value (.csv). AR System reports are typically used to export data in the specified format for use in another application, for importing data into another AR System server, and to generate statistics based on the report data.

  For information about creating and running reports in BMC Remedy User, see the BMC Remedy User help. To locate existing reports in BMC Remedy User, use the ReportSelection form rather than the Report Console.

- **Crystal reports**—Some installations of AR System are integrated with the SAP BusinessObjects or Crystal Reports reporting tools. If your administrator has installed one of these products and has designed Crystal reports for use with AR System, you can run Crystal reports from the Report Console.
Running reports

This section describes how to use the Report Console to run existing reports. For information about creating reports, see “Creating reports” on page 167.

Finding reports

When you open the Report Console from the home page, all reports to which you have permission appear in the list. You can narrow the list to show only those reports you have created, or only reports belonging to a certain category, such as Incident Management.

When you click the Report button after running a search, the Report Console lists only those reports that are based on the form you searched. In this case, when you run the report, only the data you selected from the search results is included, and you cannot add to or override the report query.

Use any of the following methods to locate reports in the Report Console list:

- In the Show field, select Created by Me to list only reports you have created.
- If report categories are defined, select a category from the Category field menu to see only the reports assigned to that category.
- Sort the list by clicking any of the column headings. For example, click the Form Name column heading to sort the list by the associated forms.
- Use the expand and collapse buttons located below the list to see a longer or shorter view of the list, or to hide the list.

Running reports and saving the output

You can run AR System, Web, and Crystal reports from the Report Console. The available output formats and how you select them vary by the report type. (The type of report is listed in the Report Type column.)

In some cases, you can add an additional qualification to the report query at runtime, or override the built-in query with a new qualification.

**NOTE**

In order to run a report, you must have permissions to the form and to the fields included in the report. If you do not have permission to the form, the report does not appear in the list of available reports. If you have permission to the form but do not have permission to a field included in the report, that column is blank when you run the report.
Running a report

This section describes how to run reports of all types. You can run the report as is, or if the report definition allows, you can change the report results by adding to or overriding the built-in query.

To run a report

1. Locate the report you want to run in the Report Console list.

2. (Optional) To narrow the report results by adding a query, click Show Additional Filter, and then follow the steps described in “To add a qualification at runtime” on page 163.

   WARNING

   If the report includes a primary and secondary form, the filter shows only fields that are included in the primary form.

3. (Optional) To override a built-in report query, click Override. See “Adding to or overriding a report query at runtime” on page 163.

4. For AR System reports only, select the output format before running the report. See “Exporting AR System reports” on page 163.

   Web reports run in HTML and you select the output format after running the report. See “Exporting and printing Web reports” on page 160.

5. Use one of these methods to run the report:
   - Select the report and click Run . In this case, the report appears in a viewing area below the list of reports.
   - Double-click the report entry in the list. In this case, the report appears in a separate window. This can be helpful if you need to compare two or more reports at a time.

6. If the Parameter dialog appears, enter the requested information to narrow the report results, and then click OK.

Working with report results

This section describes how to export or print the results of Web reports and AR System reports, and how to drill down from a Web report to open the underlying records.

Exporting and printing Web reports

You can export Web reports to Microsoft Excel, Microsoft Word, Microsoft PowerPoint, Adobe PDF, and Adobe PostScript formats. You can either save the result to a file in the selected format, or open the report in the selected application to work with the report data.
TIP
Although you cannot save a Web report directly to .csv format, you can still use this format to transfer the data from a Web report to another application. To do so, export the Web report to Microsoft Excel, and then use Excel functions to save the data in .csv format.

To export a Web report
1. Run the report as described in “To run a report” on page 160.
2. In the report viewer, click Export Report.
3. In the Export Report dialog box, select the format for the exported report.
4. (Optional) Select which pages of the report to export. By default, all pages are selected.
5. (Optional) For PDF, PostScript, and PowerPoint formats, select Auto, Actual Size, or Fit to Page.
   These options help control how large reports are paginated in the selected output file type.
6. Click OK.
7. In the File Download dialog box, select whether you want to open or save the file.
   - **Open**—The report opens in the selected application, such as Excel. (You must have the application installed to use this option.)
   - **Save**—The Save As dialog box appears. Navigate to the appropriate location, enter a file name, and then click Save.

If you select Open, you can then use menu options in the associated application to print, email, and search the report results.

The links to the underlying records in a list report remain active when you export the report. This means that other users with access to the AR System server where the report was run can use the links in the report to drill down to the underlying records. However, if a user without access to the AR System server clicks on the link in the exported report, the user will see a browser “page not found” error.

**NOTE**
Chart drill-down is deactivated in an exported report. Only list report links remain active.

To print a Web report
1. Run the report as described in “To run a report” on page 160.
2. In the report viewer, click Print Report.
3. In the Print Report dialog box, indicate which pages you want to print.
4. Click OK.
**TIP**

You can also export the report as described in “To export a Web report”, and then print the report from the selected application.

**Opening the records in the report**

Web reports can contain links to the underlying data. This allows you to “drill down” by clicking the links to open the underlying records and work interactively with the data in the report.

In a list report, each row represents a single request and contains a link to that request. The link appears in the Request ID column if it is included in the report. If the Request ID field is not included, the link is created on the Short Description field, if included, or on the first field in the report (the left-most column). When you click the link, the request underlying that row of the list opens.

In a chart report, elements of the chart reflect a group of one or more underlying records. For example, the bars in a bar chart might represent the number of students enrolled in each class in the Sample applications. Clicking on a bar in the chart opens the form, and the records summarized in that bar of the chart are listed in the results list.

There are some restrictions on using the drill-down feature of Web reports. These include:

- The form must allow drilling down from a report. If the administrator has turned off the “Allow Drill Down from Web Report” form property, reports on that form do not allow you to drill down to the underlying requests.
- If the form is a vendor form, the associated plug-in must include the fields used in the report query. If not, AR System error 3355, “Illegal field encountered in the qualifier,” appears.
- In a chart report, you cannot drill down in the following situations:
  - The report was run from a search results list or table field by selecting records and then clicking Report. In this case, the chart drill-down links are not available, because the records represented in the chart are already available in the search results.
  - The selected field is a field type that contains group IDs, including the Group List field on the User form, the Assignee Group field, or a dynamic field (field ID in the range 60000 - 69999). In this case, AR System reports “No matching requests (or no permission to requests) for qualification criteria. (ARWARN 9296).”
  - The field used for the Category axis contains records with a null value. In this case, AR System reports “No matching requests (or no permission to requests) for qualification criteria. (ARWARN 9296).”
  - The Category axis is based on a group field. This includes the Group List field in the User form (field 104), the Assignee Group field in any form (field 112), or any dynamic group field (field ID in range 60000 – 69999).
  - The chart is in an exported report.
Exporting AR System reports

You can export the results of an AR System report to the following file formats:

- AR System export (file extension .arx)
- AR System XML (file extension .xml)
- Comma-Separated Value (file extension .csv)

All of these formats can be used to import data to an AR System form with BMC Remedy Data Import. CSV files can also be imported to other applications, such as Microsoft Excel.

For more information about the AR System report file types, see “Export file formats for AR System reports” on page 183.

To export an AR System report

1. Select the report from the list.
2. In the Destination field, select whether to send the report to the screen, to a file, or to a printer.
3. In the Format field, select the output format for the report.
4. Run the report as described in “To run a report” on page 160.

Adding to or overriding a report query at runtime

When you open the Report Console to run a report, AR System uses the report’s built-in query to select the records included in the report. Two additional options allow you to add a qualification to narrow the report results (Show Additional Filter) or override the built-in query to widen or change the report results (Override).

Adding a qualification at runtime

A “qualification” is any query statement, such as “Number enrolled is greater than 0”. When you enter an additional qualification using Show Additional Filter, and do not select Override, your qualification is added to the report’s built-in query (using the AND operator). If you add a qualification and select Override, then your qualification replaces the report’s built-in query. If you select Override but do not add a qualification, then the report’s built-in query is ignored.

To add a qualification at runtime

1. Open the Report Console and select the report to run from the list of reports.
2. Click Show Additional Filter.
**WARNING**

If the report includes a primary and secondary form, the filter shows only fields that are included in the primary form.

3 Build the additional qualification, using either the Simple Query Builder or the Advanced Query Builder, as described in “Using a query in a Web report” on page 173.

4 (Optional) Select Override to replace the report’s built-in query with the added qualification.

If the Override check box is not available, overrides are disabled for this report. In that case you can only add your qualification to the report and cannot override the built-in query.

5 Click Run to run the report with the added qualification.

**Example of adding a qualification to narrow a report**

An example report named Class Registration, based on the Sample:Classes form, has a built-in query stating “Number enrolled is greater than 0”. The report normally includes all classes for which at least one student is enrolled. An instructor, Peter Thomas, needs to see this list, but only for the courses he teaches.

Peter could use the Class Registration report and add a qualification before running the report, such as “Instructor is equal to Peter Thomas” or “Instructor is myself”. His additional qualification is added to the built-in query, and the resulting report shows only those courses for which he is the instructor and at least one student is enrolled. In other words, he narrows the report results from all classes with enrolled students to only those he teaches that have enrolled students.

**Examples of overriding a report query**

A manager for the training program, on the other hand, needs to see a list of all classes, including those where the enrollment is zero. Instead of writing a new report, she could use the Class Registration report, but override the built-in query. By overriding the built-in query and adding no additional conditions, she eliminates the built-in query. Thus she widens the report results to include those classes that have no enrollees.

You can also use the Override and Show Additional Filter options together to replace any built-in query in the report. For example, to see a list of all classes in Madrid with or without students enrolled, the training program manager could use the Class Registration report, add the query “Location is LIKE Madrid%”, and click Override. The additional query narrows the report to include only classes in Madrid, and the override causes the report to include classes with no enrollees as well as those with students enrolled.
Restrictions on modifying queries at runtime

Some reports do not allow modification at runtime. These options are unavailable in the following cases:

- If you search a form and then use the Report button in the search results list to create a report, the records that you selected in the search results are passed to the Report Console as a predefined query. In this case, the Show Additional Filter and Override options are not available.

- The administrator can configure a report to disallow overrides, additional qualifications, or both. In case, either or both options are unavailable.

Override does not override the “base qualification” used in AR System reports. A base qualification is defined by the administrator and is outside of the report definition. If the report contains a base qualification, your qualification is added to the base qualification. Base qualifications are not visible in the report designer screen.

Reporting based on a search

When you run a search on an AR System form or view a table in a browser, the Report button appears below the search results or in the table (assuming the form or table field is not configured to prevent this). The Report button allows you to generate a report based on the search results or table field contents.

Figure C-3: Search results with Report button

![Search results with Report button]

When you click Report, the following actions occur:

- The Report Console opens, listing only those reports that are associated with the form you searched.

You can also create a new report definition based on this search. In this case the report is automatically associated with the current form. If you select the “Add default fields and sort order” option, the results list fields are automatically included in the report.

- The records that are selected in the search results at the time you click Report, along with the sort order, are passed to the Report Console as a predefined query.
When you search a form, the first record in the search results is automatically selected. If you click Report without changing this selection, only the first record is included in the report. Use any of the following methods to select the records you want to include in the report:

- **Select All**—Selects all entries in the table.
- **SHIFT-click**—To select a range of entries, click an entry and hold down the SHIFT key. Click another entry above or below the original selection, and then release the SHIFT key.
- **CTRL-click**—To report on multiple entries, click an entry and then hold down the CTRL key. Continue to click the entries you want to include in the report while holding down the CTRL key. When you have finished selecting table entries, release the CTRL key.
- **Deselect All**—Clears all selections in the table.

If no entries in the table are selected when you click Report, the report includes all the entries in the search results.

### Using the My Reports toolbar button

With the My Reports toolbar button, you can save the sequence that generates a report based on a search. Each named report in the My Reports list is unique per server, per form, and per user. The My Reports feature is helpful if you frequently generate reports based on the same search, but don’t want to create a report definition.

#### To save a report to the My Reports toolbar menu

1. Run a search on a form.
   
   See Appendix B, “For your end users: Running and saving searches on the Web.”
2. Run a report based on the search results. See “Reporting based on a search” on page 165.
3. Close the report.
4. In the browser window containing the search results, choose My Reports > Save.
5. Enter a name for the report, and click OK.

#### To run a saved report from the My Reports toolbar menu

1. Open the form associated with the report that you saved.
2. Choose My Reports > Run > reportName.

#### To manage reports from the My Reports toolbar menu

1. Open the form associated with the report that you saved.
2. Choose My Reports > Manage.

Saved reports appear in a dialog box.
3 Delete, disable, or enable reports as needed.
4 Click Save.

Creating reports

This section describes how to define a new Web or AR System report. (Crystal reports are pre-designed and must be installed by the administrator.)

Web reports are suitable for preparing formatted list reports, which are presented in a table, and chart reports, which allow you to select from various types of charts to illustrate the data. By using the preview feature, you can use Web reports to work interactively with the data in the form.

AR System reports are often used to export data in XML, .arx, or .csv format for use in another application or on another AR System server. In addition, you can use AR System reports generate statistical values based on the data. AR System reports are can be run on the Web and in BMC Remedy User.

Setting up a new report

When you click New to create a report, you must first define the type of report, its associated form, and the report name in the New Report screen.

![New Report Form]

Depending on the type of report you are creating, AR System then opens either the report design screen of the Report Console (for Web reports) or the ReportCreator form (for AR System reports).

► To start a new report

1 In a browser, click the AR System Report Console link on the home page to open the Report Console.
2 Click New icon.
3 In the Type field of the New Report window, select the Web or AR System report type. This field is required.
4 In the Form field, enter the name of the form to use for the report. This field is required.
(Optional) To limit the list of forms to those that are already used in other reports, select Forms Used in Existing Reports. This can speed up retrieval of the list of forms, but any form that is not already used in some report does appear on the list.

To find the form quickly, type the first few letters of the form name into the field. For example, type “Sample” to select from the list of forms related to the Sample application.

5 Select or deselect the “Add default fields and sort order” check box:

- **Selected**—Fields that appear in the form’s results list after a search are automatically added to the report definition, along with the default sort order. You can remove or change these fields and sort order later if necessary.

- **Not selected**—No fields are added to the report definition automatically.

6 In the Name field, type a name for the report. This field is required.

The report name must be unique. The maximum length is 128 characters. Also, you cannot change the name of the report after you exit this screen, so use care in assigning a report name.

---

**NOTE**

Each report must have a unique Name/Locale combination. For example, two reports can both be name “Monday”, if the locale for each report is different.

---

7 Click OK.

If you selected the Web report type, the Report Console report designer screen appears. Build the Web report definition using the following procedures:

- “Defining a Web list report” on page 168
- “Defining a Web chart report” on page 170
- “Using a query in a Web report” on page 173

If you selected the AR System report type, the ReportCreator form opens instead. See “Defining AR System reports” on page 177.

### Defining a Web list report

List reports are presented in the form of a table, with one column for each field that you add to the report. One column of the report includes a link to the record in the underlying form (assuming the form properties allow this), so you can open the record and view the data underlying the report.

For example, a partial report based on the Sample:Classes form might list all class records in the form, showing the class title, location, instructor and number enrolled.
Creating reports

A link to the underlying data appears in the report results, assuming the form properties allow this. The link is created on the Request ID if it is included in the report. If the Request ID field is not included, the link is created on the Short Description field, if included, or on the first field in the report (the left-most column).

To define a list report

1. Follow the steps described in “To start a new report” on page 167.
2. (Optional) In the Report Definition area, add a brief description of the report in the Description field.
   This description appears in the list of reports in the Report Console. If you do not enter a description, it is identified as a “Web Report.”
3. In the Content field, select List or Chart + List.
   - **List**—The report is presented as a table.
   - **Chart + List**—The report is presented as a chart, followed by a table. Use this procedure to define the list section of the report. To define the chart, see “Defining a Web chart report” on page 170.
4. (Optional) To share this report with other users who share at least one permission group in common with you, clear the Private check box.
   Other users must have also permission to the form in order to run the report, and they must have permission to the fields included in the report in order to see the data in the report.
5. In the Columns tab, select fields from the Available Fields list to include in the report, and then click Add, double-click, or drag them to the Column list.
   - You must add at least one field to the Column list to be able to save the report.
   - If you selected “Add default fields and sort order” when creating the report, the defined results list fields for the form are already in the Column list.
   - You can select multiple fields at a time from the Available Fields list. To add all fields to the report, click Add All.
   - You can include any field type except Diary fields in the report.
To remove a field from the report, select it in the Column list and then click Remove, double-click the field, or drag it from the Column list back to the Available Fields list. To remove all fields from the report definition, click Remove All.

**NOTE**
The available fields come from the standard view of the form or from the view defined as the Master View for the locale. If the fields that appear do not match the fields you see on the form, there might be a Web - Alternate view defined. Fields in a Web - Alternate view do not appear in the Available Fields list.

6 Use the Up and Down buttons next to the Column list to change the order of the columns in the report.

7 (Optional) In the Sorting and Grouping tab, select one or more fields on which to sort the report, and then click Add, or drag the selected field to the sorting list area.
   - If you selected “Add default fields and sort order” when creating the report, the default sort order for the form is already added to the report definition.
   - To change the sort order between ascending and descending, click the arrow in the Dir column for each field.
   - To group repeated values, click the Group check box.

8 (Optional) Define a qualification to identify the records that appear in the report. See “Using a query in a Web report” on page 173.

9 (Optional) To preview the report before you save it, click Preview.
   A sample report runs and appears in a separate browser window. The Preview feature allows you to check and modify the report design until you are satisfied with the results.
   You can also use the Preview feature in cases where you want a quick view of the data in a form. You can print the report or export data from the preview screen.

   **NOTE**
   When you preview a Report that has a base qualification, the base qualification is ignored. In this case, the report preview might include more records than when you run the report from the Report Console list.

10 To save the report for future use, click Save.

11 Click Back to return to the Report Console report list.

**Defining a Web chart report**

You can generate various types of charts and graphs to illustrate the report data. You can also generate a chart or graph together with a list report that shows the supporting data.
For example, a tube chart could give a quick visual summary of the number of students enrolled in each class in the Sample application, using the Sum aggregation type to calculate the total enrolled for all locations.

**Figure C-5: Example chart report based on the Sample:Classes form**

In ad hoc reports, you can click in the data area of the chart to open the form with a results list containing the underlying requests. This drill-down function allows you to work interactively with the data at the time you run or preview the report.

For example, to see more information about the students enrolled in the class “Managing Within the Law” in the Sample application, the instructor can run this example report and then click the column labelled “Managing Within the Law” in the chart. The Sample:Classes form then opens with a results list containing the records for each student enrolled.

**Type of charts**

The following table describes the types of reports available from the Report Console:

<table>
<thead>
<tr>
<th>Chart</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pie</td>
<td>Pie charts are most often used to display a few components that are easily distinguishable. Typically, each slice of a pie chart displays statistics from one variable as a slice of the pie.</td>
</tr>
<tr>
<td>Bar</td>
<td>Bar charts are most often used for direct comparison of magnitude between categories. Bar charts can also be used to show time dependent data when the time interval is small.</td>
</tr>
<tr>
<td>Line</td>
<td>Line charts are most often used to display trends. Line charts display values along a common baseline, which allows quick and accurate comparisons.</td>
</tr>
<tr>
<td>Area</td>
<td>Area charts are used to display a limited number of related, continuous variables.</td>
</tr>
</tbody>
</table>
To define a chart report

1. Create a new report as described in “To start a new report” on page 167.
2. In the Content field, select Chart or Chart + List.
   - **Chart**—The report is presented as a chart or graph of the type you select.
   - **Chart + List**—The report is presented as a chart, followed by a table. Use this procedure to define the chart section of the report. To define the list, see “Defining a Web list report” on page 168.
3. In the Chart Options tab, select the chart options:
   - **Type**—The type of chart you want to produce, such as a pie chart or a bar chart.
   - **Category Field**—Select the field to supply the category data for the chart.
     
     In a pie chart, the values in the category field become the “slices” of the pie. In graphs, such as a bar chart, the values in the category field are plotted on the X-axis.

   **WARNING**
   
   Make sure that the category you selected includes values. A null value can inhibit the interactive drill-down functionality of the report.

   - **Category Label**—Supply a label to appear on the chart that describes the category data.
   - **Aggregation**—Select an aggregation method that makes sense for the data in the report.
     - **Count**—Reports the number of existing records for each unique value in the category field.
     - **Sum**—Adds the values in the series field for each unique value in the category field.
     - **Average**—Calculates an average of the values in the series field for each unique value in the category field.
- **Minimum**—Shows the minimum of the values in the series field for each unique value in the category field.
- **Maximum**—Shows the maximum of the values in the series field for each unique value in the category field.
- **Series Field**—Select the field to supply the category data for the chart.
  
  In a pie chart, the values in the series field are used to create each “slice” of the pie. In graphs, the values in the series field are plotted on the Y-axis.
- **Series Label**—Supply a label to appear on the chart that describes the series data.

For example, to produce a chart report based on the Sample:Classes form that shows the number of students enrolled in each class, select the following chart options:

- **Type**—Tube Chart
- **Category**
  - Field—Class Title*
  - Label—Class title
- **Series**
  - Aggregation—Sum
  - Field—Number Enrolled*
  - Label—Total enrolled

4 (Optional) To preview the report before you save it, click Preview.

A sample report runs and appears in a separate browser window.

5 To save the report for future use, click Save.

6 Click Back to return to the Report Console report list.

### Using a query in a Web report

To control which records from the form will appear in the report, build a query to select the data when the report runs. The query is saved as part of the report definition.

You can use the simple query builder, the advanced query builder, or both. The simple query builder joins all query statements with the AND operator. Alternatively, advanced users can build the query using AR System query syntax with the advanced query builder. To use the operator types OR or NOT, you must use the advanced query builder.

### Using the simple query builder

The Report Console includes a simple query builder that allows you to quickly construct a simple query. By default, the report designer screen opens with the simple query builder active.
To build a query using the simple query builder

1. In the Filter By area of the report designer screen, select a field from the Available Fields list.
2. Drag the field to the query area, or click Add Field.
3. Select the query operator:
   - **Is equal to**—Selects records in which the value in the chosen field matches exactly the value entered in the query.
   - **Is not equal to**—Selects records in which the value in the chosen field does not match the value entered in the query.
   - **Is empty**—Selects records in which the chosen field is empty.
   - **Is not empty**—Selects records in which the chosen field contains some data.
   - **Is myself**—Selects records in which the value in the chosen field matches the current user’s login ID.
   - **Is not myself**—Selects records in which the value in the chosen field does not match the current user’s login ID.
   - **Is LIKE**—Selects records in which the value in the chosen field matches the string defined in the query.

   The LIKE operator requires that you use the percent (%) wildcard, which matches any string of 0 or more characters. For example, to get a report of classes for which Teresa Logan is the instructor, use one of the following search strings:
   - Teresa% matches all entries that begin with “Teresa”
   - %Logan matches all entries that end with “Logan”
   - T%eresa% would find entries that start with “Teresa” or “Theresa”
4. Type the value to search for in the blank field.

   For example, to find Teresa Logan’s classes that have students enrolled, you could use the simple query builder to construct the following query:
Using the advanced query builder

The advanced query builder is located below the simple query builder. By default, the advanced query builder is closed. Click the expansion arrow to open it.

Figure C-7: The advanced query builder, opened

To use the advanced query builder to find the same records (Teresa Logan’s classes that have students enrolled), expand the advanced query builder and then add the following qualification:

'Instructor' LIKE "Teresa%" AND 'Number Enrolled' > 0

To add fields, you can drag them from the Available Fields list, or select the field and then click Add Field. To cause the query builder buttons to appear, you must add a field or click in the query area.

It is possible to enter queries in both the simple and advanced query builders for the same report. If you do, these queries are linked with an AND operator when the report runs. If the advanced query builder is closed, but contains a query, the beginning of the query appears along with the Advanced expansion button:

TIP

You cannot add elements in the middle of an existing query in the advanced query builder. If you need to modify an advanced query, you must add the modification on to the end of the existing query, or revise the entire query.

For more information about building AR System qualifications, see the Workflow Objects Guide, “Building qualifications and expressions,” page 49.

You can also use these query builders to add a query to an existing report at runtime. See “Adding to or overriding a report query at runtime” on page 163.

Queries on selection fields

Selection fields include drop-down lists, radio buttons, and check boxes. In selection fields, the sort order is determined by the database value assigned to each selection. This value is not visible when you are constructing the query. Depending upon how the database value is configured, you might get unexpected results.
For example, a Priority field in which the user selects High, Medium, or Low might have the database values High=0, Medium=1, Low=2. In this case, the query “Priority is greater than or equal to Medium” will return records with priority set to Medium or Low, because in database terms qualification is seeking values greater than or equal to 1.

If this occurs, try revising the query to use the opposite operation, for example “Priority is less than or equal to Medium,” and then re-run the search.

**Defining a query**

The following procedure begins in the Report Definition screen and assumes that you have already created the report itself as described in “To start a new report” on page 167.

- **To define a report query using the simple query builder**

  1. In the Filter By area, select the first field that you want to use in the query from the Available Fields list.
  2. Click Add or drag the field to add it to the simple query builder.
  3. In the simple query builder, click the down-arrow and select from the list of operations.
  4. Enter the value to search for.
     
     For example, to find classes for which Teresa Logan is the instructor, select the Instructor* field and the is equal to operation, and then type in Teresa Logan.
  5. To add another item to the qualification, select the appropriate field from the Available Fields list, and then click Add or drag the field to the simple query builder.
     
     The second search criterion is added to the simple query builder with an AND search. In other words, a record must match both conditions in order to appear in the report.
     
     For example to find Teresa’s classes that have at least one person enrolled, select Number enrolled and is greater than, and then type in 0.
  6. Click Save.

**Editing and deleting reports**

You can edit or delete any report that you created, and administrators can modify or delete any report. You cannot edit or delete reports created by others, but you can open them to view the built-in query and fields used in the report.

You can also create a copy of a report by using the Save As button to save the report with a new name. In that case, you are the creator of the new report and can edit it.
To edit an existing report
2. Click the Edit Report icon that appears to the left of the report name in the console.
3. Make any necessary modifications to the report as described in:
   - “Defining a Web list report” on page 168
   - “Defining a Web chart report” on page 170
   - “Using a query in a Web report” on page 173
   - (For AR System reports) “Defining AR System reports” on page 177.
4. Click Save to save your changes.
5. Click Back to return to the Report Console list.

To delete an existing report
2. Click Delete.

Defining AR System reports
Create an AR System report if you need to export data directly to AR System export (.arx), AR System XML, or comma-separated value (.csv) format.

To create an AR System report
1. In the Report Console, click New.
2. Select the AR System report type.
   The ReportCreator opens in New mode.
In the Report Name field, enter a unique, locale-specific name for the report; for example, MyReport-en.

4. From the Report Format drop-down list, select one of the following choices for the format of the report:
   - **Record**—Displays each field of the request on a separate line.
   - **Column**—Displays each field as a column heading, and displays information from each request in a separate row.
   - **Compressed**—Compresses the information with commas, white space, or any other specified character between the columns. In a browser, the compressed format is viewed in a column format.

5. (For administrators) In the Locale field, enter the locale of the report in the format language_COUNTRY, for example pt_BR.

The country portion of the locale code is optional, depending on whether you want to allow all country variations of a language to use the report. If you enter only the language portion, all country variations of a language can use the report. For example, an entry of pt would include all country variations of Portuguese, but pt_BR designates only Brazilian Portuguese.

For a list of standard choices for this field, check the Locale view property on any form in BMC Remedy Developer Studio.

6. In the Report Set field, enter a locale-independent description for the report.

The Report Set field is used to identify locale variants of the same report. The combination of Report Set and Locale must be unique.

7. Update each tab in the form as described in the following sections.
Entries that are specific to Windows reports are identified in each of the tabs. Those settings are ignored for Web reports.

8 Save the report.

**Fields tab**

In the Fields tab, define the fields on the form from which data is being reported to be included in the report.

- **To specify fields to be included in a report**
  1. In the Field field, click the menu button to select which fields on the specified form will be displayed on the report.
  2. In the Label field, enter the field name as you want it displayed on the report.
  3. In the Field to Add Before/After field, select a field to use as a reference when clicking the Add After or Add Before buttons.
  4. Click Add Before or Add After to set the positioning of fields in a report, with reference to the Field to Add Before/After field.
  5. Click Modify to update the selected field label or width specification.
  6. Click Remove to remove a selected field.
  7. Click Remove All to remove all selections from the field list.

**Sorting tab**

In the Sorting tab, select fields to sort on and set the sort order and grouping for each field for the report. You can select up to five fields for sorting.

- **To specify sorting criteria**
  1. From the first Field Name list, select the field on which you want to sort.
  2. Select Ascending or Descending Sort Order for the selected field.
  3. To group by a field, select the Group check box for the selected field.
  4. Repeat steps 1 through 3 for the other fields on which you want to sort.

**Statistics tab**

In the Statistics tab, define expressions that will calculate statistics for the requests contained in the report. Use the Statistics tab to specify what type of statistics to include.

- **To include statistics in a report**
  1. From the Operation field, select the appropriate operation:
     - **Count**—Tallies the number of requests.
     - **Sum**—Adds up specified fields or the arithmetic relationship among fields.
- **Average**—Calculates the average of specified fields.
- **Minimum**—Calculates the minimum value for a specified field.
- **Maximum**—Calculates the maximum value for a specified field.

Except for Count, these operations can be applied only to numeric and date/time fields. Each operation can apply to the whole report, or to a group of requests in a report. Groups are defined in the Sorting tab.

2 From the Expression field, select a field from the menu list to include as part of a statistic.

An expression is required for all statistical operations except Count. Whether you include an expression for a Count operation depends on how you want rows with null values to be counted.

If you are defining a Count operation that includes an expression, only rows with a value that is not null for the specified expression are counted when the report is run. If you are defining a Count operation that does not include an expression, all rows returned are counted, including those with null values.

The menu list displays all numeric or date fields in the form. Expressions can include any of the following values:

- Numeric fields
- Date fields
- Status history fields
- Keywords

The most commonly used keywords are $DATE$, $NULL$, $TIME$, $TIMESTAMP$, $USER$, and $WEEKDAY$. Keywords are case-sensitive and must be entered in all capital letters. For a complete list of AR System keywords, see the *Workflow Objects Guide*, “Keywords,” page 221.

**NOTE**

For reports to run properly in a browser, you must add a backslash to the keyword in the Expression field, for example, $\TIMESTAMP$.

- Numbers
  - You can type numbers directly into the Expression field, for example, 5.25, 33, and so on.
- Arithmetic operators (+, -, *, /, and %)
  - You can type arithmetic operators directly into the Expression field, similar to the way they are entered in the advanced search bar.

3 In the Label field, type the label to identify a statistic on the report.
You can use text, keywords, or field values, and enter as many as 128 characters. To use keywords for the Label field, click the menu list and select the appropriate keyword. Include one of the following results formats:

- `%* %` Default format
- `%#%` Numerical format (total number of seconds)
- `%:%` Time format (hh:mm:ss; hours, minutes, and seconds)

On the report, the statistic will appear inside the label. For example, a label created as `Statistical result is %#% days` will appear on the report as `Statistical result is 123 days`.

You can also include any of the following control characters in a label field:

- `` Backspace
- `
` Return
- `	` Tab
- `\` Backslash
- `\\` ASCII character

4. From the Compute On field, select the scope of a statistic.
   You can determine whether a statistic is calculated for the entire report, or for defined groups within the report by selecting the appropriate setting in the Compute On field.
   - **Report**—Calculates the statistic for all entries in the report. The statistic appears at the end of the report.
   - **Group N**—Calculates a statistic for groups defined in the Sorting tab. The statistic appears below each group.

5. In the Layout field, for the Windows platform only, specify how you want the results to be displayed in the report by choosing one of the following options:
   - **Single**—Displays all the statistical results on one line.
   - **Multiple**—Displays each statistical result on its own line.
   - **Column**—Displays the result for each value at the bottom of the column of the field specified in the Expression field. Column is valid only for a column-formatted report.

The Layout field setting works with the Compute On setting to determine where a statistic appears on a report.

**Page Setup tab**

In the Page Setup tab, you only need to specify the page configuration information in the General section.
To specify general page configuration information

1. Enter the name of the report in the Title field. The report title appears at the top of the report.
2. Enter text in the Header field. The header appears at the top of every page.
3. Enter text in the Footer field. The footer appears at the bottom of every page.

To use keywords for the Title, Header, and Footer fields, click the menu list and select the appropriate keyword. The data in the Title, Header, and Footer fields must be a single line. Embedded carriage returns are not allowed.

The other sections on the Page Setup tab, marked “(windows)”, are for use in BMC Remedy User only and are not required when creating an AR System report on the Web.

Qualification tab

In the Qualification tab, specify which records to include in a report. If a report is run from a results list, any qualifications defined in this tab are ignored. See the Workflow Objects Guide, “Building qualifications and expressions,” page 49.

Description tab

In the Description tab, enter a description of the report.

Permissions tab

(For administrators only) In the Permissions tab, use the Assignee Groups field to define who has access to a report.

If the server is configured to allow multiple groups in the Assignee Group field, then this field will allow multiple groups to be specified, separating each group with a single space. If the server is not configured to allow multiple groups, then only one group can be specified in this field.

Leaving the Assignee Groups field blank allows only the submitter to view the report. Specifying Public allows anyone to view the report.

Administration tab

In the Administration tab of the Report Creator form, enter the user name of the person who is creating the report, and define the status of the report.

1. In the Submitter field, enter the name of the user creating the report.
2. In the Status field, select one of the following options:
   - Active—Makes the report available in the Report Console.
   - Inactive—Indicates a report that is no longer active.
   - Pending—Indicates a report that is being reviewed.
If Inactive or Pending is selected, the report does not appear the Report Console list.

Export file formats for AR System reports

You can save or export AR System data to use in AR System forms, in a spreadsheet, or in other applications. You can also save or export non-AR System data from another application to use in an AR System form.

The file formats that you choose for exporting depend on the original data source and how you will use the data. File formats for AR System reports are explained in the following sections.

**AR Export format**

AR Export (.arx) is the default file type. It yields the cleanest results when data is exported and imported within AR System. The AR Export format properly formats data that you import into an AR System form by using BMC Remedy Data Import.

**NOTE**

When an attachment is exported in AR Export format from a browser, a .zip file is created that includes the .arx file and the attachments.

**AR XML format**

AR XML (.xml) is a BMC Remedy XML standard derived from the W3C XForm standard, and it contains several elements that are required for AR System use. To import XML data into an AR System form by using BMC Remedy Data Import, your data must conform to the AR XML data specification. Data exported to the AR XML file type conforms to this specification. You can also convert XML data obtained outside AR System to the AR XML standard.

Conversely, you can export AR XML data, parse it with any tool that parses documents that conform to the XForm specification, and use the data outside AR System. For information about XForms, see the W3C website.

Attachments are handled in the same manner as in the .arx file type.

**NOTE**

When you export AR System data from Crystal Reports to HTML 3.2, HTML 4.0, or XML, your default export directory depends on whether your computer is connected to a network. If your computer is connected to a network, and your login profile has a temporary directory setting under Windows, your default export directory will be USERPROFILE%\LocalSettings\Temp. If your computer is not connected to a network your export will default to whatever temporary directory is set in your Windows environment settings, for example, C:\Temp or C:\Windows\Temp.
Comma-separated values format

You can use the comma-separated values (.csv) format if you plan to use the report data in other applications, such as Crystal Enterprise or in spreadsheets. For example, if you want to use the report data in a Microsoft Excel spreadsheet, export it as a .csv file, open Excel, and import the data into the Excel file.

**NOTE**
You cannot export the content of an attachment with a .csv file. If you export a .csv file with an attachment, only the file name of the attachment is exported.

Record, column, and compressed formats

When you select Record, Column, or Compressed format in the ReportCreator form in a browser, the report is saved as an HTML file (for example, report.rep.html).

Also, the compressed format is not supported in a browser. If you select Compressed as the report format, the report is displayed in Column format instead.
If an application that you are using has flashboards, you can manipulate the appearance of flashboards and go deeper into the displayed data.

The following topics are provided:

- Viewing flashboards (page 186)
- Drilling down to information in flashboards (page 187)
Viewing flashboards

If an application includes a flashboard (a graph such as bar chart or pie chart), you can manipulate the look of the flashboard.

➤ To manipulate a flashboard

1 Use the following controls to manipulate the flashboard.

Table D-1: Flashboard controls

<table>
<thead>
<tr>
<th>Button or field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Options panel" /></td>
<td>Opens the Options panel where you can make changes as described in step 2.</td>
</tr>
<tr>
<td><img src="image" alt="Full-screen view" /></td>
<td>Opens the flashboard to a full-screen view. In a browser, press ESC to return to normal view.</td>
</tr>
<tr>
<td><img src="image" alt="Normal view" /></td>
<td>Returns the flashboard to a normal view.</td>
</tr>
<tr>
<td><img src="image" alt="Toolbar" /></td>
<td>Opens the toolbar, which reveals the Zoom buttons, the Show Legend check box, and the chart selection menu.</td>
</tr>
<tr>
<td><img src="image" alt="Closes toolbar" /></td>
<td>Closes the toolbar, which reveals the Zoom buttons, the Show Legend check box, and the chart selection menu.</td>
</tr>
<tr>
<td><img src="image" alt="Legend" /></td>
<td>Displays a legend for the flashboard.</td>
</tr>
<tr>
<td><img src="image" alt="Zoom in" /></td>
<td>Zooms in on specific parts of the flashboard. Click the button, and move the cursor to the flashboard. Click and drag the area you want to zoom in on.</td>
</tr>
<tr>
<td><img src="image" alt="Zoom out" /></td>
<td>Zooms out to view more of the flashboard.</td>
</tr>
<tr>
<td><img src="image" alt="Chart selection" /></td>
<td>Allows you to change the flashboard to another type of chart. The options are: Line Chart, Column Chart, Stacked Bar, Area Chart, Stacked Area, Pie Chart</td>
</tr>
</tbody>
</table>

2 To change labels or variables, click the properties ( ) button, and edit the following options:

- Title—Title that appears in the tab above the set of flashboards.
- X Axis Label
- Y Axis Label
- Active Variables—Enables you to add or remove variables from the flashboard.
Drilling down to information in flashboards

You can view more information about a chart in a flashboard using the following methods:

- Mouse over a grouping, and a tooltip displays the statistics for that grouping.
- Click a grouping, and a tooltip displays more statistical information (such as the x and y values).

To view the information on line, area, and stacked area charts, mouse over or click the end point of the group.
In large AR System applications such as those in the BMC Remedy IT Service Management Suite (BMC Remedy ITSM Suite), some actions performed through the AR System Administration Console might trigger a client cache load or an admin copy cache. This section describes action ITSM action that can trigger a client re-cache or an admin copy cache event.

The following topic is provided:

- “Actions in ITSM 7.0.00 applications that trigger caching” on page 190.
## Actions in ITSM 7.0.00 applications that trigger caching

<table>
<thead>
<tr>
<th>Action</th>
<th>Client cache load</th>
<th>Admin copy cache</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating, modifying, or deleting a nonsupport user</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Creating, modifying, or deleting an organization</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Creating, modifying, or deleting a company</td>
<td>NO</td>
<td>YES(^1)</td>
</tr>
<tr>
<td>Creating, modifying, or deleting an association between a company and one of these items:</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>■ Approval mapping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Cause</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Operational category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Product category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Status reason</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creating, modifying, or deleting a resolution category</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Adding a company to a support user’s access restriction list</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Deleting a company from a support user’s access restriction list</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Adding a support group to a support user’s profile</td>
<td>NO(^2)</td>
<td>NO</td>
</tr>
<tr>
<td>Deleting a support group from a support user’s profile</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Adding an application permission to a support user’s profile</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Deleting an application permission from a support user’s profile</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Creating a service target</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Deleting a service target</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Adding or removing attributes in the BMC Atrium CMDB</td>
<td>YES(^3)</td>
<td>YES</td>
</tr>
</tbody>
</table>

\(^1\) Removes the group record associated with the company.

\(^2\) Support groups are not used as permission groups in structures. This action does not trigger a client cache load.

\(^3\) The form must be open.
This section describes the best practices for configuring mid tier cache settings. The following topics are provided:

- “About mid tier caching” on page 192
- “Configuration recommendations” on page 192
- “Actions that affect mid tier caching” on page 196
About mid tier caching

The first time a form, view, or form and view combination is requested via the mid tier, performance can be impacted by the intensive processing necessary to obtain the form, field, active link, and associated information from AR Server. To minimize the usability impact of this performance hit, the mid tier configuration tool includes the following configuration options:

- **Flush cache**
  
  Removes all items from the mid tier cache. When the objects are requested, the most up-to-date versions are retrieved from the AR System server. For details about the Flush Cache feature see Table 1-4, “Flush Cache” on page 31.

- **Sync cache**
  
  Clears only objects that have changed on the server after the last cache clear event. In this case the mid-tier contacts AR Server and compares the last-changed-timestamp on elements and synchronizes any changes. For details about the Sync Cache feature see “Sync cache option” on page 31.

**NOTE**

The Sync cache feature is not available for 7.1.0 and prior releases.

- **Definition Change Check Interval**
  
  This mid tier cache setting is configured to set an interval (in seconds) at which information in the cache is updated. The default value is 3600 seconds. For details about the Definition Change Check Interval setting see Table 1-4, “Definition Change Check Interval (seconds)” on page 21.

Configuration recommendations

To maximize performance and usability, the following configuration practices are recommended:

- “Disable mid-tier Prefetch” on page 192
- “Performance checking” on page 193
- “Activate the Pre-Load option” on page 194
- “Enable Cache Persistence” on page 195
- “Clear the cache and restart the server” on page 195

Disable mid-tier Prefetch

Prefetch loads forms into memory based on a somewhat arbitrary list of forms configured in the prefetch Config.xml file by the system administrator. Forms and other cache objects end up in memory that may not ever be accessed by end users. This can waste valuable memory space.
Use the following steps to disable Prefetch.

**Disable Prefetch**

1. From the mid tier configuration tool, click Cache Settings.
2. Scroll down to the Prefetch Configuration text box.
3. Remove the contents of the `prefetchConfig.xml` file.
4. Add the following content:
   ```xml
   <?xml version="1.0" encoding="UTF-8"?>
   <midtier-prefetch-config xmlns="http://www.bmc.com/remedy/midtier/midtier">
   </midtier-prefetch-config>
   ```
5. Click Save Changes.

**Performance checking**

Sync Cache eliminates the need for administrators to flush the entire mid-tier cache after a form, active link, menu, or other definition change on AR Server. When this feature is activated, the mid tier cache is automatically synchronized with the changed objects. The check is performed at the interval selected in the Definition Change Check Interval field.

**Activate the Perform Check feature:**

1. Open the mid tier configuration tool and click Cache Settings.
2. On the Cache Settings page ensure that the Perform Check checkbox is selected. This activates Sync Cache.
3. Use the Definition Change Check Interval text box to configure the time (in seconds) interval for the sync to activate.

**NOTE**

An administrator can press the new Sync Cache button to have the changes synchronized immediately.

The Sync Cache operation synchronizes any of the following objects, if the changed timestamp on AR Server is more recent than the cached item in the mid-tier cache:

- Forms
- Active links
- Containers (guides, applications, web services)
- Menus (character menus)

Sync Cache completely removes and rebuilds the following cache items since the performance hit is minimal:
- Group data
- Role data
- Image objects

**NOTE**
The Sync Cache feature is not available in pre 7.5, patch 004 versions.

### Activate the Pre-Load option

When the Pre-Load option is activated, the following items are loaded with the server is started (or restarted):
- Active links
- Menus
- User facing forms (any form with an associated active link)

#### Activate the Pre-Load option

1. Open the mid tier configuration tool and click AR Server.
2. Select the server to edit, and click Edit (If you are adding a server, click Add Server).

### AR Server Settings

<table>
<thead>
<tr>
<th>DELETE/EDIT</th>
<th>SERVER NAME</th>
<th>ADMIN PASSWORD</th>
<th>PORT</th>
<th>RPC</th>
<th>PRE-LOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>arsysinfo</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

Select All  Clear All

Add Server  Edit  Delete  Help
3 Select the Pre-Load checkbox next to the server name.

4 Click Save AR Server (or Add Server if adding a new server).

**Enable Cache Persistence**

Enable faster retrieval of forms when the server is restarted, by activating the Enable Cache Persistence option.

1 Open the mid tier configuration tool and click Cache Settings.
2 Select the Enable Cache Persistence check-box.

3 Click Save Changes.

**Clear the cache and restart the server**

Use the followings steps to clear the cache and restart the server after implementing the setting changes outlined in this section.

1 Shutdown the JSP engine.
2 Remove the contents of the following mid tier directories:
   - cache
   - cachetemp
3 Start the JSP engine.
4 Allow Pre-Load to complete processing.
5 Allow end users access to the system.

Before moving to the next step, it is recommended to allow one to two days of normal system usage. Patch 004 provides functionality to update the statistics file (viewstats.dat) with the following information about forms and views access requests.

6 After 1-2 days of usage disable Pre-Load in mid-tier configuration tool by unchecking the check box next to the AR server name on the AR Server Settings page.

7 Stop the JSP engine.

8 Start the JSP engine. With Prefetch and Pre-Load disabled mid-tier will on startup use its statistics file to quickly load up into memory from the disk cache only forms which users have really been accessing. This will allow for the most efficient use of mid-tier’s in memory cache and the best form access performance for end users.

**Actions that affect mid tier caching**

The following actions will affect an object cache or re-cache in the case of a flush, cache, sync cache or Definition change:

- Add a user
- Modify a user
- Delete a user
- Add a group
- Remove a group
- Remove a group from the Group List in the User form
- Add a user to a group
- Remove a user from a group
- Add a computed group
- Add a group to a computed group
- Remove a group from a computed group
- Add a user to a group that is part of a computed group
- Remove a user from a group that is part of a computed group
- Create, modify, or delete an application
- Create, modify, or delete an active link
- Create, modify, or delete an active link guide
- Create, modify, or delete an entry in the Group form (not every field must be affected)
- Create, modify, or delete an entry in the Role Mapping form (not necessarily every field)
Actions that affect mid tier caching

- Create, modify, or delete a form
- Create, modify, or delete a menu
- Create, modify, or delete a packing list
- Create, modify, or delete a view
- Create, modify, or delete a web service
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