Business Objects™

Crystal Reports XI R1 and XI R2

Dynamic, Cascading Prompts Performance Tuning

Overview

This white paper describes how to configure your system to achieve optimal performance from Crystal reports that use dynamic, cascading prompts when deployed to Crystal Reports Server, BusinessObjects Crystal Decisions, or BusinessObjects Enterprise.

Contents

Introduction

Dynamic, Cascading prompts (DCP) were introduced in Crystal Reports XI and have proven to be very popular. This new technology added the ability to populate a pick list from a dynamic data source, but it also modified how static pick lists were implemented.

This whitepaper describes how to achieve the best possible performance from your system when dynamic, cascading prompting is in use.

Patch Requirements

This document is written assuming you have installed the following patches. If you are on a prior version of BusinessObjects Enterprise or Crystal Reports Server, then we recommend you migrate to this service pack for optimal prompting performance.

BusinessObjects XI R1: Install SP3, English Readme.

BusinessObjects XI R2: Install SP2

Definitions

Managed Report: A report stored in either BusinessObjects Enterprise or Crystal Reports Server.

View Time Security: A Business View that has a filter at the Business Element or Data Foundation level, and that filter is associated with a security group.

Prompting Components

This section reviews the relevant components used by a BusinessObjects
Enterprise or Crystal Reports Server installation. Components that are
not relevant to Crystal Reports prompting are not shown for clarity.

Figure 1
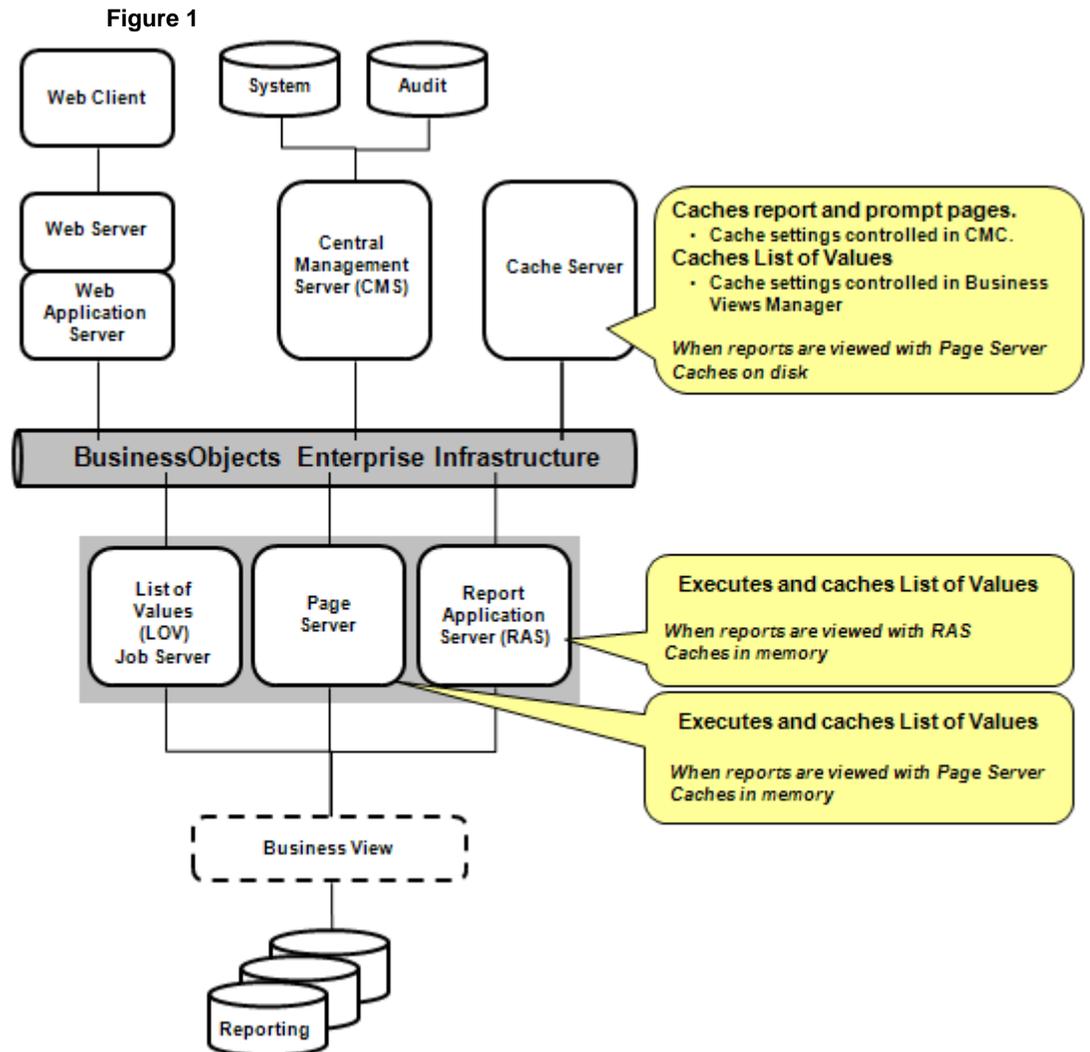
If the report is viewed using the Report Application Server (RAS) (such
as when using the Advanced DHTML Viewer), then the RAS will be
responsible for caching the List of Values (LOV), and the RAS will
respect the cache settings of the LOV set in Business Views Manager.

If the report is viewed using the Page Server (when using the DHTML
Page Viewer), then the Cache Server caches the LOV.

Business Element Tuning

Let's review the components in the LOV metadata stack:

Table 1

Component	Description
LOV	Arranges Business Element fields into one or more levels of Value and Description fields to be used for dynamic cascading prompts.
Business View	Container of multiple Business Elements
Business Element	The 'logical view' of the Data Foundation layer. A list of Business Fields that are referenced from the Data Foundation layer.
Data Foundation	The 'physical view' of the database represented by the Data Connection. Identifies tables and establishes join conditions.
Data Connection Dynamic Data Connection	The connection to the underlying database.

The Business Views engine will load metadata from the system that is identified in the Business Element layer.

Therefore the Business Element that you use for your LOV should have the fewest number of fields as possible. Additional fields in the Business Element that are unused by LOV objects will have their metadata loaded regardless if they are used or not.

Recommendations

We recommend that the Business Element used by your LOV contain only one-two times the number of fields that are used by the LOV.

Business Elements can still be reused by multiple LOV objects.

For example, if there are three LOV using a Business Element, and each LOV has four fields, then the underlying Business Element should contain a maximum of eight fields.

To perform this tuning in Crystal Reports XI, you will need to modify parameters to use different LOV objects that are based on lightweight Business Views.

To perform this tuning in Crystal Reports XI R2, the LOV can be modified in Business Views Manager to reference a different (but type-compatible) Business View and Business Element. No report modification is needed. To perform this step in Business Views Manager XI R2 do the following,

1. Right-click on the LOV you want to modify.

2. Click **Change Business View…**

3. Select the new Business View that you want to use as the data source for your LOV

4. Map the current fields to the new Business Element fields.

Cascading LOV Data Access Tuning

The values in a cascading LOV object are fetched from the database in one of two ways:

- All values for all levels in one database access

- On demand for each level.

The prompting engine will choose which access method to use based on how the LOV is constructed. If any of the following conditions are true, then the prompting engine fetches values for all levels in a single database access:

- A stored procedure is the datasource of the LOV – either directly or indirectly through a Business View.

- A command object is the datasource of the LOV – either directly or indirectly through a Business View.

- The LOV is based on a secured Business View. A Business View is secured when either the Data Foundation or Business Element level includes a filter that is associated with a security right.

- The LOV uses a description field at any level.

If all of the above conditions are false, then the system can access the database on demand for each level in the LOV.

Recommendations

- Configure your LOV to ensure on-demand access for each level of the LOV.

- Schedule the LOV if your LOV is executed once for all levels, or there are a lot of values on all levels (many hundreds or thousands). This reduces the amount of time taken to access the database.

Cache Server and Page Server Tuning

Caching occurs at many levels of the system. This section describes caching within the Cache Server and Page Server level.

Cache Server Behavior

The Cache Server is the first cache checked when generating a prompt page.

The Cache Server can cache both report pages and the prompt page for the report. It also caches individual LOV or prompts. The Cache Server is the first cache that is encountered by the system, so a cache hit at this level will result in the fastest possible prompting performance.

It operates on a simple request-response model whereby it attempts to satisfy requests for pages from its cache, and if it cannot then it forwards the request to the Page Server.

Page Server Behavior

The Page Server generates prompt pages.

If a cached prompt page cannot be found on the Cache Server, then a request to rebuild the prompt page is sent to the Page Server. The Page Server will then check the Cache Server for any cached LOV that can be used on the new prompt page. LOV that cannot be found on the Cache Server are re-executed and re-populated by the Page Server. Newly created prompt pages are cached in memory in the Page Server and on disk the Cache Server for future use.

Command Line Options

Ignoring View Time Security

When the Cache Server receives a request for a prompt page, it checks the cache to see if it is there. The request includes the report and the BusinessObjects Enterprise user name. The default behavior for the Cache Server is to look for prompt pages that were previously created for the user and the report that is in the request. This means that if the requesting user has run the same report previously, and that reports' prompt page is still in the cache, then there will be a cache hit and the system will return the same prompt page that was generated for the prior run.

This is the default behavior because the system assumes that lists of values are 'secured', or unique for each requesting user. **If you know that there are no secured lists of values in your system**, then you can modify this behavior with a new Cache Server command line option. A LOV is considered secured if is based on a Business View or Business Element that uses a filter associated with a user group other than 'Everyone'.

The Cache Server/Page Server command line option is

```
–cacheIgnoresLovViewTimeSecurity
```

When this command line option is set, the Cache Server/Page Server ignores the userid in the incoming request when looking for prompt pages. This means that cached prompt pages can be shared between users.

CAUTION	If this option is turned on for systems with secured LOV, then it will be possible to display secured values to users that are not supposed to see them.

For this reason, we only recommend that you use this option if you know that there are no LOV in your system that use view time security. If there are reports that use view time security, and no LOV with view time security, then you can still enable this option.

Controlling Data Sharing

The Cache Server and Page Server will attempt to share data between report jobs. In some cases, such as when the report and prompt page are secured, attempts to share data between users will fail in most cases.

If you know that the reports in your system all use view time security, or the reports have at least one parameter that uses a secured LOV object, then we recommend you turn on this command line option.

The Cache Server/Page Server command line option is

```
–doNotWaitToShare
```

When this command line option is set, the Cache Server/Page Server will not wait to attempt to share data between users, resulting in better overall performance and scalability.

Data sharing will still be possible in this scenario, but only when multiple requests are not received by the system simultaneously.

NOTE	If you have a mix of view time security and non-view time security reports in your system, then we do not recommend applying this command line option.

Optimizing the Page Server for Viewer Processing

There are many viewers that can use the Page Server. Most support dynamic, cascading prompts, but the Java Applet Viewer does not.

 If the Page Server knows that there won't be any requests from the Java Applet Viewer, then it doesn't need to incur the overhead of gathering prompting information to service these requests.

To let the Page Server know that it can make this optimization add this command line option to the Page Server the command line to:

```
-procreportoptions __nosupportforoldviewers
```

Command Line Option Reference

The following section summarizes the Cache Server and Page Server command line arguments that can improve dynamic, cascading prompt performance.

These parameters <u>must be set on both the Cache Server and the Page Server</u> to coordinate the sharing logic between these servers.

Table 2

Parameter	Description
-cacheIgnoresLovViewTimeSecurity	Optional. Use this when you have no secured lists of values in the system. The system can then share prompt pages between users. If this is not set, then the system assumes that the lists of values are secured, and prompt pages are not shared between users.
-doNotWaitToShare	Optional. Use this when you know the reports and prompt pages are secured and should not be shared between users. The system will not attempt to share data for these objects between users.
-procreportoptions __nosupportforoldviewers	Optional. Use this when you know the Page Server won't be receiving any requests from the Java Applet Viewer. This option is available after applying BusinessObjects XI R1 SP1 or higher.

Cache Server Configuration

The Cache Server is configured in two different areas of the Central Management Console (CMC).

Server Default Settings

These settings apply to all objects in the Central Management Server (CMS) that have not overridden the system defaults. The important value to tune is **Oldest on-demand data given to a client (in minutes)**.

Figure 2
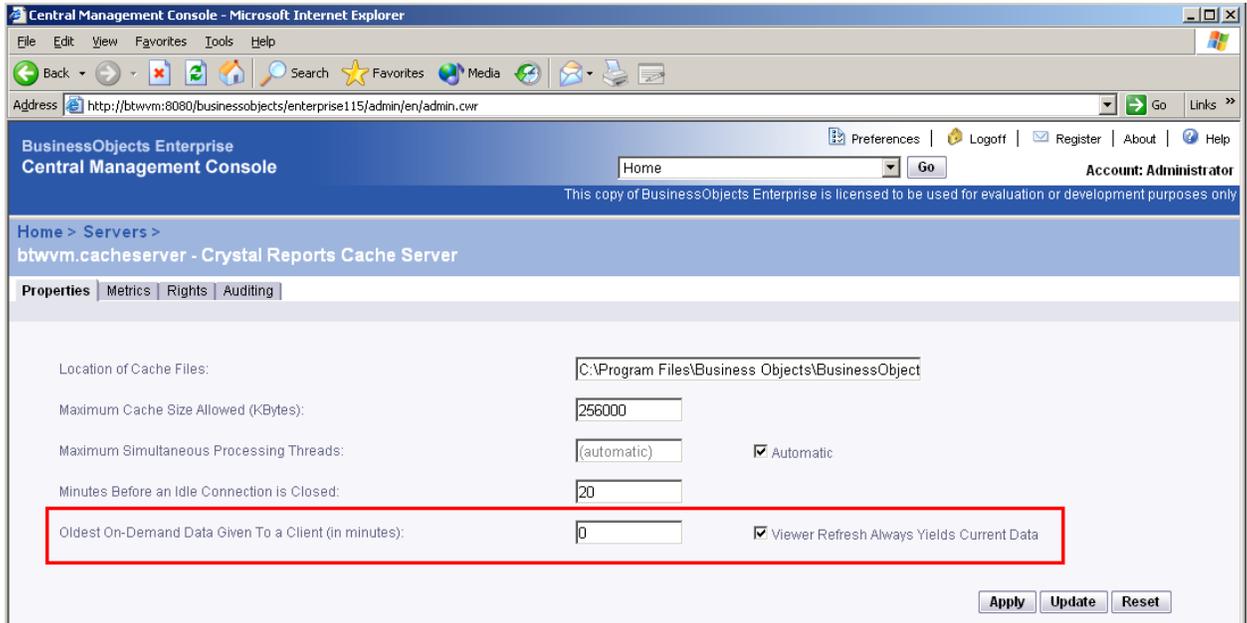
This value controls how long report pages and prompt pages can stay in the cache. Once an object has been in the cache for the given number of minutes, it is aged out of the cache and there will be no further cache hits for this object.

The default setting is 0 – which means that no prompt pages or report pages will be server from cache.

For optimal prompting performance, we recommend setting this value to the largest possible value without impacting data currency. For example, if the data that your reports access changes only once a day, then you can probably set this value to be 8 hours (or 480 minutes). If the data that your reports access changes every 5 seconds, and your report consumers need to see current data, then this value should be set to 0.

Remember when setting these values that these are system-wide defaults, so you should set these values to accommodate the most common case. You can override these system-wide defaults with different settings per object, and make them shorter or longer than the default setting here.

Selecting **Viewer Refresh Always Yields Current Data** will generate new prompt pages and report pages whenever the refresh button on the report viewer is pushed. We suggest leaving this selected to ensure that

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reports show the latest data after the **Refresh** button is clicked in the viewer.

When increasing the **Oldest on-demand data given to a client (in minutes)** setting, ensure there is sufficient disk space on the Cache Server and the maximum cache size allowed is set appropriately.

Object Override Settings

These settings apply to each specific Crystal Report object in the CMS.

Figure 3
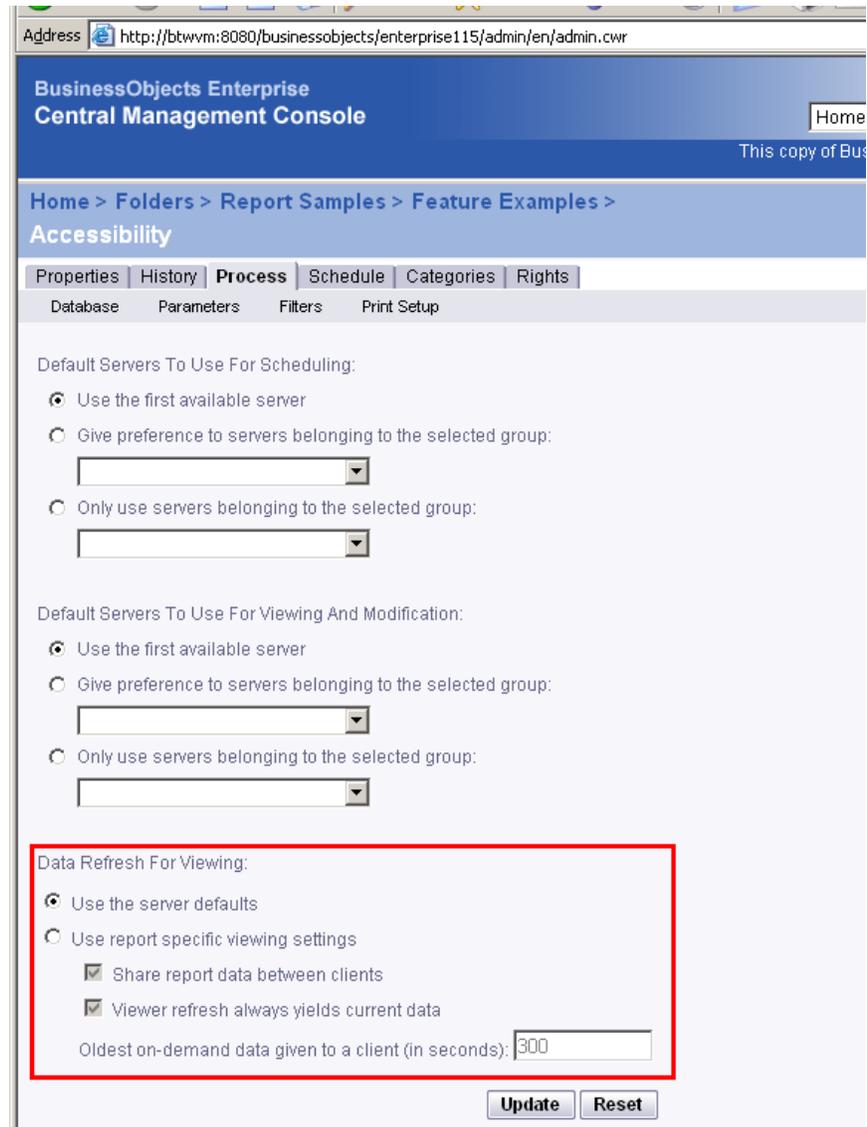
When set to **Use the server defaults**, the report object will use the Cache Server settings described in the prior section.

When set to **Use report specific viewing settings**, you can configure report-specific cache timeout values.

The **Oldest on-demand data given to a client (in seconds)** value here has the same meaning as for the Cache Server as a whole – the only difference is the scope of the setting is for the current report and not for all reports processed by that server.

For optimal prompting performance, we recommend setting this value to the largest possible value without impacting data currency.

Recommendations

1. Set the **Oldest on-demand data given to a client (in minutes)** value on the Cache Server and the **Oldest on-demand data given to a client (in seconds)** at the report object level to the largest possible value without impacting data currency. Keep in mind that this value applies to both the report pages and the prompt page.

2. Apply the same command line settings to all Cache Server and Page Server instances in your installation.

3. Use the `–cacheIgnoresLovViewTimeSecurity` command line option on the Cache Server and Page Server if there are no reports in your system that use lists of values with view time security.

4. Use the `–doNotWaitToShare` command line option on the Cache Server and Page Server if all reports in your system use view time security for both report data and LOV.

5. Use the `-procreportoptions __nosupportforoldviewers` command line option if you know your system does not need to support the Java Applet Viewer.

NOTE	The -procreportoptions __nosupportforoldviewers command line option is available after applying BusinessObjects XI R1 SP1 or higher.

RAS Server Tuning

When the user views report using Advanced DHTML viewer, or another viewer that has been configured to use the RAS, then the prompt engine will use the RAS to process each LOV in the prompt page. RAS has its own cache, and can satisfy the request for LOV data from its own cache.

The cache timeout value for the RAS cache is controlled from two places:

- At the LOV level from the **Edit List of Values** dialog within the Business Views Manager. (See above)

- At the RAS level from the Central Configuration Manager (CCM).

The image below shows the RAS properties dialog from the CCM:

Figure 4
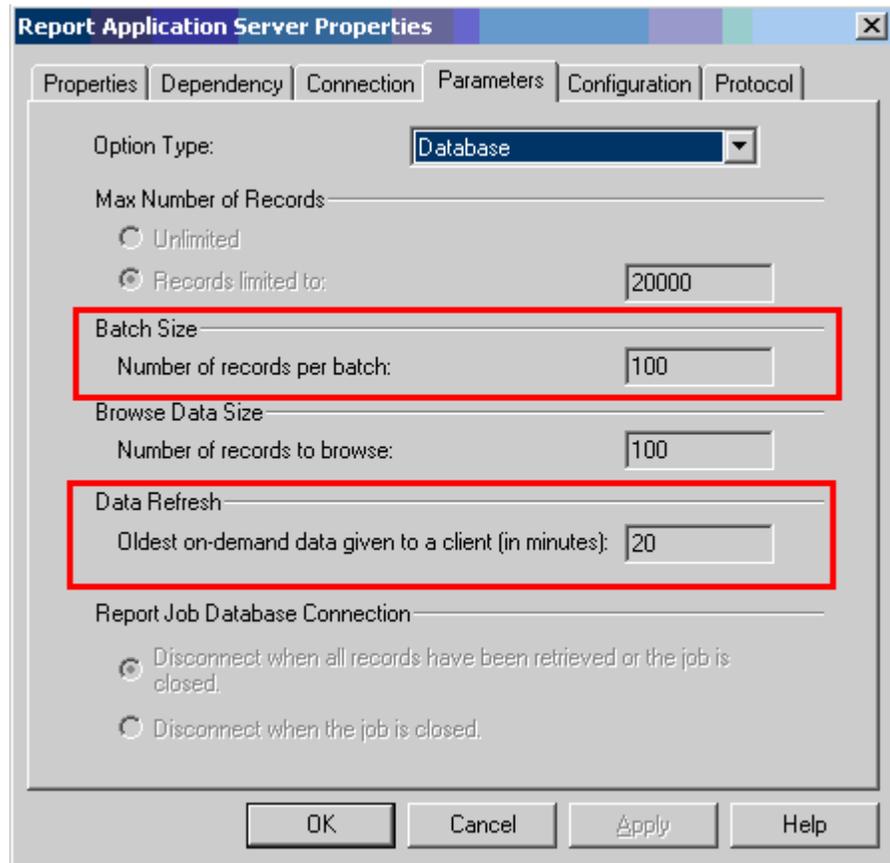
The **Batch Size** parameter is used to control the number of records returned to the prompt engine in a single batch. You should set this value to a number that can accommodate most records in your LOV. If most of your LOV is 500 records or less, then you can increase this value to 500 then the prompt engine can retrieve the values in a single batch.

The **Data Refresh** parameter needs to be set to a value at least as large as the largest **Oldest On-demand data given to a client (in seconds)** value set at the LOV level.

These parameters can also be set in the Web UI in the CMC.

Java Server Tuning

When a report is viewed using RAS (such as when using the Advanced DHTML Viewer), the Java Server is an internal component used by the Prompting Engine to communicate to RAS. It is only used when a new prompt page is generated. It is used in all BusinessObjects Enterprise and Crystal Reports Server installations for versions XI R1 and XI R2.

The Java Server has a timeout that will allow it to shut down after a period of inactivity. The default value is 1800 and is specified in

seconds. For optimal performance, the Java Server timeout should be increased to a large number so that it will not have to be restarted during a typical workday.

This will also help to ensure cache hits within the RAS Cache Server.

To set the Java Server timeout, edit the crconfig.xml file. By default, on Windows, this is found in these directories:

XI R1: `C:\Program Files\Common Files\Business Objects\3.0\java`

XI R2: `C:\Program Files\Business Objects\Common\3.5\java`

Add the values:

```
<JavaServerTimeout>28800</JavaServerTimeout> in the
<Javaserver-configuration> section, for example:

<Javaserver-configuration>

    <JavaServerTimeout>28800</JavaServerTimeout>

</Javaserver-configuration>
```

Recommendations

- Set the **Oldest on-demand data given to a client (in minutes)** value on the RAS and the **Oldest on-demand data given to a client (in seconds)** at the report object level to the largest possible value without impacting data currency. Keep in mind that this value applies to both the report pages and the prompt page.

- Set the Java Server timeout to a larger value (8-12 hours).

LOV Server-side Settings Tuning

If there is a cache miss within the Cache Server for the prompt page, then the prompt engine is activated and it rebuilds the prompt page by accessing the LOV used on that prompt page.

LOV are cached separately from the prompt page. The cache timeout value for each LOV object is controlled from the **Edit List of Values** dialog within the Business Views Manager.

The image below shows the **Edit List of Values** dialog in the Business Views Manager

Figure 5

We recommend that this value be set to the largest possible value that can maintain data currency. The larger the LOV (in terms of number of records), the more time will be saved by having a larger cache timeout value here.

Scheduled LOV

Scheduling LOV is beneficial in three cases:

- Cascading LOV that use both Value and Description fields.

- Single level or cascading LOV that use view time security on the underlying Business View.

- Cascading LOV based directly or indirectly off a stored procedure or command object.

Any other case will not deliver performance benefits.

Recommendations

1. Set the LOV setting **Oldest on-demand data given to a client (in seconds)** value to the largest possible value without impacting data currency.

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2. Ensure the server level setting for setting **Oldest on-demand data given to a client (in minutes)** is equal to or greater than the largest LOV setting.

3. Schedule LOV only when necessary.

Static LOV Performance

This section applies if you have reports with long static lists of values, and are running BusinessObjects Enterprise or Crystal Reports Server versions XI R1 or XI R2.

The amount of time for the system to open a report was found to have degraded if you have a report with a large number of static lists of values saved in the report. To solve this problem we have modified how we stored the static values in the RPT file.

This means that any reports saved or published to BusinessObjects Enterprise or Crystal Reports Server XI before XI R1 SP1 and XI R2 (original version) will need to be resaved to BusinessObjects Enterprise after applying the corresponding service pack.

Recommendation

For BusinessObjects Enterprise or Crystal Reports Server XI R1 and XI R2 customers, review your system for reports that have large numbers of static lists of values. If these were saved in a version of prior to XI R1 SP1 or XI R2 (original version) then you should resave these reports to the system after applying the patches **below** to both the report designer and report server. This issue is tracked in ADAPT00407417 and fixed in BusinessObjects XI R1 SP1 and above.

NOTES	• Apply the same SP version (SP3 for example) to both the report designers and report servers. Do not mix versions (SP 2 on report designer and SP 3 on report server).
	• A machine that has both the report designer and report server installed only needs to have BusinessObjects XI SP applied as it also contains the Crystal Reports SP.

Crystal Reports XI R1 report designer – Apply the latest service pack, currently SP3. Readme available.

BusinessObjects Enterprise or Crystal Reports Server XI R1 report server – Apply the latest service pack (currently SP3) depending on your platform.

Finding more information

For more information and resources, refer to the product documentation and visit the support area of the web site at:
http://www.businessobjects.com/

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