Dynamic Query Guide
# Table of Contents

**Introduction**  5  
**Chapter 1: Dynamic query mode**  7  
  - Key improvements  8  
  - In-memory caching  9  
  - Optimized master detail relationships in reports  10  
  - Enhanced null suppression  10  
    - Configuring arithmetic null suppression using the dynamic query mode  11  
  - Query visualizations  12  
  - Considerations when using the dynamic query mode  12  
    - Models that use multiple data sources  13  
    - Minimal support for SAP BW modeling in Framework Manager  13  

**Chapter 2: Set up the dynamic query mode**  15  
  - Setting up connectivity to OLAP data sources for the dynamic query mode  15  
    - Using Oracle Essbase with Dynamic Query Mode  16  
  - Create data source connections  17  
  - Administer the Query Service  17  
  - Test migrated reports using Lifecycle Manager  18  
  - Enable packages in Framework Manager to use dynamic query mode  18  

**Index**  19
Table of Contents
Introduction

This document describes the benefits of the dynamic query mode of IBM® Cognos® Business Intelligence and will help you decide whether to use it for your organization. It also provides the steps that are necessary to implement dynamic query mode.

Audience
To use this guide, you should have the following:

- Knowledge of your business requirements
- Experience installing and configuring applications

Finding information
To find IBM® Cognos® product documentation on the web, including all translated documentation, access one of the IBM Cognos Information Centers at http://publib.boulder.ibm.com/infocenter/cogic/v1r0m0/index.jsp. Updates to Release Notes are published directly to Information Centers.

You can also read PDF versions of the product release notes and installation guides directly from IBM Cognos product disks.

Using quick tours
Quick tours are short online tutorials that illustrate key features in IBM Cognos product components. To view a quick tour, start IBM Cognos Connection and click the Quick Tour link in the lower-right corner of the Welcome page. Quick Tours are also available in IBM Cognos Information Centers.

Accessibility features
Accessibility features help users who have a physical disability, such as restricted mobility or limited vision, to use information technology products. IBM Cognos Business Intelligence has accessibility features. For information about these features, see "Enabling access for more people” in the New Features guide.

Forward-looking statements
This documentation describes the current functionality of the product. References to items that are not currently available may be included. No implication of any future availability should be inferred. Any such references are not a commitment, promise, or legal obligation to deliver any material, code, or functionality. The development, release, and timing of features or functionality remain at the sole discretion of IBM.

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Chapter 1: Dynamic query mode

The success of your business depends on your ability to analyze information, quickly find the right answers, and make timely responses. To meet this challenge, IBM® Cognos® Business Intelligence, Version 10.1.0, provides an enhanced Java™-based query execution mode while still maintaining native access to the leading data sources. The dynamic query mode offers key query optimizations to address query complexity and data volumes with improved query execution. It also provides advanced query capabilities such as in-memory caching, that provide benefits for query planning, execution, and results while maintaining users’ security permissions.

You can visualize and troubleshoot the query logs generated by the dynamic query mode with IBM Cognos Dynamic Query Analyzer, a query visualization tool.

You can use the dynamic query mode with the following OLAP data sources:

- SAP Business Information Warehouse (SAP BW), Version 7.1
- Oracle Essbase, Versions 9 and 11
- IBM Cognos® TM1®, Version 9.5.1

How the dynamic query mode helps your organization

The following table outlines the benefits of the dynamic query mode for each role within your organization.

<table>
<thead>
<tr>
<th>Role</th>
<th>Business problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Manager &amp; Data Professional</td>
<td>You have or are moving to Java-based architectures and you require Java connectivity to data sources.</td>
<td>The dynamic query mode provides expanded data reach to support connectivity to various data sources. IBM Cognos Business Intelligence now provides Java connectivity to OLAP data source such as IBM Cognos TM1, Oracle Essbase, and SAP BW.</td>
</tr>
<tr>
<td>IT Manager &amp; IT Administrator</td>
<td>More database vendors exclusively support 64-bit platforms. You want your applications to take advantage of your investment in 64-bit technology.</td>
<td>The IBM Cognos Business Intelligence query platform supports 64-bit environments which provide better memory management and improved scalability and performance.</td>
</tr>
<tr>
<td>Role</td>
<td>Business problem</td>
<td>Solution</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Modeler &amp; IT Manager</td>
<td>Your business users want to quickly find answers when looking at information. As an IT manager, you want to provide this while maintaining the security of your applications.</td>
<td>With the dynamic query mode, business users get the right information quickly without compromising security. In-memory caching stores both the query plan and the query results while maintaining the security permissions for each user.</td>
</tr>
<tr>
<td>BI Director &amp; IT Manager</td>
<td>You invested in OLAP technologies and you want to optimize and gain the maximum value from your investment.</td>
<td>The dynamic query mode provides optimized access to OLAP data sources. It provides customized and enhanced MDX for the specific source and version of your OLAP technology, and it harnesses the intelligence of the OLAP data source.</td>
</tr>
<tr>
<td>BI Administrator</td>
<td>You find it challenging to easily troubleshoot what happens when a query is planned and executed.</td>
<td>The dynamic query mode provides detailed logging and query visualization. IBM Cognos Dynamic Query Analyzer enables you to visualize the logs and helps you troubleshoot.</td>
</tr>
</tbody>
</table>

To review an up-to-date list of the environments that are supported by IBM Cognos products, including information on operating systems, patches, browsers, Web servers, directory servers, database servers, and application servers, visit the IBM Cognos Customer Center (http://www.ibm.com/software/data/cognos/customercenter/).

**Key improvements**

The dynamic query mode offers query and data source optimizations to address increasing query complexity, large data volumes, and timeliness expectations with improved query execution techniques.

**Dynamic query mode highlights for your data source**

The dynamic query mode offers different optimization benefits depending on the data source that you use.
By default, with the dynamic query mode, all data sources use a local cache.

The dynamic query mode offers improved caching for SAP BW and Oracle Essbase data sources. When the dynamic query mode is enabled on a package, the cache is built on demand as users build and run reports, perform analyses, execute reports in batch mode, and so on. When a report is run, a number of requests are made to the underlying data sources. Those requests range from metadata requests to data requests. As results are returned, the query engine caches each request for future use. The cache is specific to the user and the data source. In addition, the cache is independent and can be shared by all report processes on the same dispatcher.

The optimized cache provides better query performance by re-using previously executed results and, when possible, avoids sending new queries to the data source. Caching provides the greatest performance improvement when reports are re-run with small modifications, analyses are performed within the same cube, and repetitive master detail requests are performed for large reports. The cache maintains the security permissions of the user who is executing the request.

Report authors benefit from the performance improvements of the cache. For example, a report is authored and includes various dimensions and measures. The report author runs the report and then decides to add calculations using the existing measures. Caching allows report authors to make changes to reports, from simple formatting to complex calculation adjustments, without the need to constantly refresh data.

Users also benefit when running the same report in different output formats. For example, you run a report in CSV format. You then run the same report in PDF format. With caching, re-querying the data source is not required because all data is retrieved from the cache.

When performing analyses, metadata requests from the data source are required to present data to users. Metadata requests are often costly, in terms of speed and performance, when running reports. Without the use of the dynamic query mode, only some metadata results could be reused. For example, with SAP BW data sources, metadata requests that were obtained using MDX with variables are never reused. With the dynamic query mode, they can now be reused. This makes hierarchy navigation easier and faster.
Chapter 1: Dynamic query mode

Using IBM® Cognos® Administration, you can analyze cache usage and maintain cache storage manually or automatically using scheduling. For more information about administering the cache, see the IBM Cognos Administration and Security Guide.

For more information about how the cache works, see the IBM® Cognos® 10 Dynamic Query Cookbook in the Proven Practices section of the IBM Cognos Customer Center (http://www.ibm.com/software/data/cognos/customercenter/).

Optimized master detail relationships in reports

Master detail relationships allow you to deliver information that would otherwise require two or more reports. You specify a relationship between the query in the master data container and the query in the detail data container. For example, you can combine a master list with a detail chart. The list can contain product lines and the chart can show details for each product line.

With the dynamic query mode, master detail relationships are optimized. IBM® Cognos® pushes the master query as a separate edge to the detail query. Therefore, instead of sending one detail query to the data source for each master value, only one query is sent for HTML, PDF, and Microsoft® Excel spreadsheet software output formats.

For more information about creating master detail relationships, see the IBM Cognos Report Studio User Guide.

Enhanced null suppression

Suppressing rows and columns that contain only null values makes a report easier to read. For example, a product that has no sales for a given quarter may result in a very large report with thousands of cells that contain no data.

The time required to evaluate a table to determine which rows and columns contain only null values is mainly determined by the number of cells in the table. Other factors such as the nesting levels on the axes and the use of complex calculated columns might also affect the time.

The number of cells in a table is determined by the number of cross joins, which are the Cartesian product of member sets. The number of cross joins are calculated as follows:

crossjoin({a1, a2},{b1,b2},{c}) = {(a1,b1,c) (a1,b2,c) (a2,b1,c) (a2,b2,c)}

In the following example, the resolved edge has 1 X 1 X 170 X 818 X 818 = 113,751,080 tuples, or cells, to process.
IBM® Cognos® Business Intelligence introduces query optimizations for suppression when authoring reports with OLAP data sources in IBM Cognos Query Studio, IBM Cognos Report Studio, and IBM Cognos Business Insight Advanced, where you can enable suppression with the suppress button.

If a cell's expression evaluates to null, it does not have to be computed during query evaluation, which reduces the number of cells that need to be processed.

The results vary based on a combination of the structure of the cube, the cardinality, the style of report, the size of the query, and the sparsity of the results.

For more information about null suppression and implementing optimizations specific to TM1 data sources, see the IBM Cognos 10 Dynamic Query Cookbook in the Proven Practices section of the IBM Cognos Customer Center (http://www.ibm.com/software/data/cognos/customercenter/).

**Configuring arithmetic null suppression using the dynamic query mode**

The dynamic query mode offers a configuration option that you can use to change the behavior of null values for the following arithmetic operators: +, -, *,-, /, and %.

When enabled, this option treats null values as zeros for calculations such as 100 + null = 100. This configuration is applied system-wide but does not affect other cells where a null value is valid and is subject to suppression.

**To enable the arithmetic null suppression**

1. Go to the c10_location/configuration/xqe directory and open the .properties file for your data source in a text editor.

2. Find the following settings:

```
#
#
# Null behaviour in the MDX engine for the arithmetic operators: +, -, *, /, %
#
# When null.divide.denominator is set to zero, a number divided by null will return infinity (/0).
```

Dynamic Query Guide 11
Chapter 1: Dynamic query mode

```plaintext
# When null.divide.denominator is set to null, a number divided by null will return null.
#
null.plus.operator=null
null.minus.operator=null
null.multiply.operator=null
null.divide.numerator=null
null.divide.denominator=null
null.modulo.operator=null

3. Change all the parameters to zero, as follows, to have all math operations on nulls become zeros:
   null.plus.operator=zero
   null.minus.operator= zero
   null.multiply.operator= zero
   null.divide.numerator= zero
   null.divide.denominator= zero
   null.modulo.operator= zero

4. Save the file.
```

Query visualizations

IBM® Cognos® Dynamic Query Analyzer, a query visualization tool available on the Microsoft® Windows® and Linux® operating systems, helps you troubleshoot by allowing you to look at your IBM Cognos queries in a graphical way. It allows you to easily access and analyze the query log files. It allows you to view the MDX code generated by a query in a friendlier format than looking at the log files in a text editor.

For example, you create a report that runs slower than expected or produces unexpected results. Or you have a report that fails and it is not clear from the error message why the report is failing. You capture the run tree and analyze it using Dynamic Query Analyzer.

For more information about how to install, configure, and use Dynamic Query Analyzer, see the IBM Cognos 10 Dynamic Query Cookbook in the Proven Practices section of the IBM Cognos Customer Center (http://www.ibm.com/software/data/cognos/customercenter/).

Considerations when using the dynamic query mode

After you upgrade your IBM® Cognos® Business Intelligence version 8.x models and reports to version 10.1.0, you can use the dynamic query mode. There are some scenarios where the dynamic query mode is compatible with your upgraded reports, and other scenarios where it is not compatible. For information about and examples of these scenarios, see the IBM Cognos 10 Dynamic
Query Cookbook in the Proven Practices section of the IBM Cognos Customer Center (http://www.ibm.com/software/data/cognos/customercenter/).

Models that use multiple data sources

You cannot enable the dynamic query mode on packages that contain both supported and unsupported data sources. If the package references any unsupported data sources and you select the Use Dynamic Query Mode check box when publishing a package, you will encounter an error.

Minimal support for SAP BW modeling in Framework Manager

The IBM® Cognos® Business Intelligence dynamic query mode provides limited support for modeling SAP BW data sources in IBM Cognos Framework Manager. Creating the following objects in a model is not supported:

- shortcuts
- query subjects
- calculations
- expressions that include filters

In addition, the test functionality is disabled when working in the dynamic query mode. You can still model and publish packages, however you cannot test dimensions or other objects.

When modeling SAP BW metadata for the dynamic query mode, the following actions are supported:

- setting attributes for prompts (modelFilterReference)
- changing variable prompt types
- setting variable default values
- using all the governors for SAP BW

For more information about modeling SAP BW metadata, see the Framework Manager User Guide.
Chapter 1: Dynamic query mode
Chapter 2: Set up the dynamic query mode

If you decide to use the dynamic query mode, complete the following tasks to configure the mode, set up connectivity, and publish and test your reports:

- Set up connectivity to the dynamic query mode by installing the required database client for OLAP data sources (p. 15).
- In IBM® Cognos® Administration, create data source connections.
  For more information about creating data source connections, see the IBM Cognos Administration and Security Guide.
- In IBM Cognos Administration, administer the Query Service (p. 17).
- Use IBM Cognos Lifecycle Manager to compare your reports run with the dynamic query mode with the same reports run in a previous version of IBM Cognos Business Intelligence (p. 18).
- In IBM Cognos Framework Manager, enable packages to use the dynamic query mode and then publish them (p. 18).
- Use IBM Cognos Dynamic Query Analyzer to view a graphical representation of the queries generated when running a report and to troubleshoot the queries. You can also run reports from within Dynamic Query Analyzer.
  For more information about using Dynamic Query Analyzer, see the IBM Cognos 10 Dynamic Query Cookbook in the Proven Practices section of the IBM Cognos Customer Center (http://www.ibm.com/software/data/cognos/customercenter/).

Setting up connectivity to OLAP data sources for the dynamic query mode

To allow the reporting engine to connect to supported OLAP data sources using dynamic query mode, you must install the full, or thick, client provided by the OLAP vendor.

For more information about installing and configuring IBM® Cognos® Business Intelligence, see the IBM Cognos Business Intelligence Installation and Configuration Guide.

Steps

1. If the IBM Cognos service is running, stop the service.
2. Install the full client for the data source on the same computer as the report server (where the Application Tier Components are installed), as indicated in the following table.
Chapter 2: Set up the dynamic query mode

<table>
<thead>
<tr>
<th>Data source &amp; version</th>
<th>Software to install</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM Cognos® TM1®, Version 9.5.1</td>
<td>full client</td>
</tr>
<tr>
<td>Oracle Essbase, Versions 9 and 11</td>
<td>full client</td>
</tr>
<tr>
<td>SAP Business Information Warehouse (SAP BW), Version 7.1</td>
<td>full client</td>
</tr>
</tbody>
</table>

3. Start the IBM Cognos service.

Reporting connectivity for dynamic query mode is configured. You must also do the following:

- Configure Oracle Essbase to use the dynamic query mode (p. 16).
- Create new data source connections to the OLAP data sources (p. 17).

Existing data source connections will not use dynamic query mode. For more information, see the IBM Cognos Administration and Security Guide.

- Publish packages with the option to use dynamic query mode (p. 18).

Existing packages will not use the dynamic query mode unless you republish them with the dynamic query mode option. For more information, see the IBM Cognos Framework Manager User Guide.

Using Oracle Essbase with Dynamic Query Mode

IBM® Cognos® Business Intelligence, Version 10.1.0 supports using dynamic query mode with Oracle Essbase versions 9 and 11. The Java™ Client that is required is installed during normal installation of the Oracle Essbase data source. To make IBM Cognos BI aware of the Oracle Essbase client Java Archive (.jar) files, the ARBORPATH environment variable or the databaseDriverLocations.properties file must point to the .jar files. In most typical installations, the ARBORPATH environment variable will be set and no further configuration is required.

If the ARBORPATH environment variable is missing or points to the wrong location for the .jar files, perform the steps below. If both the environment variable and the databaseDriverLocations.properties file are set, the databaseDriverLocations.properties file takes precedence.

Steps

1. Do one of the methods, step 2 or steps 3 to 8.

2. Create a system environment variable named ARBORPATH and set the value as follows:

   - For a Microsoft® Windows® operating system,
     C:\Hyperion\products\Essbase\EssbaseClient
   - For a UNIX® or Linux® operating system,
     /olapqc/V5/JDBC
3. Go to the `c10_location/v5dataserver` directory.

4. Rename the `databaseDriverLocations.properties.sample` file as `databaseDriverLocations.properties`.

5. Open the `databaseDriverLocations.properties` file in a text editor.

6. For Essbase 11, type the following value for the `databaseClasspath` property:
   - For Windows,
     
     \[\text{databaseClasspath}=C:\Hyperion\products\Essbase\EssbaseClient\JavaAPI\lib\cpdl14.jar;C:\Hyperion\products\Essbase\EssbaseClient\JavaAPI\lib\ess_es_server.jar;C:\Hyperion\products\Essbase\EssbaseClient\JavaAPI\lib\ess_japi.jar\]

   - For UNIX or Linux,
     

7. For Essbase 9, type the following value for the `databaseClasspath` property:
   - For Windows,
     
     \[\text{databaseClasspath}=C:\Hyperion\products\Essbase\EssbaseClient\JavaAPI\lib\ess_es_server.jar; C:\Hyperion\products\Essbase\EssbaseClient\JavaAPI\lib\ess_japi.jar\]

   - For UNIX or Linux,
     
     \[\text{databaseClasspath}=/olapqc/V5/JDBC/ess_es_server.jar:/olapqc/V5/JDBC/ess_japi.jar\]

8. Save the file and restart the IBM Cognos service.

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**Create data source connections**

After you enable connectivity by installing the required database client, you must create or modify existing data source connections.

For more information about creating data source connections, see the IBM® Cognos® Administration and Security Guide.

**Administer the Query Service**

The Query Service supports the dynamic query mode. It manages dynamic query requests and returns the result to the requesting batch or report service. Using IBM® Cognos® Administration, you can administer the Query Service properties and the Query Service caching.

For more information, see the IBM Cognos Administration and Security Guide.
Test migrated reports using Lifecycle Manager

You can use IBM® Cognos® Lifecycle Manager to help you test your reports. Lifecycle Manager is a verification tool that checks that your reports run and produce the same results in the new environment as they did in the previous environment.

Lifecycle Manager connects to the source and target environments, validates and executes reports in both environments, and then compares them. The results of the comparison are presented in a dashboard. To test and compare reports that are run with the dynamic query mode enabled, ensure that you select DQM Enabled in the Query mode Options in Lifecycle Manager (Settings menu > Configure > Preferences tab).

For more information about testing your reports, see the Lifecycle Manager User Guide.

Enable packages in Framework Manager to use dynamic query mode

After the dynamic query mode is enabled and data source connections are created, you use IBM® Cognos® Framework Manager to publish your packages to IBM Cognos Business Intelligence with the dynamic query mode enabled. If your package contains supported data sources, select the Use Dynamic Query Mode check box when publishing your package.

Note: You cannot enable dynamic query mode on packages that contain both supported and unsupported data sources. You will get an error if you select the Use Dynamic Query Mode check box.

Once a Framework Manager package is enabled to use the dynamic query mode, all reports using the package are run using the dynamic query mode. You can change back to the original mode by republishing the package with the Use Dynamic Query Mode option cleared.

For more information about publishing packages, see the Framework Manager User Guide.
Index

C
  caching, 9
    administration, 17

D
  database connectivity
    OLAP data sources, 15
  data source connections, 17
  Dynamic Query Analyzer, 12
  dynamic query mode
    using ESSBASEPATH, 16

E
  ESSBASEPATH
    dynamic query mode, 16

F
  Framework Manager
    packages, 18

L
  Lifecycle Manager, 18

M
  master detail reports, 10

N
  nulls
    suppressing, 10

P
  packages
    publishing with Framework Manager, 18

Q
  Query Service, 17
  query visualizations, 12
  quick tours, 5

S
  SAP BW data sources
    modeling, 13
    suppressing nulls, 10

T
  testing
    reports, 18