

IBM Cúram Social Program Management
Version 6.0.5

*Business Intelligence Development
Compliance Guide*



Note

Before using this information and the product it supports, read the information in "Notices" on page 13

Revised: March 2014

This edition applies to IBM Cúram Social Program Management v6.0.5 and to all subsequent releases unless otherwise indicated in new editions.

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About this information

This document contains the Cúram Business Intelligence development compliancy guidelines.

Purpose

You must follow these guidelines to ensure that you can easily upgrade to future versions without affecting your custom changes.

Intended audience

You must read this document if you are a developer who intends to develop with Cúram Business Intelligence.

Prerequisites

You need a working knowledge of the application development environment to understand this document.

Developing Compliantly with Cúram Business Intelligence

When you develop Cúram applications, you must comply with certain guidelines to ensure that you can easily upgrade to future versions without affecting your custom functions. Complying with these guidelines is also essential to ensure that IBM Support can better support your custom implementation.

There are changes to the guidelines since version 6.0.3. While all application customization mechanisms that were already implemented continue to be supported, some customization mechanisms are now discouraged for new development.

Starting a New Project

When you start a new project, it is important to understand the development directory structure. It is also important to put it under source code control.

Understand the Development Directory Structure

Knowledge of the development directory structure is required to understand where development artifacts are located, how they are organized, and where to store changes to these artifacts. To access the development directory structure for an application, you must first install a development version of the application.

Business Intelligence: Development Directory Structure

Business Intelligence development artifacts are installed into the Reporting directory.

There is a components subdirectory, which has a further subdirectory named custom. Place all client-based project-specific development artifacts in the custom subdirectory. The other subdirectories within the components folder contain all the BI application development artifacts that are delivered with the product.

The development directory structure is as follows:

```
<component_name>
• data_manager
  - initialdata
  - demodata
• ddl
  - oracle
    - staging
    - central
    - datamarts
  - db2
    - staging
    - central
    - datamarts
• etl
  - oracle
```

- source
- staging
- central
- datamarts
- configtest
- CuramBIWarehouse
- jar
- run
 - orcl
- sample
- source

Important: The custom folder contains a starter structure for first usage and is referred to throughout developer documentation as the area for customizing all artifacts. This rule is not enforced and it is a project choice to develop within this component or to create a new named component appropriate for your project. For example, within the \components\custom folder, there are starter files and some file fragments.

Source Code Control

To track all changes to source artifacts, place the development directory structure under source code control. When under source code control, tag all development artifacts.

Ensure that the tag refers to the version of the application. At any point, you can then produce a report by using file comparison tools to identify all files that were added or changed. This report is useful when you are upgrading the application.

From version 6.0.3, changes were made to how Java™ source code is delivered.

Business Intelligence: Changing Source Artifacts

Direct customer modification of all default Business Intelligence artifacts is now prohibited. Service Packs and Emergency Patches need to be able to safely move, restructure, or overwrite default files.

If default files are modified, Service Packs or Emergency Patches can overwrite them without notice with changes that might not be compatible with the modifications. Reapplying the in-place changes afterward might not be possible.

There are many types of artifacts. Some of these artifacts are critical to the execution of the system and must not be changed. Others can be changed without impacting the overall systems integrity. It is important to be able to distinguish between the two.

Write Source Code for Database Entities

Write all new customer-specific entities in new source files. Place all new source files in the DDL subdirectory in the components\custom directory.

Write Source Code for Initial and Demo Data

Write new customer specific initial and demo data items in new source files. Place all new source files in the data_manager subdirectory of the components\custom directory.

Writing Source Code for IBM InfoSphere Warehouse and Oracle Warehouse Builder

The development tools that you use can enforce certain rules on how code is written, referenced, and used. Do not customize any default Business Intelligence metadata. Write new customer-specific metadata in new source files.

The IBM® InfoSphere® Warehouse is the design and runtime environment for DB2® clients. Oracle Warehouse Builder provides the design and runtime environment for Oracle clients.

Place all new source files in the ETL subdirectory of the components\custom directory.

New Build Environment Commands

The scripts directory contains most of the default Apache Ant build scripts. Do not modify these scripts directly. Updates to these scripts can be made by creating new custom Ant scripts and by using the Ant inheritance capability.

Source Code and APIs

All application Java functionality is distributed as previously built JAR files. You must regenerate and rebuild applications in a customer installation only if required by the use of customer extension mechanisms.

The customer build process does not need to rebuild the entire Java source code base; only project-specific source code and any dependent regenerated Java source code need to be rebuilt.

For a limited number of key functional areas from version 6.0.3 onwards, Java source code is no longer distributed in any form. Source code for the remainder of the application continues to be included as sample code for documentation purposes only. This code is not directly involved in the build process from version 6.0.3 onwards. This sample source code is distributed in JAR files on a per-component basis as follows:

```
components\<<component name>\sample\src.zip
```

The built versions of each component can be found in the following location:

```
components\<<component name>\lib\<<component name>.jar
```

Also, from version 6.0.3, class operations are marked as Internal or External by annotations.

External operations are now the official API, which you are encouraged to use and call from your own code.

Important: By default, classes with no annotations are internal.

Internal APIs

While it is possible to call and subclass Internal APIs from custom code, this practice is discouraged from version 6.0.3. Such APIs are annotated with `@AccessLevel(INTERNAL)`.

Important: 'Discouraged' in this context means that their use continues to be supported, but that such APIs might be changed or removed in future releases. A minimum notice period of one year is given to customers in respect of any such change or removal.

Note: No such notice is being given for any of the APIs marked as Internal in version 6.0.3. That is, there are no current plans to change any of the APIs marked as Internal in 6.0.3. This approach provides adequate time for customers to plan any such migrations.

Existing customer references to APIs that are marked as Internal from version 6.0.3 onwards continue to function as before. However, discouraged warnings are generated within Eclipse projects that have such dependencies.

Try to move your projects away from dependencies on Internal APIs over time, and do not introduce new dependencies on them where possible. Within reason, depending on where a customer project is in its design or development process, it might be inevitable in the short term. Most existing customers will see discouraged references that are reported after they install version 6.0.3 or later versions. It is not expected that customers fix these references immediately as part of an upgrade. These references do not affect their support entitlements.

As with previous versions of the application, some Internal APIs are configured to produce 'access restriction' errors in Eclipse if referenced. These APIs are annotated with `@AccessLevel(RESTRICTED)`. Such references are not supported in customer projects. These APIs were always Internal, and were never supported for customer use. Access-restricted APIs produce Eclipse errors and discouraged APIs produce Eclipse warnings.

External APIs

External APIs can be referenced directly by customer projects. Such APIs are annotated with `@AccessLevel(EXTERNAL)`. Javadoc is provided for all External APIs on a per-component basis.

The Javadoc for each component can be found at `components\<component name>\doc\api.zip`. Some components might not have any Javadoc if they have no External APIs. Only reference classes that are documented in Javadoc from customer code; referencing other classes produce discouraged warnings or access restricted errors and are not supported.

As with all APIs, it is expected that classes that are marked as External will evolve over time, while they remain compatible with previous versions. If you require some capability that cannot be fulfilled through a combination of External APIs and allowed extension mechanisms, raise your requirements through Support. If appropriate, a new API, customization hook, strategy pattern or configuration-based approach is made available, and such new APIs can be delivered in Feature Packs. Alternatively, an existing Internal API might in some circumstances be redesignated as External if appropriate.

Business Intelligence: Recommended Extension Mechanisms

Direct customer modification of all default Business Intelligence artifacts is now discouraged.

Service Packs and Emergency Patches need to be able to safely move, restructure, or overwrite default files. If default files are modified, Service Packs or Emergency Patches can overwrite them without notice with changes that might not be compatible with the modifications made. Reapplying custom changes afterward might not be possible.

Initial Data

Direct customer modification of initial data is now discouraged.

Through the supported customization mechanisms, customers can change the following data items. These overrides must be created in new files within the custom component.

1. Customers can update any "description" data items for initial data records and last written values.
2. The default "Warehouse language" property value can be updated. That is, the default value for the property BI.BILOCALE is allowed to change for each customer configuration.

Demo Data

Direct customer modification of demo data is now discouraged.

Demo data is included by default as sample data. Create custom demo data in new files in the custom component.

Entities (DDL)

To add data, add new customer-specific entities and wrap custom BI maintenance operations in their own processes to maintain both tables atomically.

You can then change other application or BI objects, such as BIRT reports, to point to the new entities or views.

You can change the following data definition language objects through the supported customization mechanisms. Create these objects in new files within the custom component.

1. Sequences: Add new sequences, or change the minimum or maximum values of existing sequences.
2. Entities: Add new data items to new customer-specific entities. Customers are discouraged from adding new columns to default entities.
3. Views: Do not change the default views. Add new data items to a new view. Overriding views to redefine the business meaning of the view is discouraged. That is, do not change WHERE or JOIN clause conditions so that it materially changes the business meaning of the view. Create a view if there is a need to define a new business flow.
4. Foreign keys: Creating foreign keys from default entities to custom entities is discouraged. Instead, create keys from custom entities to default entities.
5. Functions and procedures: Create new functions and procedures for any custom transformations.

ETL Metadata

Direct customer modification of BI ETL metadata is now discouraged.

As with the extension of BI Entities, direct extension or override of BI ETL metadata is discouraged. Specifically, direct extension or override of ETL processing is now potentially unsafe. Customers can no longer necessarily have full visibility of where such data is used.

Similar to Entity classes, model and code your own ETL metadata, either wrapping existing ETL processes or implementing new functionality. Otherwise, you might have problems during upgrades.

Specifically, with regards to ETL metadata on Oracle or DB2, the following rules now apply:

1. Schema metadata objects (DDL): Always create new metadata files to define custom data items or any other DDL objects.
2. Data files: Specifically, with Oracle Warehouse Builder new metadata files must be created to define any new data items that are in the file system. The file must be named `<datafiles.mdo>` and must be in the custom component. This same file name does not infer that an override is in place. It ensures that the order of metadata import is consistent. With IBM InfoSphere Warehouse, ensure that a new data flow is created and that the file is available at the standard file system location.
3. ETL processes: Generically, all ETL processes must be saved in a file system file with the following naming convention.

`XXX_NAME_ETL.yyy`

- Where XXX is the schema tier and is represented by one of these conventions: `[S_|DW_|DM_]`.
- Where yyy is the file extension.

All ETL processes must be prefixed with `_ETL`. Schema metadata files must not have `_ETL` in the file name.

Other Scripts - Run and Grant Scripts

Direct customer modification of all files within the run directory is now discouraged.

Similar to entities, customers must instead code their own run and grant scripts. Customers must create their own custom entries. Custom grant scripts can override the default grant scripts. Custom run scripts can extend and override the default entries.

Java Code

Direct customer modification of Java is now discouraged.

Similar to entities, customers must instead code their own Java processes, either wrapping existing Java processes or implementing new functionality. Direct modification can cause problems during upgrades.

Build Environment

Direct customer modification of the build environment is now discouraged.

Similar to entities, customers must instead code their own build extensions, either wrapping existing build commands or implementing new processes. Direct modification can cause problems during upgrades. Customer can use the Apache Ant inheritance mechanisms to extend or customize the build environment.

Avoiding Common Compliancy Pitfalls

Read about compliancy issues that can arise and guidelines for avoiding these issues. Following these guidelines from the early stages of a project is relatively easy. However, if they are not followed, they can result in serious disruption later on and fixing them can be both costly and difficult.

Use Project-specific Prefixes in Artifact Names

Prefix all new source artifact names with a relevant acronym or abbreviated word. By using a project-specific prefix, you can prevent naming collisions from occurring between new artifacts that you add, and new artifacts that IBM might add over time. Naming collisions can be costly and difficult to fix when they occur.

Use the same acronym or abbreviated word throughout. As the project progresses, this prefix makes project additions to core artifacts more obvious. This distinction becomes more useful as the development effort grows. Most projects are described by some kind of acronym and this acronym is a good candidate to use as the prefix.

Some artifact types have more than one identifier and you must remember this fact when you are naming them.

It is important to note that the use of project-specific prefixes might not apply when overriding some application artifacts. Your approach depends on the design and development methodology. Typically, an override mechanism is based on naming the custom artifacts with the same name as the default artifacts that it overrides, but there are exceptions.

There are further considerations as follows:

- There are many different types of identifiers. For example, a file name, an XML ID, a Java class name, or a combination of identifiers.
- A short prefix is advisable as there might be places where name lengths are restricted. For example, certain types of database identifiers.

Note: In addition to source artifacts, it is also important to consider identifier values that might conflict with values used by IBM.

Business Intelligence: Examples of Project-specific Prefixes in Artifact Names

These types of collisions can be avoided by ensuring that you always name new, custom artifacts with a consistent prefix.

Example

For example, you install a Service Pack. You then discover that a new Business Intelligence application ETL process with a custom data item that was also added with the same name, but with a different meaning.

Some artifact types have more than one identifier and you must remember this fact when you are naming them.

Example

For example, ETL processes. In Oracle Warehouse Builder, an ETL process has a file name, and it also has a logical physical name and a logical business name. The logical physical and logical business names are used internally within the Oracle Warehouse Builder workspace. The file name has no relevance within the Oracle Warehouse Builder workspace.

Business Intelligence: Use Numeric Identifiers in Custom Initial and Demo Data

Predefined initial and demo data is provided with IBM Cúram Business Intelligence and Analytic Reporting.

Initial data is loaded into the BI schemas. Demo data is loaded into a separate data mart schema that is intended for use in demos. A separate schema for demo data ensures that an unintentional dependency on demo data cannot be introduced.

Initial data is installed into the database when a system is first set up or when a system is upgraded.

A set of initial and demo data is provided in the BI application. Customers might also need to add their own initial and or demo data.

To avoid clashes with the initial and demo data that is included in the BI system, take the identifiers for customer initial and demo data from the defined database ranges. For example, identifiers such as primary keys.

Avoid In-Place Modifications to Application Files

Service Packs and Emergency Patches must be able to safely move, restructure, or overwrite application files. If default files are modified, Service Packs or Emergency Patches can overwrite them without notice with changes that might not be compatible with the modifications. Reapplying the in-place changes afterward might not be possible.

Business Intelligence: Exceptions for In-Place Modifications

A list of the small number of exceptions to the in-place modifications rule for Business Intelligence development.

- <reporting-dir>/project/properties/BIBootstrap.properties
- <reporting-dir>/project/properties/BIAApplication.properties
- <reporting-dir>/classpath
- <reporting-dir>/project
- <reporting-dir>/components/BIBuildTools/classpath
- <reporting-dir>/components/BIBuildTools/project

Never Create Dependencies on Sample or Demo Artifacts

Never create dependencies on Sample or Demo artifacts. That is, never rely on dependencies or references to sample or demo artifacts from custom code. Sample or Demo artifacts are subject to change without notice

Different product areas in Cúram take different approaches to marking artifacts as Internal, Sample, or Demo, so this information cannot give a concise statement of how to identify them. However, there are a few instances where they can be

identified. These instances are artifacts whose name, code package, model package, or file path contain the words Internal, Sample, or Demo, or obvious derivatives of those words. If in doubt, contact Support.

Business Intelligence Sample or Demo Artifacts

For Business Intelligence, the Data Dictionary contains a list of the objects that are Sample or Demo.

For example, default demo data is provided as Sample.

IBM Cognos content is provided as Sample.

IBM InfoSphere Warehouse control flows are provided as Sample.

Business Intelligence: Reflecting Runtime Changes Back to Development System

If artifacts types are modified on production or test systems, always ensure that these modifications are reflected back to the development system.

Do not Create New Dependencies on Internal APIs

From version 6.0.3 onwards, avoid calling or customizing application classes and operations that are marked as Internal, as such APIs might change in subsequent versions of the application.

Business Intelligence: Component Compliance Details

You must comply with these specific details for the Business Intelligence component.

Where you want to reference a class in your custom code:

- If the class is External, you are allowed to reference it.
- If the class is Internal, you are supported in referencing it in your existing code, but discouraged from doing so. Do not reference internal classes in new code.
- If the class is Access Restricted, you are not supported in referencing it where you want to customize an application class in your custom code.

Files from the `BIBuildTools` and other component folders are copied to temporary build folders during the application build process. The presence of files outside of these folders does not make them available for customization. The `BIApplication.properties` file has a property that lists the set of components that are licensable. Only folders that are specified with this property can contribute to the build.

IBM Cúram Business Intelligence and Analytics Reporting components:

1. The components Javadoc details all customization points and External APIs.
2. The scripts directory of a component contains Apache Ant build scripts that must not be modified directly. Updates to any build processes can be made by creating new custom Ant scripts and by using the Ant inheritance capability.
3. The jar folder of this component contains previously built build tools. You must use these tools in accordance with the tool sets specified with the IBM Cúram Business Intelligence and Analytics supported prerequisites.
4. With the `BIBuildTools` component, the drivers folder contains database drivers that are used to access the application database. If necessary, these drivers

might be replaced with another supported database driver. For supported database versions, see the IBM Cúram Business Intelligence and Analytics supported prerequisites.

Note: If a problem arises with a driver that was not included with the product (that is, was not tested and verified for use with the application), the customer might be requested to replace the driver with a version that was tested while the specific issue is raised with the third-party vendor.

Business Intelligence: Discouraged Extension Mechanisms

Some of the mechanisms that were allowed in versions before 6.0.5 as a means of extending or customizing Business Intelligence artifacts are now discouraged. If you find that a mechanism combination that you want to use is now discouraged, see the Business Intelligence recommended extension mechanisms for current guidance and recommendations for what to do.

Entities

The addition of new data items to default entities is now discouraged.

Customers wanting to add data can add new customer-specific entities and wrap custom BI maintenance operations in their own processes to maintain both tables atomically. Other application or BI objects, such as BIRT reports for ETL processes, can then be changed to point to the new entities or views.

Custom Key Performance Indicator (KPI) charts or graphs that are built with BIRT or IBM Cognos can be built to point to the new views or entities.

Changing an entity attribute option to Not Allow Null values, or creating new attributes without a default value, are now discouraged. If you feel you have a valid need for these options on application Entity attributes, contact Support.

ETL Code Extensions

Use these guidelines when you create ETL code extensions.

Direct modification of ETL code is now discouraged

Previously you might have directly modified default ETL processes. Direct modification of the default ETL processes is now discouraged.

Create an ETL process for any custom processing. Both the physical name on disk and canonical name must be unique.

Overriding ETL Processes by copy and paste is now discouraged

Overriding ETL processes is now discouraged. Some ETL processes form part of the critical path of the BI Warehouse component. Overriding ETL processes is now potentially unsafe as you do not have full visibility of any data impacts.

Create an ETL process for any custom processing required.

Overriding ETL Processes for new data items is now discouraged

Previously you might have added an attribute to a default entity to populate data to a new data item. You might have copied and modified a default ETL process to load data into this attribute.

Specifically, overriding of ETL processing is now potentially unsafe. Customers no longer necessarily have full visibility of where such data is used.

For new data items, create a new ETL process that updates the new data item only. In this way default ETL processes continue to support the default business flow while they also supporting the fix packs and interim fixes.

If your customized code base contains any such artifact types, split out any custom processing to new ETL processes, leaving the default processing to be handled by default files. For example, if you copied and modified an existing ETL process to ensure that a new data item is loaded, then the new ETL should now only update the new data item, leaving the default processing to be run by the default ETL process.

Adding metadata for new entities or new attributes to default BI schema metadata files is now discouraged

You might have previously added Oracle Warehouse Builder or IBM InfoSphere Warehouse metadata for new entities or new attributes to the default BI schema metadata files. For example, Warehouse Oracle Builder <staging.mdo> for Oracle, or <CuramSTcore.dbm> for DB2.

This practice is now discouraged. Add any custom entities or custom attributes to new files.

DDL and Initial Data

Previously, in some cases direct modification of default artifacts was the only option available to ensure that customer customizations were built, deployed, and ran by the BI build environment.

From 6.0.5 onwards, the BI build environment now supports the inclusion of customer extensions cleanly. Create all customer extensions in new files within a custom component.

BIRT Reports

Direct modification of all BIRT content is now discouraged.

Service Packs and Emergency Patches need to be able to safely move, restructure, or overwrite default files. If you modify these files, Service Packs or Emergency Patches can overwrite them without notice with changes that might not be compatible with the modifications. Reapplying custom changes afterward might not be possible.

How to Structure Custom Code

For example, to add a custom entity to the warehouse and data mart for the Oracle database, you can use the following process.

DDL changes

Note: Do not prefix the file names in steps 1-3 as they have a special meaning to the build environment. However, you must prefix the objects that are defined with these files.

1. Add any ALTER TABLE, CREATE, or DROP statements to DropAppTables.sql and CreateAppTables.sql in the components\custom\ddl\oracle folder. Repeat these changes for the staging, warehouse, and datamart folders.
2. Create any initial data in components\custom\data_manager\initialdata. For a list of the file names that are required, see the development directory structure.
3. Add new ETL process control entries to the files in files\components\custom\data_manager.

ETL changes

1. Create an Oracle Warehouse Builder metadata file, that is, central.mdo, in components\custom\etl\oracle\central. Add the new table to this file only. Do not prefix this file name as it has a special meaning to the build environment. However, you must prefix the objects that are defined with this file.
2. Create an Oracle Warehouse Builder metadata file, that is, datamarts.mdo, in components\custom\etl\oracle\datamarts. Add the new table to this file only. Do not prefix this file name as it has a special meaning to the build environment. However, you must prefix the objects that are defined with this file.
3. Create new ETL processes in components\custom\etl\oracle\central and components\custom\etl\oracle\datamarts as required, ensure the ETL processes file names on disk are prefixed.
4. Add the necessary statements to the files within components\custom\run\oracle to ensure that the ETL processes run. Add any GRANT statement to files in this directory also. Do not prefix this file name as it has a special meaning to the build environment.

Where new data items were added to existing tables, create a custom Oracle Warehouse Builder metadata object with the custom folder. That is, add a custom entity to staging.mod, central.mdo, and datamarts.mdo as required.

For example, assume a data item was added to DW_PersonHistory. Add an object called DW_PersonHistory_PROJECTNAME to central.mdo, and write a custom ETL to update this new data item only. The default ETL process can now be overwritten by updates without affecting your changes.

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