IBM Application Discovery Build V5.0.5

User Guide

IBM
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Chapter 1. Accessibility Features for IBM Application Discovery

Accessibility features assist users who have a disability, such as restricted mobility or limited vision, to use information technology content successfully.

Overview

IBM® Application Discovery includes the following major accessibility features:

- Keyboard-only operation
- Operations that use a screen reader

IBM Application Discovery uses the latest W3C Standard, WAI-ARIA 1.0 (www.w3.org/TR/wai-aria/), to ensure compliance with US Section 508 (www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-section-508-standards/section-508-standards) and Web Content Accessibility Guidelines (WCAG) 2.0 (www.w3.org/TR/WCAG20/). To take advantage of accessibility features, use the latest release of your screen reader and the latest web browser that is supported by IBM Application Discovery.

The IBM Application Discovery online product documentation in IBM Knowledge Center is enabled for accessibility. The accessibility features of IBM Knowledge Center are described in the Accessibility section of the IBM Knowledge Center help (https://www.ibm.com/support/knowledgecenter/en/about/releasenotes.html).

Keyboard navigation

This product uses standard navigation keys.

Interface information

For alternative installation using Command Line Installation (CLI), refer to section Alternative Installation for ADDI Using CLI in IBM Application Discovery Installation and Configuration Guide.

The IBM Application Discovery user interfaces do not have content that flashes 2 - 55 times per second.

The IBM Application Discovery web user interface relies on cascading style sheets to render content properly and to provide a usable experience. The application provides an equivalent way for low-vision users to use system display settings, including high-contrast mode. You can control font size by using the device or web browser settings.

The IBM Application Discovery web user interface includes WAI-ARIA navigational landmarks that you can use to quickly navigate to functional areas in the application.

Related accessibility information

In addition to standard IBM help desk and support websites, IBM has a TTY telephone service for use by deaf or hard of hearing customers to access sales and support services:

TTY service
800-IBM-3383 (800-426-3383)
(within North America)

For more information about the commitment that IBM has to accessibility, see IBM Accessibility (www.ibm.com/able).
Chapter 2. Introduction

IBM Application Discovery High Level Architecture Overview

A brief overview of the high level architecture of IBM Application Discovery suite.

The diagram below illustrates IBM Application Discovery high-level architecture and the relationships among the different components of the suite.

Figure 1: IBM AD High Level Architecture

Below is a brief description of the relationships among the different components of IBM Application Discovery – IBM AD suite of products.
IBM AD Configuration Server ensures the consistency of the installation parameters throughout an installation and allows the system administrator to manage user access to workspaces.

IBM AD Build uses data from mainframe systems to build projects and AD Connect for Mainframe to bring data from mainframe systems.

IBM AD Validation Service verifies that all data brought from the mainframe systems is valid and ready to be compiled on the mainframe.

IBM AD GraphDB Service starts the OrientDB server so that IBM AD Analyze can connect to OrientDB repository and use the data found there to generate the graphs.

IBM AD Batch Server imports data from the relational database repository into the GraphDB (OrientDB) repository. It also automates processes such as report generation and indexing. Manages several critical clients' configurations such as the creation of the annotations database and the reports configuration which must be performed before starting IBM AD Analyze Client.

IBM AD Analyze analyzes mainframe projects (from IBM AD Build) and other types of projects (Java™, C, etc.) and displays the results of the analysis in graphs, in reports or in Usage analyses.

IBM AD Analyze Client uses zOS Explorer/CARMA to securely connect to remote mainframe systems and access/open files which it can then analyze.

IBM AD Web Service collects the data provided by Web Service Metrics component and prepares it for delivery.

Web Service Metrics component generates input data for IBM AD Web Service.

Background

IBM Application Discovery Build Client is an application-oriented Configuration Management database (CMDB) that automates application understanding and technical documentation for use in all application management activities. Synchronizing with your source configuration management system, it contains a full inventory of your application components and their details. IBM Application Discovery Build Client is an indispensable tool for support activities and a precursor to undertaking enhancements and modifications. It is designed for use by all technical staff, having management components for transparency into application metrics.

Supported Source Components

The standard edition of IBM Application Discovery Build Client supports the following source components:

- **OS** - z/OS®, OS/390®, VSE, Fujitsu AIM/VME, SMART AS/400
- **Languages** - COBOL dialects (Cobol II, VSE Cobol, Cobol 400®, Fujitsu Cobol and so on), Natural, PL/I, ADS/O, CL, Assembler, Ads
- **Databases** - DB2®, Adabas, IMS/DB, AIM/DB, IDMS, DB/400, Relational, Datacom
- **Transaction Monitor** - CICS®, IMS/DC
- **Mapping Types** - BMS, MFS, NLM, DDS, ADS Map
- **Batch Components** - JCL, Proc, Cntrl
- **File types** - ISAM, VSAM

About This Guide

The objective is to provide the information that is needed to use IBM Application Discovery Build Client, and to understand the capabilities.
**Note:** For instructions on how to install IBM Application Discovery Build Client, see the IBM Application Discovery Installation and Configuration Guide.

A description of the following sequence of steps and procedures that are typically followed to set up and analyze a system, are described as follows.

1. Setup
   - Create a project.
   - Add files to the project.
   - Update project resources.

2. Analysis
   - Collect information on an application (called a ‘Build’) and store the results in the repository.
   - Make and integrate the current version of a project resource into the built project.
   - Search in project for a specific project resource.

**Terms And Conventions**

The following terms and conventions are used:

- Commands are printed as shown.
- Chapter references are indicated as shown. For page numbers, refer to the Table of Contents.
- File references are printed as shown.
- **Button names** and options/functions within a dialog box are printed as shown.
A vital component of **IBM Application Discovery Build Client** is **Connect for Mainframe**, which brings data from the mainframe system, for details on how to install this component see IBM Application Discovery Connect for Mainframe Installation Guide.

**IBM Application Discovery Build Client** uses a relational database as a repository for storing data. If you want to view this data, you need the relational database. The tables and fields in the repository are described in detail in IBM Application Discovery Repository document.
Chapter 4. IBM Application Discovery Build Client

Following is an overview of the use of IBM Application Discovery Build Client. It introduces the concepts and capabilities of the product and describes the typical sequence of tasks to be followed for setting up a project and undertaking the analysis. Since the objective is to provide a general picture of the use of IBM Application Discovery Build Client, not all the capabilities, alternatives, and options available at each stage are described exhaustively. A detailed reference for all aspects of IBM Application Discovery Build Client is presented in Chapter 5, “IBM Application Discovery Build Client Reference,” on page 35.

Projects, Folders & Files

Organizational entities for working with IBM Application Discovery Build Client include projects, folders, and source files. A project corresponds to an application.

A project contains a number of folders, where each folder refers to a specific type of source file that is used by the application. The default folders for a project are determined by the project definition at creation time. For example, a Cobol project has by default folders for COBOL, Copy, BMS, JCL, and Configuration source files. A Natural project has by default folders for Natural programs, Natural Include, Natural Maps and Data Area. Each folder contains a list of the files of the corresponding type that are used by the original application. These files are also used by IBM Application Discovery Build Client.

Although for each IBM Application Discovery Build Client project folder a physical folder is created automatically under the project folder on the disk, any file can be added through IBM Application Discovery Build Client to the project folder without having to physically copy it to the corresponding folder on the disk. The physical folders are created only at the default location where IBM Application Discovery Build Client looks for files when you add files to the project folders. Files in an IBM Application Discovery Build Client project folder are references to the original source files somewhere on the disk or on a remote network drive and not physical copies of them.

**Note:** Starting with the 5.0.4 release, additional folders of specific type can be manually added to a project, if the Extensibility feature(s) have been enabled.

Tasks

Working with IBM Application Discovery Build Client usually includes the following tasks:

<table>
<thead>
<tr>
<th>Task</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Starting IBM Application Discovery Build Client</td>
<td>Define the database connection parameters (if applicable).</td>
</tr>
<tr>
<td>2. Starting IBM Application Discovery Build Configuration</td>
<td>Create a project by specifying the project name, project type (single or multi-app), location, environment, languages, DB type, and Map type and the relational database server name.</td>
</tr>
<tr>
<td>3. Create Project</td>
<td>Adjust the project settings.</td>
</tr>
<tr>
<td>4. Project Settings</td>
<td>Add files to the project.</td>
</tr>
<tr>
<td>5. Project Files</td>
<td>Build the project.</td>
</tr>
<tr>
<td>6. (Re)build</td>
<td></td>
</tr>
</tbody>
</table>

Tasks 2, 3, 4 and 5 are set up and organizational steps. Their purpose is to define the source material to be analyzed. Step 6 (Build) creates and populates the repository, which is the basis for the Analysis step in IBM Application Discovery Analyze.
The following sections describe the typical tasks that are run in IBM Application Discovery Build Client. In many cases, you have alternative ways for activating the same IBM Application Discovery Build Client functions (main menu, menus, keyboard shortcuts, and the main screen toolbar). In Tasks, references are mostly made to the main menu commands. The alternatives are described in Chapter 5, “IBM Application Discovery Build Client Reference,” on page 35.

Starting IBM Application Discovery Build Client

When IBM Application Discovery Build Client is started, the main screen appears. All activity takes place within this screen. It is empty until a new project is created or an existing one loaded.

Creating a Project

About this task

IBM Application Discovery Build projects correspond to independent applications. An IBM Application Discovery Build project can contain references to all application source files or to part of them. The source files are organized into folders that are category lists for the different kinds of files that make up the project/application. For example, program (such as COBOL) source, copy, and BMS files are listed in the project’s Program, Copy, and BMS folders. Standard folders are defined and included in the project by default. However, you can define new folders if necessary.

Creating an IBM Application Discovery Build project creates a project folder on the computer or on a network drive. You can specify the location for this folder.

To create a new project, follow these steps.

Procedure

**Note:** The options available in the **New Project** window depend on the version of the purchased application.

2. Enter the name of the new project in the **Project Name** text box.

3. The **Path** field displays the default projects path. To select a different path, click **Browse** and select an alternative location.

4. The Environment, Project Languages, DB Types, and Map Types sections present the default options.

5. From the **Project DB Type** list, select one of the following database types:
   - Microsoft SQL Server
   - IBM DB2 for z/OS

6. **CCS Environment** field: if in **IBM Application Discovery Configuration Server** only one environment was defined, this field displays the name of that environment. If several environments were defined in **IBM Application Discovery Configuration Server**, click the arrow button to display a list of available environments and select one. For details on environments, see **IBM Application Discovery Configuration Server User Guide**.

7. **Server Name** field: this field displays the name of the relational database server that was associated to the selected environment in **IBM Application Discovery Configuration Server**.

8. Click **Next**. The **Project Folders** dialog box appears for selecting and defining project folders. This screen presents different folder names, depending on the environment selected.

9. To accept the default folders without entering the **Project Folders** screen at all, click **Finish** instead of **Next**.

10. Select folders by moving them from the **All Folders** to the **Selected Folder** lists, by using >, or clear them using <. Default **All Folders** and **Selected Folder** lists are provided. The content of these lists depends on the project type that is selected in the previous step. For an existing project, you can select **Project > New Folder** to open a dialog box for adding more folders.

11. Click **Finish**. The new project is created and displayed as a tree in the **Project** pane (left side of the window).
Adjusting Settings

When resources such as COBOL, Natural, PL1 are built in IBM Application Discovery Build Client, the corresponding include/copybook, control, proc, and macro files are searched, according to the default extensions in the default project folders.

Select the Settings menu to run these actions.

1. From the Search Paths Order window, modify the default search paths, add several search paths for a resource type and set the order in which these paths are accessed.

2. Generate a log file under each project folder during the build process. This procedure takes up more disk space but allows a detailed inspection of the build process if an error occurs. Keep this option cleared. If the tech support team requests you to activate it, a password is supplied by the support team.

3. Determine whether a file or all the files from a project folder is included or not in the analysis (Build). For the Include folders (Natural Include, Cobol Include, Assembler Include), use Settings to override the default extensions for these files. More parameters are available for each resource type.
4. Enable the **Extensibility** features:

   - Enable API/Macro handling by using a configuration file.
   - Enable handling of before and after preprocessed source code.

For more information, see “Using the Settings Option” on page 45.

**Adding Files to Project Folders**

After you create the project and its folders, the files to be analyzed must be added to the appropriate project folders. Following are the project folders and the sources that can be placed in each one of them.

**Note:** Project folders depend on the type of selected project at project creation time. Therefore, for some projects, some of the following folders are not available.

The project folders that are created, differ according to the environment selected as shown in the following table:
**Environment**

**Folders - Description**

- **Natural** - Natural programs
- **Natural Include** - Natural include files.
- **Natural Map** - Natural map definitions.
- **Natural DDM** - Natural DDM files.
- **Data area** - Natural data area that includes Local Data Area, Parameter Data Area, and Global Data Area.
- **Cobol IDMS** - Cobol IDMS files.
- **DT Cobol** - Pre-compiled - Pre-compiled data type Cobol files.
- **DT Cobol** - **Data Type** Cobol files.
- **z/OS Cobol** - simple Cobol files.
- **Cobol Include** - COBOL copybooks and include files.
- **Cobol IDMS Record** - Cobol IDMS Record files.
- **PL1** - PL1 programs.
- **PL1 Include** - PL1 copybooks and include files.
- **PL1 IDMS Record** - PL1 IDMS record files.
- **ADS Process** - ADS Process files.
- **ADS Dialog** - N/A.
- **ADS Map** - N/A.
- **BMS** - BMS assembler definitions (relevant only for CICS projects).
- **JCL** - JCL Jobstream files.
- **JCL Include** - JCL Include files.
- **JCL Control files** - JCL Control files.
- **JCL Procs** - JCL procedure files.
- **AAuto Scheduling** - A-AUTO Scheduling programs.
- **Schema** - IDMS schema
- **Subschema** - IDMS Sub-schema.
- **PSB** - IMS PSB files.
- **DBD** - IMS DBD files.
- **Assembler** - Assembler files.
- **Assembler Macro** - Assembler macros.
- **Assembler Include** - "Assembler include" files.
- **MQ** - MQ configuration files.
- **Configuration** - CSD files.
- **Configuration** - IMS/T PGM
- **Configuration** - PGM Aliases.
- **IMS MAP** - MFS files (relevant for IMS projects only).
- **PreProc Before** - User's original sources.
- **PreProc MetaData** - Files that map the before files with after files.
- **PreProc Config** - Files containing mappings between the folders of the before, meta and after files.
- **API Config** - Files containing configurations for the API calls.
Environment

**Fujitsu VME**
- Cobol VME - COBOL VME programs.
- Cobol Include - COBOL copybooks and include files.
- SCL - System Control Language files.
- DDCL - Data Dictionary Control Language.

**SMART AS/400**
- Cobol AS 400 Smart - Cobol AS 400 Smart programs.
- Cobol Include - COBOL copybooks and include files.
- AAuto Scheduling - A-AUTO Scheduling programs.
- CL - CL Programs.
- Screens - DDS screens.
- Printer files - DDS printer files.
- Delete Reports - XML containing information about sources that are deleted from the AS/400.
- Object Listing - XML containing text names from the CDD repository.
- Logical View definition - XML describing logical views information.
- Datasets Definition - XML describing data sets information.
- Table Definition - XML describing table information.
- Scheduling Information - XML describing batch scheduling information.
- Batch Processes Information - XML describing batch processes information.
- Assembler - Assembler files.
- Assembler Macro - Assembler macros.
- Assembler Include - Assembler include files.

Some environment files are not added directly to one of the project folders. Instead, they are put under the project directory on the hard disk. The project directory is the location where the project was created, specified in the path box at project creation time. Following is a list of these environment files.

**Files under the project directory on the hard disk**

**Control files**
These files can be placed by default into the CTRL directory that is automatically created under the project directory. Control files must not have any extension in order for IBM Application Discovery Build Client to locate them. In case you have several control files with the same name that are taken from different libraries and used by the JCL files according to the search order, create a directory under the project directory for each library. For example, if two control files with the same name that are taken from two libraries LIB1.MYCTRL and LIB2.MYCTRL, create two directories that are named LIB1.MYCTRL and LIB2.MYCTRL under the default CTRL directory and place each procedure in the corresponding directory. IBM Application Discovery Build Client JCL compiler searches for the right folder according to the search order specified in the JCL.

**Note:** This procedure is needed only if you have two control files with the same name, in which case they cannot be both put in the default directory CTRL.

The Control files (or the PARM files) are the source members referenced in DD cards in the format of DSN=MY.PDS.NAME(CTRLMMBR). These Control files may contain SORT parameters, or SYSIN data, or DB2 command (if in SYSTSIN card for DB2 invocation programs), all depending on the step they are used in and the DD card name.

The JCL include files are files that are included in the JCL source using the INCLUDE command, e.g., //LABEL001 INCLUDE MEMBER=INCFILE1INCFILE1 is the JCL include member. Usually these
will have list of DD cards commonly used together in many JCL sources, and put into one shared file to simplify maintenance in case you want to add/remove/change a DD card. They can also contain full steps.

**DDCL files**
DDCL files contain Data Dictionary Control Language (DDCL) statements. **IBM Application Discovery Build Client** parses these files and automatically generates the Cobol data structures that correspond to the COPY DDS statements in the Cobol programs. **IBM Application Discovery Build Client** parser generates copybook files for each COPY DDS statement and store them on disk in a separate DDCL Includes folder in the project folder. COBOL compiler uses these COPY BOOK files.

**Note:** This DDCL Includes folder is not visible in the Project tab.

**Procedures (also known as PROCs)**
These files, which are referenced from JCL files, can be placed by default into the SYS1.PROCLIB directory that is automatically created under the project directory. Procedure must not have any extension in order for **IBM Application Discovery Build Client** to locate them. In case you have several procedures with the same name that come from different libraries and used by the JCL files according to the search order, create a directory under the project directory for each library. For example, if two procedures with the same name that are taken from two libraries LIB1.MYPROC and LIB2.MYPROC, create two directories that are named LIB1.MYPROC and LIB2.MYPROC under the project directory and place each procedure in the corresponding directory. **IBM Application Discovery Build Client** JCL compiler searches for the right folder according to the search order specified in the JCL.

**Note:** This procedure is needed only if you have two procedures or include files with the same name, in which case they cannot be both put in the default directory SYS1.PROCLIB.

**PSB files**
These files, used only by the IMS application, must be placed in a directory that is named PSB under the project directory. This directory is not created automatically and therefore must be created if needed.

**The AAauto scheduling folder**
This folder can host two types of files: AAauto scheduling files and AAauto Dataset Flag report files.

Before you run the build process, make sure to set the correct type for the AAauto Dataset Flag report file: In the Project pane, right-click on the Dataset flag report file that is loaded in the AAauto Scheduling folder of the project and select Properties. In the File Properties window, verify that the Type is set to AAauto Dataset Flag Report. (the file type verification can be done either when the file is loaded in the project or at a later moment, but before the build step is run).

**The CICS CSD configuration file**
A CICS administrator can use the LIST command of CICS utility DFHCSDUP to extract CSD information into a report. The report can be stored under the Configuration virtual folder and can be added to a build project as a CSD type of file. The build process parses the CSD configuration file and stores the information into the MFCICS tables.

The name of the CSD configuration file must have maximum eight characters, because the file name is used as the CICS region name. For more information, see chapter “CICS CSD Information Handling” on page 27.

**The IMS transaction mapping file**
This configuration file is used to map between IMS transactions and programs. The file must be placed under the Configuration virtual folder in the project. The type of the file must be IMS/T PGM. See the following example of mapping configurations in an IMS transaction mapping file:

```
 TRANSACTION(TRAN1) PROGRAM(PROG1) IMS-TM
 TRANSACTION(TRAN2) PROGRAM(PROG2) IMS-TM
```
The Pgm_Aliases file
This configuration file for aliases is used to specify external alias names coming from outside the source files. The file will be added in the Configuration virtual folder, in the project, with type PGM Aliases. The configuration file for aliases is a comma separated file, having the following format:

- a commented line starts with "*"
  <optional disambiguation file path>, <procedure/program name defined in file>, <alias name 2>, <alias name 3>

In case the alias name is not configured with a file path, the file format is as following:

<program/procedure defined in file>, <alias name 1>, <alias name 2>
* procedure name in case of PL/I file

PGM Aliases (Configuration) Files Example:

* this is a commented line
\\shared-resources\Projects\Pgm_Alias_002\PL1\PLI1, PLI1, PLI01, PLI001
\\shared-resources\Projects\Pgm_Alias_002\PL1\PLI1_1, PLI01, PLI_1, PLI_01, PLI1
PLI2, PLI002, PLI0002
PLI3, PLI03

Note:

- These program aliases, <program/procedure defined in file>, <alias name 2>, <alias name 3>, can be declared in any order, provided <program/procedure defined in file> exists among the aliases names. Example: if only <alias name 2>, <alias name 3> are present and <alias name 3> is called, while <alias name 2> is not found as a program/procedure definition in any source file, then <alias name 3> will not be replaced with <alias 2> in the call.

- The first item <optional disambiguation file path> which is the fully-qualified-name of the file, is optional and only needed when the same alias name refers to actually different programs: in the example above, the same program alias name PLI01 refers to two different programs, defined in two different files. If only one fully-qualified-file-names of the two will be present or the two lines meant to be told apart have no alias name in common, the fully qualified file name would not make any difference.

- If disambiguation between two alias groups is needed, the fully-qualified-file-name of a PL/I file must be added in the 1st position, as it shows in Project > Properties. Example: if the file was added with a network path, the same syntax must be used into the PGM Aliases file.

- After adding new alias name(s) into the PGM Aliases configuration file, it is recommended to (re)compile both the configuration and the PL/I files, where <procedure/program name defined in file> exists, in this order. Example: configuration file > PL/I file.

  Note: When (re)building the entire project, the configuration file is build first by default.

Important: Currently, the external alias names feature is only available for PL/I programs.

The PgmModuleName file
This file is used to map between load module and the first program that is called in the module (relevant only for batch applications). By default, IBM Application Discovery Build Client assumes the module name and the name of first program that is called are identical. In case they are not identical, a mapping must be described in the PgmModuleName.txt file, which must be placed under the project directory. Following is an example of the file content:

OKC82     OKC8201
OKC75     OKC7501
OJC07     OJC0701

On the left side, the module name is specified and on the right side, the first program name is specified.

The PSBmap file
This file is used to link the program and the PSB file names (the format contains: PgmName, PgmType, PSBFileName). By default, IBM AD Build Client assumes the program name and the name of the PSB file are identical. In case they are not identical, a mapping must be described in
the PSBmap.txt file, which must be placed under the project directory. Following is an example of the file content:

```
EDADL3M, Cobol, EDADL3P
EDADM2M, Cobol, EDADM2P
EDADM4M, PL1, EDADM4P
EDADN2M, PL1, EDADN2P
```

On the left side, the program name is specified, in the middle the program type (Cobol or PL1) and on the right side, the PSB file name is specified. For Cobol programs, in case the PROGRAM-ID and the file name are not identical, PROGRAM-ID name is used to map (link) the Cobol program with the PSB file name.

**The SCL folder**

SCL files are placed in the SCL folder, which is automatically created when a VME project is created. SCL files are specific for VME environment. *IBM Application Discovery Build Client* parses the SCL source files for these job control programs to understand the relationships between application code and assets in the VME environment (such as files). Therefore, *IBM Application Discovery Build Client* recognizes and deals with all the syntax and semantics of the SCL language.

To add files to a folder, follow these steps:

1. In the **Project** tab, click the folder name, and then select **Project > Add Files**. Alternatively, right-click the folder name and choose **Add Files**. A file selection window opens.
2. Locate the files (they can be on any drive and directory) and select them individually or in groups (by using the Windows **SHIFT** key or **CTRL** key mechanism).
3. Click **OK** to add the selected files to the project. The names of the files appear in the expanded file structure in the project tree.
4. Repeat the **Add Files** procedure to add all necessary files to each of the project folders.
5. If you need to add a long list of files, you can use the option **Add All Files from Folder**. Selecting this option presents you with the following window:

```
Add all files from folder

Add all files according to the wildcards :

Folder path :
C:\Analysis_M\Cobol II ...

OK Cancel
```

**Note:** Make sure that the folder path is correct; click **OK** to add all the files from that folder to the corresponding project folder.

6. To save the programs, files, and projects in their current states, select **File / Save All**.

**Note:** It is possible that the process of adding files can take a long time during which you cannot use the application. If you need to use the application, you can run the **Add files** process in the background. To make the **Add files** operation to run in the background, follow these steps:

a. Click **Start**, select **Run** then type **cmd** to open the command window.

b. Go to the folder where your *IBM Application Discovery Build Client* is installed and locate the `IBMApplicationDiscoveryBuildClient.exe` file. Drag the `IBMApplicationDiscoveryBuildClient.exe` file into the command window then enter `"/?"` and press **ENTER**. A window is displayed containing detailed instructions about how to make a specific process to run in the background.
Adding Files From Mainframe Library

About this task
To add files from the mainframe library to your project, some preliminary steps need to be taken in the IBM Application Discovery Build Configuration. See “Creating a z/OS Connection” on page 68 for more details.

Procedure
1. In your Project tab select the folder where you want to import files from the mainframe library then right-click to display the menu and from it select Add Files from Mainframe to display the following window.

2. A list of imported libraries is displayed. Select the libraries from which you want to import resources then click Next: the Member Files from Mainframe Selected Libraries window is displayed.

   Note: Only libraries that contain at least one member are displayed.

3. A list of members that are identified within the imported libraries is displayed. For each resource the following data is displayed:
   • The type of the resource (Assembler Macro CICS map BMS, Cobol Program).
   • The source (z/OS).
   • The name of the library where it was found.

4. Select the files that you want to add to your project and click Finish. The selected files are added in the current folder of your project: Their respective names indicate their source – z/OS, and the name of the library from where they are imported and their original name.

Adding Files From ChangeMan ZMF Packages

About this task
To add files from the mainframe by using ChangeMan ZMF Packages, some preliminary steps need to be taken in the IBM Application Discovery Build Configuration. For more information, see “Creating a z/OS Connection” on page 68 and “Configuring the z/OS Connection” on page 52.

Procedure
1. In your Project tab, select the folder where you want to import files from the mainframe then right-click to display the menu and from it select Add Files from Mainframe to display the following window.
2. Select Add by Packages (ChangeMan) then click OK to display the Add Files from Mainframe Libraries window. A list of imported packages is displayed.

Note: Only libraries that contain at least one member are displayed.

3. Select the package from which you want to import resources then click Next: the Member Files from Mainframe Selected Libraries is displayed. A list of members that are identified within the imported package is displayed. For each resource, the following data is displayed.

- The method that is used for import (SRC - ChangeMan).
- The source (z/OS).
- The name of the package where it was found.

4. Select the files that you want to add to your project and click Finish. The selected files are added in the current folder of your project: Their respective names indicate their source – z/OS, and the name of the package from where they are imported and their original name.

Building Projects

About this task

A “build” is the process where IBM Application Discovery Build Client reads project sources, places the results in the project repository, and generates the data that is needed to display the graphical representation of the applications’ internal and external program relationships.

The build process can be ran on individual programs in the project, on a batch of selected files and folders or globally on all the resources in the project. Generally, you make a global build, but if, for example, a single source file is changed, a build on that file alone would be appropriate. In that case, only the modified program is analyzed and the project repository is updated accordingly.

Procedure

1. To build a project, follow the steps bellow.
   a) Select Build / Build Project to start the build process. A warning message alerts you to the fact that this operation erases the database. Click Yes to start the build process.
   b) As each file is processed, its name and accompanying notes and messages, including error notifications, are displayed in the Message pane
   c) On completion of the build, you can double-click any of these messages to open the corresponding source file at the appropriate line.

2. To build a single program or a folder, follow these steps:
   a) In the Project pane, expand the project tree so that the required source program or folder is visible. Click the program icon or the folder to select it then right-click and select Build.
   b) The IBM Application Discovery Build Client Message window displays the file name and log messages that are created during the build process. Information about the file and its internal relationships is created and placed into the repository.

3. To build a batch of selected files, follow these steps:
a) 1. In the **Project** pane, expand the project tree so that the required source programs and folders are visible. Click the programs and folders that you want to include in the build process then right-click and from the menu, select **Build**.

b) 2. Alternatively, for large batches of files you can create a *.txt* file that contains the list of resource files that you want to build and then use the **Build Imposed Selection** option from the project node menu to load that file.

c) Browse to the location of the *.txt* file then click **Load** to load its contents. The *.txt* file must contain the FULL PATH to each resource file on a separate line. Extra syntax indications for the *.txt* file are also available. After the file is loaded, the resource files list is displayed. Click **OK** to start the build process. The **Messages** window displays the file names and log messages that are created during the build process. Information about the files and their relationships is created and placed into the repository.

4. To update the project after several sources are changed:
   a) When several sources are changed, the easiest way to update the project repository is to use the **Make** option. Run **Make** by selecting **Build / Make Project** or by pressing **F7**. **Make** works in the following way: for each source, **IBM Application Discovery Build Client** compares the last modified date with the date on the disk and decides whether an update is necessary for the source. This step is called verification.
   
b) 2. A **Build** is ran only for the sources that are chosen in the verification step.
   
c) 3. A summary of the updated sources is displayed in the **Message** pane.

5. To update files from mainframe library: to make sure that you have the current version of the resources that are brought to your project from mainframe use **Update Modified Mainframe Members** function from the project menu or select **Update Modified Mainframe Members** from **Build** menu.

6. To build only the updated resources – **Make**: to make a build exclusively with the modified resources use **Make** option. Click **Make** from the toolbar, alternatively you can select **Make** from **Build** menu.

   **Note:** If you start a **Build** on a project where other users logged in, a warning message appears indicating which users are connected to the project. You need to confirm the operation.

   If another user activates a Build while you are logged in to a project a warning message appears urging you to close the project and wait for a notification that is sent to all users when the build process is completed. During the Build process, the project is locked and cannot be accessed by any user. After the Build is successfully completed, a notification is sent to all users logged in to the project.

   It is possible that the **Make** process might take a long time during which you cannot use the application. If you need to use the application, you can run the Make process in the background. To force the **Make** operation to run in the background, follow the steps:
   
a. Click **Start**, select **Run** then type **cmd** followed by **ENTER** to open the command window.
b. Go to the folder where your **IBM Application Discovery Build Client** is installed and locate IBMApplicationDiscoveryBuildClient.exe file. Drag the IBMApplicationDiscoveryBuildClient.exe file into the command window then enter /? and press ENTER. A window is displayed containing detailed instructions about how to make a specific process to run in the background. To make the **Add files** operation to run in the background, follow the displayed steps.

### Updating Projects

**About this task**

You can update a project in two ways: manually or automatically. The process of manually updating a project is described as follows. For details on the automatic process, see “Schedule Periodic Updates for Projects” on page 24. If you want to update the project manually, this procedure takes only two steps from the project menu only.

**Procedure**

1. **Update Modified Mainframe Members.**
   - This action checks for all project members that originated from the mainframe, if a new version of their source is available.
   - All sources that are brought from the mainframe have data about their mainframe origin and last update time, which is stored in the **IBM Application Discovery** repository for the project.
   - For sources that were brought from Endevor, this action checks against Endevor if a new version for the file is available, since the last retrieval date. If a new version for the file is available, the member is brought to the mapped virtual folder that matches the Endevor library.
   - For PDS members, **IBM Application Discovery Build Client** checks the file dates on the mainframe against the last update date from **IBM Application Discovery** repository. If the member on the mainframe is newer, it gets updated on the PC folder that matches the PDS name.

2. **Make**
   - This action effectively updates the **IBM Application Discovery** repository with the information relevant to the modified sources, and keeps it up to date with the code in the sources on the mainframe.
   - Make builds a small subset of the whole project, as an incremental build step after which the full project repository is up to date with the minimal effort needed.
   - This action starts with checking all the project members on the PC disk folders against their last recorded update dates on the last build time that is stored in the **IBM Application Discovery** repository for the project.
   - If a file on the disk is newer than the information recorded in the database, then the file is part of the **Project Make** process that is an incremental build. If the newly updated files are programs or jobs, then they are added to the list of components that must be added to the programs/Jobs to be built in the **Make** process.
   - If the newly updated files are copybooks, then **IBM Application Discovery Build Client** checks in the repository for all programs that copy these files, and these programs are added to the programs to be built in the Make process.
   - If the new updated files are JCL PROCs, or JCL Include Files, or JCL Control files (PARMLIB files) then **IBM Application Discovery Build Client** checks in the repository for all JCL Jobs that use these files, and these Jobs are added to the programs to be built in the Make process.
   - After this stage, **IBM Application Discovery Build Client** runs a build for the programs and Jobs that must be updated according to the previous steps, and after these components are built a summary of the number of updated components appears on the **Make** log.
   - The Make log, just like any Build log, is saved to the disk under the project folder, with the **Make** date time. This method allows viewing past **Make** results and updated components at any time.
You do not need to do anything on **IBM Application Discovery Build Configuration** for this update of Endevor and PDS members.

For the CA7 manual update, the way to start the CA7 Data retrieval is by using the **IBM Application Discovery Build Configuration**, by using *Query Environment > CA-7 Workload Automation* option.

### Synchronize Mainframe Members

The **Synchronize Mainframe Members** feature allows the user to specify whether **IBM Application Discovery Build** must update against specific libraries, where to add/remove the related members in/from the project (that is, which virtual folder to use) and also which type of members **IBM Application Discovery Build** must be used when you add members. The basic assumption is that the specified libraries do not contain members that do not need to be added even though they are there.

The **Synchronize Members** action is run by using a configuration file that specifies what members of what type to be brought into which mapped virtual folder of the project. When you run **Synchronize Members** on a project, only the members that belong to libraries specified in the configuration file for this particular project is synchronized.

The **Synchronize Members** feature is activated from **IBM Application Discovery Build Server**. For more information, see “Members Synchronization Settings” on page 69.

For details on the syntax of the configuration file and an example, see “Appendix 2 - Synchronize Members Configuration File Examples” on page 75.

After the members’ synchronization process is finished, use **Make** to ensure that the analyses you ran are done on the current version of the mainframe sources (updated, added, or removed).

### ChangeMan – IBM Application Discovery Validation Process

This feature is relevant only for ChangeMan users and has as must have prerequisites: IBM Application Discovery Validation Server and IBM Application Discovery Connect for Mainframe.

To have this feature up and running, IBM Application Discovery Validation Server must be installed and configured. A reference to it is found in the IBM Application Discovery Installation and Configuration Guide.

The validation process works as follows.

1. Compile a member in Serena (Cobol Program, Assembler Program for example).
2. IBM Application Discovery Validation Service receives an indication that a certain program, part of a package within an application is compiled.
3. IBM Application Discovery Validation Service triggers IBM Application Discovery Build Client in background mode for the following actions: **Synchronize** and **Build** selection.
4. The **Synchronization** process is described as follows.
   a. If the compiled member is part of a simple package on Serena, then entire package is synchronized, all members part of the package is downloaded / updated on disk, and the compiled member is added in a project as configured for the Validation Process.
   b. If the compiled member is part of a participating package on Serena, then the member’s package is synchronized together with all the other participating packages part of the same complex/super package. Only the member that is compiled in Serena, is added to the project. The other members are just saved on disk.
5. **Build Selection** Process. As a prerequisite for this step, the include baseline libraries must exist in the central location for Mainframe Library Members. An important component for the **Build Selection** is the include search paths creation. The paths for the include folders are generated in two ways based on the member’s location in Serena (in a simple package or in a participating one).
   a. If the compiled member is part of a simple package, after it is synchronized and added to the project, the include paths are generated in the following order:
      1) The location of the package on disk.
2) The location of the baseline’s include folders.

Note: After the include paths are generated, Build Selection starts on the member and the relevant information is stored in the repository.

b. If the compiled member is part of a complex package, after it is synchronized and added to the project, the include paths are generated in the following order:

1) The location of the member’s package.
2) The location of the participating packages (in the order they are defined in Serena as part of a complex/super package).
3) The location of the baseline’s include folder(s).

Note: After the include paths are generated, Build Selection starts on the member and the relevant information is stored in the repository.

6. After the build selection process finishes, IBM Application Discovery Validation Service starts to generate Rules Based reports for the program that was previously staged. IBM Application Discovery Validation Service is configured to have different weights for the rules, each rule that is infringed has a value that is defined by the user in the IBM Application Discovery Validation Service configuration.

7. Return of the max weight value to ChangeMan. After the report is generated and the maximum weight value is calculated, it is returned to the mainframe agents that further pass this information as follows:

- To ChangeMan in user option 0401.
- In the user’s terminal as a message (where user is the one that initially staged the Cobol Program in ChangeMan). The messages sent to the terminal can be configured in IBM Application Discovery Validation Server in the CompletionCodeVsMessage.txt configuration file (Refer to IBM Application Discovery Installation and Configuration Guide for details); For the situation when there’s a weight that is not configured in the previous configuration file, then the user sees in the terminal the message error in flow and IBM Application Discovery Validation Server logs must be investigated for further details.

8. Default max weight values and return codes that are currently supported by IBM Application Discovery Validation process and IBM Application Discovery Connect for Mainframe when you send the information to ChangeMan:

- 0 - converted to VPAS and sent to Serena in user option 0401.
- 4 - converted to VWRG and sent to Serena in user option 0401.
- 8 – converted to VFAL and sent to Serena in user option 0401.

Any other values (except 99) – converted to NA and sent to Serena in user option 0401.

Return Code 99 – converted to DISS and sent to Serena in user option 0401. This code is a special return code that is sent only for the situation when something went wrong in the Validation Process flow (such as synchronize failed, build selection that failed, or the report cannot be generated).

**Display Build Results**

On completion of the build process, you can view the information that was collected and stored in the IBM Application Discovery Build Client project repository. Functions that can be accessed at this stage include viewing the application’s source files. For more information, see “Viewing Source Programs” on page 41.

**Schedule Periodic Updates for Projects**

To make sure that you have the current version of your resources available and built into your project, make sure that you schedule periodic updates. These periodic updates must consist of two operations:

- Updating the modified mainframe members.
- Make – building the modified resources.
Log files are generated for each update process and rewritten every time that a new update is run. A detailed description of how to run these operations is described in the following chapters.

**Updating Files from the Mainframe Library**

**About this task**

This procedure covers the steps that are required for updating files from the mainframe library.

**Procedure**

1. Click **Start**, select **Run** then type `cmd` to open the command window.
2. Go to the folder where your **IBM Application Discovery Build Client** is installed and locate the `IBMApplicationDiscoveryBuildClient.exe` file.
3. Drag `IBMApplicationDiscoveryBuildClient.exe` file into the command window then type `/?` and press **ENTER**. A window is displayed containing detailed information about how to make a specific process runs in the background. An example of the command for updating mainframe members.

   ```
   C:\Program Files\IBM Application Discovery Build Client\Bin\Release\IBMApplicationDiscoveryBuildClient.exe /umm1 Banker
   ```

4. A log file is generated for each update process and placed at the location set for the mainframe members with the Path for Retrieved Members option. The name of the log file is `SumarizeGetMFMemberSources.log`.

   **Note:** Log files are rewritten every time that a new update is run.

**Updating the Project After Several Sources Have Changed**

**About this task**

This procedure covers the steps that are required for updating the project after several sources are changed.

**Procedure**

1. Click **Start**, select **Run** then type `cmd` to open the command window.
2. Go to the folder where your **IBM Application Discovery Build Client** is installed and locate `IBMApplicationDiscoveryBuildClient.exe` file.
3. Drag the `IBMApplicationDiscoveryBuildClient.exe` file into the command window then type `/?` and press **ENTER**. A window is displayed containing detailed information about how to make a specific process runs in the background. An example of the command for updating the project.

   ```
   C:\Program Files\IBM Application Discovery Build Client\Bin\Release\IBMApplicationDiscoveryBuildClient.exe /m1 Banker /m2 y /m3 n
   ```

4. A log file is generated for each update process and placed in the project folder. The log file name is `projectname.txt`.

   **Note:** Log files are rewritten every time that a new update is run.

**Setting up Automatic Updates with Windows® 7 Scheduler**

**About this task**

If you want to make sure that the resources you are working on are always up to date, use the Windows Scheduler to run automatic, periodic updates.

You need to create a scheduled task for each process you want to schedule. Each scheduled task runs a `*.bat` file that contains a specific command. For example, the `*.bat` file that initiates the process contains the following command:

   ```
   C:\Program Files\IBM Application Discovery Build Client\Bin\Release\IBMApplicationDiscoveryBuildClient.exe /umm1 Banker
   ```
The *.bat file that initiates the process Update project contains the following command.

C:\Program Files\IBM Application Discovery Build Client\Bin\Release\IBMApplicationDiscoveryBuildClient.exe /m1 Banker /m2 y /m3 n

Procedure

1. To set up the automatic updates in Windows® 7 Scheduler, select Start > Control Panel > Administrative Tools > Task Scheduler: the following window is displayed. If you’re prompted for an administrator password or confirmation type the password or provide the confirmation.

2. Select the Action menu then click the Create Basic Task. Type a name for the task and an optional description then click Next.

3. Do one of the following actions.
   - To select a schedule based on the calendar, click Daily, Weekly, Monthly, or One time, click Next; specify the schedule that you want to use, and then click Next.
   - To select a schedule based on common recurring events, click When the computer starts or When I log on, and then click Next.
   - To select a schedule based on specific events, click When a specific event is logged, then click Next. Specify the event log and other information by using the menu lists, and then click Next.
4. To schedule a program to start automatically, click **Start a program**, and then click **Next**.

5. Click **Browse** to find the program you want to start, and then click **Next**. Click **Finish**.

**CICS CSD Information Handling**

Online programs that run under CICS require access to external data sources, such as files, tables, and queues, cannot rely on jobs to perform the mapping to physical data source entities. CICS provides a way to define such mapping and saves the mapping information in the CICS System Definition (CSD) file.

To obtain CICS CSD information, the user can choose either of the following two methods:

- Using **IBM AD Connect for Mainframe**
- Using an exported CSD report

It is recommended to choose only one method to obtain CSD information in a project. For example, if the CSD information is obtained by using **IBM AD Connect for Mainframe**, and afterward the user decides to use an exported CSD report, the previous CSD information is automatically deleted. For more information, see “Deleting data from the repository” on page 29.

**Using IBM AD Connect for Mainframe**

When **IBM AD Connect for Mainframe** is used, the obtained CSD information is stored in the following MFCICS tables: MFCICSFile, MFCICSGroup, MFCICSGROUPVsENTITY, MFCICSGroupVsEntityLinks, MFCICSMeta, MFCICSMetaFiles, MFCICSLIST, MFCICSLISTVsGROUP, MFCICSMap, MFCICSProgram, MFCICSTransaction, and MFCICSTransactionPerformance.
The information from the MFCICS tables, of the related database, is shown in graphs, reports, and usages in IBM Application Discovery Analyze.

Using an exported CSD report

When a CICS administrator wants to use an exported CSD report, a CICS utility, called DFHCSDUP, is used to extract information out of CSD. The result is a report that is generated by the LIST command of the DFHCSDUP utility.

The CICS administrator needs to carefully decide which parameters are used when the DFHCSDUP utility is invoked. The format is as follows:

```
>>-List--+------------------------+--+---------+---------------><
  +-Group--(--groupname--)+  +-Objects-+
  '-List--(--listname--)---'  '-Sigsumm-'  
```

In some cases, a CICS application uses a specific LIST. It is recommended to have a single application in a specific project and to use the appropriate list name when you run the utility. For example, LIST LIST(listname) is preferred instead of LIST ALL OBJECTS.

When the user specifies LIST ALL, the CSD report is parsed to save all the lists in the repository. In this case conflicts can occur. For more information, see “Conflict resolutions” on page 29.

The report is added to an AD project as a CSD type of file. The build process parses the file and stores the information in the MFCICS tables.

CSD report parser

The CSD report parser collects the following information:

- CICS region name.
  - When an exported CSD report is used to obtain CSD information, the CICS region name represents the name of the report file. The region name is specified in the CICSName column of the MFCICSInfo table.
- The list of the CICS LIST components.
- The list of the CICS GROUP components and their relationship to the parent LIST.
- The list of the following CICS items:
  - Files
  - Map sets
  - Programs
  - Transactions

Important:

- If a group is not related to any list, it means that the group is not included in the group lists, specified by the CICS system initialization parameter GRPLIST, that CICS installs at cold start. This Orphan Group is excluded from the parsing and the resources contained by this group are not saved in the repository.
- The parser saves the first mapping relation encountered and ignores the others, when transaction is mapped to multiple programs.

After parsing the CSD report, the following information is used in IBM Application Discovery Analyze:

- The mapping between transaction and programs. The values are stored in the MFCICSTransaction table.
  
Important: Only programs referred (that exists or are used) in the current IBM AD Build Client project are taken into account, in the mapping relation.

The mapping is used/visible in analysis like:

- Program/Transaction Callgraph
– Program Flow
– Backward/Forward Call Chains reports
– Explore project as CICS Transaction, Resource Type

• The mapping between CICS files and their related dataset names, similar as dataset mapping in batch applications. The values are stored in the MFCICSFile table.

**Important:** Only files used in existing programs in the current **IBM AD Build Client** project are taken into account, in the mapping relation.

The mapping is used/visible in analysis like:
– Dataset Record Structure report
– Dataset Usage in Programs
– Explore project as dataset, Resource Type

**Deleting data from the repository**

Deleting information from a previous region when querying a new one ensures the repository that has information from a single region each time. Whenever an exported CSD report or **IBM AD Connect for Mainframe** is used to import data all previous data from the repository is deleted. The user needs to consider that:

• All lists, inside the report, are considered for the name resolution.
• The region name is the CSD report file name.

**Conflict resolutions**

**Multiple lists**

There is the case when a transaction name is mapped to a program, in one list, and to another program, in another list. The CSD parser saves the information that is found in the first list and ignores the other mappings, from the other lists.

**Multiple regions**

In the context of an application analysis, do not store information from multiple regions in the same repository. The user is advised not to use more than one CSD report per project. It is not recommended to use the CSD report and retrieving operation information from **IBM AD Connect for Mainframe** in the same project. The **IBM AD Build Client** keeps the information from a single CICS region, based on the last **IBM AD Connect for Mainframe** action or CSD report parsing. The region is imported either by **IBM AD Connect for Mainframe** or by the CSD report.

**Extensibility**

**Preprocessing Extensibility**

In-house support preprocessors allow customers to view their familiar source code before preprocessing, while having **AD** parse the unfamiliar source code after preprocessing. Language preprocessors (also known as precompilers) are used to convert non-standard COBOL (for example) or non-COBOL code embedded in COBOL, into a form that the compiler can process. A non-integrated preprocessor takes as input a source file (defined as **before files**) reads and parses it then produces a modified source file (defined as **after files**) which is then passed as input to the COBOL compiler.

**IBM Application Discovery Build Client** can analyze COBOL, PL/I and ASM applications that use preprocessors.
In order to access the **Preprocessing Extensibility** feature, there is an option on the interface after the project creation, named **Enable handling of before and after preprocessed source code** that will create the following required folders.

- New folder for *before files* named *PreProc Before*.
- New folder for *metadata files* named *PreProc MetaData*.
- New folder for *config files* named *PreProc Config*.

To enable the **Preprocessing** feature, right click on folder tree > select **Settings** > click **Extensibility tab**. For more details, see “Adjusting Settings” on page 12.

The folders are added as an option after the project is created, so those users not using preprocessing will not get confused.

Additional to the files above, *after files* must also be added. The *after files* will be added in the folder corresponding to their type (such as Cobol, PL1, Assembler).

**Before Files**

These files represent the user’s original resources.

**Metadata Files**

The metadata files map the *before files* with *after files*. These files must have the same name as the files to be compiled and the extension specified in the configuration file. The metadata file will have a JSON format. For details on the syntax of the JSON file and an example, please see “Preprocessing Extensibility Examples” on page 79.

The following elements from the JSON file, are explained below:

- **info**
  Contains information about the **json format**.

- **version**
  Version of the format.

- **metadata**
  An array that contains metadata elements for the before/after file pair.

- **pathType**
  Specifies whether the before, after, and copybook paths are set in mainframe format or local PC/network paths. Valid values for this attribute are **MF** (for mainframe path format) and **PC** (for local/network path format).

- **beforePath**
  Path to the original file, before the preprocessing process.

- **afterPath**
  Path to the expanded file, after the preprocessing process.

  **Tip:** The **beforePath** and **afterPath** can be specified either in local/network path format or in mainframe format. For the mainframe format, only the PDS format is supported: *library_name* (member_name). If the users use Changeman or Endevor to retrieve the sources, local network paths are required to be specified in the **beforePath** and **afterPath** values.

- **diffResolution**
  An array containing lines/columns mappings between the **beforePath** and **afterPath**, mapping established by the preprocessor.

- **beforePos**
  The corresponding position in the original file.

- **afterPos**
  The corresponding position in the expanded file. A position is defined with the following attributes:
  - **startLine** - start line of the position.
  - **endLine** - end line of the position.
If lines from a copybook exist in an after file, the following elements must be added in the corresponding metadata file:

* **type**
  Specifies if the lines in the after file are from a copybook. This element is required only when the lines in the after file are from a copybook; the only supported value is INCLUDE.

* **path**
  Specifies the path of the copybook that the lines come from. It can be specified in the local path or mainframe format.

* **includeStmtPos**
  Contains the following two elements that specify the include command position.

  * **includeStmtPath**
    Specifies the path of the before file that includes the copybook.

  * **includeStmtLine**
    Specifies the line number of the include command in the before file.

**Note:** The file will be added in the PreProc MetaData separate virtual folder under the project, so it can be updated from the mainframe if required. For more details about metadata files, see section Extensibility preprocessing JSON schema in appendix 3.

**Metadata Files - Error Cases Behavior**

The format and content validation will be performed at build start on the corresponding after file.

- If the JSON validation fails, the build on the file is stopped and the data in the database is cleared.
- If the beforePath or afterPath values in the JSON file do not exist on the disk, the build on the file is stopped and the data in the database is cleared.

**Configuration Files**

The configuration file will contain mappings between the folders of the before, meta and after files and the extensions for each type. When compiling a file from folder X, a search is initiated for a metadata file in the meta folder corresponding to folder X. The metadata file must have the same name as the file being compiled and the extension specified in the configuration file.

**Important:**

1. The file will be added in the PreProc Config separate virtual folder under the project, so it can be updated from the mainframe if required.
2. The paths in the configuration file must be specified in local/network format, not mainframe format.
3. Lines in the configuration file can be commented by adding * at line start.

For details on the syntax of the configuration file and examples, please see “Preprocessing Extensibility Examples” on page 79.

**Configuration Files - Error Cases Behavior**

- **Configuration file format related errors.**

  The configuration file format will be validated at build start:

  1. If the configuration file format is incorrect, the build will not be started nor will affect the data in the database.
  2. If several files of different types are built in the same session (PL1, Assembler, Cobol and JCL) while the configuration file format is incorrect, the build for JCL will not be affected.
  3. If several configuration files are used, out of which some are incorrect, the behavior is similar to case 1 and error messages will be generated for each incorrect configuration file.

- **Other types of errors.**

  1. If the after file is present in the after folder while the meta files and before files are missing from their specific folders (meta folders, before folders), an error is logged without saving anything in the database about the after file.
2. If the *after file* and *before file* are present in their specific folders, while the *meta file* is missing from the *meta folder*, an error is logged without saving anything in the database about the *after file* and *before file*.

3. If the *after file* and *meta file* are present in their specific folders, while the *before file* is missing from the *before folder*, an error is logged without saving anything in the database about the *after file*.

**Note:**
1. If two types of resources (requiring / not requiring preprocessing) are available to a project, they must be organized in separate locations on the disk. In case this rule is not applied, the sources that do not require preprocessing will not be built.
2. The validation for the configuration file checks that the specified folders do exist on the disk.

**Feature Known Behavior**

If for a project, both *metadata file* and *configuration file* are used, the **Make Project** functionality will not be applied for these files. For more information about **Make Project** functionality, please see “Building Projects” on page 20.

**API Call/Macro Extensibility**

The **Extensibility - API** feature allows customers to access an analysis that reflects their usage of in-house or 3rd party APIs, by using a configuration file, instead of waiting for development support. Using JSON configuration files, the user describes how each API/Macro call should be interpreted by the **Application Discovery**.

IBM Application Discovery Build Client supports API calls only for COBOL and PL/I programs. Starting from version 5.0.4.2, API call events can be handled as one of the following types of calls:

- Data access calls
- Inner application program calls
- Cross application calls

The following statements are supported for API calls:

- `CALL PROGRAM`
- `EXEC CICS LINK PROGRAM`
- `EXEC CICS XCTL`

To enable the API macro extensibility feature, click **Project > Settings > Extensibility**, and then select the **Enable API/Macro handling by using a configuration file** check box. After you click **OK**, a folder with the name **API Config** is created.

In the **API Config** folder, two types of JSON configuration files can be added:

- **API Config**
  - Specifies the API calls to be translated, the API call parameters and for which one of these parameters, the values are needed.

- **User Exits Config**
  - Contains a list of API calls and the path to a user exit.

  The user exit is a JSON file or a utility that you must create. It contains new resolutions for the API calls. For more information about the user exit JSON files, see section “API/Macro Call Extensibility Examples” on page 82 in appendix 3.

  The resolution of the API calls is made using a module called the **API Resolver**, which uses the **User Exists Config** JSON configuration file.

**Note:** After each compilation, a **JVME_Pow_Compiler.log** file is created in directory C:\Users \User_Name\AD\comp\log.

**Note:** The **API Config** configuration file is validated before each build event and in case errors are found, an error message will be displayed and the build will be stopped.
The folder is added as an option after the project is created, so those users not using the API Macro feature will not get confused.

Error Cases Behavior
In case of any project containing COBOL sources, before any Build, Build Selection or Make processes, the configuration file validation starts automatically. You can also manually start the validation sequence, by right click JSON file > Validate.

1. If the JSON file is valid, the following message is displayed:
   Validation of the configuration file from 'API Config' folder has succeeded.
2. If the user tries to upload more than one API-Config type file, the following error message is displayed:
   Only one configuration file of each type can exist in "API Config" folder.
3. If the JSON file is not valid, an error message is displayed. The error message varies, depending of the error type:
   a. If an empty JSON file is added to the project, the error message is:
      Error parsing data for API Configuration file. Reason: The configuration file from 'API Config' folder is empty.
   b. If the JSON file has a syntactical error in its structure (ex: a missing bracket, an extra comma, etc.)
      the following error message will be displayed:
      Error parsing data for API Configuration file. Reason: At line (line number), column (column number)
      Note: Depending on the syntactical error, Reason can be: not a value, not an array, not an object, not a pair, no colon in pair, not a string.
   c. If one of the keys of the JSON file or their values are incorrect, the following error message will be displayed:
      Error parsing data for API Configuration file. Reason: Key '%s' is invalid or has invalid value.
   d. If any mandatory key is missing for the JSON file or it's value is unsupported, the following error message will be displayed:
      Error parsing data for API Configuration file. Reason: Key '%s' does not exist or has unsupported value.
   e. If the Api/Macro feature is enabled, but no JSON file is added to the project, the following error message will be displayed:
      Error parsing data for API Configuration file. Reason: The configuration file from 'API Config' folder is missing.
   f. If the user sets same values for more than one apiKey, the following error message is displayed:
      Error parsing data for API Configuration file. Reason: The key has a duplicated value.
      Note: Same behavior occurs for setting same values for more than one Program "Name" or Parameters "label".
   g. If an error not covered by the situations previously documented is encountered, the following default error message is displayed:
      Unknown error type.

Running API Resolver from CLI
API Resolver can be run as a standalone component by running the JVME_Post_Compiler.jar in command line. JVME_Post_Compiler.jar can be located under AD Build install folder in \Bin \Release\.

The parameters for the command line are:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ccsEnvId &lt;ccsEnvId&gt;</td>
<td>Environment id (mandatory or set java system property - DccsEnvId=&lt;ENVID&gt;)</td>
</tr>
<tr>
<td>ccsHost &lt;ccsHost&gt;</td>
<td>Configuration server host (mandatory or set java system property - DccsHost=&lt;HOST&gt;)</td>
</tr>
<tr>
<td>Parameter</td>
<td>Explanation</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ccsPort &lt;ccsPort&gt;</td>
<td>Configuration server PORT (mandatory or set java system property -DccsPort=&lt;PORT&gt;)</td>
</tr>
<tr>
<td>projectName &lt;projectName&gt;</td>
<td>Project name (mandatory).</td>
</tr>
<tr>
<td>languageId &lt;languageId&gt;</td>
<td>Language id, for API Resolver the value for languageId is 1000 (mandatory).</td>
</tr>
<tr>
<td>standalone</td>
<td>Run in stand alone mode (mandatory).</td>
</tr>
<tr>
<td>log4jConfigPath &lt;log4jConfigPath&gt;</td>
<td>Log4j config file path.</td>
</tr>
<tr>
<td>ueConfig &lt;ueConfig&gt;</td>
<td>Path to User Exit config file.</td>
</tr>
</tbody>
</table>

Example:
```
java -jar JVME_Post_Compiler.jar --standalone --languageId 1000 --projectName ITLandScape --ueConfig C:/Projects --ccsHost 127.0.0.1 --ccsPort 2181 --ccsEnvId bcc8c45d-7f08-4c4d-b970-f838c476bf1
```
Chapter 5. IBM Application Discovery Build Client Reference

Following chapters contain detailed information about all aspects of IBM Application Discovery Build Client application. It describes the IBM Application Discovery Build Client main screen, the menus, and toolbar options. Furthermore, it contains a complete description of all the IBM Application Discovery Build Client operations.

Main Screen

The main screen that opens when the program is started contains the following elements:

- **Title Bar**.
- **Menu Bar**.
- **Status Bar**.
- The **Project** pane on the left between the toolbar and the status bar.
- The **Display** area on the right between the toolbar and the status bar.
- The **Output** pane across the width of the screen under the **Project** pane and **Display** area.

Main Menu

IBM Application Discovery Build Client operations are controlled by choosing commands on the main menu and menus, clicking icons on the toolbar, and keyboard shortcuts. The **Main Menu** commands are summarized in the following table. Equivalent keyboard shortcuts, when available, are also listed.

<table>
<thead>
<tr>
<th>File</th>
<th>Keyboard shortcut</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>CTRL+N</td>
<td>Creates and opens a new text file or a new Project.</td>
</tr>
<tr>
<td>• Text File</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• New Project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>CTRL+O</td>
<td>Opens the <strong>Windows Open</strong> dialog box, from which any file can be selected and opened.</td>
</tr>
<tr>
<td>Close</td>
<td></td>
<td>Closes the active window.</td>
</tr>
<tr>
<td>Open Project</td>
<td></td>
<td>Selects and opens an existing IBM Application Discovery Build project.</td>
</tr>
<tr>
<td>Save Project</td>
<td></td>
<td>Saves the current project.</td>
</tr>
<tr>
<td>Close Project</td>
<td></td>
<td>Closes the current project.</td>
</tr>
<tr>
<td>Save</td>
<td>CTRL+S</td>
<td>Saves the active window.</td>
</tr>
<tr>
<td>Save As</td>
<td></td>
<td>Saves the active window under a new name.</td>
</tr>
<tr>
<td>Save All</td>
<td></td>
<td>Saves all components of the project.</td>
</tr>
<tr>
<td>Print Setup</td>
<td></td>
<td>Opens the <strong>Windows Print Setup</strong> dialog box.</td>
</tr>
<tr>
<td>Recent Files</td>
<td></td>
<td>Lists the last six files opened.</td>
</tr>
<tr>
<td>Recent Projects</td>
<td></td>
<td>Lists the last six projects opened.</td>
</tr>
<tr>
<td><strong>File</strong></td>
<td><strong>Keyboard shortcut</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>----------</td>
<td>----------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Exit</td>
<td></td>
<td>Exits <strong>IBM Application Discovery Build.</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Edit</strong></th>
<th><strong>Keyboard shortcut</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Paste</td>
<td>CTRL+V</td>
<td>Pastes the clipboard text to the cursor position.</td>
</tr>
<tr>
<td>Find</td>
<td>CTRL+F</td>
<td>Finds the string that is specified in the Find command.</td>
</tr>
<tr>
<td>Find next</td>
<td>F3</td>
<td>Finds the next occurrence of the string that is specified in the previous Find command.</td>
</tr>
<tr>
<td>Go To</td>
<td>Go To</td>
<td>Places the cursor at the beginning of the specified line number.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>View</strong></th>
<th><strong>Keyboard shortcut</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Toolbar</td>
<td></td>
<td>Toggles on/off the toolbar.</td>
</tr>
<tr>
<td>Status Bar</td>
<td></td>
<td>Toggles on/off the status bar.</td>
</tr>
<tr>
<td>Project</td>
<td>ALT+0</td>
<td>Toggles on/off the project pane.</td>
</tr>
<tr>
<td>Output</td>
<td>ALT+2</td>
<td>Toggles on/off the output pane.</td>
</tr>
<tr>
<td>Options</td>
<td></td>
<td>Opens <strong>Options</strong> dialog box where you can specify the output parameters.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th><strong>Keyboard shortcut</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Files</td>
<td></td>
<td>Adds files to a folder in the active project.</td>
</tr>
<tr>
<td>New Folder</td>
<td></td>
<td>Create a folder in the active project and allows specifying the types of files it contains.</td>
</tr>
<tr>
<td>Settings</td>
<td></td>
<td>Opens the <strong>Settings</strong> window.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Build</strong></th>
<th><strong>Keyboard shortcut</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Make Project</td>
<td>F7</td>
<td>Similar to <strong>Build Project</strong>, but it creates a build operation on components of the project that are modified since the last build was ran.</td>
</tr>
<tr>
<td>Build File</td>
<td></td>
<td>Builds the current file.</td>
</tr>
<tr>
<td>Build Project</td>
<td>CTRL+B</td>
<td>Builds all files in the active projects.</td>
</tr>
<tr>
<td>Stop Build</td>
<td></td>
<td>Stops the current build.</td>
</tr>
<tr>
<td>Decisions</td>
<td></td>
<td>Opens the <strong>Decisions</strong> window.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Window</strong></th>
<th><strong>Keyboard shortcut</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cascade</td>
<td></td>
<td>Arranges windows one behind the other in the display area.</td>
</tr>
<tr>
<td>Window</td>
<td>Keyboard shortcut</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Tile Horizontally</td>
<td></td>
<td>Displays all windows, arranged horizontally.</td>
</tr>
<tr>
<td>Tile Vertically</td>
<td></td>
<td>Displays all windows, arranged vertically.</td>
</tr>
<tr>
<td>Arrange Icons</td>
<td></td>
<td>This option is not currently available.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Help</th>
<th>Keyboard shortcut</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>About IBM</td>
<td></td>
<td>Provides the current IBM Application Discovery Build version and information on how to access technical support.</td>
</tr>
</tbody>
</table>

**Main Screen Toolbar**

The main screen toolbar icons enable frequently used menu commands to be run without having to browse through the menu hierarchy. A brief explanation of each is presented in the following table.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Function</th>
<th>Menu Bar/ keyboard shortcut</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Save File]</td>
<td>Save File</td>
<td>Save File</td>
<td>Saves the current file.</td>
</tr>
<tr>
<td>![Save All]</td>
<td>Save All</td>
<td>File / Save All</td>
<td>Saves the current state of the project and files.</td>
</tr>
<tr>
<td>![Previous Window]</td>
<td>Previous Window</td>
<td>N/A</td>
<td>Displays the previous window.</td>
</tr>
<tr>
<td>![Next Window]</td>
<td>Next Window</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>![Print]</td>
<td>Print</td>
<td>File / Print Ctrl+P</td>
<td>Prints the selected/displayed file.</td>
</tr>
<tr>
<td>![New Project]</td>
<td>New Project</td>
<td>File / New / New Project</td>
<td>Creates a project.</td>
</tr>
<tr>
<td>![Open Project]</td>
<td>Open Project</td>
<td>File / Open Project</td>
<td>Opens an existing project.</td>
</tr>
<tr>
<td>![Check Project]</td>
<td>Check Project</td>
<td>N/A</td>
<td>Checks the active selected project for errors.</td>
</tr>
<tr>
<td>![Build Files]</td>
<td>Build Files</td>
<td>Build / Rebuild File</td>
<td>(Re)Builds the currently selected files.</td>
</tr>
<tr>
<td>![Build Project]</td>
<td>Build Project</td>
<td>Build / Rebuild Active Project</td>
<td>(Re)Builds the active project.</td>
</tr>
<tr>
<td>![Stop Build/Check]</td>
<td>Stop Build/Check</td>
<td>Build / Stop Build / Check</td>
<td>Stops the current build/check process.</td>
</tr>
<tr>
<td>![Make Project]</td>
<td>Make Project</td>
<td>Build / Make Project</td>
<td>Similar to Build, runs a build operation only on project parts, which are updated since the last Build was run.</td>
</tr>
</tbody>
</table>

**Project Tab**

The **Project** tab displays tree hierarchy of objects in the project. The tree can be expanded or collapsed by clicking the + or - signs to the left of each node. The type of each branch is identified by an icon and a text.
label. In most cases, a node corresponds to a specific line of code in one of the project files and double-clicking the node causes the source file to be displayed in an edit window with the corresponding code line highlighted. Right-clicking a node causes a menu to open, which usually contains commands for displaying the code (similar to the double-clicking the node), for expanding or collapsing the branch represented by the node, or viewing properties of the object.

The **Project** tab contains the following nodes under the main project node:

<table>
<thead>
<tr>
<th>Node Name</th>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>File Type Folder Node</td>
<td>![Folder icon]</td>
<td>Each file type folder represents a logical container for source files of the corresponding type that are included in the project. The files list is displayed when the node is expanded.</td>
</tr>
<tr>
<td>COBOL Node</td>
<td>![COBOL icon]</td>
<td>Opens the COBOL source file.</td>
</tr>
<tr>
<td>Include (Copy) Node</td>
<td>![Include icon]</td>
<td>Opens the Include (Copybook) file</td>
</tr>
<tr>
<td>BMS Node</td>
<td>![BMS icon]</td>
<td>Opens the BMS file.</td>
</tr>
<tr>
<td>JCL Node</td>
<td>![JCL icon]</td>
<td>Opens the JCL file.</td>
</tr>
<tr>
<td>Configuration Node</td>
<td>![Configuration icon]</td>
<td>Opens a configuration file.</td>
</tr>
</tbody>
</table>

**Tab Icons Summary**

The following table summarizes the icons that are used in the Project pane:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Project icon]</td>
<td>Project</td>
</tr>
<tr>
<td>![Folder icon]</td>
<td>Folder (file type)</td>
</tr>
<tr>
<td>![Program icon]</td>
<td>Program file</td>
</tr>
<tr>
<td>![Include icon]</td>
<td>Include file</td>
</tr>
<tr>
<td>![BMS icon]</td>
<td>BMS screen</td>
</tr>
<tr>
<td>![JCL icon]</td>
<td>JCL</td>
</tr>
<tr>
<td>![Configuration icon]</td>
<td>Configuration file</td>
</tr>
<tr>
<td>![Schema closed icon]</td>
<td>Schema (closed)</td>
</tr>
<tr>
<td>![Schema opened icon]</td>
<td>Schema (opened)</td>
</tr>
<tr>
<td>![Natural Map icon]</td>
<td>Natural Map file</td>
</tr>
<tr>
<td>![Copy icon]</td>
<td>Copy file</td>
</tr>
<tr>
<td>![Screen icon]</td>
<td>Screen file</td>
</tr>
<tr>
<td>![Printer icon]</td>
<td>Printer file</td>
</tr>
</tbody>
</table>
Right Click / Shortcut Menus

When you right-click in different locations in IBM Application Discovery Build Client, different menus are available. These menus are described in the following sections.

Note: The menus might not appear exactly as described here.

Project Tab Shortcut Menu

The project tab right-click menu contains the following options:

<table>
<thead>
<tr>
<th>Menu Options</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Files</td>
<td>Adds files to the folder.</td>
</tr>
<tr>
<td>Add All Files from Folder</td>
<td>Adds all files from the selected folder. For details on how to make this operation that is run in the background see “Adding Files to Project Folders” on page 13.</td>
</tr>
<tr>
<td>Delete All Files from this Virtual Folder</td>
<td>Deletes all the files from the current virtual folder.</td>
</tr>
<tr>
<td>Add Files from Mainframe Library</td>
<td>Adds files to the folder from the mainframe library. Mainframe libraries are available if IBM Application Discovery Connect for Mainframe was used previously, by using the IBM Application Discovery Build Configuration (z/OS), to scan source libraries on the mainframe. For more information, see “Adding Files From Mainframe Library” on page 19 in Tasks and “Bringing data from mainframe libraries (PDS Libraries, Endevor, Librarian, Natural)” on page 62 in z/OS tab from IBM Application Discovery Build Configuration.</td>
</tr>
<tr>
<td>New Folder</td>
<td>Creates a folder in the active project. The new folder can have one file type only, which is the same or a subset of the parent folder.</td>
</tr>
<tr>
<td>Build</td>
<td>Builds the selected files and folders.</td>
</tr>
<tr>
<td>Delete</td>
<td>Deletes the selected folders, which are not the default ones that are created at project creation time can be deleted.</td>
</tr>
<tr>
<td>Settings...</td>
<td>Opens the Settings window, focusing on the folder’s settings.</td>
</tr>
<tr>
<td>Expand</td>
<td>Expands the folder.</td>
</tr>
<tr>
<td>Collapse</td>
<td>Collapses the folder.</td>
</tr>
<tr>
<td>Properties</td>
<td>Displays folder properties.</td>
</tr>
</tbody>
</table>

Project Node Shortcut Menu

The project node right-click menu contains the following options:

<table>
<thead>
<tr>
<th>Menu Option</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>Checks for components that are referenced in the project source code, but missing from the project definition. This option is used to ensure project completeness.</td>
</tr>
<tr>
<td>Build</td>
<td>(Re)Builds the project.</td>
</tr>
<tr>
<td>Build imposed selection</td>
<td>Builds the selected resources and folders.</td>
</tr>
<tr>
<td>Menu Option</td>
<td>Explanation</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Make</td>
<td>Similar to <strong>Build Project</strong>, but only performs a build operation on components of the project, which are modified since the last build was run.</td>
</tr>
<tr>
<td>Update Modified Mainframe Members/</td>
<td>Updates the resources that are brought in the project from the mainframe and that are changed since the last build. If <strong>Enable Members Synchronization</strong> option is selected, <strong>Update Modified Mainframe Members</strong> changes into <strong>Synchronize Members</strong>. For more information, see “Updating Projects” on page 22 and “Synchronize Mainframe Members” on page 23.</td>
</tr>
<tr>
<td>Synchronize Members</td>
<td></td>
</tr>
<tr>
<td>New Folder</td>
<td>Defines a new folder, all file types are available for a folder under the project root node.</td>
</tr>
<tr>
<td>Delete</td>
<td>Deletes the selected file. When this option is selected, a confirmation message appears asking you to confirm or cancel the delete operation.</td>
</tr>
<tr>
<td>Settings...</td>
<td>Opens <strong>Settings</strong> window, focusing on the whole project settings.</td>
</tr>
<tr>
<td>Expand</td>
<td>Expands the project tree.</td>
</tr>
<tr>
<td>Collapse</td>
<td>Collapses the project tree.</td>
</tr>
<tr>
<td>View Repository</td>
<td>This option is not currently available.</td>
</tr>
<tr>
<td>Search in Tab (Ctrl+Q)</td>
<td>Searches within the current tab for the specified string.</td>
</tr>
<tr>
<td>Search in Tab next</td>
<td>Not available in the current version.</td>
</tr>
<tr>
<td>Properties</td>
<td>Displays project properties.</td>
</tr>
</tbody>
</table>

**White Space Shortcut Menu**

The **White Space** menu appears when you right-click anywhere in the white space of the **Project** pane.  

**Note:** The project tree needs to be collapsed to display the menu.

The white space right-click menu contains the following options:

<table>
<thead>
<tr>
<th>Menu Options</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Docking View</td>
<td>Docks/undocks the pane.</td>
</tr>
<tr>
<td>Hide Workspace / Hide</td>
<td>Hides the <strong>Project</strong> pane. Use <strong>View / Project</strong> or <strong>Alt-0</strong> to display it again.</td>
</tr>
<tr>
<td>Window</td>
<td></td>
</tr>
</tbody>
</table>

**Editing Shortcut Menu**

The **Editing** menu contains standard editing commands (**Undo, Cut, Copy, Paste**) and appears when you right-click from within a text file (program).

**Output Pane**

**IBM Application Discovery Build Client** displays progress and error messages in the **Output** pane. By default, the pane is docked across the entire width of the **IBM Application Discovery Build Client** main window. It can be undocked by double-clicking its window border, and docked again by dragging it down. The **Docking View** toggle option is also available on the menu. Double-clicking the name of a resource from the **Output** pane opens the resource in the Editor.
## Output Pane Shortcut Menu

<table>
<thead>
<tr>
<th>Menu Option</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy</td>
<td>Copies the selected text in the output pane to the clipboard.</td>
</tr>
<tr>
<td>Clear</td>
<td>Clears the Output pane.</td>
</tr>
<tr>
<td>Hide</td>
<td>Hides (closes) the Output pane. Use View / Output or ALT+2 to open it again.</td>
</tr>
<tr>
<td>Docking View</td>
<td>Switches the window between docked and undocked states. In the docked state, the window is positioned along the entire width of the window (or it is minimized if the status bar is hidden). When the window is undocked, it behaves as a standard Windows window.</td>
</tr>
<tr>
<td>Save Output File</td>
<td>Saves the current contents of the Output pane to a file. The standard Windows Save As dialog box opens for specifying the name and location of the file to be saved.</td>
</tr>
<tr>
<td>Go to Error</td>
<td>When an error message in the Output pane is highlighted (by clicking it), this menu opens the corresponding source file in an Editor window at the statement that caused the error. The file can also be opened by double-clicking the error message directly.</td>
</tr>
</tbody>
</table>

## Working with IBM Application Discovery Build Client Windows

A number of special purpose windows facilitate user interaction. Some of these windows are initially docked to the borders of the display area, but they can be undocked and moved, resized, and hidden (closed). Window names are not shown on docked windows.

Many of the windows have menus that are opened by placing the mouse cursor over the window and right-clicking. In some cases, different menus appear, depending on the exact position of the cursor in the window.

The following IBM Application Discovery Build Client windows are described in the following sections:

- Decisions
- Editor
- Settings
- Properties

### Viewing Source Programs

**About this task**

To view the source code for a particular entity, follow these steps:

**Procedure**

1. Right-click the entity to open a menu, as described in “Right Click / Shortcut Menus” on page 39.
2. Select View Source. An Editor window opens containing the source listing of the entity.

### Building Decisions

**About this task**

IBM Application Discovery Build Client’s Decisions mechanism let you to overcome syntax problems that might occur at build time in some source dialects. No permanent changes are made to the original code files. Instead, the change information is stored in the repository, so that when an analysis process requires a source file, in effect a temporary internal copy of the file with the modifications is used.
Decisions are essentially specifications for **Find** and **Replace** operations that can be applied locally (at a particular location in a specified file) or globally (throughout the application). This method allows for increased flexibility as decisions can be targeted to specific files.

A decision might be implemented for any number of reasons, for example:

- The effects of *modifying* transactions can be studied.
- Build errors can be corrected.
- Unsupported COBOL features can be replaced by alternative code.

To define a decision, follow these steps:

**Procedure**

1. Click **Build / Decisions** to open the **Decisions** window. If decisions are defined previously, they are listed in the window, otherwise the window is empty.

2. In the **Decision** pane at the upper right part of the window, click the text **Click to Add New Decision** (the **Decision** column) to create a new decision. This pane contains two columns and a row for each decision. When you click **Click to Add New Decision**, a new row is added for the new decision. Overwrite **Click to Add New Decision** with a name for the decision, and then click in the Replacement field and select **TOKEN** or **PATTERN** from the list menu box.

The replacement type refers to the method that is used for search and replace operations. In this aspect, **IBM Application Discovery Build Client** follows COBOL copy that replaces the rules. In **PATTERN** search, the search string is replaced wherever it appears, while for **TOKEN** only complete words are replaced. For example, if the string **OLD TEXT** is to be replaced by the string **SOME NEW TEXT** using **PATTERN** search, a part of the string **BOLD TEXT** would be replaced by **SOME NEW TEXT** resulting in **BSOME NEW TEXT**.

For **TOKEN** searches, the string to be replaced must contain one word only and only complete words are replaced. Thus, if **OLD** is to be replaced by **NEW**, under **TOKEN** search the word **BOLD** would not be replaced. For **TOKEN** search, the string **OLD TEXT** would be disregarded since it comprises two tokens.
After the replacement mode is selected, a tree diagram of the project will appear in the left pane of the window (see the next image). If necessary, expand the tree.

3. Enter a description of the decision in the **Description** text entry box, the string (or token) to be replaced in the **Original String** box, and the replacement string in the Replace with box.

4. Expand the project tree in the left pane to show its folders and files. Set the check boxes of the files that are to be included in the Search and replace operation. Some folders do not support decisions and therefore, their respective check boxes are disabled. (In the example shown before, the replacements are to be made in all the sources).

5. Click the check boxes next to the file name that is to accept the decision. A check mark appears. The decision is now attached to the checked file. Repeat for all the files or folders to which the decision is to be attached.

**Additional Decisions**

Each decision is represented by a row in the **Decision** pane, and have its own description, original string, replacement string, and program tree that specifies the files to which the decision is to be applied.

Information including the date of the last modification to the decision and the user name of the person who made the modification is displayed.

When you click a row to select it, the information in the other controls of the window changes. The following figure shows the decision information for two decisions.
Deleting a Decision

After you define the decisions, they remain active until they are deleted or until all check boxes in the project tree for the decision are cleared. In other words, if a decision is not associated with any files (all check boxes in the project tree for that decision are cleared), then the replacement it defines is not implemented, but the decision is still available for later use. To permanently delete a decision, select it and click DELETE on your keyboard.

Applying Decisions

After you define or modify decisions, the project (or the files that are affected by the decisions) must be rebuilt.

Note: A source opened in the text editor does not show applied decisions, since these decisions are applied only at build time on a temporary copy of the source code.

Using the Editor

About this task

IBM Application Discovery Build Client includes an integrated text editor that can be used to view files.

To open a file in the Editor, follow these steps:

Procedure

1. Main Menu > File/Open to open the standard Windows Open File dialog box. Any file can be opened in this way, including files unrelated to IBM Application Discovery Build Client activities.
2. Double-Click Source File Icons. In the tree diagram of the Project pane, double-clicking an icon that represents a source code file or statement causes the corresponding file to open in an Editor window, often with the appropriate statement highlighted.
3. **Shortcut Menus.** Most menus that are associated with program/statement icons in the **Project** pane have a **View Source** option.

4. **Double-Clicking Compilation Error** messages in the **Output** Pane. If errors occur during a build, they are listed in the **Output** pane. Double-clicking the error notification causes the corresponding source file to be opened in an editor window with the erroneous statement highlighted.

**Using the Settings Option**

**About this task**

Use the **Settings** option to change the default search paths that are used for the build operation to exclude program components from the build analysis, to set custom component extensions, and to select different analysis parameters according to the resource type.

To open the **Settings** window for a resource, follow these steps:

**Procedure**

1. To open the **Settings** window for a resource, follow these steps:
   a. On the **Project tree** diagram, right-click the component that you want to exclude from the analysis.
   b. In the menu that opens, select **Settings**. In the **Settings** window select **Show the project tree**. The project tree is displayed showing the selected resource (you can select several resources if needed).
   c. If you select **Exclude File(s) from Build**, the selected files are excluded from subsequent builds. The parameter can be set for any individual file in the project, for a set of files within a folder or for an entire project folder, by selecting the folder node in the tree.

   **Note:** The options that are shown in the **Settings** window depend on the type of resource selected.

2. To open the **Settings** window for a project, follow these steps:
   a. Select the **Project** node in the **Project** pane.
   b. Goto **Project**, then select **Settings** to display the **Settings** window as in the following image.

![Settings window](image)

In the **General** tab of the **Settings** window, after the **Show the project tree** check box is selected, the following check boxes, fields, or options are available:
<table>
<thead>
<tr>
<th>Project / Folder</th>
<th>Check Box / Field / Option</th>
<th>What it does</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project node</td>
<td>Activate LOG file</td>
<td>Creates a log file of errors/warnings. This check box is password that is protected for administrator use only.</td>
</tr>
<tr>
<td></td>
<td>Search Paths area</td>
<td>Displays the default search paths that are used during the Build operation. Allows the user to change the default search paths if needed. When you click Explore, the Search Paths Order window is displayed. Use the available buttons to either create an entry, to delete the selected entry, or to change the position of the selected entry in the list. The build operation is run in the order set in this window.</td>
</tr>
<tr>
<td>All folder nodes, individual resources</td>
<td>Exclude files from build</td>
<td>Excludes the select files or folder from build operation.</td>
</tr>
<tr>
<td>Natural</td>
<td>Indent size</td>
<td>Determines the column number where the text must start (in the source code).</td>
</tr>
<tr>
<td>Natural</td>
<td>Compiler Mode- Structured mode/ Report mode</td>
<td>Sets either the Structured or the Report mode for the compiler.</td>
</tr>
<tr>
<td>All include folders</td>
<td>(Cobol, Natural) Include Extensions or Default extensions</td>
<td>Allows the user to enter custom include extensions or use the default ones.</td>
</tr>
<tr>
<td>Data Area (in Natural projects)</td>
<td>Data Area file format- Format 1 or Format 2</td>
<td>Allows the user to select either Format 1 or Format 2 for the Data Area resources' processing. The option that is selected by default is Format 2.</td>
</tr>
<tr>
<td>PL1</td>
<td>PL1 Line Settings- Line Offset, Free Text format.</td>
<td>Allows the user to select the column number where the text must start (in the source code) or choose the Free Text Format option.</td>
</tr>
</tbody>
</table>

To select an environment for EXEC DLI command parsing, select the Using EXEC DLI (IMS related) check box, and then the IMS DB Environment list is displayed. Select an appropriate environment from the list:
- CICS DBCTL
- BMP
- Batch

For more information about the difference between the environments, go to the PCBs and PSB topic in the IBM IMS documentation.

The following check boxes are available in the Extensibility tab from the Settings window:
- Enable API/Macro handling by using a configuration file.
- Enable handling of before and after preprocessed source code.

### The Options Window

This function from the View menu opens Options dialog box where you can specify the output parameters.

Specify the maximum number of output lines, whether warning messages must be displayed in the Output pane and if the build results must be automatically saved then click OK to apply the options.
The Properties Window

The Properties window displays information about the files in a project. The window can be opened from the menu of the items in the tree of the Project pane only. The labels and title of the window differ slightly according to the object type.
Chapter 6. IBM Application Discovery Build Configuration

You can perform the following actions in IBM Application Discovery Build using the Configuration Tool:

- View existing projects.
- Delete a project.
- Rename a project.
- Re-create a repository.
- Upgrade a repository.
- Display the users who are currently using a project.
- Create and configure a z/OS connection to a remote computer.

To open IBM Application Discovery Build Configuration, click Start > Programs > IBM Application Discovery Build Client > IBM Application Discovery Build Configuration.

Viewing Project Information

About this task

To view project information, follow these steps:

Procedure

1. In IBM Application Discovery Build Configuration - right-click on the project and choose Project Information.
2. A window is displayed showing the Project Path, Project Database Connection String, Project Creation Information, and Authentication Information.
3. If you are working in multi-user mode, under each project a list of users who are currently logged in is displayed.
Deleting a Project

About this task
Deleting a project can be done in two ways:

Procedure
In the IBM Application Discovery Build Configuration window.
  a) Select the project to be deleted from the list of projects.
  b) Right-click to display the menu and select Delete Project.
  c) You are asked to confirm the deletion request.
  d) If other users are logged in to the project, a warning message appears listing all the users who are connected to the project.

Renaming a Project

About this task
To rename a project, goto the IBM Application Discovery Build Configuration window and follow these steps:

Procedure
  1. Select the project to be renamed.
  2. Right-click to display the menu, select Rename project.
  3. A window is displayed waiting you to confirm the operation.
  4. The project with the new name is displayed in the projects list.

Associating a z/OS Access Point to a Project

About this task
Note: For details on how to define a z/OS node, see “Creating a z/OS Connection” on page 68.
To associate a z/OS source to a project, follow these steps:

Procedure
  1. Goto the IBM Application Discovery Build Configuration window.
  2. Select the project to which you want to associate a z/OS.
  3. Right-click to display the menu and select Associate z/OS. The Associate z/OS instance-to-project window is displayed.

A list of z/OS access points that are defined is presented and you can select the one(s) you want to associate to your project. After you select at least one z/OS node from the list, click OK to return to the initial Projects tab. The selected z/OS node is displayed under your project.

If you are working in multi-user mode and other users are logged in to the project, a warning message informs the other users about the operation about to be run.
Recreate a Repository

About this task
To re-create a repository in case the current repository was deleted or got corrupted, follow these steps:

Procedure
1. From IBM Application Discovery Build Configuration window, right-click the selected project and choose **Recreate Repository**.
2. A warning message appears, waiting for you to confirm the recreation. After you confirm the recreation, the repository is re-created, and a full build can be done by using an IBM Application Discovery Build Client to allow analysis for the project.
3. If other users are logged in to the project, a warning message informs the other users about the operation about to be run.

Upgrade a Repository

About this task
If other users are logged in to the project, a warning message informs the other users about the operation about to be run.

Procedure
1. To upgrade the repository for a single project, follow these steps:
   a) In the IBM Application Discovery Build Configuration window, right-click the selected project and choose **Upgrade repository** if available.
   b) A warning message appears, waiting you to confirm the upgrade. After you confirm, the repository is upgraded to the current version.
   c) A warning message appears, waiting you to confirm the upgrade. After you confirm, the repository is upgraded to the current version.
2. To upgrade the repository for a list of projects, follow these steps:
   a) First, create a text file by specifying the list of projects to be included in the repository upgrade operation.
      **Important:** Each project name must appear on a separate line in the text file.
   b) Open the command prompt and enter the following command:

   ```
   C:\Program Files\IBM Application Discovery Build Client\Bin\Release\IBMApplicationDiscoveryBuildClient.exe\ ru <fully qualified LOG file name> <fully qualified projects file name>
   ```

   Where,
   - `<fully qualified LOG file name>` is the log file that is created detailing the results of the upgrade operation.
   - `<fully qualified projects file name>` contains the file name with the projects to be upgraded, one per line.
   
   If `<fully qualified projects file name>` is not present, all projects are upgraded.
   **Tip:** This operation runs in the background.
Stop the Mainframe Import

This function is used to cancel the library scanning, query environment and get files operations.

If other users are logged in to the project, a warning message informs the other users about the operation about to be run.

Configuring the z/OS Connection

About this task

You can use this option to specify different settings for the z/OS Connection and the names of the libraries that contain the resources you want to import in your project. You can enter all the data that you consider relevant in a dedicated tab, for each type of resource.

Important: Authentication with proper credentials through Carma/Endevor is enforced before one can read/obtain any source file, regardless of method used for obtaining these sources:

1. By downloading from mainframe (Endevor)
2. Otherwise provided. These sources can only be viewed if they are shared over the network. Read only access is required.

Procedure

1. Goto IBM Application Discovery Build Configuration, Projects tab and select the project then the corresponding z/OS node, then right-click to display the menu. Select Configure connection to display the following window.

![zOS configuration window]

2. Complete the settings or the names of the libraries that contain the resources you want, according to the type of resource you need to import.
3. To add a library, enter its name in the corresponding field, then click **Add**. The name of the new library is displayed in the library list. Use the **Update**, **Edit**, and **Remove** to modify the list of libraries or the name of an existing library.

4. Next, select the **CICS information** tab to enter the CICS information library details.

   ![Image of CICS information tab](image.png)

   Existing CICS information libraries are listed in the central part of the tab.

   - To add a **CICS information library**, enter the details in the corresponding fields then click **Add**. The new library is displayed in the list in the central part of the screen.

   - To edit the details of an existing library, select it from the list and click **Edit**. The corresponding details are displayed. Make the changes then click **Update**.

   - To remove a library from the list, select it then click **Remove**.

5. Next, select the **ENDEVOR Info** tab to display it as in the following image:
Fill the available fields with the required data then click **Add**. The parameters file is added to the list in the central part of the tab.

- To edit the details of an existing parameters file, select it from the list and click **Edit**. The corresponding details are displayed. Make the changes then click **Update**.
- To remove a parameters file from the list, select it then click **Remove**.

**Important:** From the **Types list** field, click **Browse** and select the **TypesList.txt** file containing all Endevor supported file types that can be imported into the project. Make sure you have access to the location where the **TypesList.txt** file is stored.

6. Next, select the **DB2** and **MQ** tab to display it as in the following image:
Select the DB2 and MQ agents and enter the corresponding system names in the associated fields.

7. Next, select the **Natural** and **Adabas** tab to display it as in the following image.

![Image of Natural and Adabas tab](image)

Complete the required settings information for the **Natural** and **Adabas** libraries. Use the prior procedure to add, edit, update, and remove libraries.
8. Next, select the **IMS Information** tab to display it as in the following image:

![IMS Information Tab](image1.png)

Complete the required settings for the IMS libraries.

9. Select the **Librarian** tab to display it as in the following image:

![Librarian Tab](image2.png)
Add the names of the required libraries and use **Add**, **Edit**, **Update**, and **Remove** to manage these libraries.

10. Select the **ChangeMan ZMF** tab to display it as in the following image:

![ChangeMan ZMF Configuration](image)

Complete the name of the IBM ParmLib library and then enter the number of the ChangeMan ZMF Subsystem.

In the **Applications** field, click **+** to add an application name to the list. Click **-** to remove the selected application from the list. Use **↑** and **↓** to change the position of the selected application in the applications list.

**Note:** If no **Applications** are mentioned, the members are scanned/retrieved only from packages.

11. Select the **Tivoli Workload Scheduler** tab to display it as in the following image:
Complete the Subsystem name of the TWS controller. After you finish, click **Save**.

12. Select the **CA-7 Workload Automation** tab to display it as in the following image:
In the Get Libraries area, complete the name of the library where the INIT Deck is located and the actual name of the INIT Deck member that lists all the libraries in which CA-7 must look for to find, and submit Jobs.

In the Get Jobs area, follow these steps:

- **In memory** - this mode is the default retrieval mode and it uses CAICCI (CA Common Communications Interface) to get Job information. The results are retrieved directly from CA-7 into the memory address space of the agents and transferred back to the IBM Application Discovery Build side. For this method, you need to specify the following parameters.
  - **Instance name** - identifies the CA-7 instance name and is used when you make the Job information request.
  - **User name** - the user under which the agents are running.

- **Via dataset** - this mode is the alternative retrieval mode and it uses BTI (Batch Terminal Interface) to get Job information. The results are delivered by CA-7 into a data set from which the agents, then read the data and transfer it back to the IBM Application Discovery Build side. For this method, you need to specify.
  - **Instance Name** - CA-7 instance name.
  - **User name** - the user under which the agents are running.
  - **Library name** - the name of the library that contains the IBM Application Discovery Skeleton. This library is a member that is delivered as part of the installation if the CA-7 access through BTI is required.
  - **Skeleton name** - the name of the IBM Application Discovery skeleton that is used for accessing CA-7 through the BTI. This skeleton is submitted by the agents and that Job uses the BTI interface to get the information back to the data set.

## Bringing Operational Information

**About this task**

To retrieve operational information, follow these steps:

**Procedure**

1. Configure the z/OS connection (for details see “Configuring the z/OS Connection” on page 52)
2. Retrieve operational information.

**Retrieve Operational Information**

**Restriction:** Before you retrieve the operational information, you must configure the z/OS connection. If you associate the z/OS connection to a project only but you do not configure it, then you cannot retrieve the data.

Goto IBM Application Discovery Build Configuration, select the Projects tab, select the project, select the z/OS node, right-click to display the menu, and select the Retrieve Operational Information option to display the following window.
Note: If you do not configure the z/OS connection for the selected task, a warning message is presented, indicating the entries for which the configuration is missing.

A list of available tasks is presented grouped by categories: You can choose to Retrieve schedulers information, Retrieve TP monitor information, Retrieve Database information, or Retrieve other information. Make the selections then click OK to run Query Operational Information.

Note: The available options depend on the type of project you create.

Following is a list of entities/objects for which Connect for mainframe brings information:

• Adabas

  The Connect for mainframe gives information about a total of three entities:
  1. Adabas Database.
  2. Adabas File.
  3. Adabas Field.

  The information refers to physical allocations, defined files that include file fields.

• CA Workload Automation CA 7 Edition

  The Connect for mainframe gives information about a total of three entities:
  1. CA 7 Jobs.
  2. Datasets.
  3. Networks.

  The information refers to triggering and dependencies.

• CSD (CICS)

  The Connect for mainframe gives information about a total of seven entities:
  1. CICS Region
  2. CICS Group
  3. CICS List
  4. CICS File
  5. CICS Map
6. CICS Program
7. CICS Transaction

The information refers to all CICS regions, including defined programs\transactions\maps\files, hierarchy of groups and lists, and performance information for transactions such as Elapsed time, IO count, and DB2 count.

• DB/2

Connect for mainframe brings information about a total of 14 entities:

1. DB2 Database.
2. DB2 Table.
3. DB2 Column.
4. DB2 Index.
5. DB2 Key.
6. DB2 Package.
7. DB2 Package List.
8. DB2 Plan.
9. DB2 Storage Group.
10. DB2 Stored Procedure.
11. DB2 Table Space.
12. DB2 Trigger.
13. DB2 View.
14. DB2 Volume.

The information refers to all databases, tables, columns, table spaces, triggers, views, plans storage groups.

• Devices and Physical files

The Connect for mainframe gives information about the following entities:

1. Physical files
2. Devices

The information refers to all devices connected to the LPAR, and all physical data sets on disk devices.

• Hardware

The Connect for mainframe gives information about a one entity:

1. CPU

• IMS

The Connect for mainframe gives information about a total of three entities:

1. IMS Database.
2. IMS Transaction.
3. IMS Program.

The information refers to databases, programs, and transactions of IMS.

• LPAR and SYSPLEX

The Connect for mainframe gives information about a total of two entities:

1. LPAR Information.
2. Sysplex Information.
The information refers to LPARS, SYSPLEXS, the relationships, and links to other entities (CPU, installed software)

- **MQ Series**
The **Connect for mainframe** gives information about a total of three entities:
  1. Queue Manager
  2. Queue
  3. Channel

The information refers to Queue Managers, Queues, and Channels.

- **Predict**
The **Connect for mainframe** gives information about a total of two entities:
  1. Predict file.
  2. Predict field.

The information refers to predict files and fields.

- **SMF**
The **Connect for Mainframe** gives information about a total of three entities:
  1. SMF JCL information.
  2. SMF JCL Step information.
  3. SMF JCL Step IO.

The information refers to scheduled jobs, including total CPU consumption, IO count, and CPU count per steps, and used physical files.

- **Tivoli® Workload Scheduler**
The **Connect for mainframe** gives information about a total of two entities:
  1. TWS Applications.
  2. TWS Jobs.

The information refers to TWS defined applications, jobs, and their dependencies.

Before you retrieve the information, a confirmation window is displayed. Click **Yes** to start the selected query operation.

After the operation is finished, 2 log files are generated: One containing the errors (if applicable), the other detailing the operations undertaken. These log files are stored in the following location: `project name/zOS/logs/zOS name`.

---

**Bringing data from mainframe libraries (PDS Libraries, Endevor, Librarian, Natural)**

1. Associate a z/OS connection to project (for details see “Associating a z/OS Access Point to a Project” on page 50).
2. Configure the z/OS connection (for details see “Configuring the z/OS Connection” on page 52).
3. Query the environment.
4. Scan files.
5. Scan libraries.

Following is the detailed description of the steps 3-5.
Note: The mainframe agent uses z/OS Unicode services to convert character data from one code page to another. There are two settings that tell the agent which code page to use for the host and the client:

1. HOST CODE PAGE
2. CLIENT CODE PAGE

Each variable is a five digit number, denoted by a Coded Character Set Identifier (CCSID) and established by the Character Data Representation Architecture (CDRA). Usually the CCSID is the same as the code page number used in the informal use. In case there is a doubt in using the correct CCSID, see z/OS Unicode Services User’s Guide and Reference, Appendix A. Description of CCSIDs.

**Retrieving Source Code Information**

About this task

**Warning:** Before you retrieve the source code information, you must configure the z/OS connection. If you associate the z/OS connection to a project only but you do not configure it, then you cannot retrieve the data.

This step reads the contents of the sources (either auto-discovered or manually added) configured as presented in “Configuring the z/OS Connection” on page 52.

Goto IBM Application Discovery Build Configuration, select Projects tab, then select the project, then select the z/OS node, and then right-click to display the menu.

**Note:** You can run this operation on several projects simultaneously through several z/OS connections. Select all the z/OS connections that you want to use (several connections that are defined for the same project or for different projects) then right-click to display the menu and select the scanning operation that you want to apply. If the scan operation cannot be completed on one or more of the selected z/OS connections, a warning message is displayed but the scanning operation continues for the rest of the selected connections. Also, for each z/OS connection a dialog box offers the possibility of individually selecting the libraries to be scanned.

**Procedure**

1. Select the **Retrieve Source Code Information** option to display the following window:

   ![Query Source Code Information Tasks](attachment:image)

   If libraries are found on the remote computer, a list of libraries that are automatically discovered are presented.
2. To scan the libraries added manually, select the **Manual Selection** option. The list is updated to present only those libraries. Select the libraries that you want to include in the scanning process, then press **Scan**. Alternatively, you can manually add a library to the list.

**Note:** The **Delete** option becomes available if you select a manually added library.

For PDS Libraries and members, **Connect for mainframe** brings information about a total of three entities:

a. Source Library  
b. Source Member  
c. User

The information refers to libraries and members within the libraries, including member creation date, modification date, users who modified members. After you select **Scan Endevor libraries**, the scanning window displays a list of libraries that are selected for the scanning operation.

The **Connect for mainframe** brings information about the following CA Endevor entities:

a. Endevor members.  
b. Endevor Systems.  
c. Endevor Subsystems.  
d. Endevor Environments.  
e. Endevor Stages.  
f. Endevor Types.

The information refers to System, Subsystem, Environment, Stage, and type.

3. If the **Scan Librarian Libraries** option is selected, the scanning window is displayed.

4. If the **Scan Natural Libraries** option is selected, the scanning window is displayed.
From the list, select the Natural libraries that you want to scan, then click Proceed. Alternatively, you can use the Add new libraries field to add new libraries to the list of existing ones.

The Connect for mainframe brings information about the following Natural entities:

a. Natural Library  
b. Natural Member

The information refers to last update date, version, user name.

5. Before scanning, a confirmation window is displayed: Click Yes to start scanning the selected libraries.

   Note: After the operation is finished, 2 log files are generated: One containing the errors (if applicable) and the other detailing the operations that are undertaken. These log files are stored in project name/zOS/logs/zOS name.

6. Repeat the procedure to scan all the libraries.

**Bringing Data From Mainframe Using ChangeMan® ZMF**

1. Associate a z/OS connection to project (for details see “Associating a z/OS Access Point to a Project” on page 50)

2. Configure the z/OS connection (for details see “Configuring the z/OS Connection” on page 52)

3. Retrieve ChangeMan® information.

   Following is the description of the step 3.

**Retrieving ChangeMan® Information**

**Procedure**

1. In the IBM Application Discovery Build Configuration, select the project and then right-click to display the corresponding menu. Click Retrieve source code information.
2. If applications are configured in the **z/OS Configuration > ChangeMan ZMF**, then the next screen is displayed after you click **OK**.

![Screen shot of ChangeMan ZMF configuration options](image)

Select **Retrieve from Packages** or **Retrieve from Baseline** or both.

**ChangeMan ZMF**

The **Connect for Mainframe** brings information about a total of four entities:

a. ZMF Applications.
b. ZMF Components.
c. ZMF Libraries.
d. ZMF Packages.

The information refers to Applications, Components, Libraries and Packages, including relationships such as Library to Component, Package to Component, Packages to Application.

If applications are not configured in the **z/OS Configuration > ChangeMan ZMF** (ChangeMan ZMF tab), a warning message is displayed after you click **OK**.

---

**Bringing Sapiens Data from Mainframe**

1. Associate a z/OS connection to project (for details, see “Associating a z/OS Access Point to a Project” on page 50).
2. Configure the z/OS connection (for details, see “Configuring the z/OS Connection” on page 52).
3. Retrieve Sapiens information.
Following is the description of the step 3.

**Retrieving Sapiens Information**

**Procedure**

Goto IBM Application Discovery Build Configuration, select the project and then right-click to display the corresponding menu. Click Retrieve source code information.

Select the Sapiens option to retrieve the Sapiens information according to the parameters set in the Sapiens tab of the Configuring the z/OS connection window.

**Sapiens**

The Connect for mainframe brings information about a total of nine entities:

- a. Classes.
- b. Forms.
- c. Fields.
- d. Menus.
- e. Operations.
- f. Programs.
- g. Queries.
- h. Rules.
- i. Rule sets.

The information refers to Sapiens Classes, forms, fields, menus, Operations, Programs, Queries, Rules, and Rule sets, including their relationships.

**The zOS Tab**

When you work on a project, you might want to use resources that are on a remote computer. You can set up your remote connections and associate them to your project, by using the zOS option.

The zOS tab presents a list of all the zOS connections that are defined and you can modify the existing ones or create new connections.
Creating a z/OS Connection

About this task

**Note:** Before you create a **z/OS connection**, you must set the corresponding data path. If you did not set a data path for the **z/OS connection**, when you select this option you are asked to enter the name of the folder where you want to create the z/OS. For more information, see “**z/OS Connection Data Path**” on page 69.

**Procedure**

1. To create a new z/OS node, goto **z/OS** tab, right click on the root and select **Create z/OS.** The **Mainframe Access Point Connection** window is displayed.
2. Enter the name for the new z/OS connection then click **OK:** The **z/OS Connection Setup** window is displayed. This dialog box waits you to configure the new z/OS connection: The name that you entered for your z/OS connection is displayed.
3. Enter the host IP or host name and the port number in the corresponding fields then click **Test Connection** to check the connection to the new Mainframe access point defined. If the parameters you entered are correct, a confirmation window is displayed.

**z/OS Connection Data Path**

Use this option to display the path to the folder where the configuration file is stored and to modify it if necessary.

Goto **z/OS** tab, then select the root and then right-click to display the menu. Click **z/OS Connection Data Path**. The current path is presented. If you want to change the current path, click **Yes** to display a standard **Browse** window and select a new path.

**Note:** The **z/OS Connection Data Path** is a shared path (on the **AD Build Server** machine) with read/write access rights for all **AD Build Server / Ad Build Client** users.

**Path for the Retrieved Members**

**About this task**

Use this option to specify the path to the folder where the members that are retrieved from the mainframe are stored. A log file for the **Update mainframe members** operation is stored in the same location.

**Procedure**

1. Goto **z/OS** tab, then select the root, and then right-click to display the menu.
2. Click **Path for the retrieved members**.
3. A window is displayed showing the current path. If you want to change the current path, click **Yes** to display a standard **Browse** window and select a new path.

**Note:** The path for the retrieved members is a shared path (on the **AD Build Server** machine) with read/write access rights for all **AD Build Client** users that may download members from a mainframe system and also for **AD Analyze Client** ones.

**Members Synchronization Settings**

**About this task**

Use this function to enable the **Members Synchronization** feature.

**Procedure**

1. In the **z/OS** tab of **IBM Application Discovery Build Server**, right-click on the z/OS node. From the menu, select **Members Synchronization Settings**.
2. In the window that is displayed, select **Enable Members Synchronization** to activate the feature. You can run the members’ synchronization operation only by using a configuration file. The configuration file is intended to instruct **IBM Application Discovery Build Client** on whether it needs to update against specific libraries, where to add/remove the related members in/from the project (that is, which virtual folder to use) and also which type of members **IBM Application Discovery Build Client** must use when you add members.
3. After you press **OK**, the selected configuration file is verified. Make sure the message **The configuration file is valid!** is displayed in the output window of **IBM Application Discovery Build Server**. If the configuration file is not validated review the instructions in “Appendix 2 - Synchronize Members Configuration File Examples” on page 75, correct the file and try loading it again.

The configuration file is a text file, in comma-separated format, where the details of the synchronization process are specified. The following parameters must be set:

- Project name
- Library type
• Library name
• The name of the mapped virtual folder
• Members type
• The z/OS connection name.

An example of a configuration file and details about the syntax are available in “Appendix 2 - Synchronize Members Configuration File Examples” on page 75.

The Advanced Options

You can decide whether the communication logs and buffers are saved for later use and inspection, by using the advanced options for the z/OS connection root.

Enable Special Encoding

If you download members containing Japanese characters from a mainframe system, use this option to enable the Japanese encoding.

If there is no need for downloading members with Japanese characters, then select No Encoding.

Important: Once you try to change this setting, a message is displayed in both AD Build Server and all opened clients, notifying about this change and that the session will be closed.

Automatic Messaging

When multiple users are connected to the same project and one user changes the folder structure of the project or attempts one of the following operations: Delete project, Associate z/OS, Recreate
repository, Upgrade repository, Restart Application Server, all the other users receive an automatic notification.
Appendix 1 - Log Files Location

IBM Application Discovery Build Configuration

The log files for IBM Application Discovery Build Configuration are available at the following locations and have these name formats:

- **Installation Log**
  - <Installation Path>\install.log
- **COM+ Applications**
- **Event Viewer**

IBM Application Discovery Build Client

The log files for IBM Application Discovery Build Client are available at the following locations and have these name formats:

- **Installation Log**
  - <Installation Path>\Log
- **Error messages that are displayed in IBM Application Discovery Build Client.**
- **Build log.**
  - <Project Path>\<ProjectName>\<ProjectName>.txt
- **Event Viewer.**
- **Mainframe process (z/OS Logs).**
  - **Scan Libraries.**
    - <z/OS Connection Data Path>\Logs\<z/OS name>\MF_Import.log and MF_Errors.log
  - **Add/Update files from Mainframe.**
    - < Path for the retrieved members>\ Mainframe Library Members\ <z/OS name>\GetMFMemberSources.log, UpdateMFMemberSources.log.
    - < Path for the retrieved members>\ Mainframe Library Members\ SummaryGetMFMemberSources.log, SummaryUpdateMFMemberSources.log.
- **Background Actions**
  - **Make Project.**
    - <Project Path>\<ProjectName>\ BatchMakeStatusFile.txt, BatchMakeErrFile.txt.
  - **Update Project**
    - <Project Path>\<ProjectName>\ UpdateInBackgroundLog.txt
    - Update Modified Mainframe Members.
    - < Path for the retrieved members >\ Mainframe Library Members\ BackgroundUpdateMFMemberSources.log
Synchronize Members Process Log Files

The following log files are generated:

- `<Project Folder>\ Synchronize\SynchronizeMembersProgress_<timestamp>.log`
  This log records the actual progress of the process (parsing the configuration file, validating the configuration file). This method is useful when the process is run in background.

- `<Project Folder>\ Synchronize\SynchronizeMembersSummary_<timestamp>.log`
  This log is generated at the end of the process and records the modified, added, and deleted member files.

- `<Project Folder>\ Synchronize\SynchronizeMembersExtendedInfo_<timestamp>.log`
  This log is generated at the end of the process and consolidates detailed log files. See “Detailed Log Files Location” on page 74 for the source logs.

Detailed Log Files Location

Previously existing log files that are generated by sub processes.

- **Scan libraries** - `<Project Folder>\<z/OS>\Logs\<z/OS name>\MF_Import_<timestamp>.log`
- **Scan libraries** - `<Project Folder>\<z/OS>\Logs\<z/OS name>\MF_Errors_<timestamp>.log`
- **Update mainframe members** - `<Path For The Retrieved Members>\Mainframe Library Members\SummaryUpdateMFMemberSources_<timestamp>.log`
- **Update mainframe members** - `<Path For The Retrieved Members>\Mainframe Library Members\<z/OS name>\UpdateMFMemberSources_<timestamp>.log`
- **Update mainframe members** - `<Path For The Retrieved Members>\Mainframe Library Members\<z/OS name>\BackgroundUpdateMFMemberSources_<timestamp>.log`
- **Add/Remove files from project** - `<Project Folder>\UpdateInBackgroundLog_<timestamp>.txt`
- **New log files**
- **Configuration file validation** - `<Project Folder>\Synchronize\ConfigFileValidation_<timestamp>.log`
Appendix 2 - Synchronize Members Configuration File Examples

The configuration file is intended to instruct **IBM Application Discovery Build Client** on whether it needs to update against specific libraries, where to add/remove the related members in/from the project (that is, which virtual folder to use) and also which type of members **IBM Application Discovery Build Client** must use when you add members. The basic assumption is that the specified libraries do not contain members that do not have to be added even though they are there.

The configuration file must contain the following parameters:

- `<Project name>`, `<Library type>`, `<Library name>`, `<Mapped virtual folder>`, `<Members type>`, `<z/OS>`, `Application`

**Project name**
The name of the project that needs to be synchronized with the mainframe system.

**Library type**
The type of the library from which members are added.

**Library name**
The name of the library against which the synchronization takes place.

**Mapped virtual folder**
The name of the project folder where the members are added/updated/deleted.

**Members type**
The type of the members that are synchronized. The allowed types are presented in the **Member types names** table.

**z/OS**
The name of the connection to the mainframe system, as defined in the **zOS** tab of the **IBM Application Discovery Build Configuration**. For more information, see “The zOS Tab” on page 67.

**Application**
The name of the application as defined for ChangeMan® ZMF in **zOS Configuration** screen.

Following are some examples for configuration files, based on Library types.

**Note:** Each line in the configuration file must contain a unique `<Project name>`, `<Library type>`, `<Library name>`, `<Mapped virtual folder>`, `<z/OS>` tuple. If not, the configuration file is invalidated. Also, if the synchronization process runs for more than one Library/Project, a unique line must be added for each project that needs synchronization.

To comment a line in the configuration file, add `*` at the beginning of that line.

**PDS Library**- `<PROJECT>`, PDS(MVS™), ITLS.COBOL.II, z/OS Cobol, COBOL_MVS, zOSCONN

**Endevor**- `<PROJECT>`, Endevor, SMPLTEST.EZLPROJ.EZLCOMP.COBOC, z/OS Cobol, COBOL_MVS, zOSCONN

**ChangeMan Baseline**- `<PROJECT>`, CHANGEMAN_BASELINE, EZL.SERENA.SYNC.EZLX.COBOC, z/OS Cobol, COBOL_MVS, zOSCONN, EZLX

**ChangeMan Package**- `<PROJECT>`, CHANGEMAN_PACKAGE, EZLX000020, z/OS Cobol, COBOL_MVS, zOSCONN

**Available library types**- PDS(MVS), Endevor, PDS(MVS)_CONTROLM, NATURAL, LIBRARIAN, CHANGEMAN_BASELINE, CHANGEMAN_PACKAGE.

**Member types names:**

<table>
<thead>
<tr>
<th>Virtual Folder</th>
<th>FileType Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAuto Scheduling</td>
<td>AAUTO_SCHEDULING</td>
</tr>
<tr>
<td>Virtual Folder</td>
<td>FileType Name</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>AAuto Scheduling</td>
<td>AAUTO_DS_FLAG_REPORT</td>
</tr>
<tr>
<td>ADS Dialog</td>
<td>ADS_DIALOG</td>
</tr>
<tr>
<td>ADS Map</td>
<td>ADS_MAP</td>
</tr>
<tr>
<td>ADS Process</td>
<td>ADS</td>
</tr>
<tr>
<td>Assembler</td>
<td>ASSEMBLER</td>
</tr>
<tr>
<td>Assembler Include</td>
<td>ASSEMBLER_INCLUDE</td>
</tr>
<tr>
<td>Assembler Macro</td>
<td>ASM_MACRO</td>
</tr>
<tr>
<td>Batch Processes</td>
<td>XML_SCHDL_INFO</td>
</tr>
<tr>
<td>information</td>
<td></td>
</tr>
<tr>
<td>BMS</td>
<td>BMS</td>
</tr>
<tr>
<td>CL</td>
<td>CL</td>
</tr>
<tr>
<td>Cobol AIM</td>
<td>COBOL_FUJITSU_AIM</td>
</tr>
<tr>
<td>Cobol AS400 Smart</td>
<td>COBOL_AS400_SMART</td>
</tr>
<tr>
<td>Cobol IDMS</td>
<td>COBOL_IDMS</td>
</tr>
<tr>
<td>Cobol IDMS Record</td>
<td>COBOL_IDMS_RECORD</td>
</tr>
<tr>
<td>Cobol Include</td>
<td>COPY</td>
</tr>
<tr>
<td>Configuration</td>
<td>CSD</td>
</tr>
<tr>
<td>Configuration</td>
<td>IMST_PGM</td>
</tr>
<tr>
<td>Configuration</td>
<td>JCL_PGM</td>
</tr>
<tr>
<td>Configuration</td>
<td>PGM_ALIAS</td>
</tr>
<tr>
<td>Data Area</td>
<td>LDA</td>
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<tr>
<td>Datasets Definition</td>
<td>XML_DATASET_DEF</td>
</tr>
<tr>
<td>DBD</td>
<td>DBD</td>
</tr>
<tr>
<td>Delete Reports</td>
<td>XML_DELETE_REPORT</td>
</tr>
<tr>
<td>IMS Map</td>
<td>MFS</td>
</tr>
<tr>
<td>JCL</td>
<td>JCL</td>
</tr>
<tr>
<td>JCL Control files</td>
<td>JCL_CTRL</td>
</tr>
<tr>
<td>JCL Include</td>
<td>JCL_INCLUDE</td>
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<tr>
<td>JCL Processes</td>
<td>JCL_PROCLIB</td>
</tr>
<tr>
<td>Log</td>
<td>LOG</td>
</tr>
<tr>
<td>Logical View Definition</td>
<td>XML_LOGICAL_FILE_DEF</td>
</tr>
<tr>
<td>MQ</td>
<td>MQ_CONFIG</td>
</tr>
<tr>
<td>Natural</td>
<td>NATURAL</td>
</tr>
<tr>
<td>Natural Include</td>
<td>NATURALINCLUDE</td>
</tr>
<tr>
<td>Virtual Folder</td>
<td>FileTypeName</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Natural Map</td>
<td>NATURALMAP</td>
</tr>
<tr>
<td>Object Listing</td>
<td>XML_OBJECT_LISTING</td>
</tr>
<tr>
<td>PL1</td>
<td>PL1</td>
</tr>
<tr>
<td>PL1 IDMS Record</td>
<td>PL1_IDMS_RECORD</td>
</tr>
<tr>
<td>PL1 Include</td>
<td>PL1_INCLUDE</td>
</tr>
<tr>
<td>Printer Files</td>
<td>DDS_PRINT_FILES</td>
</tr>
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<td>PSB</td>
<td>PCB</td>
</tr>
<tr>
<td>Scheduling Information</td>
<td>XML_BATCH_SCHDL_MAP</td>
</tr>
<tr>
<td>Schema</td>
<td>SCHEMA</td>
</tr>
<tr>
<td>Screens</td>
<td>DDS_SCREEN_DEF</td>
</tr>
<tr>
<td>Subschema</td>
<td>SUBSCHEMA</td>
</tr>
<tr>
<td>Table Definition</td>
<td>XML_TABLE_DEF</td>
</tr>
<tr>
<td>zOS Cobol</td>
<td>COBOL_MVS</td>
</tr>
<tr>
<td>PreProc Before</td>
<td>EXTENS_PREPROC_BEFORE</td>
</tr>
<tr>
<td>PreProc MetaData</td>
<td>EXTENS_PREPROC_META</td>
</tr>
<tr>
<td>PreProc Config</td>
<td>EXTENS_PREPROC_CONFIG</td>
</tr>
</tbody>
</table>

Validation configuration files examples.

**ProjectMapping.txt**

This file is the configuration file for defining the Project Name, Serena Application Name, and the Subsystem that is used for the validation process. Valid means that the format is correct and the Project does exist.

```
<Project Name>, <Serena Application Name>, <Subsystem> (comma separated values)
```

**IncludesOrder.txt**

This file is the configuration file for defining the Baseline Libraries types and the order, of Cobol Includes locations. This configuration file is used later on while you set up the path for the Cobol Include folders.

```
<type>,<type1>,...,<typen>
```

**Note:** It is EXTREMELY important to add the types in the order in which the include files must be looked after.

**FoldersMapping.txt**

This file is the configuration file for defining a mapping between a Logical Folder of the project and the type of a member that is part of the validation process. This configuration file is used during the validation stage of the Synchronize Members process.

```
<Member Type>,<Logical folder>
```

**ServicePort.txt**
This file is the configuration file for defining the Service’s port. If you use a firewall, make sure that the port is added as an exception.

<Port Number>
Appendix 3 - Extensibility JSON/Configuration File Examples

Schema JSON files and examples of creating configuration JSON files are provided in this appendix.

Preprocessing Extensibility Examples

Examples are provided to show how metadata JSON files and configuration files must be created to integrate their business-specific cases in the analysis.

The following use case is for the situation when a user uses the %Call using CICS XCTL and #Copybook macros in a before file.

**Before file example: PREPROC.bef**

```plaintext
IDENTIFICATION DIVISION.
PROGRAM-ID.
PREPROC.

DATA DIVISION.
WORKING-STORAGE SECTION.
  01  FIRST-NAME PIC X(09).
  01  COMMAREA-FOR-PROG2 PIC X(09).
PROCEDURE DIVISION.
  MOVE 'TEST-NAME' TO FIRST-NAME.
  CALL 'PROG1'
    USING FIRST-NAME.
%Call using CICS XCTL
#Copybook
```

**After file example: PREPROC.cbl**

```plaintext
IDENTIFICATION DIVISION.
PROGRAM-ID.
PREPROC.

DATA DIVISION.
WORKING-STORAGE SECTION.
  01  FIRST-NAME PIC X(09).
  01  COMMAREA-FOR-PROG2 PIC X(09).
PROCEDURE DIVISION.
  MOVE 'TEST-NAME' TO FIRST-NAME.
  CALL 'PROG1'
    USING FIRST-NAME.
  EXEC CICS XCTL PROGRAM('PROG2')
    COMMAREA(COMMAREA-FOR-PROG2)
    LENGTH(38) END-EXEC.
  CALL 'PROG3'
    USING FIRST-NAME.
```

The following lines in the after file are from Copybook:

```plaintext
CALL 'PROG3'
  USING FIRST-NAME.
```

**JSON file used for mapping: PREPROC.meta**

```json
{
  "info":
  {
    "version":"1.0.0"
  },
  "metadata":
```
Configuration file example
The configuration file contains the information of the mappings between before files, metadata files, after files, and the extensions for each type of the files:

```
"C\BeforeFolder1" | "C\MetaFolder1" | "C\AfterFolder1" | ".bef" | ".meta" | ".cbl"
"C\BeforeFolder2" | "C\MetaFolder2" | "C\AfterFolder2" | ".cbl" | ".meta" | ".after"
"C\BeforeFolder3" | "C\MetaFolder3" | "C\AfterFolder3" | ".cbl" | ".meta" | ".after"
```

Extensibility preprocessing JSON schema

```json
{
  "$schema": "http://json-schema.org/draft-06/schema#",
  "title": "AD Extensibility preprocessing definition file",
  "type": "object",
  "properties": {
    "info": {
      "type": "object",
      "properties": {
        "version": {
          "type": "string",
          "description": "Version of the preprocessing metadata format",
          "pattern": "^[0-9.]+.^[0-9.]+.^[0-9.]+."
        }
      },
      "required": [ "version" ],
      "additionalProperties": false
    },
    "metadata": {
      "type": "array",
      "items": {
        "type": "object",
        "properties": {
          "pathType": {
            "type": "string",
            "description": "Format of the before and after file paths: local or mainframe",
            "enum": [ "PC", "MF" ]
          },
          "beforePath": {
            "type": "string",
            "description": "Path of the original source",
            "minLength": 1
          },
          "afterPath": {
            "type": "string",
            "description": "Path of the preprocessed source",
            "minLength": 1
          },
          "diffResolution": {
            "type": "array",
            "description": "Ordered list of correspondences between lines in the after file and lines in the before file",
            "items": {
              "oneOf": [
                { "$ref": "#/definitions/diffResolutionType1" },
                { "$ref": "#/definitions/diffResolutionType2" }
              ]
            },
            "required": [ "pathType", "beforePath", "afterPath", "diffResolution" ],
            "additionalProperties": false
          }
        },
        "required": [ "info", "metadata" ],
        "definitions": {
          "position": {
            "type": "object",
            "description": "Interval of lines in the source file",
            "properties": {
              "startLine": { "type": "integer", "description": "Starting line of the interval", "minimum": 1 },
              "endLine": { "type": "integer", "description": "Ending line of the interval", "minimum": 1 }
            }
          }
        }
      }
    }
  },
  "required": [ "info", "metadata" ],
  "additionalProperties": false
}
```
API/Macro Call Extensibility Examples

API Call/Macro Extensibility Use Cases
The purpose of this chapter is to help users understand how the Configuration files must be created in order to integrate their business specific cases in the analysis.

API Programs for calling utilities Use case
This use case is created to cover the situation when the API programs are used to call a program that is defined through one of the initial call parameters. The following represents the Sample1 Cobol program:

IDENTIFICATION DIVISION.
  PROGRAM-ID. Sample1.
  *
  ENVIRONMENT DIVISION.
  *
  DATA DIVISION.
  *
  WORKING-STORAGE SECTION.

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The Sample1 Cobol program contains a call to a specific API program named API1.

In case a call to the API1 program has to be interpreted as a call to the value of the first call parameter (VALUE1), the following Configuration Files containing the rules for the new resolution are to be used.

Note: The API_Config.json file specify that the first parameter has to be saved with its value while for the rest of parameters there is no need for their values.

```
{
  "info":
  {
    "version": "5.0.4.1"
  },
  "extensions":
  [{
    "apiKey": "a1",
    "name": "API1",
    "type": "call",
    "parameters":
    [{
      "position": 1,
      "label": "program",
      "resolve": true
    },
    {"position":2,
      "label": "accessType",
      "resolve": false
    },
    {"position":3,
      "label": "outputVariable",
      "resolve": false
    },
    {"position":4,
      "label": "inputVariable",
      "resolve": false
    }
  ]
}
```

The ue-config.json file specify the type of user exit file (for v5.0.4, only .Json file is supported) and the path where the user exit file is located.

```
{
  "schemaVersion": "1.0.1",
  "documentVersion": "1.0.1",
  "ueConfig":
  [{
    "name": "uejson",
    "type": "file-json",
    "location": "location/of/the/file/which/contains/the/resolution.json",
    "appliesTo": ["a1"]
  }]
}
```
The resolution.json file specifies that the API1 call is replaced with a call to a Cobol program, its name is resolved in the first parameter and parameters 2, 3 and 4 are only referred.

```json
{
  "schemaVersion": "1.0.1",
  "documentVersion": "1.0.1",
  "entries": [
    {
      "input": 
      {
        "apiKey": "a1",
        "apiText": "API1",
        "params": [
          {
            "paramKey": "program",
            "paramMode": "byValue"
          },
          {
            "paramKey": "accessType",
            "paramMode": "byRef"
          },
          {
            "paramKey": "outputVariable",
            "paramMode": "byRef"
          },
          {
            "paramKey": "inputVariable",
            "paramMode": "byRef"
          }
        ]
      },
      "resolutions": [
        {
          "action": "call",
          "target": 
          {
            "resourceType": "CobolProgram",
            "paramKey": "program",
            "paramMode": "byValue",
            "read": true
          },
          "resources": 
          {
            "resourceType": "Variable",
            "paramKey": "accessType",
            "paramMode": "byRef",
            "read": true
          },
          {
            "resourceType": "Variable",
            "paramKey": "outputVariable",
            "paramMode": "byRef",
            "read": true
          },
          {
            "resourceType": "Variable",
            "paramKey": "inputVariable",
            "paramMode": "byRef",
            "read": true
          }
        }
      ]
    }
  ]
}
```

**API Programs for Data Access Use Case**

This use case is created to cover the situation when the API programs are used to perform SQL Select and SQL Delete on specified fields from TABLE1 and TABLE2 SQL tables defined in the Cobol program. The following represents the **Sample2** Cobol program.

```
IDENTIFICATION DIVISION.
  PROGRAM-ID. Sample2.
    * ENVIRONMENT DIVISION.
    * DATA DIVISION.
      WORKING-STORAGE SECTION.
      EXEC SQL DECLARE TABLE1 TABLE
      ( COL11                          CHAR(7),
        COL12                         CHAR(10)
      )END-EXEC.
```
EXEC SQL DECLARE TABLE2 TABLE
( COL21                          CHAR(7),
 COL22                         CHAR(10)
)END-EXEC.

01 VALUE1-DATA.
  03 VALUE1-DATA  PIC S9(9).
01 VALUE2-DATA.
  03 VALUE2-DATA  PIC S9(9).
01 FIRST-PARAM.
  03 ACCESS-ID PIC S9(9).

PROCEDURE DIVISION.
  MOVE 'VALUE1' TO ACCESS-ID
  MOVE 'AAAAAA' TO VALUE1-DATA
  CALL 'API2' USING FIRST-PARAM
          VALUE1-DATA.

  MOVE 'VALUE2' TO ACCESS-ID
  MOVE 'AAAAAA' TO VALUE2-DATA
  CALL 'API2' USING FIRST-PARAM
          VALUE2-DATA.

The first call to the API2 program has to be interpreted as an SQL Select performed on fields COL11 and COL12 from TABLE1 SQL table. This action is specified by the value of the second API call parameter VALUE1.

The second call to the API2 program has to be interpreted as an SQL Delete performed on fields from TABLE SQL table. This action is specified by the value of the second API call parameter VALUE2.

The second call to the API2 program has to be interpreted as an SQL Delete performed on fields from TABLE SQL table. This action is specified by the value of the second API call parameter VALUE2.

{  "info":
    {
      "version":"5.0.4.1"
    },
    "extensions":
    {
      "apiKey":"a1",
      "name":"API2",
      "type": "call",
      "parameters":
      {
        "position":1,
        "label": "p1",
        "resolve": true,
        "locator":{
          "offset":1,
          "length":9
        },
        "position":2,
        "label": "p2",
        "resolve": true,
        "locator":{
          "offset":1,
          "length":9
        },
        "position":2,
        "label": "p3",
        "resolve": false
      }
    }
}
The `ue-config.json` file specifies the type of user exit file (for v5.0.4, only `.json` file is supported) and the path where the user exit file is located.

```
{
  "schemaVersion": "1.0.1",
  "documentVersion": "1.0.1",
  "ueConfig": [
    {
      "name": "uejson",
      "type": "file-json",
      "location": "location from disk/resolution.json",
      "appliesTo": ["a1"]
    }
  ]
}
```

The `resolution.json` file specifies:

- if VALUE1 is found in parameter values the API2 call will become a SQL Select on `COL11` and `COL12` fields from **TABLE1 SQL** Table.
- if VALUE2 is found in parameter values the API2 call will become a SQL Delete on `COL21` field from **TABLE2 SQL** Table.

```
{
  "schemaVersion": "1.0.1",
  "documentVersion": "1.0.1",
  "entries": [
    {
      "input": {
        "apiKey": "a1",
        "apiText": "API2",
        "params": [
          {
            "value": "VALUE1"
          },
          {
            "paramKey": "p2",
            "paramMode": "byRef"
          },
          {
            "paramKey": "p3",
            "paramMode": "byRef"
          },
          {
            "paramKey": "p4",
            "paramMode": "byRef"
          }
        ]
      },
      "resolutions": [
        {
          "action": "SQLSelect",
          "resources": [
            {
              "resourceType": "SQLTable",
              "value": "TABLE1",
              "read": true
            }
          ],
          "clauses": [
            {
              "clause": "into",
              "from": {
                "resourceType": "SQLField",
                "qualifiers": [
                  "TABLE1"
                ],
                "value": "COL11",
                "read": true
              },
              "to": {
                "resourceType": "Variable",
                "paramKey": "p2",
                "paramMode": "byRef",
                "read": false
              }
            }
          ]
        }
      ]
    }
  ]
}
```
"clause": "into",
"from":
{
  "resourceType": "SQLField",
  "qualifiers": [ "TABLE1" ],
  "value": "COL12",
  "read": true
},
"to": {
  "resourceType": "Variable",
  "paramKey": "p3",
  "paramMode": "byRef",
  "read": false
}
},
"clause": "where",
"from":
{
  "resourceType": "SQLField",
  "qualifiers": [ "TABLE1" ],
  "value": "COL11",
  "read": false
},
"to": {
  "resourceType": "Variable",
  "paramKey": "p4",
  "paramMode": "byRef",
  "read": true
}
}
},
"input": {
  "apiKey": "a1",
  "apiText": "API2",
  "params": [
    {
      "value": "VALUE2"
    },
    {
      "paramKey": "p2",
      "paramMode": "byRef"
    },
    {
      "paramKey": "p3",
      "paramMode": "byRef"
    },
    {
      "paramKey": "p4",
      "paramMode": "byRef"
    }
  ]
},
"resolutions": [
  {
    "action": "SQLDelete",
    "resources": [
      {
        "resourceType": "SQLTable",
        "value": "TABLE2",
        "read": true
      }
    ],
    "clauses": [
      {
        "clause": "where",
        "from":
        {
          "resourceType": "SQLField",
          "qualifiers": [ "TABLE2" ],
          "value": "COL21",
          "read": false
        },
        "to": {
          "resourceType": "Variable",
          "paramKey": "p4",
          "paramMode": "byRef",
          "read": true
        }
      }
    ]
  }
]
The following JSON schemas might help you create the configurations files.

**Schema for API_Config.json**

```json
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "title": "AD Extensibility extensions definition file",
  "type": "object",
  "properties": {
    "extensions": { "type": "array", "minItems": 1, "items": { "$ref": "#/definitions/Extension" } },
    "required": [ "info", "extensions" ]
  },
  "definitions": {
    "Extension": { "oneOf": [ { "$ref": "#/definitions/ExtensionType1" }, { "$ref": "#/definitions/ExtensionType2" } ] },
    "LocatorType1": { "type": "object", "description": "Locator specifying the parameter value from a record's child", "properties": { "name": { "type": "string", "description": "Name of the record child from which to take the parameter value", "minLength": 1 } }, "required": [ "name" ], "additionalProperties": false },
    "LocatorType2": { "type": "object", "description": "Locator specifying the parameter value by offset and length", "properties": { "offset": { "type": "integer", "description": "Starting offset for the value", "minimum": 0 }, "length": { "type": "integer", "description": "Length of the value to be read", "minimum": 0 } }, "required": [ "offset", "length" ], "additionalProperties": false },
    "ExtensionType1": { "type": "object", "properties": { "apiKey": { "type": "string", "minLength": 1 }, "name": { "type": "string", "minLength": 1 } },
    "ExtensionType2": {
      "type": "object", "properties": {
        "paramKey": { "type": "string", "paramMode": "byRef", "read": false }
      }
    }
  }
}
```
"type": {
  "type": "string",
  "enum": [
    "call"
  ],
  "description": "Extension for call statements",
  "minLength": 1
},
"parameters": {
  "type": "array",
  "minItems": 1,
  "items": {
    "$ref": "#/definitions/ParameterType1"
  }
}
]
"required": [
  'apiKey',
  'name',
  'type',
  'parameters'
],
"additionalProperties": false
"ExtensionType2": {
  "type": "object",
  "properties": {
    'apiKey': {
      "type": "string",
      "minLength": 1
    },
    'name': {
      "type": "string",
      "minLength": 1
    },
    'type': {
      "type": "string",
      "enum": [
        "cics"
      ],
      "description": "Extension for cics statements",
      "minLength": 1
    },
    'parameters': {
      "type": "array",
      "minItems": 1,
      "items": {
        "$ref": "#/definitions/ParameterType2"
      }
    }
  }
}
"required": [
  'apiKey',
  'name',
  'type',
  'parameters'
],
"additionalProperties": false
"ParameterType1": {
  "type": "object",
  "description": "Parameter for call statements",
  "properties": {
    'position': {
      "type": "integer",
      "description": "Position of the parameter in the call",
      "minimum": 1
    },
    'label': {
      "type": "string",
      "description": "Identifier for the parameter",
      "minLength": 1
    },
    'resolve': {
      "type": "boolean",
      "description": "Specify whether to determine the values of the parameter or not",
      "default": true
    },
    'optional': {
      "type": "boolean",
      "description": "Specify whether the parameter is optional or not",
      "default": false
    },
    'locator': {
      "oneOf": [
        {
          "$ref": "#/definitions/LocatorType1"
        },
        {
          "$ref": "#/definitions/LocatorType2"
        }
      ]
    }
  }
}
"required": [
  'position',
  'label',
  'resolve'
],
"additionalProperties": false
"ParameterType2": {
  "type": "object",
  "description": "Parameter for CICS statements",
  "properties": {
    'name': {
      "type": "string",
      "description": "Name of the parameter in the CICS statement",
      "minLength": 1
    }
  }
}
Schema for `ue-config.json`

```json
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "version": "1.0.1",
  "type": "object",
  "description": "An ordered list of user exits",
  "properties": {
    "schemaVersion": {
      "description": "This json schema version",
      "$ref": "#/definitions/versionDef"
    },
    "documentVersion": {
      "description": "The user exit json file version",
      "$ref": "#/definitions/versionDef"
    },
    "ueConfig": {
      "type": "array",
      "description": "An array which contains user exit configurations",
      "items": {
        "type": "object",
        "description": "An user exit configuration object.",
        "properties": {
          "name": {
            "type": "string",
            "description": "A name for this user exit configuration.”
          },
          "type": {
            "type": "string",
            "description": "The user exit type",
            "enum": ["file-json", "utility"
          ],
          "location": {
            "type": "string",
            "description": "The path of the file containing the resolutions (applies for file-json type only)."
          },
          "appliesTo": {
            "type": "array",
            "description": "An array of API (defined in API config json) to which this user-exit is applied.",
            "items": {
              "type": "string",
              "description": "An extensibility API key as defined in the API config json file.”
            },
            "minItems": 1,
            "uniqueItems": true
          },
          "command": {
            "type": "array",
            "description": "An array of strings used to call an external utility in order to obtain the user exit resolutions.”,
            "items": {
              "type": "string"
            }
          },
          "required": ["name", "type", "appliesTo"]
        }
      },
      "required": ["ueConfig", "schemaVersion", "documentVersion"
    ],
    "definitions": ["versionDef": {
      "type": "string",
      "description": "Schema/Document versioning pattern",
      "pattern": "^[0-9]{1,3}\\.[0-9]{1,3}\\.[0-9]{1,3}$"" ]
  }
}
```
Schema for resolution.json

```json
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "version": "1.0.2",
  "type": "object",
  "description": "The json schema for a file-json based AD resolutions.",
  "properties": {
    "schemaVersion": {
      "description": "This json schema version.",
      "$ref": "#/definitions/versionDef"
    },
    "documentVersion": {
      "description": "The user exit json file version.",
      "$ref": "#/definitions/versionDef"
    },
    "entries": {
      "type": "array",
      "description": "An array containing the user exit content.",
      "items": {
        "type": "object",
        "description": "A user exit content object.",
        "properties": {
          "resolutions": {
            "type": "array",
            "description": "An array which contains the user exit resolution objects.",
            "items": {
              "type": "object",
              "description": "A user exit resolution object.",
              "properties": {
                "action": {
                  "type": "string",
                  "description": "The action which will replace the API call.",
                  "enum": [
                    "call",
                    "CICSStart",
                    "CICSStop",
                    "SQLSelect",
                    "SQLInsert",
                    "SQLDelete",
                    "SQLUpdate",
                    "FileRead",
                    "FileWrite",
                    "FileRewrite",
                    "FileDelete",
                    "CICSFileRead",
                    "CICSFileWrite",
                    "CICSFileRewrite",
                    "CICSFileDelete",
                    "CICSSendMap",
                    "CICSReceiveMap",
                    "IMSSendMap",
                    "IMSSendReceiveMap",
                    "IMSSendTransaction",
                    "IMSSendReadNext",
                    "IMSSendInsert",
                    "IMSSendDelete",
                    "IMSSendUpdate"
                  ]
                },
                "location": {
                  "type": "string",
                  "description": "A string which defines the location (another AD project or a CICS region) where the API action is performed.
                },
                "locationType": {
                  "type": "string",
                  "description": "The AD project name or an CICS region.",
                  "enum": ["application", "CICSRegion"
                },
                "target": {
                  "description": "The targeted resource (if any). Will be deprecated in the next versions.",
                  "$ref": "#/definitions/resourceTypeDef"
                },
                "resources": {
                  "type": "array",
                  "description": "An array containing the user exit values for the given resolution.",
                  "items": {
                    "description": "",
                    "$ref": "#/definitions/resourceTypeDef"
                  }
                },
                "clauses": {
                  "type": "array",
                  "description": "An array containing SQL statements related options.",
                  "items": {
                    "type": "object",
                    "description": "",
                    "properties": {
                      "clause": {
                        "type": "string",
                        "description": "The relationship between the 'from' and the 'to' 'value' objects.",
                        "enum": ["into", "where", "set"]
                      },
                      "from": {
                        "description": "A SQLField value object.",
                        "$ref": "#/definitions/resourceTypeDef"
                      },
                      "to": {
                        "description": "A host variable 'value' object.",
                        "$ref": "#/definitions/resourceTypeDef"
                      }
                    }
                  }
                },
                "additionalProperties": false
              }
            }
          }
        }
      }
    }
  }
}
```

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"type": "string",
"description": "A marker which defines how the parameter value is read by the resolver.",
"enum": ["byValue", "byRef"]
],
"qualifiers": [ {
"type": "array",
"description": "An array of strings. The strings will be used to qualify the resource.",
"items": {
"type": "string",
"description": "A string qualifier."
}
},
"value": [ {
"type": "string",
"description": "A string value for the resource type."
}
],
"additionalProperties": false}
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This edition applies to version 5.0.5 of IBM Application Discovery with the corresponding fix packs.


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