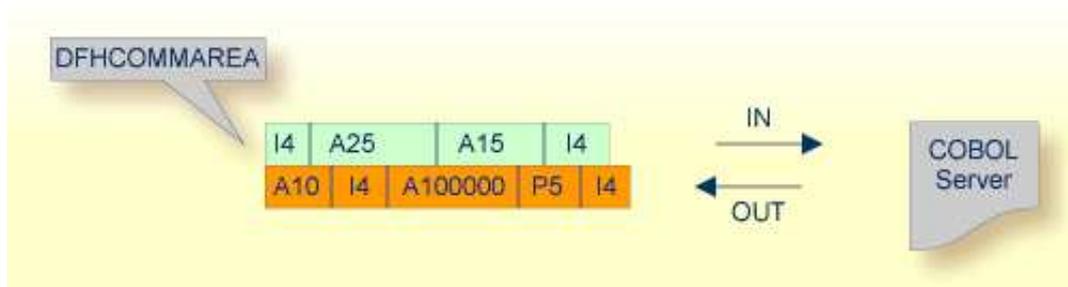


CICS with DFHCOMMAREA Calling Convention - In different to Out

This chapter describes using the COBOL Mapping Editor to extract from a CICS DFHCOMMAREA program where COBOL output parameters are different to COBOL input parameters, that is, the DFHCOMMAREA on output is overlaid with a data structure that is different to the data structure on input.



- Introduction
- Extracting from a CICS DFHCOMMAREA Program
- Mapping Editor User Interface
- Mapping Editor IDL Interface Mapping Functions
- Programming Techniques

Introduction

Depending on the programming style used in the CICS program and the various different techniques for accessing the CICS DFHCOMMAREA interface, finding the relevant COBOL data structures can be a complex and time-consuming task that may require CICS COBOL programming knowledge. Please note also the following:

- A CICS program does not require a `PROCEDURE DIVISION` header, where parameters are normally defined. See *PROCEDURE DIVISION Mapping*.
- The DFHCOMMAREA can be omitted in the linkage section.
- If there is no DFHCOMMAREA in the linkage section or no `PROCEDURE DIVISION` header present in the `PROCEDURE DIVISION`, the CICS preprocessor completes the interface of the COBOL server and adds a DFHCOMMAREA and a `PROCEDURE DIVISION` header to the CICS program before compilation.

If you have selected an IDL file and opened the COBOL Mapping Editor with an existing COBOL to IDL mapping, continue with *Mapping Editor User Interface*.

Extracting from a CICS DFHCOMMAREA Program

This section assumes **Input Message same as Output Message** is not checked. COBOL output and COBOL input parameters are different, that is, the DFHCOMMAREA on output is overlaid with a data structure that is different to the data structure on input. See the examples provided under *Programming Techniques*.

If you are extracting IDL from a COBOL source or extending the IDL file by extracting an additional COBOL source with interface type CICS with DFHCOMMAREA calling convention, the **Extractor Settings** dialog appears (see also *Step 4: Define the Extraction Settings and Start Extraction*).

Make sure the interface type is correct and check box **Input Message same as Output Message** is cleared.



COBOL Source

File Name:

Operating System:

Interface Type:

Input Message same as Output Message

Press **Next** to open the COBOL Mapping Editor.

➤ To select the COBOL interface data items of your COBOL server

1. Add the COBOL data items of the CICS input message to **Input Message** by using the context menu or toolbar available in the *COBOL Source View* and *COBOL Interface*. See Notes.
2. Add the COBOL data items of the CICS output message to **Output Message** by using the context menu and toolbars available in the *COBOL Interface* and *IDL Interface*. See Notes.
3. Continue with *COBOL to IDL Mapping*.

Notes:

1. If a DFHCOMMAREA is present, the DFHCOMMAREA COBOL data item itself cannot be selected. In this case, select the COBOL data items directly subordinated to DFHCOMMAREA and map to IDL. See *Map to*.
2. It is very important to select the right COBOL data items describing the interface of the COBOL server correctly. This means the COBOL data items used as parameters must match in number and in sequence of formats (COBOL usage clause).
3. If your COBOL server contain REDEFINES, the first REDEFINE path is offered by default. Check manually whether this is the one you want. If not, correct it. You can select any other REDEFINE path.
4. See the examples provided under *Programming Techniques*.

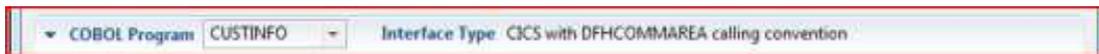
The user interface of the COBOL Mapping Editor is described below.

Mapping Editor User Interface

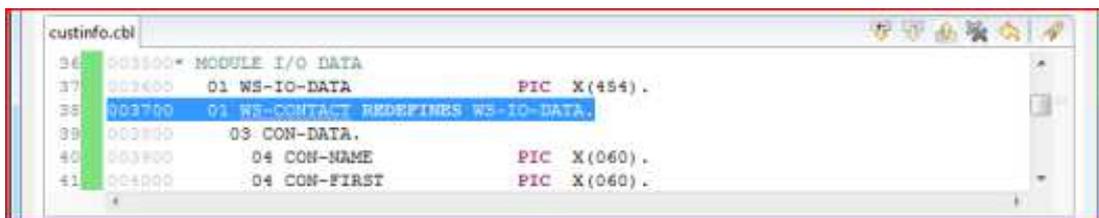
This section assumes you have set the extraction settings as described above. The following areas of the COBOL Mapping Editor user interface are described here:

- COBOL Program Selection
- COBOL Source View
- COBOL to IDL Mapping

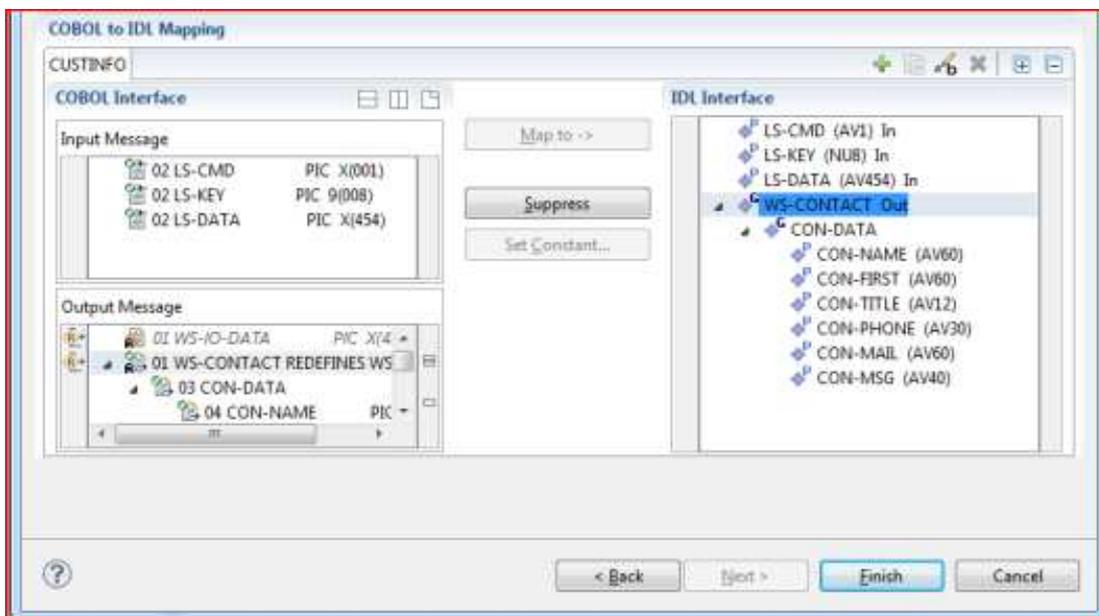
For COBOL interface types where COBOL input and COBOL output parameters are different, the user interface of the COBOL Mapping Editor looks like this:



COBOL Program Selection. Currently selected program with interface type  More info

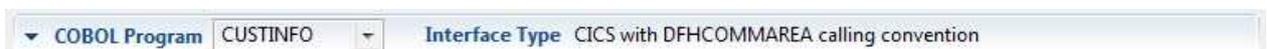


COBOL Source View. Contains all related sources for the currently selected COBOL program  More info



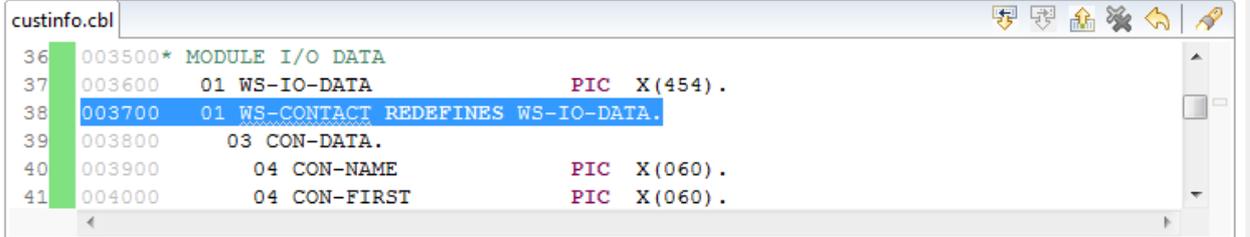
COBOL to IDL Mapping. Tree view of your selected COBOL data items and mapping buttons with which you can map these items to your IDL interface  More info

COBOL Program Selection



The COBOL Program Selection displays the current selected COBOL program with its interface type. If you have extracted more than one COBOL program within associated IDL file, you can switch to another COBOL program with its mapping by selecting the name in the combo box.

COBOL Source View



```

custinfo.cbl
36 003500* MODULE I/O DATA
37 003600 01 WS-IO-DATA PIC X(454).
38 003700 01 WS-CONTACT REDEFINES WS-IO-DATA.
39 003800 03 CON-DATA.
40 003900 04 CON-NAME PIC X(060).
41 004000 04 CON-FIRST PIC X(060).

```

All COBOL data items contained in the LINKAGE and WORKING-STORAGE SECTION are offered in a text view. The text view contains all related sources (including copybooks) for the currently selected COBOL program. It is used for selecting data items and retrieving information from the original COBOL sources. The light green bar indicates that the data item is already contained in the COBOL Interface; a dark green bar indicates the data item is selectable and can be added to the COBOL Interface. This section can be collapsed. If you open the Editor with **Modify Interface** it is collapsed by default. The toolbar provides the following actions:

-  Add selected COBOL data item to COBOL Interface as Input Message.
-  Add selected COBOL data item to COBOL Interface as Output Message.
-  Remove selected COBOL data item from COBOL Interface.
-  Remove all COBOL data items from COBOL Interface.
-  Reset COBOL Interface to initial state.
-  Show dialog to find text in Source.

The same functionality is also available from the context menu.

COBOL to IDL Mapping

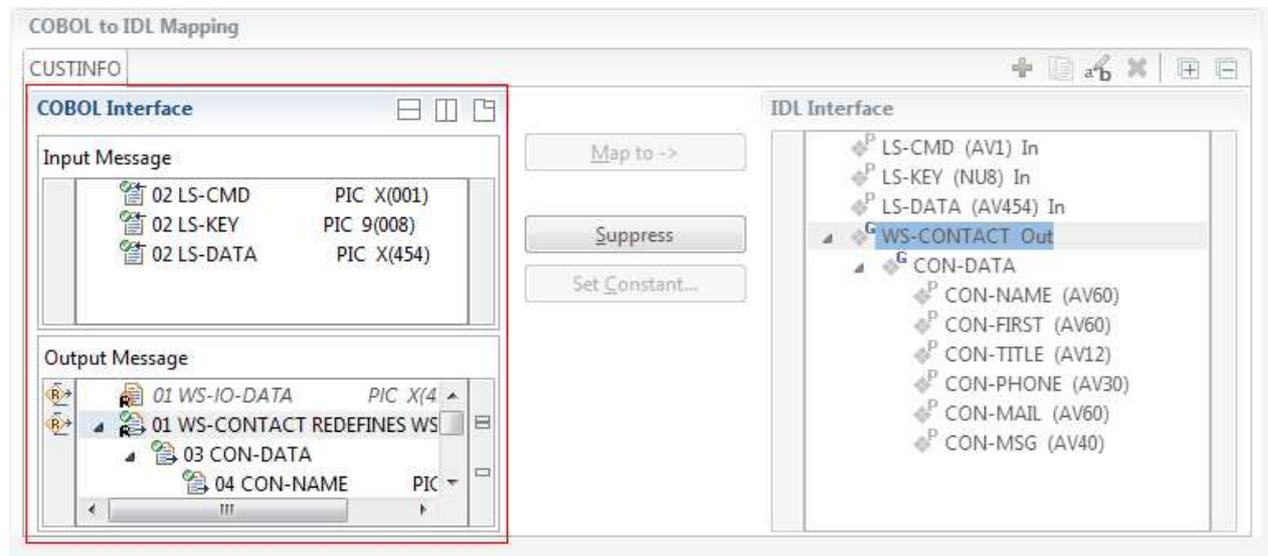
This section covers the following topics:

- COBOL Interface
- Mapping Buttons
- IDL Interface

COBOL Interface

The **COBOL Interface** shows a tree view of your selected COBOL data items describing the interface of the COBOL server. A context menu is available for the COBOL data items, which provides mapping and other functions. On some COBOL data items, decision icons indicate where particular attention is needed, including mapping icons to visualize the COBOL data type and your current mapping.

The COBOL data item names are derived from the COBOL source from which they were extracted. If your COBOL interface contains parameters without a name, that is, the keyword FILLER is used, those COBOL data items are shown as [FILLER]. See *FILLER Pseudo-Parameter*.



You can modify the COBOL interface using context menu or toolbar; decision and mapping icons provide additional information.

Context Menu

The context menu on COBOL data items provides the following mapping and other functions, depending on the data item type, the COBOL level and the current mapping.

These functions are described in more detail under *Mapping Editor IDL Interface Mapping Functions*.

Map to	A suppressed COBOL data item becomes visible in the IDL interface. Used also to select another REDEFINE path.
Suppress	Suppress unneeded COBOL data items.
Set Constant	Set COBOL data items to constant.
Remove from COBOL Interface	Remove the data item from the COBOL interface. This also removes the mapped IDL parameter from all IDL interfaces for the current COBOL program. See <i>COBOL Program Selection</i> .

Toolbar

The toolbar offers the following actions:

-  Create IDL Interface. Creates a new IDL interface based on the current COBOL interface: all IDL parameters are of IDL direction InOut; no IDL parameters are set to constant; for COBOL REDEFINE, the first REDEFINE path is mapped to IDL; FILLERS are suppressed according to your selection, see *Step 4: Define the Extraction Settings and Start Extraction*.
-  Copy current IDL Interface. Creates a duplicate of the current IDL interface: all modifications such as IDL directions, suppress, selection of REDEFINE paths etc. are kept.
-  Remove current IDL Interface.
-  Rename current IDL Interface.
-  Expand the full tree.
-  Collapse the full tree.

See also *Map to Multiple IDL Interfaces*.

Decision Icons

The decision icons in the first column are set on COBOL data items where particular attention is needed:

-  This icon visualizes a COBOL REDEFINE. It is essential that you map the correct redefine path for your mapping to In, Out or InOut using the context menu. If you map a REDEFINE path, all other sibling REDEFINE paths are automatically set to "Suppress".

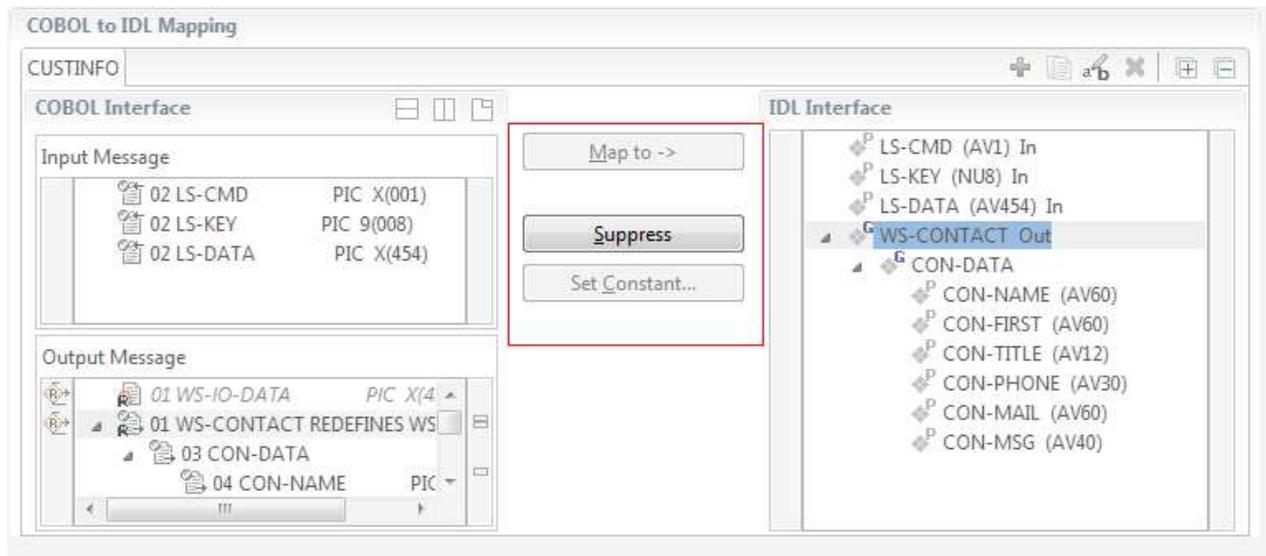
Mapping Icons

The following mapping icons on the COBOL data items indicate your current IDL mapping:

-  Scalar parameter, mapped to In.
-  Scalar parameter, mapped to Out.
-  Group parameter, here mapped to In.
-  REDEFINE parameter, here mapped to Out.
-  Parameter set to Constant.

Mapping Buttons

The following buttons are available:



Map to ->

A suppressed COBOL data item becomes visible in the IDL interface. Used also to select another REDEFINE path.

Suppress

See *Suppress Unneeded COBOL Data Items*.

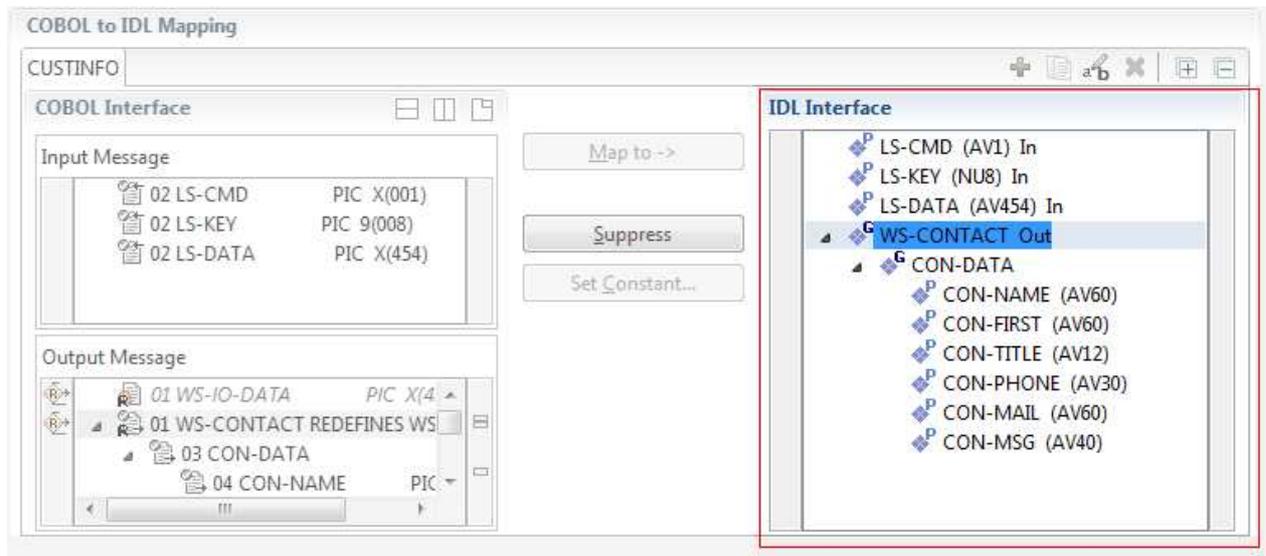
Set Constant...

See *Set COBOL Data Items to Constants*.

IDL Interface

If you have mapped the COBOL interface to multiple IDL interfaces, select the IDL interface by choosing the tabs. In the **IDL Interface** tree view, a context menu is also available with the following possibilities:

- Rename
- Remove from COBOL Interface. This also removes the mapped IDL parameter from all IDL interfaces for the current COBOL program. See *COBOL Program Selection* above.



Mapping Editor IDL Interface Mapping Functions

This section covers the following topics:

- Map to
- Suppress Unneeded COBOL Data Items
- Set COBOL Data Items to Constants
- Map to Multiple IDL Interfaces
- Select REDEFINE Paths

Map to

With the **Map to** functions you make a COBOL data item visible as an IDL parameter in the IDL interface, that is, you design the IDL interface by defining input and output parameters.

➤ To map a COBOL data item to IDL interface

1. Go *step-by-step* through all *top-level* COBOL data items in the COBOL interface and use the **Map to** function available in the context menu and as mapping button to make a COBOL data item visible as an IDL parameter in the input message of the IDL interface.
2. Do the same for the output message of the IDL interface.

Notes:

1. If a COBOL group is mapped, all subsequent child COBOL data items are also made visible in the IDL interface.
2. With the inverse function **Suppress Unneeded COBOL Data Items** (see below) available in the context menu and as mapping button, a COBOL data item can be removed from the IDL interface.

Suppress Unneeded COBOL Data Items

COBOL data items without any relevant information can be made invisible in the IDL interface. The IDL interface is simplified – it becomes shorter and tidier. This is useful, for example

- for FILLER data items
- if the RPC client or Adapter Service does not need an Out parameter
- if the RPC server or Adapter Service does not need an In parameter and a low value can be provided

If you are using an RPC server such as the z/OS (CICS | Batch), z/VSE (CICS | Batch), Micro Focus or BS2000/OSD RPC server, the amount of data to be transferred to/from the RPC client is also reduced.

➤ To suppress unneeded COBOL data items

- Use the **Suppress** function available in the context menu and as mapping button to make the COBOL data item invisible in the IDL interface.

Notes:

1. The COBOL data item is not part of the IDL interface. It is invisible for RPC clients or Adapter Services.
2. The RPC server or Adapter Service provides the COBOL data item to your COBOL server with low value, managing the offset to the next COBOL data item.
3. If a COBOL group is suppressed, all subsequent child COBOL data items are suppressed as well.
4. With the inverse function **Map to** (see above) available in the context menu and as mapping button, a COBOL data item can be made visible in the IDL interface again.

Set COBOL Data Items to Constants

COBOL data items that always require fixed constant values on input to the COBOL server program can be made invisible in the IDL interface and initialized with the required constant values. This is useful for keeping the IDL interface short and tidy. RPC clients or Adapter Services are not bothered with IDL parameters that always contain constants, such as RECORD-TYPES. This function is often used in conjunction with **Map to Multiple IDL Interfaces** (see below).

➤ To map COBOL data items to constants

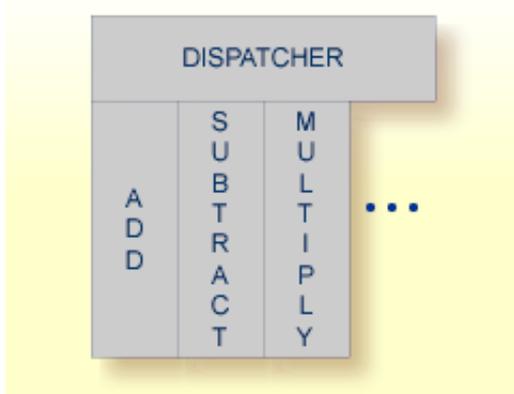
- Use the **Set Constant** function available in the context menu and as mapping button to define a constant value for a COBOL data item. You are prompted with a window to enter the constant value.

Notes:

1. The COBOL data item is not part of the IDL interface. It is invisible for RPC clients or Adapter Services.
2. The RPC server or Adapter Service provides the defined constant in the COBOL data item to your COBOL server.
3. With the function **Map to** (see above) available in the context menu and as mapping button, a COBOL data item can be made visible in the IDL interface again.

Map to Multiple IDL Interfaces

Assume the COBOL server program provides multiple functions or operations, in the following example ADD, SUBTRACT, MULTIPLY. Some dispatcher front-end code executes the correct function, for example, depending on a *function-code* or *operation-code* parameter:



This example is described in more detail under *Example 1: COBOL Server with Multiple Functions*.

If you have such a situation, a good approach is to expose each COBOL server program function separately as an IDL program. This gives advantages in further processing of the IDL and COBOL mapping files (SVM and CVM). For example:

- If your target endpoint is a web service: instead having a Web service with a single operation, you get a web service with multiple operation, one operation for each COBOL function.
- If your target endpoint is Java or .NET: instead having a class with a single method, you get a class with multiple methods, one method for each COBOL function.

➤ To map a COBOL interface to multiple IDL interfaces

1. Select the tab with COBOL to IDL Mapping. For each function, define a separate IDL interface with the toolbar functions  or .
2. Give the IDL interfaces meaningful names with the toolbar function .
3. Define the required constant values to the *function-code* or *operation-code* parameter, see *Set COBOL Data Items to Constants* above.

For the delivered Example 1: COBOL Server with Multiple Functions:

- First, for step 1 above: Extract and define 3 separate IDL programs ADD, SUBTRACT, MULTIPLY.
- Second, for step 2 above: Rename them to suitable names, e.g. 'ADD', 'SUBTRACT', 'MULTIPLY'.
- Third, for step 3 above: Define the constants '+', '-' and '*' to the parameter OPERATION respectively.

Notes:

1. The following functions are offered to create further mappings from the COBOL interface, resulting in multiple IDL interfaces (IDL programs).

Icon	Function	Description
	Create IDL Interface	Creates a new IDL interface based on the current COBOL interface. All IDL parameters are of IDL direction InOut; no IDL parameters are set to constant; for COBOL REDEFINE, the first REDEFINE path is mapped to IDL; FILLERS are suppressed according to your selection, see <i>Step 4: Define the Extraction Settings and Start Extraction</i> .
	Copy current IDL Interface	Creates a duplicate of current IDL interface. All modifications such as IDL directions, suppress, selection of REDEFINE paths etc. are kept.
	Rename current IDL Interface	The default name for the IDL interface is based on the COBOL program name plus appended number. With this function you can give the IDL interface a suitable name.
	Remove current IDL Interface	Deletes the current IDL interface.

2. With the steps 1 thru 3 described here you can emulate the behavior of function Map to Operation of EntireX version 9.6 and earlier.

Select REDEFINE Paths

For COBOL server programs containing COBOL REDEFINES, the correct REDEFINE path needs to be chosen for the IDL interface.

> To select redefine paths

- Use the **Map to** function available in the context menu and as mapping button to make the COBOL REDEFINE path available in the IDL interface.

Begin with the COBOL REDEFINE defined at the highest level first. Work through all inner COBOL REDEFINE data items, going from higher levels to lower levels.

Notes:

1. Only one REDEFINE path of a COBOL REDEFINE can be mapped to the IDL interface. All COBOL REDEFINE siblings are suppressed.
2. If a REDEFINE path is actively mapped to the IDL interface, all COBOL REDEFINE siblings are suppressed.
3. You can suppress all REDEFINE paths of a COBOL REDEFINE. Simply suppress the active REDEFINE path, see *Suppress Unneeded COBOL Data Items above*.

Programming Techniques

This section covers the following topics:

- Example 1: COBOL Server with Multiple Functions
- Example 2: Redefines
- Example 3: Buffer Technique
- Example 4: COBOL SET ADDRESS Statements

Example 1: COBOL Server with Multiple Functions

Assume a COBOL server program has a FUNCTION or OPERATION code COBOL data item in its COBOL interface. The COBOL server program behaves differently depending on field values of this data item. See the following example where a COBOL programs implements a calculator with the functions ADD, SUBTRACT, MULTIPLY, etc. The execution of the different functions is controlled by the COBOL data item OPERATION:

```

. . .
01 OPERATION                PIC X(1) .
01 OPERAND1                 PIC S9(9) BINARY .
01 OPERAND2                 PIC S9(9) BINARY .
01 FUNCTION-RESULT         PIC S9(9) BINARY .
. . .
MOVE 0 TO FUNCTION-RESULT .
EVALUATE OPERATION
  WHEN "+"
    ADD OPERAND1 OPERAND2
    GIVING FUNCTION-RESULT
  WHEN "-"
    SUBTRACT OPERAND2 FROM OPERAND1
    GIVING FUNCTION-RESULT
  WHEN "*"
    MULTIPLY OPERAND1 BY OPERAND2
    GIVING FUNCTION-RESULT
  WHEN . . .

END-EVALUATE .
. . .

```

You can expose each COBOL server program function separately. The advantages or reasons for wanting this depend on the target endpoint. For example:

- **Web Service**
Instead having a Web service with a single operation, you want a web service with multiple operations, one operation for each COBOL function.
- **Java or .NET**
Instead having a class with a single method, you want a class with multiple methods, one method for each COBOL function.

- etc.

To do this you need to extract the COBOL server program as described under *Map to Multiple IDL Interfaces*.

Example 2: Redefines

The output data is described with a REDEFINE that overlays the input data as in the following example. In this case you need to select IN-BUFFER for the input message and OUT-BUFFER for the output message of the COBOL interface.

```
LINKAGE SECTION.
01 DFHCOMMAREA.

02 IN-BUFFER.
03 OPERATION                PIC X(1).
03 OPERAND-1                PIC S9(9) BINARY.
03 OPERAND-2                PIC S9(9) BINARY.
02 OUT-BUFFER REDEFINES IN-BUFFER.
03 FUNCTION-RESULT          PIC S9(9) BINARY.
. . .
PROCEDURE DIVISION USING DFHCOMMAREA.
* process the IN-BUFFER and provide result in OUT-BUFFER
  EXEC CICS RETURN.
```

Example 3: Buffer Technique

On entry, the server moves linkage section field(s) - often an entire buffer - into the working storage and processes the input data inside the working storage field(s). Before return, it moves the working storage field(s) - often an entire buffer - back to the linkage section. In this case, the relevant COBOL data items are described within the working storage section. You need to select IN-BUFFER for the input message and OUT-BUFFER for the output message of the COBOL interface.

```
WORKING STORAGE SECTION
01 IN-BUFFER.
02 OPERATION                PIC X(1).
02 OPERAND-1                PIC S9(9) BINARY.
02 OPERAND-2                PIC S9(9) BINARY.
01 OUT-BUFFER.
02 FUNCTION-RESULT          PIC S9(9) BINARY.
LINKAGE SECTION
01 DFHCOMMAREA.
02 IO-BUFFER                PIC X(9).
. . .
PROCEDURE DIVISION USING DFHCOMMAREA.
  MOVE IO-BUFFER TO IN-BUFFER.
* process the IN-BUFFER and provide result in OUT-BUFFER
  MOVE OUT-BUFFER TO IO-BUFFER.
  EXEC CICS RETURN.
```

Example 4: COBOL SET ADDRESS Statements

COBOL SET ADDRESS statements are used to manipulate the interface of the CICS server. On entry, the server addresses the input data with a (dummy) structure IN-BUFFER defined in the linkage section. Upon return, the server addresses the output data again with a different (dummy) structure OUT-BUFFER defined in the linkage section. You need to select IN-BUFFER for the input message and OUT-BUFFER for the output message of the COBOL interface.

```
LINKAGE SECTION.  
01 IN-BUFFER.  
    02 OPERATION                PIC X(1).  
    02 OPERAND-1                PIC S9(9) BINARY.  
    02 OPERAND-2                PIC S9(9) BINARY.  
01 OUT-BUFFER.  
    02 FUNCTION-RESULT          PIC S9(9) BINARY.  
    . . .  
PROCEDURE DIVISION.  
    SET ADDRESS OF IN-BUFFER TO DFHCOMMAREA.  
* process the IN-BUFFER and provide result in OUT-BUFFER  
    SET ADDRESS OF OUT-BUFFER TO DFHCOMMAREA.  
    EXEC CICS RETURN.
```