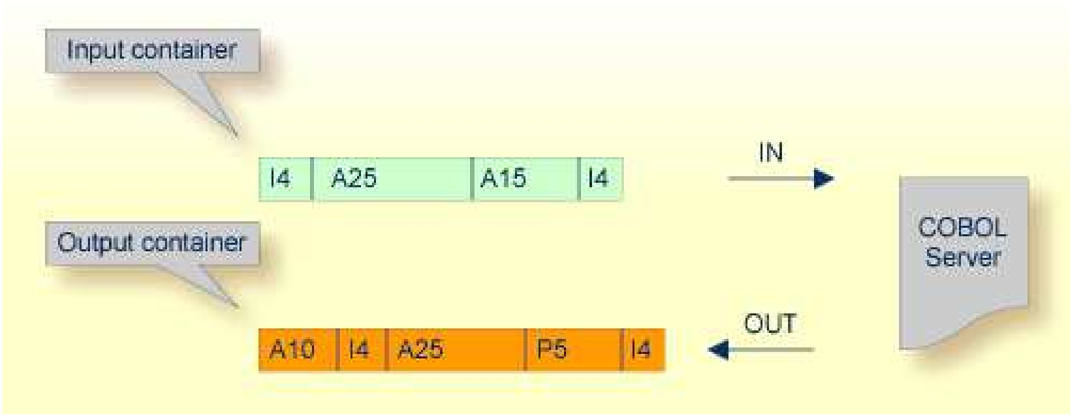
CICS with Channel Container Calling Convention

This chapter describes using the COBOL Mapping Editor to extract from a CICS channel container program.



Introduction

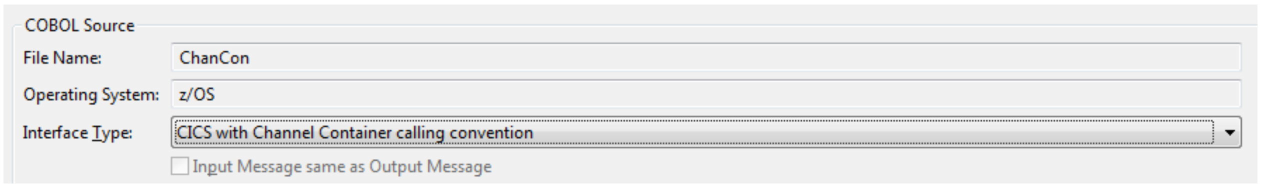
Modern CICS programs may use the CICS channels and containers model. During extraction, containers are mapped to IDL structures. See `structure-parameter-definition` (IDL).

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 Channel Container Program

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 channel container 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, if required, that the channel name (max. 16 characters) is provided. If you do not provide a channel name, "EntireXChannel" is used as the default value.


COBOL Source
File Name: ChanCon
Operating System: z/OS
Interface Type: CICS with Channel Container calling convention
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. Define all the CICS input containers, one after another: in the **Source View**, use the toolbar icon **Find text in Source** and enter "`EXEC CICS`" to find a `GET` call containing `"EXEC CICS GET"`, function `"CONTAINER"` etc. Example:

   ```
   EXEC CICS GET
         CONTAINER(<container name constant>)
         CHANNEL  (<channel>)
         INTO     (<container>)
         NOHANDLE
   END-EXEC
   ```

   The COBOL data item `<container>` is the item you are looking for. Add the COBOL data item `<container>` to **Input Message** by using the context menu or toolbar available in the *COBOL Source View* and *COBOL Interface*. In the **Input Message** pane, select the corresponding COBOL data item `<container>`. Enter the container name, found in the value of `<container name constant>`. You can select multiple CICS input containers. See Notes.

2. Define all the CICS output containers using the steps as above, but look for `"EXEC CICS PUT"`. Example:

   ```
   EXEC CICS PUT
         CONTAINER(<container name constant>)
         CHANNEL  (<channel>)
         FROM     (<container>)
         FLENGTH  (LENGTH OF <container>)
         NOHANDLE
   END-EXEC
   ```

   Add the corresponding COBOL data item `<container>` to **Output Message**. In the **Output Message** pane, select the corresponding COBOL data item `<container>`. Enter the container name, found in the value of `<container name constant>`. The `EXEC CICS PUT` statement can be executed multiple times (for example in a loop) for the same container definition, creating an array of container. If this is true, set the column Array in the wizard to "Yes" and enter the maximum number of occurrences for the container in the **Max** column. You can select multiple CICS output containers. See Notes.

3. Continue with *COBOL to IDL Mapping*.

Notes:

1. 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).
2. If your COBOL server contain `REDEFINE`s, 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.

3. The container name length is restricted to 16 characters.
4. Container arrays will enlarge the container name, because the number of occurrences (**Max** column) will be added to the name (max. 16 characters). Example:
   For `MYCONTAINER` as the container name and 99999 as the number of occurrences, the container names are `MYCONTAINER00001` - `MYCONTAINER99999`.

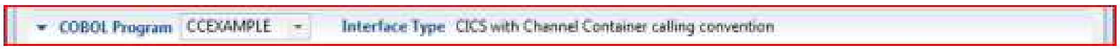
The user interface of the COBOL Mapping Editor is described below.

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:

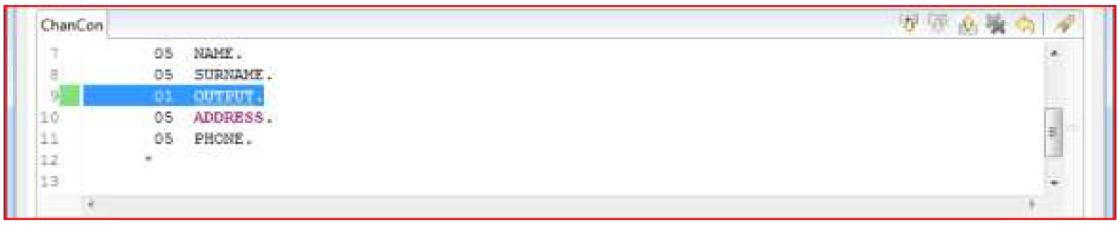
- COBOL Program Selection
- COBOL Source View
- COBOL to IDL Mapping

For COBOL server programs with CICS channel container interface, the user interface of the COBOL Mapping Editor looks like this:



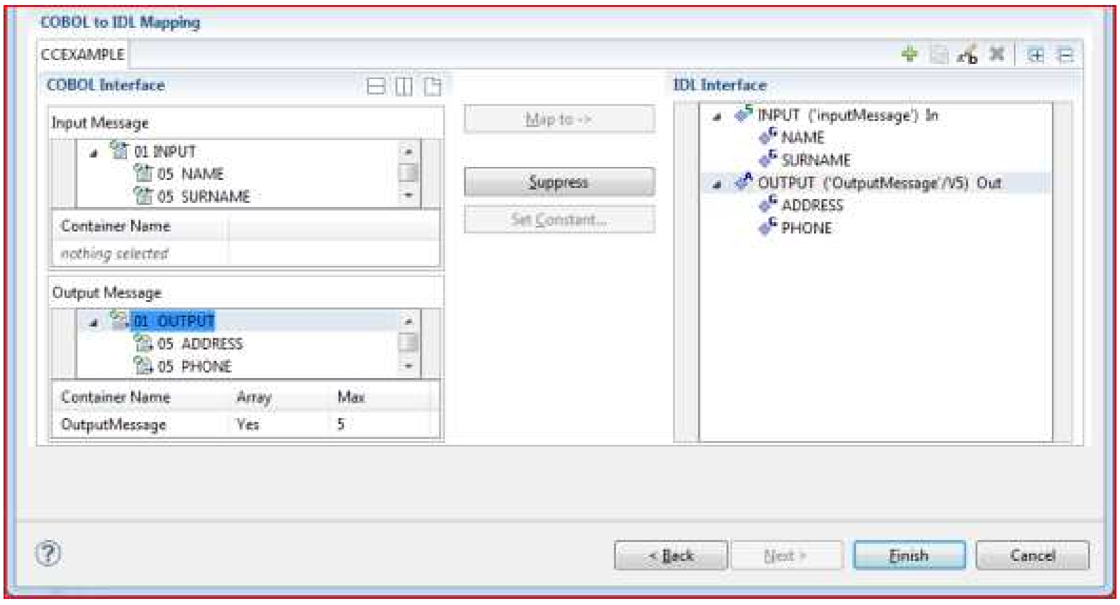
COBOL Program: CCEXAMPLE Interface Type: CICS with Channel Container calling convention

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



```
           05   NAME.
           05   SURNAME.
           01   OUTPUT.
           05   ADDRESS.
           05   PHONE.
       *
```

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



Input Message:

```
01 INPUT
   05 NAME
   05 SURNAME
```

Container Name	
nothing selected	

Output Message:

```
01 OUTPUT
   05 ADDRESS
   05 PHONE
```

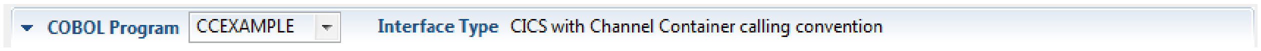
Container Name	Array	Max
OutputMessage	Yes	5

IDL Interface:

```
INPUT ('inputMessage') In
   NAME
   SURNAME
OUTPUT ('OutputMessage'/V5) Out
   ADDRESS
   PHONE
```

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

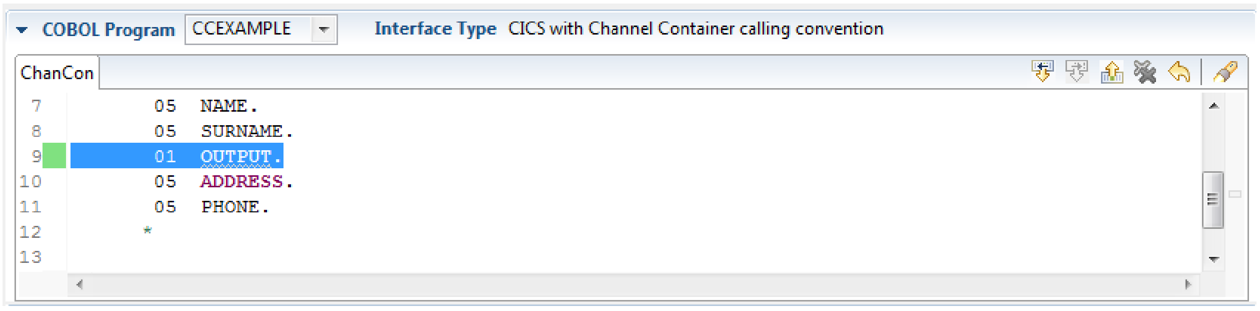
COBOL Program Selection



COBOL Program: CCEXAMPLE Interface Type: CICS with Channel Container calling convention

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



```
       05  NAME.
       05  SURNAME.
       01  OUTPUT.
       05  ADDRESS.
       05  PHONE.
      *
```

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

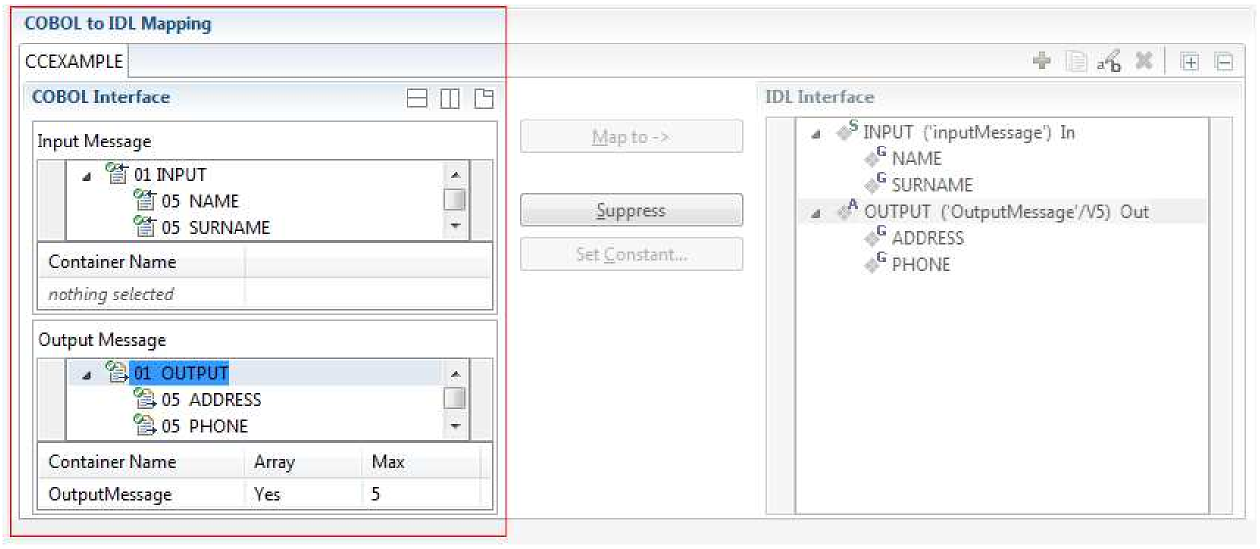
This section covers the following topics:

- 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*.



Container Name	
nothing selected	

Container Name	Array	Max
OutputMessage	Yes	5

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.
Set Array Mapping	Map an array to a fixed sized or unbounded array. **Note:** This option should be used carefully and requires knowledge of the COBOL server program. Be aware that an incorrect mapping could result in runtime errors.
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 *COBOL Program Selection*.

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; `FILLER`s 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".

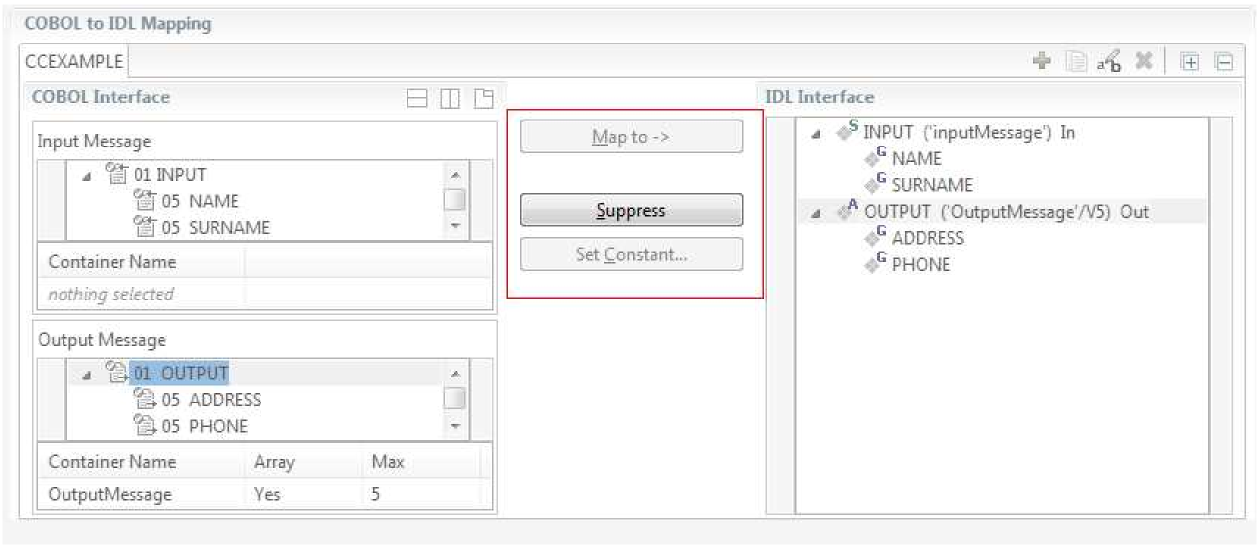
Mapping Icons

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:



Container Name	Array	Max
OutputMessage	Yes	5

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*.

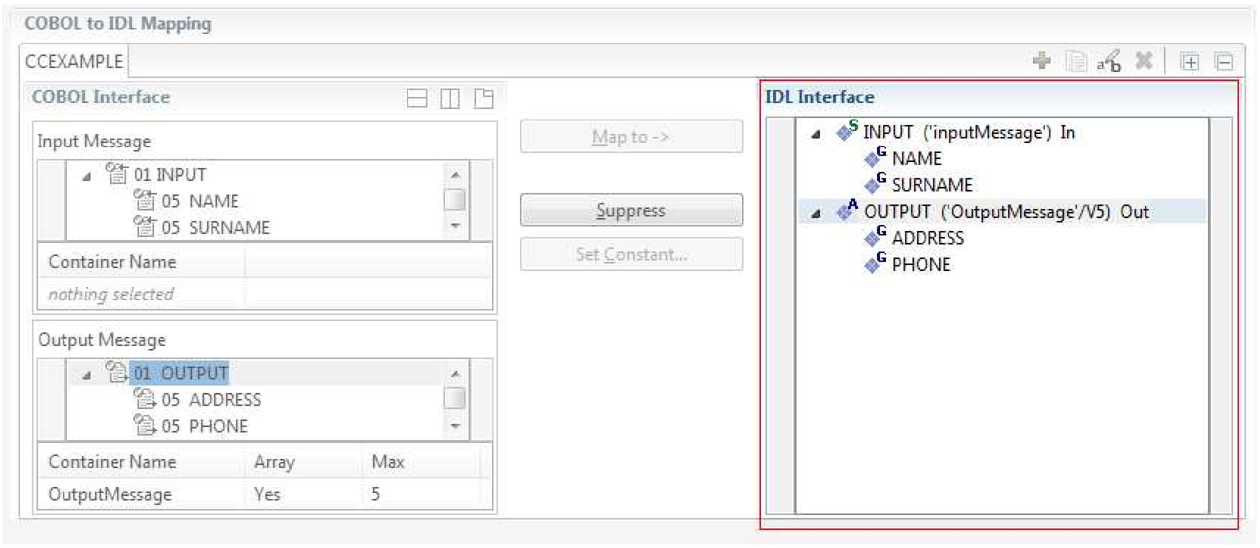
Set Constant...

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.



Container Name	Array	Max
OutputMessage	Yes	5

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
- Set Arrays (Fixed <-> Unbounded)

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

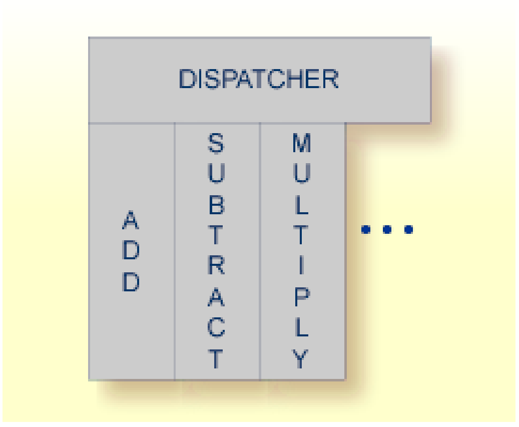
- Use the **Set Constant** function available in the context menu and as mapping button to define a constant value for a COBOL data item. You are prompted with a window to enter the constant value.

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`, `SUBRACT`, `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; `FILLER`s are suppressed according to your selection, see *Step 4: Define the Extraction Settings and Start Extraction*.
📄	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 `REDEFINE`s, 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.*

Set Arrays (Fixed <-> Unbounded)

For COBOL server programs using the message length to transfer a variable number of elements in a COBOL table with a fixed size (see *Tables with Fixed Size*) in a variable manner (see *Tables with Variable Size - `DEPENDING ON` Clause*) you need to set the mapping to unbounded array.

For details of such a COBOL server program see *Example 2: COBOL Server Using Data Length to Process a Variable Number of Array Elements*.

To set arrays from fixed to unbounded or vice versa

- Select the COBOL table and use the function **Set Arrays (Fixed<->Unbounded)** available in the context menu. A modal window is displayed. Select **Unbounded array**. The IDL array parameter will be changed from fixed array /*`number`* to an unbounded array /V*`number`*, see *`array-definition`* under *Software AG IDL Grammar* in the IDL Editor documentation.

Notes:

1. This option should be used carefully and requires knowledge of the COBOL server program. Be aware that an incorrect mapping results in runtime errors.
2. The COBOL Table with a fixed size (see *Tables with Fixed Size*) used in this manner must be the last parameter of the COBOL interface; it must not be a subparameter of any other COBOL table and must not contain any `DEPENDING ON` clause (see *Tables with Variable Size - `DEPENDING ON` Clause*).

Programming Techniques

This section covers the following topics:

- Example 1: COBOL Server with Multiple Functions
- Example 2: COBOL Server Using Data Length to Process a Variable Number of Array Elements

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: COBOL Server Using Data Length to Process a Variable Number of Array Elements

Assume a COBOL CICS channel container server program has a fixed-length COBOL table as its last parameter, similar to COBOL data item `COBOL-TABLE-FIX` in the example below; each table element is 100 bytes; the length of `COBOL-FIELD1` + `COBOL-FIELD2` + `COBOL-FIELD3`; the length of the data preceding the COBOL table is described by `COBOL-GROUP1`; its length is 1000 bytes.

```
WORKING-STORAGE SECTION.
01 LS-CONTAINER-NAME                PIC X(16) VALUE "VAR-INPUT".
01 WS-CONTAINER-NAME                PIC X(16) VALUE "VAR-OUTPUT".
01 NUMBER-OF-INCOMING-ELEMENTS      PIC S9(8) BINARY.
01 NUMBER-OF-OUTGOMING-ELEMENTS     PIC S9(8) BINARY.

 . . .

01 WS-CONTAINER-LAYOUT.
  10 COBOL-GROUP1.
    20 COBOL-TABLE-PREFIX           PIC X(1000).
  10 COBOL-TABLE-FIX                OCCURS 20.
    20 COBOL-GROUP2.
      25 COBOL-FIELD1               PIC X(4).
      25 COBOL-FIELD2               PIC X(3).
      25 COBOL-FIELD3               PIC X(50).
LINKAGE SECTION.
01 LS-CONTAINER-LAYOUT.
  10 COBOL-GROUP1.
    20 COBOL-TABLE-PREFIX           PIC X(1000).
  10 COBOL-TABLE-FIX                OCCURS 20.
    20 COBOL-GROUP2.
      25 COBOL-FIELD1               PIC X(30).
      25 COBOL-FIELD2               PIC X(20).
      25 COBOL-FIELD3               PIC X(50).
```

```
          . . .
        PROCEDURE DIVISION.
           EXEC CICS GET
               CONTAINER (LS-CONTAINER-NAME
               SET       (ADDRESS OF LS-CONTAINER-LAYOUT)
               FLENGTH   (WS-CONTAINER-LENGTH)
               RESP      (WS-RESP)
               RESP2     (WS-RESP2)
           END-EXEC.
           COMPUTE NUMBER-OF-INCOMING-ELEMENTS = (WS-CONTAINER-LENGTH
                 - LENGTH OF COBOL-GROUP1 IN AREA LS-CONTAINER-LAYOUT)
                 / LENGTH OF COBOL-GROUP2 IN AREA LS-CONTAINER-LAYOUT.
          . . .
           COMPUTE WS-CONTAINER-LENGTH = LENGTH OF COBOL-GROUP2 IN AREA WS-CONTAINER-LAYOUT
                 + (NUMBER-OF-OUTGOING-ELEMENTS
                 * LENGTH OF COBOL-GROUP2 IN AREA WS-CONTAINER-LAYOUT).

           EXEC CICS PUT
                CONTAINER (WS-CONTAINER-NAME)
                FROM      (WS-CONTAINER-LAYOUT)
                FLENGTH   (WS-CONTAINER-LENGTH)
                RESP      (WS-RESP)
                RESP2     (WS-RESP2)
           END-EXEC.
    EXEC CICS RETURN END-EXEC.
```

During input the COBOL channel container server program uses the container length `WS-CONTAINER-LENGTH` to evaluate the `NUMBER-OF-INCOMING-ELEMENTS`. During output the `WS-CONTAINER-LENGTH` is determined according to the `NUMBER-OF-OUTGOING-ELEMENTS` and set in the `EXEC CICS PUT CONTAINER` statement.

Although the COBOL table is defined as a table with a fixed size (see *Tables with Fixed Size*) it is used in a variable manner, similar to tables with variable size (see *Tables with Variable Size -* ***`DEPENDING ON`*** *Clause*). In this case you need to map the COBOL table to an IDL unbounded array. See *Set Arrays (Fixed <-> Unbounded)*.