# Oracle Tuxedo Application Runtime for IMS

Reference Guide

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The Oracle Tuxedo Application Runtime for IMS (Tuxedo ART for IMS) Reference Guide describes system processes and commands delivered with the Tuxedo ART for IMS software.

This chapter contains the following topics:

- ARTIMS Utilities
- ARTIMS DL/I Support
- ART IMS Language Environment
- ARTIMS MFS Support
- ARTIMS Non-Terminal Access Support
- Server Configurations
- Security Configuration
- Environment Variables
- Commands and Parameters
- Configuration Files
- COBOL Runtime Support

## ARTIMS Utilities

Table 1 lists the ARTIMS utilities.

Table 1 ARTIMS Utilities

| Name | Description |
|---|---|
| MFSGEN | Binary control blocks generator for ARTICTL server |
| chgcobol.sh | Shell script used to switch between MicroFocus and COBOL-IT for ARTIMS. |
| DFSRRC00 | Utility used to activate the ARTIBMP server. |
| prepro-ims.pl | Utility used to transfer C program on z/OS to the format that could be run in ART IMS. |
| odbastop | A tool on open system and it is used to stop ODBA proxy on z/OS |
| STOPROXY(z/OS ) | A JCL used to stop ODBA proxy on z/OS. |

## MFSGEN

### Name

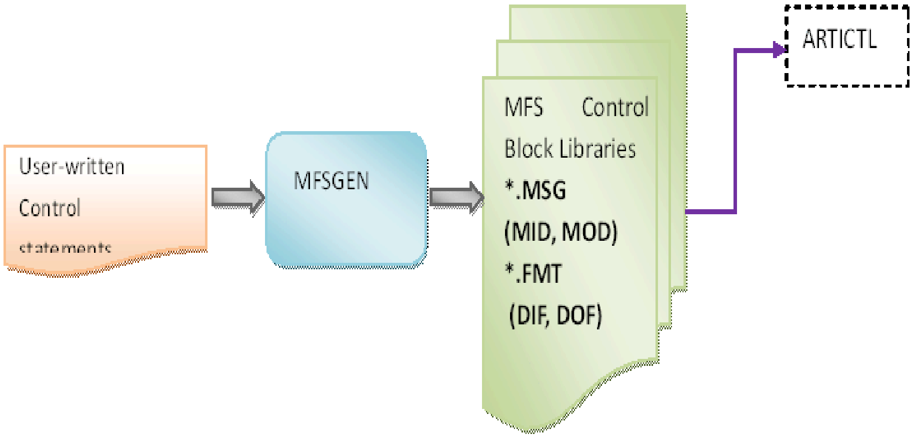
MFSGEN - Binary control blocks generator for ARTICTL. server

### Description

This utility is meant for ART MFS development. It converts user-written control statements to MFS binary control blocks.

Figure 1shows the MFSGEN workflow.

**Figure 1 Mfsgen Workflow**



## Synopsis

```
mfsgen [-options…] files
```

## Options

The command options are:

**`-l`**

Generate a listing (`.lst`) file for each input file.

**`-d dir`**

Specifies an existing directory as the target directory to store all output files, including binary control blocks files (`*.MSG` and `*.FMT`) and listing files.

It is `<current directory>/format` by default.

## Files

The `MFSGEN` utility creates the following files:

**`FILE.MSG`**

One category of binary files for MID and MOD control blocks. The name "`FILE`" should be obtained from input `MSG` definition statements.

**`FILE.FMT`**

One category of binary files for DIF and DOF control blocks. The name "`FILE`" should be obtained from input FMT definition statements.

**FILE.lst**

Source listing file. Here, `"FILE"` is the same as the base name of input file.

### Return code

**0**

Success. All input file(s) is/are successfully parsed and converted to control blocks without any errors and warnings.

**1**

Success with warnings. All input file(s) is/are successfully parsed and converted to control blocks, but warnings exist.

**2**

Fail. Some/All of input file(s) are failed being parsed or converted to control blocks.

### Example

To convert the source file file.mfs, use the following command:

```
$mfsgen file1.mfs  file.mfs   file3.mfs
```

**Note:** the input file `.mfs` suffix is not mandatory.

## chgcobol.sh

### Name

`chgcobol.sh` - shell script used to switch between MicroFocus and COBOL-IT for ARTIMS.

### Synopsis

`chgcobol.sh` must be run under the `IMS_RT` root
`chgcobol.sh [mf|cit]`

### Description

You can have both MicroFocus and COBOL-IT installed at the same host, and can switch from one to the other or back. `chgcobol.sh` is used to switch between MicroFocus and COBOL-IT. To switch to COBOL runtime, you must first shutdown the ARTIMS application.

`chgcobol.sh` takes the following options:

**Without any option**

Shows the current COBOL environment

`cit`
: Change COBOL Runtime to COBOL-IT

`mf`
: Change COBOL Runtime to MicroFocus

### Example(s)

`./chgcobol.sh`
: Output: Current COBOL Runtime is COBOL-IT

`./chgcobol.sh mf`
: Output: COBOL runtime has been changed to MicroFocus

## DFSRRC00

### Name

`DFSRRC00` - Utility used to activate the `ARTIBMP` or `ARTIBMPT` server.

### Description

`DFSRRC00` is used to activate the `ARTIBMP/ARTIBMPT` server which waits for `DFSRRC00` input . The `DFSRRC00` parameter is a string passed from the script converted by workbench from JCL. Currently, only 5 sub-parameters contained in the string are supported : `"BMP, ${MBR}, ${PSB}, ${IN}, ${CKPTID}"` . The remaining sub-parameters in the string are ignored.

**Note:** 16 additional parameters are reserved for future use and, currently, are not supported.

### Synopsis:

```
DFSRRC00 "BMP,${MBR},${PSB},${IN},,,,,${CKPTID},,,,,,,,,,,,"
```

### Parameter(s)

`BMP`
: A hard-coded string.

`${MBR}`
: Represents the batch program to be called and it is required by both normal BMP and transaction oriented BMP.

`${PSB}`
: Represents the `PSB` name used for the program.

`{IN}`
: Represents the transaction/queue name for a transaction oriented BMP program,

`{CKPTID}`
: Represents the check point ID used in `XRST`.

**Notes:** When `${MBR}` is empty, `DFSRRC00` exits with error directly.

When `${IN}` is empty, the request is sent to `ARTIBMP`/`ARTIBMP_ORA` to call a `BMP` program.

When `${IN}` is not empty, the request is sent to `ARTIBMPT` to call transaction oriented BMP program whose transaction code is `${IN}`.

## prepro-ims.pl

### Name

`prepro-ims.pl` - Utility used to transfer C program on z/OS to the format that could be run in ART IMS.

### Description

`prepro-ims.pl` is used to transfer C programs on z/OS to a format that can be run in ART IMS. When file conversion failes, the failure information and lines of source file leading to failure are printed to the `stderr`.When complete, a summary is reported to `stdout`.

Processing rules are as follows:

- Delete

  Comment the "`#pragma runopts`" line and other pragma directives.

  The `env(IMS)` establishes the correct operating environment and `plist(IMS)` establishes the correct parameter list when invoked under IBM IMS. They are not necessary in ARTIMS Runtime and should be removed.

- Re-construct

  Functions `ctdli()`/`aibtdli()` are reconstructed by adding additional trailing `NULL` to the argument list. This `NULL` is used to mark the end of the ARTIMS argument list. For `aibtdli()`, the `parmcount` parameter is removed.

  The function `main()` argument list is eliminated (including "`argc`", "`argv`" and "`envp`"). On mainframes, IMS uses a global list and a macro to define the list. On ARTIMS, the `__getcb(int)` function is implemented as `GET` method to obtain the PCB list.

The `exit()` function is renamed to `__art_ims_return ()`. According to IBM IMS documentation, when there are no messages for the program to process, the program returns control to IMS by returning from main or by calling `exit()`. To avoid `exit()` unexpectedly exiting the container server, The `__art_ims_return ()` function is used and helps to return control to container server.

Table 2 shows processing rules examples.

**Table 2 Processing Rules Examples**

| Rules | Source | Destination |
|---|---|---|
| Delete | `#pragma runopts(env(IMS), plist(IMS))` | `/*#pragma runopts(env(IMS), plist(IMS))*/` |
| Re-construct | `ctdli(func_GU, io_pcb, msg_seg_io_area);` | `ctdli(func_GU, io_pcb, msg_seg_io_area, NULL);` |
| | `aibtdli(parmcount, func_GU, io_pcb, msg_seg_io_area);` | `aibtdli(func_GU, io_pcb, msg_seg_io_area, NULL);` |
| | `main(/* if any argument */)` | `main()` |
| | `exit(val)` | `__art_ims_return(val);` |

**Note:** `prepro-ims.pl` cannot handle all generic C porting from mainframes to open systems.

**Limitations**

1. If one program requires multiple source files, the preprocessor performs simple processing on the source file containing the main entry. Users have to modify the `makefile` manually to add other depending C files.
2. Invoking `ctdli/aibtdli` as a function pointer is not supported.
3. The lines with valid a pragma symbol are commented out.
4. The directory of source file must be different from the destination source file.
5. If the input is a directory, its subdirectories will not be processed.

6. Columns 73-80 containing sequence numbers are not supported. These columns should be replaced with blank spaces or left empty.

**Dependencies**

1. `gmake` should be used for the generated makefile.
2. Before conversion, you must ensure that the C source code is in UNIX format.
3. Some header files provided by IMS, (e.g., `ims.h`), should be copied from mainframes to the open systems.

## Synopsis:

```
prepro-ims.pl -i source-file -o dest-file [-m yourmakefile]
```

## Parameter(s)

`prepro-ims.pl` parameters, exit codes, and support modesare listed in Table 3, Table 4, and Table 5r espectively.

**Table 3 prepro-ims.pl Parameters**

| Option name | Value range | Comment |
|---|---|---|
| `-i` | existing file(s) or directory | It's the original C program file[s] from IBM IMS application project. The suffix of file name must be .c or .h. As well, simple wildcards like '*' and '?' are supported. |
| `-o` | file or directory | It's the destination file or directory to be written. If the directory doesn't exist it will be created. |
| `-m` | file | It's the makefile generated for destination programs. It is placed in the destination directory. This file name should not be relative or absolute path. |

Table 4 Exit Codes

| Exit code | Meaning | Comment |
|---|---|---|
| 0 | Success | |
| 1 | Failure | general failure |
| 2 | Failure | invalid argument |

Table 5 Support Modes

| -i | -o | Support? |
|---|---|---|
| directory | directory | Y |
| dir1/file1 | dir2/file2 | Y |
| dir1/file1 | dir2 | Y |
| dir1/file1<br>dir2/file2<br>… | dir3 | Y<br>Directories of source files must diff with dir3. |

The source program should look like that shown in Listing 1.

Listing 1 Source Program

```
/* #pragma runopts(env(IMS), plist(IMS)) */
#include <ims.h>
#include <stdio.h>
#define n 20  /* I/O area size - Application dependent */
typedef struct {PCB_STRUCT(10)} PCB_10_TYPE;

int main()
{
static const char func_GU[4] = "GU  ";
static const char func_ISRT[4] = "ISRT";
char ssa_name[] = "ORDER ORDER   (ORDERKEY   = 666666)";

int rc;
char msg_seg_io_area[n];
char db_seg_io_area[n];
char alt_msg_seg_out[n];

PCB_STRUCT_8_TYPE *alt_pcb;
PCB_10_TYPE *db_pcb;
IO_PCB_TYPE *io_pcb;

io_pcb = (IO_PCB_TYPE *)__pcblist[0];
alt_pcb = __pcblist[1];
db_pcb = (PCB_10_TYPE *)__pcblist[2];
..
/* get first message segment from message area */
rc = ctdli(func_GU, io_pcb, msg_seg_io_area, NULL);
..
/* get the data from the database having the specified key value */
rc = ctdli(func_GU, db_pcb, db_seg_io_area, ssa_name, NULL);
..
/* build output message in program's I/O area */
rc = ctdli(func_ISRT, alt_pcb, alt_msg_seg_out, NULL);
..
}
```

## odbastop

### Name

`odbastop` - Open system tool used to stop ODBA proxy on z/OS.

### Description

Use `odbastop` on open systems to stop ODBA proxy running on z/OS.

### Synopsis

```
odbastop -l host -p port -c cmd
```

### Parameter(s)

`host`
: The ODBA proxy hostname or ipv4 address.

`port`
: The ODBA proxy port for receiving ODBA request.

**`cmd`**
: Only supports SHUTDOWN

## STOPROXY(z/OS)

### Name

`STOPROXY` - Used to stop ODBA proxy on z/OS

### Description

Use `STOPROXY` on z/OS to stop ODBA proxy running on z/OS.

### Synopsis:

Modify `USER.ODBA.JCL(STOPROXY) JCL` and submit it to stop ODBA proxy. For more information, see Using ODBA PRoxy in the Oracle Tuxedo Application Runtime for IMS Users Guide.

# ARTIMS DL/I Support

In ARTIMS, DL/I is implemented in a group of dynamically loaded libraries. The supported DL/I functionalities are as follows:

- Supported DL/I Interfaces
- Message Processing
- Database Operation
- Plug-in Definition for Different Implementation of IMS/DB
- Transaction Management

## Supported DL/I Interfaces

Table 6 lists supported DL/I interfaces.

**Table 6 Supported DL/I Interfaces**

| Interfaces Name | Description |
|---|---|
| CBLTDLI | The 0 entry for DL/I calls in IMS/TM on OS/39 |
| AIBTDLI | AIBTDLI is an entry function for the whole DL/I layer. The essential difference from CBLTDLI is that AIBTDLI uses AIB mask as the first parameter to pass control information in and out. |
| CTDLI | CTDLI is an entry function for the whole DLI library. Any request to DLI is passed by calling this function. CTDLI can only be called from C programs. |

## CBLTDLI

### Name

CBLTDLI - The 0 entry for DL/I calls in IMS/TM on OS/39.

### Description

In ARTIMS, CBLTDLI is a function acting as the entry of DLI library. CBLTDLI calls appropriate function based on the function code passed to it.

### Parameter(s)

Function Code, e.g. “GU ”; I/O PCB or alternate PCB, I/O area, MOD

## AIBTDLI

### Name

AIBTDLI - an entry function for the whole DL/I layer.

### Description

AIBTDLI is an entry for DL/I calls in IMS/TM on z/OS. In ARTIMS, AIBTDLI is a function acting as an entry of the DL/I library. AIBTDLI gets the PCB address according to the PCB name specified in AIB mask, then calls appropriate function based on the function code passed to it with the PCB address found.

## Parameter(s)

Function Call: e.g. 'GU '; AIB Mask, I/O Area: Input or Output Buffer. Table 7 lists the AIB mask parameters.

**Table 7 AIB Mask Parameters**

| Name | Value | Description | Support |
|---|---|---|---|
| AIBID | X(8) | AIB Identifier, it must be set to "DFSAIBbb". It's for input only | Yes |
| AIBLEN | X(4) | AIB Length, the length of the AIB mask. It must be set correctly in the application program and its minimum value is 128. It's for input only. | Yes |
| AIBSFUNC | X(8) | AIB subfunction, the subfunction required by some DL/I calls. It must be set correctly by application program if it's required. | Yes.<br>In IMS, we only support INQY subfunction. |
| AIBRSNM1 | X(8) | This field contains the PCB name. It must be specified by program correctly. For its setting, referring to AIBTDLI section. | Yes |
| RESERV1 | X(16) | Reserved 16 bytes | No |
| AIBOALEN | X(4) | AIB Output Area Length, the length of the I/O area specified for AIBTDLI | Yes |
| AIBOAUSED | X(4) | AIB output area used length, the length of returned data in the I/O area. It's valid only in case the I/O area is used as output buffer. | Yes |
| RESERV2 | X(12) | Reserved 12 bytes | No |

Table 7 AIB Mask Parameters

| Name | Value | Description | Support |
|---|---|---|---|
| `AIBRETRN` | `X(4)` | AIB Return Code, the return code of AIBTDLI call. | Partial support.<br>Currently, we only support setting this field in the following scenarios:<br>1. INQY subfunction.<br>2. DLI call upon DBPCB(excludes GSAM database).<br>For other scenarios, if operation fails, this field is set to 0x0900, You must check the related PCB status.<br>If operation is successful success, this field is set to 0x0000. |
| `AIBREASN` | `X(4)` | AIB Reason Code, the reason code of AIBTDLI call. | Partial support.<br>Currently, we only support setting this field in the following scenarios:<br>1. NQY subfunction.<br>2. DLI call upon DBPCB(excludes GSAM database).<br>If operation is successful success, this field is set to 0x0000. |
| `AIBERRXT` | `X(4)` | AIB Error Code Extension, contains the additional error information | No |

**Table 7 AIB Mask Parameters**

| Name | Value | Description | Support |
|---|---|---|---|
| `AIBRSA1` | X(4) | AIB Resource Address, it's an output field to hold the PCB address corresponding to the PCB name specified in AIBRSNM1. In ART/IMS 64-bit, the PCB address is 8 bytes long, this field occupies actually 8 bytes, the other 4 coming from the first 4 bytes in the following reserved area. | Yes.<br>But on 64bit platform, customer needs to use the AIBRSA1 plus the first 4 bytes in RESERV3 to get the right PCB's address. |
| `RESERV3` | X(48) | In ART/IMS 64-bit, its firstly 4 bytes are borrowed to store the returned PCB address in combination with AIBRSA1, so it can't be used for any other purpose. | No |

The detailed rules for specifying PCB name in AIB mask field `AIBRSNM1` is as follows:

**I/O PCB**
The name of I/O PCB must be specified as "`IOPCBbbb`",

**Alternate PCB**
The name of alternate PCB must be configured with "`label=`" in `$appname.psb` configuration file, and must be specified correctly in AIB mask, the name (label) of each alternate PCB must be unique in a single PSB (i.e., in a single `$appname.psb` file).

**DB PCB**
The name of DB PCB must be configured with "`label=`" in `$appname.psb` configuration file, and must be specified correctly in AIB mask, the name (label) of each DB PCB must be unique in a single PSB (i.e., in a single `$appname.psb` file).

## CTDLI

### Name

`CTDLI` - An entry function for the whole DL/I layer.

### Description

In ARTIMS, `CTDLI` is a function acting as the entry of DLI library. `CTDLI` calls appropriate function based on the function code passed to it.

### Parameter(s)

Function Call: e.g. 'GU '; PCB: I/O PCB or Alternate PCB, I/O Area: Input or Output Buffer.

The `op` argument specifies the DL/I function to be performed. The `ctdli()` call format depends on the function selected. For more information, see CBLTDLI.

**Note:** When using CTDLI, SSA parameter must be a pointer parameter.

## Message Processing

DL/I is responsible for processing incoming messages and building outgoing messages against PCBs in IMS/TM. In ARTIMS, Tuxedo infrastructure is responsible for the message queue and message delivery, so the processing of incoming messages only involves the current request message. DLI library can retrieve the first and subsequent segments (FML fields) based on the request from any COBOL application. For building outgoing message, each PCB has an associated message buffer (FML) as the intermediate storage area, which holds the message data before the message is sent out. Detailed APIs for message processing are listed in Table 8.

**Table 8 ARTIMS DL/I Processes and Commands**

| Name | Description |
|---|---|
| `GU` | Used to retrieve the first segment from the message queue in IMS/TM environment. |
| `GN` | Used to retrieve the subsequent segment from message queue in IMS/TM environment. |
| `ISRT` | Used to add a segment into the message associated with the specified PCB in IMS/TM. |
| `PURG` | Used to tell IMS/TM that the message is complete for non-express PCB |
| `CHNG` | Used to change the destination in PCB in IMS/TM |
| `CMD` | Sends/issues IMS commands, and retrieves the first segment of the response message. |
| `GCMD` | Retrieves the second and subsequent segments of the response message of a CMD command |

## GU

### Name

GU - Used to retrieve the first segment from the message queue in IMS/TM environment.

### Description

GU is used to retrieve the first segment in a message. For conversational transaction, the first segment of a message is always SPA.

In ARTIMS, the simulated GU call is used to get the first field in the FML buffer of the message being processed. For conversational transaction, GU call always retrieve the field for SPA, otherwise retrieves the first field for user data.

### Synopsis

```
I/O PCB or AIB, I/O Area
```

### Parameter(s)

**I/O PCB**

A pointer to the PCB that represents the source of the request

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter. The following fields must be initialized in the AIB:

AIBID Eyecatcher.
This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.
This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.
This 8-byte, left-justified field must contain the PCB name `IOPCBbbb`.

AIBOALEN I/O area length.
This field must contain the length of the I/O area that is specified in the call list.

**I/O Area**

Pointer to a buffer to be filled in with the first segment

```
<~runChNum>
```

### Result (status code)

'bb': successful (two blanks)

'AB': segment I/O area not specified

'AD': functional parameter invalid: function call not provided to CBLTDLI or invalid function call name provided to CBLTDLI

'QC': no input message

'QF': segment less than 5 characters

## GN

### Name

`GN` - Used to retrieve the subsequent segment from message queue in IMS/TM environment.

### Description

After the last segment has been retrieved, a `GN` call results in a "`QD`" status code returned in PCB. In ARTIMS, the simulated `GN` call is used to get next field in the FML buffer of the message being processed.

### Synopsis

```
I/O PCB or AIB, I/O Area
```

### Parameter(s)

**SI/O PCB**

A pointer to the PCB that represents the source of the request.

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter. The following fields must be initialized in the AIB:

AIBID Eyecatcher.

This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name IOPCBbbb.

AIBOALEN I/O area length.

This field must contain the length of the I/O area that is specified in the call list.

**I/O Area**

A pointer to a buffer to be filled in with the first segment.

### Result (Status Code):

'bb': successful (two blanks)

'AB': segment I/O area not specified

'AD': functional parameter invalid: function call not provided to CBLTDLI, invalid function call name provided to CBLTDLI

'QD': no more segments

## ISRT

### Name

`ISRT` - Used to add a segment into the message associated with the specified PCB in IMS/TM.

### Description

In ARTIMS, the simulated ISRT call is used to add a field of CARRAY type into the FML buffer associated with the specified PCB. For conversational transaction, the first segment is always SPA.

### Synopsis

```
I/O PCB or alternate PCB or AIB, I/O Area, MOD
```

### Parameter(s)

**I/O PCB or alternate PCB**

Pointer to the PCB that represents the destination of the outgoing message

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter. The following fields must be initialized in the AIB:

AIBID Eyecatcher.

This 8-byte field must contain `DFSAIBbb`.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name `IOPCBbbb` (if the TP PCB is used), or the name of an alternate PCB (if an alternate PCB is used)

AIBOALEN I/O area length.

This field must contain the length of the I/O area that is specified in the call list.

**I/O Area**

Pointer to a buffer that holds a segment to be sent. For conversational transaction code, the first segment must be SPA.

**MOD**

Used for the output message, the 8-byte MOD name must be left-justified and padded with blanks as necessary. It can be only accompanied with the first segment into a message.

If MOD equals DFS.EDT or DFS.EDTN, the message bypasses MFS formatting. When MFS is bypassed on output, the application program is responsible for constructing the entire 3270 data stream (beginning with the command code and ending with the last data byte).

## Result (Status Code):

‘bb’: successful (two blanks)

‘AB’: segment I/O area not specified

‘AD’: functional parameter invalid: function call not provided to CBLTDLI, invalid function call name provided to CBLTDLI

‘QF’: segment less than 5 characters

‘QH’: No destination name in PCB

‘XA’: trying to forward the request to another transaction after responding the request

‘XB’: trying to respond the request after forwarding it to another transaction

‘XC’: Z1 bit is not 0, it is reserved and always kept as 0

## PURG

### Name

`PURG` - Used to tell IMS/TM that the message is complete for non-express PCB.

### Description

`PURG` call is normally, but not send; or send out the message immediately for an express PCB.

If an I/O area is provided to `PURG` call, `PURG` call also acts as an ISRT call. That is, `PURG` marks the (current) message associated with the PCB as complete and "`ISRT`" the data in the I/O area as the first segment of the next message. The final result is same as a `PURG` call without I/O area followed by an `ISRT` call.

In ARTIMS, the simulated `PURG` call is used to mark the associated message as complete for a non-express PCB, or send out the associated message for an express PCB. If an I/O buffer is provided, however, it is ignored since multiple pending messages for a single PCB are not supported, therefore the MOD is ignored too. No special status code is added for this case, however, since the status code is checked by customer program.

### Synopsis

```
I/O PCB or alternate PCB or AIB, I/O Area (optional), MOD (optional)
```

### Parameter(s)

**I/O PCB or alternate PCB**

Pointer to the PCB that represents the destination of the outgoing message.

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter. The following fields must be initialized in the AIB:

AIBID Eyecatcher.

This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name `IOPCBbbb` (if the TP PCB is used), or the name of an alternate PCB (if an alternate PCB is used)

AIBOALEN I/O area length.

This field must contain the length of the I/O area that is specified in the call list.

**I/O Area**

If provided, is a pointer to a buffer that is to be inserted as the first segment of next message.

**MOD**

Used for the output message, the 8-byte MOD name must be left-justified and padded with blanks as necessary.

### Result (Status Code):

'bb': successful (two blanks)

'AD': functional parameter invalid: function call not provided to `CBLTDLI`, invalid function call name provided to `CBLTDLI`

'A3': a modifiable TP PCB with no destination set but PURG called to it

## CHNG

### Name

`CHNG` -Used to change the destination in PCB in IMS/TM.

### Description

In ARTIMS, the simulated `CHNG` is to specify another service name (only) in an alternate PCB. The destination transaction name is not greater than 8 bytes and is truncated to 8 if the limit is exceeded. The tailing blanks are removed too. The transaction name is evaluated as valid if it exists in the imstrans.desc file and has a legal configuration.

If one transaction code in one Tuxedo domain is designed to switch to another service in a different domain, the transaction code to be switched must be defined in the [imstrans.desc] configuration file as a valid transaction but should NOT be advertised with the control of its class.

For program switch, the new target is another transaction code. For conversational program switch, ARTIMS does not have limitation on the spa sizes of the originating code and the target code.

### Synopsis

`Alternate PCB or AIB`, destination transaction code

### Parameter(s)

**I/O PCB**

Pointer to the PCB that represents the destination of the outgoing message destination name is a string that represents the name of another transaction (service).

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter. The following fields must be initialized in the AIB:

AIBID Eyecatcher.

This 8-byte field must contain `DFSAIBbb`.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the name of a modifiable alternate PCB.

AIBOALEN I/O area length.

This field must contain the length of the I/O area that is specified in the call list

### Result (Status Code):

‘bb’: successful (two blanks).

‘AD’: functional parameter invalid: destination not provided, functional call invalid.

‘A1’: PCB is not valid.

‘A2’: PCB is not modifiable or ISRT operation already done.

‘QH’: the transaction to be specified in an alternate PCB is blank or invalid.

## CMD

### Name

`CMD` - Used to enable a program to issue IMS commands.

### Description

Sends/issues IMS commands, and retrieves the first segment of the response message.

`CMD` is used to issue IMS commands. It forwards the IMS command to an interface which can assumedly process all supported IMS commands. The CMD call waits for the interface to process IMS commands, and get the first field of the response message.

**Restrictions**

For commands, only "/DIS TRAN", "/DIS PGM" and "/DIS USER" are supported. Once these commands are issued by CMD API, related title segment will be returned through the I/O area, which describes the meaning of each field in subsequent segments.

- "/DISP TRAN", transaction related information that can be retrieved in Tuxedo is returned in I/O area. Returned segment is (excluding the llzz part): CUR_TRAN CUR_QCNT

- "/DISP user", user related information that can be retrieved in Tuxedo is returned. Returned segment is (excluding the llzz part): CUR_USER CUR_TRAN

- "/DISP PGM", program related information that can be retrieved in Tuxedo is returned. Returned segment is (excluding the llzz part): CUR_PGM CUR_TRAN

**Note:** Currently, we ignore all other parameters in above three commands. If other commands than above three supported ones are issued by "CMD" call, we return success status without any response segment.

## Synopsis

I/O PCB or AIB, I/O Area

## Parameter(s)

**I/O PCB**

Represents the source of the request

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter. The following fields must be initialized in the AIB:

AIBID Eyecatcher.

This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name IOPCBbbb.

AIBOALEN I/O area length.

This field must contain the length of the I/O area that is specified in the call list

**I/O Area**

Pointer to a buffer, which contains the IMS command with its parameters, and to be filled in with the first segment. The general format of I/O area is:

LLZZ/verb KEYWORD1 P1 KEYWORD2 P2, P3. Comments

| | |
|---|---|
| LL | Two-byte field containing the length of the command text, including LLZZ |
| ZZ | Two-byte field reserved for IMS |
| / | Indicates that an IMS command follows |
| verb | The command you issued |
| KEYWORDx | Keywords that apply to the command you issued |
| Px | Parameters for the keywords you specified |
| . (period) | End of the command |

### Result (status code):

'bb': successful (two blanks), but no response segments.

'CC': one or more response segments have been produced.

'AB': segment I/O area not specified

'CH': IMS ignored the CMD call just issued because the AOI command interface detected a system error and was unable to process the command. IMS processing continues.

## GCMD

### Name

GCMD - Retrieves the second and subsequent segments of the response message of a CMD command.

### Description

GCMD retrieves the second and subsequent response segments from IMS TM when your application program processes IMS commands using the CMD call. Each returned segment contains the fields according to the title segments of above "CMD" Call. After the last segment has been retrieved, a GCMD call results in a "QD" status code returned in PCB.

<~runChNum>

## Synopsis

```
I/O PCB or AIB, I/O Area
```

## Parameter(s)

**I/O PCB**

Pointer to the PCB that represents the source of the request.

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter. The following fields must be initialized in the AIB:

AIBID Eyecatcher.

This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name IOPCBbbb.

AIBOALEN I/O area length.

This field must contain the length of the I/O area that is specified in the call list

**I/O Area**

Pointer to a buffer to be filled in with the first segment.

## Result (Status Code):

'bb': a segment was retrieved successfully (two blanks)

'AB': segment I/O area not specified

'QD': no more segments

'QE': GCMD request before CMD.

## Database Operation

The DLI library performs the database operations issued from MPP or BMP programs. It can retrieve and hold one specific segment according the specified segment search criteria, updates a specific segment, inserts a segment at a specific position, deletes a specific segment, etc. Detailed APIs for database operation are listed in Table 9.

Table 9 Database Operation Processes and Commands

| Name | Description |
|---|---|
| GU/GHU | Retrieves (and Holds) the first segment that satisfies the criteria (if any) from the current position (if any) or the beginning of the database |
| GN/GHN | Retrieves (and Holds) the next segment that satisfies the criteria (if any) from current position |
| GNP/GHNP | Retrieves (and Holds) the next segment that satisfies the criteria from the dependent segments of the established parent |
| ISRT | Used to insert a new occurrence of an existing segment type into a hierarchy database. |
| REPL | Used to update an existing segment |
| DLET | Used to remove a segment and its dependents. |
| FLD | Used to access a field within a segment. |
| POS | A qualified Position (POS) call is used to retrieve the location of a specific sequential dependent segment. An unqualified POS points to the logical end of the sequential dependent segment (SDEP) data. |
| OPEN | Used to explicitly open a GSAM database |
| CLSE | Used to explicitly close a GSAM database |

## GU/GHU

### Name

GU/GHU - Retrieves (and Holds) the first segment that satisfies the criteria (if any) from the current position (if any) or the beginning of the database.

### Description

GU is used to retrieve the first segment that satisfies the specified SSA and establishes a starting point for sequential processing. The search start point of GU is the beginning of the database (i.e., the root level). After locating the first segment that satisfies the call, the current position is the starting position for sequential processing.

`GHU` locks the segment for sequential write operation (e.g., replace, delete, etc.), in addition to `GU`. `GHU` is not applicable for GSAM.

## Synopsis

`DB PCB,GSAM PCB` or `AIB, I/O Area, and SSA list (optional)` or `RSA (Mandantory for GSAM)`

## Parameter(s)

**DB PCB**
Contains all the DB related information, especially the DB name.

**AIB**
Specifies the AIB for the call. This parameter is an input and output parameter.

These fields must be initialized in the AIB:

AIBID Eye catcher.
This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.
This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.
This 8-byte, left-justified field must contain the name of a DB PCB.

AIBOALEN I/O area length.
This field must contain the length of the I/O area specified in the call list

**I/O Area**
Used to receive the returned segment.

**SSA:**
Number of SSA is less than or equal to min. (number of hierarchy levels, 15).

**RSA:**
Specifies the area in your program that contains the record search argument. This required input parameter is only used for GSAM.

**Note:** The RSA "`00010000`" resets the position to the start of the GSAM.

## GN/GHN

### Name

GN/GHN - Retrieves (and Holds the next segment that satisfies the criteria (if any) from current position.

### Description

GN is used to retrieve the next segment that satisfies the specified SSA, searching from current position. After locating the segment, the current position is updated for sequential processing. If no current position established in the DB, GN acts like GU (i.e., searching from the beginning). Sequential retrieval in hierarchy DB is always from top to bottom and from left to right, i.e. pre-order retrieval in a tree.

GHN locks the returned segment for sequential write operation on it, in addition to GN. GHN is not applicable for GSAM.

### Synopsis

```
DB PCB,GSAM PCB or AIB, I/O Area, and SSA list (optional) or RSA(opitional
for GSAM)
```

### Parameter(s)

The usage and restriction on parameters of GN are similar to GU.

**RSA:**

Specifies the area in your program where the RSA for the record should be returned. This output parameter is used for GSAM only and is optional.

## GNP/GHNP

### Name

GNP/GHNP - Retrieves (and Holds) the next segment that satisfies the criteria from the dependent segments of the established parent.

### Description

GNP is used to retrieve the next qualified segment in the dependent segments of the established parent. The established parent in a hierarchy DB is the lowest-level segment returned in previous successful GU/GN call, and is canceled by an unsuccessful GU/GN call.

GHNP locks the returned segment for sequential write operation in addition to GNP.

### Synopsis

`DB PCB, GSAM PCB or AIB, I/O Area, and SSA list` (optional)

### Parameter(s)

The usage and restriction on parameters of GNP/GHNP are similar to `GU`.

## ISRT

### Name

`ISRT` - Used to insert a new occurrence of an existing segment type into a hierarchy database.

### Description

`ISRT` is used to insert a new occurrence of an existing segment type into a hierarchy database. The insert location is determined by a series of qualified SSA excluding the level of the segment being inserted, or by current position if no qualified SSA.

### Synopsis

`DB PCB, GSAM PCB or AIB, I/O Area, and SSA list or RSA(opitional for GSAM)`

### Parameter(s)

**I/O**

Area contains the segment to be added

**AIB**

Specifies the AIB for the call. This parameter is an input and output parameter. These fields must be initialized in the AIB:

AIBID Eye catcher.

This 8-byte field must contain `DFSAIBbb`.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the name of a DB PCB.

AIBOALEN I/O area length.

This field must contain the length of the I/O area specified in the call list

**SSA**

Contains a series of qualified/unqualified SSA to establish the position of the segment being inserted, the lowest-level SSA (i.e. the SSA at the level of the segment being inserted) must be unqualified. An unqualified SSA is satisfied with the first occurrence of the segment type.

**RSA**

Specifies the area in your program where the RSA should be returned by DL/I.

## REPL

### Name

`REPL` - Used to update an existing segment.

### Description

`REPL` is used to update an existing segment. you must firts use a `Get Hold` call to retrieve the segment, then modify the segment and update the segment. The field length of the segment in the I/O area cannot be changed.

### Synopsis

`DB PCB or AIB, I/O Area, and SSA list`

### Parameter(s)

The usage and restriction on parameters are similar to `GU`.

## DLET

### Name

`DLET` - Used to remove a segment and its dependents.

### Description

`DLET` call is used to remove a segment and its dependents. It must follow a `Get Hold` call. Qualified SSA must NOT be specified for `DLET` call.

### Synopsis

`DB PCB or AIB, I/O Area, and SSA list` (optional)

```
<~runChNum>
```

### Parameter(s)

The usage and restriction on parameters are similar similar to `GU`.

## FLD

### Name

FLD - Used to access and change a field within a segment.

### Description

`FLD` call is used to access and change a field within a segment.

### Synopsis

```
DB PCB or AIB, I/O Area, and SSA list
```

### Parameter(s)

**I/O**

Area contains the Field Search Argument to locate a specific field.

**AIB**

Specifies the AIB for the call. This parameter is an input and output parameter. These fields must be initialized in the AIB:

AIBID Eye catcher.
This 8-byte field must contain `DFSAIBbb`.

AIBLEN AIB lengths.
This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.
This 8-byte, left-justified field must contain the name of a DB PCB.

AIBOALEN I/O area length.
This field must contain the length of the I/O area specified in the call list

**SSA**

Specifies the SSA used with this call. You can use up to 15 SSAs in this input parameter. The SSA that you supply will point to those data areas that you have defined for the call. This parameter is mandantory for the `FLD` call.

## POS

`POS` - A qualified Position (POS) call is used to retrieve the location of a specific sequential dependent segment. An unqualified POS points to the logical end of the sequential dependent segment (SDEP) data.

### Description

`POS` only supports DEDB. In ARTIMS, it has the following limitations:

1. `keyword` parameters are not supported.

2. The LL and corresponding numeric field (Field 4, Field 5) are stored in host byte endian

### Synopsis

`DB PCB or AIB, I/O Area, and SSA list` (optional)

### Parameter(s)

**DB PCB**

Contains all the DB related information, especially the `DB` name

**AIB**

Specifies the AIB for the call. This parameter is an input and output parameter. These fields must be initialized in the AIB:

AIBID Eye catcher.
This 8-byte field must contain `DFSAIBbb`.

AIBLEN AIB lengths.
This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.
This 8-byte, left-justified field must contain the name of a DB PCB.

AIBOALEN I/O area length.
This field must contain the length of the I/O area specified in the call list I/O Area is used to received the returned output.

Because keywords are not supported, the output format of the I/O area is as following:

LL Field 1 Field 2 Field 4 Field 5

LL: This 2 bytes number, indicates the whole length.

Field 1? This 8-byte field contains the ddname from the AREA statement

Field 2: Sequential dependent next to allocate CI.

Field 4: This 4-byte field contains the number of unused control intervals in the

sequential dependent part.

Field 5: This 4-byte field contains the number of unused control intervals in the

independent overflow part

**Note:** The I/O data area will have 24 bytes of positioning information for every area in the DEDB.

**SSA list**

Contains a series of qualified/unqualified SSA to establish the position of the segment being inserted, the lowest-level SSA (i.e. the SSA at the level of the segment being inserted) must be unqualified. An unqualified SSA is satisfied with the first occurrence of the segment type.

## OPEN

### Name

`OPEN` - Used to explicitly open a GSAM database.

### Description

Explicitly opens a GSAM database.The following operation for the GASM database will not open the GSAM database again. If you do not open GSAM database explicitly, other operations open the GSAM database implicitly.

### Synopsis

```
GSAM PCB or AIB,  i/o area
```

### Parameters

**GSAM PCB**

The GSAM database corresponding PCB.

**AIB**

Specifies the AIB for the call. This parameter is an input and output parameter. These fields must be initialized in the AIB:

AIBID Eye catcher.
: This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.
: This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1Resource name.
: This 8-byte, left-justified field must contain the PCB name of a GSAM PCB.

AIBOALENI/O area length.
: This field must contain the length of the I/O area specified in the call list. I/O Area.

Specifies the kind of data set you are opening.

**Note:** This parameter is ignored. In Oracle Implementation for IMS/DB, we simulate GSAM database with local file system, so, I/O area is not used to specify the data set kind. We use the PROCOPT option in $appname.psb to define whether the data set is to be read only or to be get and append.

## CLSE

### Name

CLSE - Used to explicitly close a GSAM database.

### Description

Explicitly closes a GSAM database. If you do not close the GSAM database explicitly, IMS closes the GSAM database implicitly.

### Synopsis

GSAM PCB or AIB

### Parameters

#### GSAM PCB

The GSAM database's corresponding PCB.

#### AIB

Specifies the AIB for the call. This parameter is an input and output parameter. These fields must be initialized in the AIB:

AIBID Eye catcher.

This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name of a GSAM PCB.

## Plug-in Definition for Different Implementation of IMS/DB

To support different kinds of implementation of IMS/DB, the support for IMS/DB is designed as a dynamically linked library (DLL) that can be plugged into ARTIMS and can be loaded by ARTIMS servers after being plugged. To enable this plug-and-play mechanism, there should be an agreement of what APIs exported by the DLL.

ARTIMS servers (ARTIMPP and ARTIBMP) are used as a container to run an online or batch COBOL program. To enable database access operations issued by the programs, normally the servers need to do some initialization or configuration for database implementation, need to do something prior to invoking a COBOL program, need to do something after completing the program, and need to do some cleanup before the servers go down. Besides, each database operation through "CBLTDLI" need to be mapped to a specific API.

### Data structure Definition for IMS/DB Plug-in

A pointer to DB PCB structure is passed from ARTIMS servers to COBOL programs, and finally to `db_entry()` of plug-in for IMS/DB. To enable the plug-in work properly, the DB PCB structure should be filled in correctly before calling COBOL program each. This section defines the detailed requirement regarding how to fill in DB PCB.

The DB PCB structure example is shown in Listing 2.

**Listing 2 DB PCB Structure**

```
struct {
    char dbname[8];
    char seglevel[2];
    char stat_code[2];
    char opt[4];
    char res[4];
    char segname[8];
    char keylen[4];
    char segnum[4];
    char keyfa[IMS_FEEDAREA_LEN];
};
```

- **dbname**: If the PCB statement in PSB contains a `PROCSEQ=<name>`, populate dbname with `<name>`. Otherwise, populate `dbname` with the name in `NAME=<name>` from PSB.
- **seglevel**: Populate with NULL
- **stat_code**: Populate with spaces
- **opt**: Populate with value set to `PROCOPT` option from the PCB statement in PSB
- **res**: Do not populate with anything
- **segname**: Populate with NULL
- **keylen**: Do not populate with anything
- **segnum**:Do not populate with anything
- **keyfa**: Populate with NULL

Listing 3 shows the structure definition used for the `get_dbpcbattr` interface. The content is read from th `PSB` file and returned to application through `get_dbpcbattr` interface.

#### Listing 3 Structure Definition Used for the get_dbpcbattr Interface

```
enum PCBTYPE {IOPCB = 1, ALTPCB = 2, GSAMPCB = 3, DBPCB = 4};

enum SEQUENTIALBUFFERING {NO = 1, COND = 2};

enum PCBPOS {SINGLE = 1, MULTIPLE = 2};

enum SENSITIVITY {READ = 1, UPDATE = 2};

struct __SENFLD {

       char name[8];        /* mandatory, less than 8 filled with blank */

       unsigned short start;/* mandatory, range [1-32767] */
```

```
        int replace;         /* optional, default is 1 */
    };

    struct SSPTR {
        unsigned short pointer; /* range[1-8], default 0 */
        enum SENSITIVITY sens;
    };

    struct __SENSEG {
        char segname[8]; /* mandatory, less than 8 filled with blank */
        char parent[8];  /* mandatory, less than 8 filled with blank */
        char procopt[4]; /* optional, default filled with blank */
        SSPTR ssptr[8]; /* each slot contains a subset pointer number and
    associated sensitivity, pointer of 0 indicates end, totally up to 8 can be
    specified */
        char indices[8]; /* optional, default filled with blank */
        SENFLD * senfld; /* optional, default is NULL */
        unsigned short senfld_num; /* optional, default is 0, up to 255
    SENFLD can be defined for each SENSEG */
    };

    struct __DB_PCB_ATTR { /* PCB Attributes */
        enum PCBTYPE type; /* mandatory */
        char dbname[8];   /* db name, default filled with blank */
        char pcbname[8]; /* pcb name, optional, default filled with blank */
        char procopt[4]; /* procopt , default filled with blank */
        enum SEQUENTIALBUFFERING sb; /* optional, default is NO */
        enum PCBPOS pos; /* optional, default is SINGLE */
        int keylen; /* optional, default is invalid value 0 */

        char procseq[8]; /* optional, default filled with blank */

        int msdb_commit; /* optional, default is 0 */

        int list; /* optional, default is 1 */

        char *areas; /* area list set by SETR in DFSCTL, no change will be
applied on it in ART/IMS */

        int senseg_num; /* optional, default is 0 */

        struct SENSEG * senseg; /* optional, default is NULL */

};
```

## API Definition for IMS/DB Plug-in

You must do the following steps to define an API for IMS/DB plug-in:

1. Initialization

   `extern "C" int db_init(int argc, char * argv[])`

   **Functionality**: Initialization for configuration or others required by an implementation

   **Arguments**: parameter list passed from CLOPT of the servers

   **Return Value**: 0 - success, -1 -- failure

   **Where to use**: This API is called while an ARTIMS server starts. If a specific implementation of IMS/DB doesn't need any initialization work, just provide an empty function and make it return 0.

2. Cleanup

   `extern "C" int db_destroy()`

   **Functionality**: Cleanup for configuration or others required by an implementation

   **Arguments**: None, because the servers can't provide input for Plug-in

   **Return Value**: 0 - success, -1 -- failure

   **Where to use**: This API is called while an ARTIMS server shuts down. If a specific implementation of IMS/DB doesn't need any initialization work, just provide an empty function and make it return 0.

3. Action Prior to Invoking a COBOL program

   ```
   extern "C" int db_pre()
   ```

   **Functionality**: Pre-Action required by an implementation before invoking a COBOL program which may access IMS/DB implementation

   **Arguments**: None, because the servers can't provide input for Plug-in

   **Return Value**: 0 - success, -1 -- failure

   **Where to use**: This API is called before ARTIMS servers invokes a COBOL program that may access IMS/DB implementation. If a specific implementation of IMS/DB doesn't need any initialization work, just provide an empty function and make it return 0.

4. Action After Invoking a COBOL program

   ```
   extern "C" int db_post()
   ```

   **Functionality**: Post-Action required by an implementation after invoking a COBOL program which may access IMS/DB implementation

   **Arguments**: None, because the servers can't provide input for Plug-in

   **Return Value**: 0 - success, -1 -- failure

   **Where to use**: This API is called after ARTIMS servers invokes a COBOL program that may access IMS/DB implementation. If a specific implementation of IMS/DB doesn't need any initialization work, just provide an empty function and make it return 0.

5. Database Access Entry

   ```
   extern "C"

   int db_entry(const char * op, __DB_PCB * pcb, void * io, char *
   ssa_list[], int ssa_cnt);
   ```

   Functionality: The entry point of accessing the IMS/DB implementation. Each DL/I call for database access issued from a COBOL program is finally handled by it.

   Argument:

   op: function call name, e.g. "GU  "

   pcb: pointer to a __DB PCB, which is a superclass of user provided DB PCB.

   io: pointer to a buffer, DB_IO_AREA is defined by the external implementer

   ssa_list: an array of strings, each containing a SSA, the format is up to the external implementer

   ssa_cnt: number of elements in ssa_list, the value range is [0..15]

**Return Value**: 0 - success; -1 - failure

**Where to use**: DL/I DB call issued by COBOL program

6. Get db pcb attributes

   ```
   extern "C"
   const __DB_PCB_ATTR * get_dbpcbattr (struct __DB_PCB * pcbm)
   ```

   Functionality: Used to get additional attributes of db pcb. These attributes are configured in PSB file.

   Argument:

   pcbm: PCB Mask pointer

   **Return Value**: PCB Attribute pointer, the user can't modify anything contained in the PCB attribute structure returned by this API; If the input is not DB PCB or GSAM PCB, null is returned; If any optional attribute is not configured, default value is returned;No need to free the pointer;

   **Where to use**: 3rd party DB plugin when called with db pcb.

7. Fill db pcb segment name

   ```
   extern "C"
   int fill_dbpcb_segname (struct __DB_PCB * pcb)
   ```

   Functionality: Used to get segment name of db pcb. This interface should be provided by DB plugin.

   Argument::

   pcb: PCB Mask pointer(DB PCB or GSAM PCB), segname in the pcb mask should be filled with correct value;

   **Return Value**: 0 : success, other: failed.

### Default Implementation for IMS/DB

Within ARTIMS, a default DLL is provided as an Oracle solution for IMS/DB.

## Transaction Management

DLI library performs the transaction management work, i.e .committing the changes that have been made and sending out the messages already built or rolling back all the changes and drop out all the messages, according to the direction passed from COBOL application. If the COBOL application does not issue a clear direction to commit the transaction, ARTIMPP commits the transaction.

Table 10 lists the transaction management processes and commands.

**Table 10 Transaction Management Processes and Commands**

| Name | Description |
|---|---|
| `CHKP (Basic)` | Used to set an explicit commit point. |
| `CHKP (Symbolic)` | Used to set an explicit commit point. Sets a check point from which the program can be started, saves as many as seven data areas in the program, and records current GSAM DB retrieval position. |
| `ROLB` | Used to cancel the database updates |
| `ROLL` | Used to cancel the database updates and return to ART IMS. |
| `SYNC` | Commits the changes made by application programs. |
| `INQY` | Used to request information regarding execution environment, destination type and status, and session status. |
| `XRST` | Used to enable a program to start normally or to restart from a check point ID specified in a symbolic CHKP call. |

## CHKP (Basic)

### Name

`CHKP` (Basic) - Used to set an explicit commit point.

### Description

`CHKP` is used to set an explicit commit point. At a commit point, IMS/TM commits the changes made by application programs, normally database updates, sends out all the message marked as complete (by PURG for non-express PCB), and retrieves the next input message into the IOAREA provided.

In ARTIMS, the simulated `CHKP` is used to commit the changes already made by using `tpcommit()`. The messages that have been marked by complete are sent out. The messages that have not been marked by explicit `PURG` call are sent out too.

If the transaction is persistent transaction and handled by `ARTIMPP` in persistent mode or handled by `ARTIBMPT`, the next message will be retrieved from /Q of this transaction.

If the transaction is not persistent transaction, no next message is retrieved.

## Parameter(s)

`I/O PCB or AIB, I/O Area`

**I/O PCB**

Pointer to the PCB that represents a destination.

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter.The following fields must be initialized in the AIB:

AIBID Eye catcher.

This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name `IOPCBbbb`.

AIBOALEN I/O area length.

This field must contain the length of the I/O area that is specified in the call list.

**I/O Area**

Pointer to a buffer to receive the next input message.The area must be long enough to hold the longest message that can be returned.

## Result (Status Code)

‘bb’: successful (two blanks).

‘AD’: functional parameter invalid: function call not provided to `CBLTDLI`, invalid function call name provided to `CBLTDLI`.

‘AB’:  no I/O area provided.

‘QC’: no input message.

‘QF’: segment less than 5 characters.

## CHKP (Symbolic)

### Name

CHKP (Symbolic) - Used to set an explicit commit point. Sets a check point from which the program can be started, saves as many as seven data areas in the program, and records current GSAM DB retrieval position.

### Description

CHKP (Symbolic) can be used for recovery purposes. It commits all changes made by the program and, if your application program abends, establishes the point at which the program can be restarted. In addition, the symbolic CHKP call can:

- Work with the extended restart (XRST) call to restart your program if your program ends.
- Enables you to save as many as seven data areas in your program, which are restored when your program is restarted.

In ARTIMS, the simulated CHKP (Symbolic) is used to:

1. Commit the changes already made by using `tpcommit()`, which is the same as basic CHKP.
2. Retrieve the next message which is the same as basic CHKP.
3. Accept at most 7 data areas and save it with the check pint ID.
4. Record current retrieval position of all related GSAM DB.

**Note:** If ART BMP server was restarted after user used symbolic CHKP to store data area, but before user uses XRST to restart program, the stored data area by symbolic CHKP will not be restored by XRST.

CHKP record will be saved in record log file named “programname.psbname.log”. An environment variable ART_IMSLOGDIR is used to specify the directory where the record log files are located. If environment variable ART_IMSLOGDIR is not set, its default value is $APPDIR/IMSLOGDIR.

For MP mode, if you want to share the record log file among machines, the ART_IMSLOGDIR should point to NFS directory which machines in the Tuxedo domain could access. The CHKP record is always appended to the record log file by Symbolic CHKP and the saved record will not be deleted at any time except the user empty the record log file manually. Duplicate CHKP records are be appended to the CHKP record file.

The status code of all related GSAM/DB PCB is blank after the CHKP (symbolic) call.

## Parameter(s)

```
I/O PCB or AIB, I/O Area, I/O Area Length, IO Area, area length, area, …
```

**I/O PCB**

Pointer to the PCB that represents a destination.

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter. The following fields must be initialized in the AIB:

AIBID Eye catcher.

This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name IOPCBbbb.

AIBOALEN I/O area length.

This field must contain the length of the I/O area that is specified in the call list.

**I/O Area Length**

No longer used. For compatibility reasons, this parameter must still be included in the call, and it must contain a valid address.

**I/O Area**

As an input parameter, used to specify the check point ID (8-bit). As an output parameter, pointer to a buffer to receive the next input message. The area must be long enough to hold the longest message that can be returned.

**Area length**

Specifies a 4-byte field in your program that contains the length in binary of the first area to checkpoint. This parameter is an input parameter. Up to seven area lengths can be specified. For each area length, you must also specify an area parameter.

**Area**

Specifies the area in your program that you want IMS to checkpoint. Always specify the area length parameter first, followed by the area parameter.

## Result (Status Code)

' bb': successful (two blanks)

'AD': functional parameter invalid: function call not provided by ARTIMS

'AB': no I/O area provided

'QC': no input message

'QF': segment less than 5 characters

## ROLB

### Name

`ROLB` - Used to cancel the database updates.

### Description

`ROLB` is used to cancel the database updates. It cancels all the messages that were inserted but not available for transmission. For express PCB, the message is made available for transmission when IMS knows that the message is complete (i.e., when a `PURG` call is called. For non-express PCB, the message is not made available for transmission until the program reaches a commit point.

In ARTIMS, the simulated `ROLB` call is used to roll back all the changes made by the application program by using `tpabort()`, and empty the message buffers that have not been sent out.

For persistent transaction (TP or transaction oriented BMP program), if it is handled by `ARTIMPP` in persistent mode or handled by `ARTIBMPT`, `ROLB` will return the first segment of the first message from last commit point to IOAREA, and delete first message from last commit point in /Q.

For non persistent transaction (TP or Transaction oriented batch), ART IMS will only return the first segment of the current handling message.

### Synopsis

```
I/O PCB or AIB, I/O Area
```

### Parameter(s)

**I/O PCB**

Pointer to the PCB that represents a destination.

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter.The following fields must be initialized in the AIB:

AIBID Eye catcher.
This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.
This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.
This 8-byte, left-justified field must contain the PCB name `IOPCBbbb`.

AIBOALEN I/O area length.
This field must contain the length of the I/O area that is specified in the call list.

**I/O Area**
Pointer to a buffer to receive the first segment of the returned message.

### Result (Status Code):

‘bb: successful (two blanks).

‘AD’’ functional parameter invalid: function call not provided to CBLTDLI, invalid function call name provided to CBLTDLI, or PCB not provided.

‘QE’: GU is not called previously when IOAREA is not NULL.

‘QC’: no input message.

‘QF’: segment less than 5 characters.

## ROLL

### Name

ROLL - Used to cancel the database updates and return to ART IMS.

### Description

`ROLL` is used to cancel the database updates, cancels all the messages that were inserted but not available for transmission. For express PCB, the message is made available for transmission when IMS knows that the message is complete (i.e., when a `PURG` call is called. For non-express PCB, the message is not made available for transmission until the program reaches a commit point.

In ARTIMS, the simulated `ROLL` call is used to roll back all the changes made by the application program by using `tpabort()`, and empty the message buffers that have not been sent out, then it return control to ART IMS but don't return control to the calling program.

For persistent transaction (TP or transaction oriented BMP program), if it is handled by ARTIMPP in persistent mode or handled by `ARTIBMPT`, `ROLL` deletes the current message from last commit point in /Q.

### Synopsis

ROLL

### Parameter(s)

The only parameter required for the ROLL call is the call function.

### Result (Status Code):

No returned status codes.

## SYNC

### Name

`SYNC` - Used to commit the changes made by application programs (normally database updates).

### Description

In ARTIMS, the simulated SYNC is used to commit the changes already made, not to establish places in your program where you can restart, if your program terminates abnormally.

### Synopsis

`I/O PCB or AIB`

### Parameter(s)

**I/O PCB**

Pointer to the PCB that represents a destination.

**AIB**

Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter.The following fields must be initialized in the AIB:

AIBID Eye catcher.

This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name IOPCBbbb

## INQY

### Name

`INQY`-Used to request information regarding execution environment, destination type and status, and session status. INQY is valid only when using the AIBTDLI interface.

### Description

In IMS, only the following subfunctions are supported: `NULL`, "`FINDbbbb`", "`PROGRAMb`", "`DBQUERYb`".

For `NULL` subfunction, ART/IMS can only return the PCB related information that ART/IMS can support into the I/O area. "Terminal Location" and "Transaction Location" are only supported using "LOCAL".

For "`FINDbbbb`", the PCB address is returned in the AIBRSA1 field.

On 64-bit platform, the first 4 bytes of AIBRES3 is also used because the address length is 8 bytes.

Subfunction "`PROGRAMb`" returns the program name in the first 8 bytes of the I/O area.

For "`DBQUERYb`" subfuntion, if there is no `DBPCB` in defined in PSB, "BJ" is returned in the IO PCB status. Otherwise, the IO PCB status is returned according to database availability.

### Synopsis

```
AIB  I/O Area
```

### Parameters

**AIB**

Specifies the address of the application interface block (AIB) that is used for the call. This parameter is an input and output parameter. The following fields must be initialized in the AIB:

AIBID Eye catcher.

This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.

This field must contain the actual length of the AIB that the application program obtained.

AIBSFUNC Subfunction code.

This field must contain one of the 8-byte subfunction codes as follows:

```
bbbbbbbb (Null)
DBQUERYb
FINDbbbb
PROGRAMb
```

AIBRSNM1 Resource name.

This 8-byte, left-justified field must contain the PCB name of any PCB named in the PSB.

AIBOALEN I/O area length.

This field must contain the length of the I/O area that is specified in the call list. This field is not changed by IMS.

**I/O Area**

Used to received the returned output.

## Result in AIB:

Return code and Reason code is aligned to IBM's return code and reason code description. For "`DBQUERYb`", The database availability status is in the IOPCB status.

' bb' (two blanks): The call is successful and all databases are available.

'BJ': No DB PCB exists in the PSB. Or None of the databases in the PSB are available, or no PCBs exist in the PSB. All database PCBs (excluding GSAM) contain an NA status code as the result of processing the INQY DBQUERY call.

'BK' At least one of the databases in the PSB is not available or availability is limited. At least one database PCB contains an NA or NU status code as the result of processing the INQY DBQUERY call.

In IMS, after the `"DBQUERYb"` call, status codes in each DB PCB should not be used to check DB status.

## XRST

### Name

XRST - Used to restart your program. If you use the symbolic Checkpoint call in your program, you must use the XRST call.

### Description

XRST is used to restart your program. If you use the symbolic Checkpoint call in your program, you must use the XRST call.

In ARTIMS, the simulated XRST is used to recover the data that was saved in the related CHKP (symbolic) call. The GSAM is repositioned to the recorded position where the CHKP (symbolic) call occurs so that all subsequent "GN" calls continue with the recovered position. The status codes of all related GSAM/DB PCB are blank after the successful XRST call (with an existing CHKPID).

For specific CHKP ID: XRST searches the CHKP record use the following search key in record log file from the beginning to the end: `Job name + program name + psb name + CHKP ID`. If the first CHKP record matches the search key, XRST restores the data in this record and returns success. If no CHKP record matches the search key, XRST abends.

For CHKP ID 'LAST': XRST searches the CHKP record using the following search key in record log file from the end to the begining: `Job name + program name + psb name`. If the first CHKP record match the search key, XRST restores the data in this record and return success. If no CHKP record matches the search key, XRST abends.

### Parameter(s)

I/O PCB or AIB, I/O Area, I/O Area Length, IO Area, area length, area, …

**I/O PCB**
: Pointer to the PCB that represents a destination

**AIB**
: Specifies the application interface block (AIB) that is used for the call. This parameter is an input and output parameter.

The following fields must be initialized in the AIB:

AIBID Eye catcher.
: This 8-byte field must contain DFSAIBbb.

AIBLEN AIB lengths.
    This field must contain the actual length of the AIB that the application program obtained.

AIBRSNM1 Resource name.
    This 8-byte, left-justified field must contain the PCB name `IOPCBbbb`.

AIBOALEN I/O area length.
    This field must contain the length of the I/O area that is specified in the call list. This parameter is not used during the `XRST` call. For compatibility reasons, this parameter must still be coded.

**I/O Area Length**

No longer used. For compatibility reasons, this parameter must still be included in the call, and it must contain a valid address.

**I/O Area**

Used to specify the check point ID from which the program should be restarted. If the program is to start normally, the first 5 characters of I/O area must be blanks.

**Area length**

Specifies a 4-byte field in your program that contains the length in binary of the first area to checkpoint. This parameter is an input parameter. For each area length, you must also specify an area parameter. The number of areas you specify on a XRST call must be less than or equal to the number of areas you specify on the CHKP calls the program issues.

**Area**

Specifies the area in your program that you want IMS TM to restore. Always specify the area length parameter first, followed by the area parameter.

### Result (Status Code)

' bb': successful (two blanks)

'AD': functional parameter invalid: function call not provided by ARTIMS

## ART IMS Language Environment

### CEE3ABD/ART3ABD

`CEE3ABD` requests that ART IMS terminate the execution of the program with an abend code. There is no return from this function, nor is there any condition associated with it. In ARTIMS you can initiate this function by doing the following:

1. Back out the database updates that the program has made since the most recent program commit point.
2. Cancel the non-express output messages that the program has created since the most recent program commit point.
3. Abort the transaction.

#### Parameter(s)

`abcode`
: A 4 bytes integer, no greater than 4095, specifying the abend code that is issued .

`clean-up`
: Not used.

**Note:** In a COBOL IT environment, a COBOL program can call the API using the names "`CEE3ABD/`" or "`ART3ABD`". In a Microfocus environment, COBOL program can call the API only using the name `ART3ABD`.

## ARTIMS MFS Support

### IMS MFS Control Block Support

The definition of message formats and device formats is accomplished with separate hierarchic sets of definition statements. Table 11 shows all the definition statements and their descriptions.

**Table 11 Definition Statements and Descriptions**

| Definition Statement Sets Name | Statement Name | Description |
|---|---|---|
| Message Definition Statement Set<br>----<br>Used to define message formats. | `MSG` | Initiates and names a message input or output definition. |
| | `LPAGE` | The optional LPAGE statement defines a group of segments comprising a logical page. |
| | `PASSWORD` | Identifies a field or fields to be used as an IMS password. |
| | `SEG` | Identifies a message segment. |
| | `DO` | Requests iterative processing of the subsequent MFLD statements. |
| | `MFLD` | The MFLD statement defines a message field as it will be presented to an application program as part of a message output segment. At least one MFLD statement must be specified for each MSG definition. |
| | `ENDDO` | Terminates iterative processing of the preceding MFLD statements. |
| | `MSGEND` | Identifies the end of a message definition. |

**Table 11 Definition Statements and Descriptions**

| Definition Statement Sets Name | Statement Name | Description |
|---|---|---|
| Format Definition Statement Set<br>----<br>Used to define device formats. | `FMT` | Identifies the beginning of a format definition. |
| | `DEV` | Identifies the device type and operational options. |
| | `DIV` | Identifies the format as input, output, or both. |
| | `DPAGE` | Identifies a group of device fields corresponding to an LPAGE group of message fields. |
| | `PPAGE` | Identifies a group of logically related records that can be sent to a remote application program at one time. |
| | `DO` | Requests iterative processing of the subsequent DFLD statements. |
| | `DFLD` | Defines a device field. Iterative processing of DFLD statements can be invoked by specifying DO and ENDDO statements. To accomplish iterative processing, the DO statement is placed before the DFLD statements and the ENDDO after the DFLD statements. |
| | `ENDDO` | Terminates iterative processing of the previous DFLD statements. |
| | `FMTEND` | Identifies the end of a format definition. |
| END | | Defines the end of the input file. |

The “END” statement in above table defines the end of input file. All contents after it will be ignored. If the input file doesn’t have an “END”, `MFSGEN` will give an warning message and add one for the input file.

For each statement name, there are several fields. The detailed field name and value requirements are listed in Table 12 and Table 13. All other statements are assumed unsupported fields currently (listed in Table 14.

**Table 12 Message Definition Statement Set Fields**

| Statement Name | Field | Possible Value | Note |
|---|---|---|---|
| MSG | TYPE | INPUT | Support |
| | | OUTPUT | |
| | SOR= | (formatname, IGNORE) | "IGNORE" is a mandatory |
| | OPT= | 1 or 2 or 3 | Warning |
| | NXT= | msgcontrolbl ockname | Support |
| | PAGE= | No or YES | Warning |
| | FILL= | C' ' | Warning if fill is not space. |
| | | C'c' | |
| | | NULL | |
| | | PT | |
| LPAGE | SOR= | dpagename | Error |
| | COND= | (mfldname \| mfldname(pp) \| Segoffset, > \| < \| \| \| = \| != , ‘value’ ) | |
| | NXT= | msgcontrolbl ockname | |
| | PROMPT= | (dfldname,'l iteral') | |
| PASSWORD | PASSWORD | blanks | Error |
| | | comments | |

**Table 12 Message Definition Statement Set Fields**

| Statement Name | Field | Possible Value | Note |
|---|---|---|---|
| SEG | EXIT= | (exitnum,exitvect) | Warning |
| | GRAPHIC= | YES or NO | Warning |
| DO | count | | Support |
| | SUF= | number | Support |

<~runChNum>

**Table 12 Message Definition Statement Set Fields**

| Statement Name | Field | Possible Value | Note |
|---|---|---|---|
| MFLD | dfldname | | Support |
| | ‘literal’ | | Support |
| | G`literal` | | Support |
| | (dfldname, 'literal') | | Support |
| | (dfldname, G'literal') | | Support |
| | (dfldname, system-liter al) | | Support |
| | (,SCA) | | TBD |
| | LTH= | 1 | Support |
| | | nn | Support |
| | | (pp, nn) | Warning |
| | JUST= | L or R | Support |
| | ATTR= | YES or NO, nn | Support |
| | FILL | X'40' | Warning |
| | | X'hh' | Warning |
| | | C'c' | Support only when c=SPACE |
| | | NULL | Warning |
| | EXIT= | (exitnum, exitvect) | Warning |
| ENDDO | | | Support |
| MSGEND | | | Support |

**Note:** system-literals include: TIME, DATE1, DATE2, DATE3, DATE4, DATE1Y4, DATE2Y4, DATE3Y4, DATE4Y4, YYDDD, MMDDYY, DDMMYY, YYMMDD, YYYYDDD, MMDDYYYY, DDMMYYYY, YYYYMMDD, DATEJUL, DATEUSA, DATEEUR, DATEISO, LTSEQ, LTNAME.

For LTMSG and LPAGENO, a warning message is displayed and will not take any effect. For other strings not in Table 12, a syntax error. is displayed

**Table 13 Format Definition Statement Set Fields**

| Statement Name | Field | Possible Value | Support or Other |
|---|---|---|---|
| FMT | | | Support |

**Table 13 Format Definition Statement Set Fields**

| Statement Name | Field | Possible Value | Support or Other |
|---|---|---|---|
| DEV | TYPE= | 3270 | Support |
| | | 3270-A2 \| \| (3270,2) | Support |
| | | (3270,1) \| Other values | Error |
| | FEAT= | IGNORE | Support |
| | | (CARD \| NOCD \| PFK \| NOPFK \| DEKYBD \| PEN \| NOPEN) | Warning |
| | | 1 \| 2 \| 3 \| 4 \| 5 \| 6 \| 7 \| 8 \| 9 \| 10 | Warning |
| | PEN= | dfldname | Warning |
| | CARD= | dfldname | Warning |
| | SYSMSG= | dfldlabel | Support |
| | DSCA= | X'value' | Support |
| | | number | Support |
| | PFK= | (dfldname, 'literal'…) | Support |
| | | (dfldname, integer='literal'…) | Support |
| | | (dfldname, NEXTPP \|NEXTMSG \| NEXTMSGP \| NEXTLP \| ENDMPPI …. ) | Warning |
| | | (dfldname, integer= NEXTPP \|NEXTMSG \| NEXTMSGP \| NEXTLP \| ENDMPPI …. ) | Warning |
| | SUB= | X'hh' | Warning |
| | | C'c' | Warning |
| | PDB= | pdbname | Warning |
| DIV | TYPE= | INOUT | Support |
| | | OUTPUT | |

**Table 13 Format Definition Statement Set Fields**

| Statement Name | Field | Possible Value | Support or Other |
|---|---|---|---|
| DPAGE | CURSOR= | (lll, ccc)<br>(111,ccc,dfld) | Support;<br>cursor > 1:<br>Warning |
| | MULT= | YES | Warning |
| | PD= | pdname | Warning |
| | FILL= | PT or X'hh' | Warning |
| | | C'c' | Support only when c=SPACE |
| | | NULL | Warning |
| | | NONE | Warning |
| | ACTVPID= | (for the 3290 in partition formatted mode) | Warning |
| PPAGE | comments | | Error |
| DO | Count | | Support |
| | 1, MAX | | Support |
| | line-inc,<br>column-inc | | Support |
| | Position-inc | | Warning |
| | SUF= | number | Support |
| | BOUND= | LINE \| FIELD | Support |

<~runChNum>

**Table 13 Format Definition Statement Set Fields**

| Statement Name | Field | Possible Value | Support or Other |
|---|---|---|---|
| `DFLD` | `'literal'` | | Support |
| | `G'literal'` | | Support |
| | `PASSWORD` | | Error |
| | `POS=` | `(lll,ccc)` | Support |
| | | `(lll,ccc,pp)` | Warning |
| | `LTH=` | `nnn` | Support |
| | `PEN=` | `‘literal` | Warning |
| | | `NEXTPP` | Warning |
| | | `NEXTMSG` | Warning |
| | | `NEXTMSGP` | Warning |
| | | `NEXTLP` | Warning |
| | | `ENDMPPI` | Warning |
| | `ATTR=` | `ALPHA\|NUM` | Support |
| | | `NOPROT\|PROT` | Support |
| | | `NODET\|DET\|IDET` | Warning |
| | | `NORM\|NODISP\|HI` | Support |
| | | `NOMOD\|MOD` | Support |
| | | `STRIP\|NOSTRIP` | Warning |
| | `OPCTL=` | `tablename` | Warning |
| | `EATTR=` | `HD \| HBLINK \| HREV \| HUL` | Support |

**Table 13 Format Definition Statement Set Fields**

| Statement Name | Field | Possible Value | Support or Other |
|---|---|---|---|
| | | CD \| BLUE \| RED \| PINK \| GREEN \| TURQ \| YELLOW \| NEUTRAL | Support |
| | | PX'00' \| PX'hh' \| PC'c' | Warning |
| | | EGCS \| EGCS'hh' | Support, For EGCS'hh', only 'hh' value of X'00' and X'F8' are supported |
| | | VDFLD \| VMFILL, VMFLD \| VMFILL \| VMFLD | Warning |
| | | OUTL \| OUTL'hh' \| BOX \| RIGHT \| LEFT \| UNDER \| OVER | Support |
| | | MIX \| MIXD | Support |
| ENDDO | | | Support |
| FMTEND | | | Support |

**Table 14 Other definition statements and compilation statements which we don't support**

| Statement Name | Fields | Support or other |
|---|---|---|
| END | | Support |

<~runChNum>

Table 14 Other definition statements and compilation statements which we don't support

| Statement Name | Fields | Support or other |
|---|---|---|
| PDB | LUSIZE | WARNINGS |
| | SYSMSG | |
| | PAGINGOP | |
| | LUDEFN | |
| PD | PID | |
| | VIEWPORT | |
| | VIEWLOC | |
| | PRESPACE | |
| | WINDOWOF | |
| | CELLSIZE | |
| | SCROLLI | |
| PDBEND | comments | |
| TABLE | comments | |
| IF | DATA | |
| | LENGTH | |
| | 'literal' | |
| | NOFUNC | |
| | NEXTP | |
| | NEXTMSG | |
| | NEXTMSGP | |
| | NEXTLP | |
| | PAGEREQ | |
| | ENDMPPI | |

**Table 14 Other definition statements and compilation statements which we don't support**

| Statement Name | Fields | Support or other |
|---|---|---|
| TABLEEND | comments | |
| ALPHA | 'EBCDIC literal character string' | |
| COPY | member-name | |
| EQU | number | Error |
| | alphanumeric identifier | |
| | literal | |
| | symbol | |
| RESCAN | OFF \| ON | WARNING |
| | number | |
| STACK | ON \| OFF | |
| | id | |
| UNSTACK | DELETE \|KEEP | |
| | id | |
| TITLE | literal | |
| PRINT | ON \| OFF | |
| | GEN \| NOGEN | |
| SPACE | number | |
| EJECT | comments | |

For the last column in above tables, "Support" means the field is supported; "Warning" means the field is not supported, and the tool ignores this field just like it is not specified, meanwhile a warning is generated; "Error" means the field is not supported, the tool reports an error and fails parsing current definition statement set.

**Table 15 Message Dynamic Attribute Modification Support**

| Byte | Bit | Detail | Support |
|---|---|---|---|
| 0 | 0-1 | If both bits are on, requests that the cursor be placed on the first position of this field on the device. The first cursor-positioning request encountered in an LPAGE series (first MFLD with cursor attribute or cursor line/column value) that applies to a physical page is honored; these bits must be 00 or 11. | Yes |
| 0 | 2-7 | Must be off | Yes |
| 1 | 0 | Must be on | Yes |
| 1 | 1 | If on, replace<br>If off, addition | Yes |
| 1 | 2 | Protected | Yes |
| 1 | 3 | Numeric | Yes |
| 1 | 4 | High-intensity | Yes |
| 1 | 5 | Non-displayable | Yes |
| 1 | 6 | Detectable | Yes |
| 1 | 7 | Premodified | Yes |

**Table 16 Message Dynamic Modification of Extended Field Attributes Support**

| Type | Value | Detail | Support |
|---|---|---|---|
| 01 | 0 – 4 bit Reserved<br>5 bit Mandatory fill<br>6 bit Mandatory field<br>7 bit Reserved | Validation replacement. | No |
| 02 | As above | Validation addition | No |

**Table 16 Message Dynamic Modification of Extended Field Attributes Support**

| Type | Value | Detail | Support |
|---|---|---|---|
| 03 | 0 – 3 bit Reserved<br>4 bit Left line<br>5 bit Over line<br>6 bit Right line<br>7 bit Under line<br>X'00' Default (no outline) | Field outlining replacement | Yes |
| 04 | As above | Field outlining addition | Yes |
| 05 | 0 – 6 bit Reserved<br>7 bit SO/SI creation<br>X'00' Default (no SO/SI creation) | Input control replacement | No |
| 06 | As above | Input control addition | No |
| C1 | X'00' Device default<br>X'F1' Blink<br>X'F2' Reverse video<br>X'F4' Underline | Highlighting | Yes |
| C2 | X'00' Device default<br>X'F1' Blue<br>X'F2' Red<br>X'F3' Pink<br>X'F4' Green<br>X'F5' Turquoise<br>X'F6' Yellow<br>X'F7' Neutral | Color | Yes |
| C3 | Valid local ID values are in the range X'40'--X'FE', or X'00' for the device default. | Programmed Symbols | Yes |

**Table 17 Bit Settings for DSCA Field Support**

| Byte | Bit | Detail | Support |
|---|---|---|---|
| 0 | 0-7 | Should be 0 | Yes |
| 1 | 0 | Should be 1 | Yes |
| 1 | 1 | Force format write (erase device buffer and write all required data). | Yes |
| 1 | 2 | Erase unprotected fields before write. | Yes |
| 1 | 3 | Sound device alarm. | Yes |
| 1 | 4 | Copy output to candidate pointer. | No |
| 1 | 5 | Bit 1 -  protect the screen when output is sent.<br>Bit 1 - do not protect the screen when output is sent. | No |
| 1 | 6-7 | Should be 0 | No |

## ARTIMS Non-Terminal Access Support

To support the Non terminal access to service exported by MPP, and to enable more client to utilize service exported by MPP, this feature enhances ARTIMS to support Non terminal access. User can utilize the ARTIMS MPP service via Non- terminal applications, such as native Oracle Tuxedo client, SALT client and JCA client.

This feature support both non-terminal tuxedo clients (including native Tuxedo client, SALT client, JCA client) and MQ application.

For non-terminal tuxedo clients, programing interface is provided. Client can access the MPP service by following the programing interface.

Different from non-terminal Oracle Tuxedo clients, a WebSphere MQ application is not an Oracle Tuxedo client. The MQ message format and message flow between MQ applications and traditional IMS applications is already defined in the WebSphere MQ Application Programming Guide. In an IMS environment, MQ application utilizes MQ-IMS Bridge to enable implicit MQI support so that tradition IMS applications can be accessed by WebSphere MQ messages, without having to rewrite, recompile, or re-link them. This feature leverages the Oracle Tuxedo MQ Adapter to convert the MQ application to an Oracle Tuxedo client.

# Programming Interface

## Programming Interface for Non-terminal Oracle Tuxedo Clients

ARTIMS provides a server, `ARTIGW`, working as a bridge between Non-terminal clients and the ARTIMS MPP server. A non-terminal client calls the `ARTIGW` service following the programming interface list below. `ARTIGW` forwards the service request to `ARTMPP`.

The only interface between `ARTIGW` and Non terminal Oracle Tuxedo clients is an FML table.

To run an IMS transaction (for example, TRANS1) with application buffer, do the following steps:

1. The client user must prepare the send buffer containing these FML fields:

   `IMS_SVC_NAME`
   IMS transaction name (i.e., "`TRANS1`").

   `IMS_SVC_FLAG`
   Reserved for future use.

   `IMS_SEG_DATA`
   Application buffer data. LLZZ is not expected in the buffer. The maximum segment length is `32764` (which is the `ARTIMPP` limit).

2. Client issues a `tpcall()`/`tpacall()` with the buffer prepared in step 1.

   ```
   ret = tpcall(< tuxclt_service_name>, …)
   ```

   Here `< tuxclt_service_name>` is the ARTIGW advertised service; the service name is configurable. For more information, see ARTIGW CONFIGURATION.

3. Client gets the reply. In the reply message, the following FML fields are present:

   `IMS_SVC_RESULT`

   0: `ARTIMPP` processes the request successfully with a response message.

   1: `ARTIMPP` processes the request successfully without a response message.

   -1: `ARTIGW` error

   -2: `ARTIMPP` error

   `IMS_SEG_DATA`
   Buffer contains reply data. LLZZ is not included in the buffer.

   `IMS_SVC_SYSMSG`
   Verbose error message if IMS_SVC_RESULT is a negative integer.

The interface FML Fields table (ARTIGWFML) and header file (ARTIGWFML.h) can be found under $IMSDIR/include. Listing 4 shows the ARTIGWFML contents.

**Listing 4 ARTIGWFML Contents**

```
*base 30000700

#name         rel-number    type      flags     comment
#-----        -----------   ------    -------   ------------------------
IMS_SVC_NAME      181        string
IMS_SVC_FLAG      182        long
IMS_SVC_RESULT    183        long
IMS_SEG_DATA      184        carray
IMS_SVC_SYSMSG    185        carray
```

## Supported MQ Messages for MQ Applications

The MQ-ARTIMS Bridge accepts the following message types:

- Messages containing IMS transaction data and an MQIIH structure:

  `MQIIH LLZZ<trancode><data>[LLZZ<data>][LLZZ<data>]`

- Messages containing IMS transaction data but no MQIIH structure:

  `LLZZ<trancode><data>[LLZZ<data>][LLZZ<data>]`

**Notes:**

1. The square brackets, [ ], represent optional multi-segments.
2. If message contains MQIIH structure, the MQMD structure Format field is set to MQFMT_IMS.
3. If message does not contain MQIIH structure, the MQMD structure Format field is set to MQFMT_IMS_VAR_STRING.

# Configuration

## Oracle Tuxedo MQ Adapter Configuration

To support MQ application, user must apply Tuxedo 12cR1 RP17 or later and follow the instruction list below:

1. In the Oracle Tuxedo MQ Adapter configuration file, the `TM_MQI *SERVICE` sections must be defined as follows:

   For message with MQIIH structure:

   ```
   *SERVICE
      NAME=< mq_service_name >
      FORMAT= MQIMS
      TRAN = N
   ```

   For message without MQIIH structure:

   ```
   *SERVICE
      NAME=< mq_service_name>
      FORMAT= MQIMSVS
      TRAN = N
   ```

   Here `< mq_service_name>` is the `ARTIGW` advertised service; the service name is configurable. For more information, see ARTIGW Configuration.

2. In the `TM_MQI` configuration file *`SERVER` section, the following parameters must be specified.

   ```
    *SERVER
           TPESVCFAILDATA=Y
           REPLYONSVCERR=Y
           MSGTYPEONTPFAIL=Y
           IMPORTMQMD=Y
   ```

3. In the `UBBCONFIG` file, `TM_MQI` server must be in a Group configured with TMS Server for the WebSphere MQ Resource Manager.

## ARTIGW Configuration

ARTIGW is a Tuxedo server working as a bridge between non-terminal client and the ARTIMPP server. For more information, see Server Configurations.

## Cross Domain Configuration

If `ARTIGW` and `ARTIMPP` are deployed in different domains, `ARTIGW` exports services named as `<tuxclt_service_name>_REPLY_<grpid>_<srvid>` and `<mq_service_name>_REPLY_<grpid>_<srvid>`. The `GRPID` and `SVRID` are 5 characters (starting with 0).

The service names mentioned above should be configured in the `DM_REMOTE_SERVICES` section of the `DMCONFIG` file of every remote domain which `ARTIMPP` belongs to. In addition, make sure correct service names are exported by each domain where `ARTIGW` lives, and make sure there are no service conflicts.

For example, assume that `ARTIGW` is in domain `GW` and `ARTIMPP` is in domain `MPP`. `ARTIGW` is configured to use default service name with `SRVID=101, SRVGRP= GROUP1`. Listing 5 shows an example of the `DMCONFIG` files for `MPP` and `GW` domains.

**Listing 5 MPP and GW Domains DMCONFIG Files**

- MPP domain:

```
*DM_REMOTE_SERVICES
IMSGW_SVC_REPLY_00001_00101
```

- GW domain:

```
*DM_LOCAL_SERVICES
IMSGW_SVC_REPLY_00001_00101
```

**Notes:**

1. No data conversion is done by the `ARTIGW` for non-terminal tuxedo clients. The data provided by the client application should be in the format expected by ARTMPP server and application programs.

2. `ARTIGW` is a single thread Tuxedo server. User can deploy multiple instance of `ARTIGW` for performance tuning.

3. The Oracle Tuxedo MQ Adapter is the MQI interface with the MQ application. Due to the different behavior of WebSphere MQ on mainframe and open system, the Tuxedo MQ Adapter behavior may look different either.

For example, if an MQ application puts a message with the `MQPMO_NONE` option on a Mainframe, the Oracle Tuxedo MQ Adapter will not trigger an IMS transaction until `MQCMIT` is called by the MQ application.

**Note:** On open systems, IMS transaction is triggered immediately.

4. For MQ Applications, if an unexpected event occurs with `ARTIGW` or `ARTIMPP` during message processing, a report message is generated and sent to the reply queue specified by original message. The report message contains no data from the original message, only a string containing the detailed error message

## Limitations

### Non-Terminal Oracle Tuxedo Client Limitations

1. Global transaction is not supported. If a `tpcall` to the `ARTIGW` is in the global transaction, the `TPNOTRAN` flag must be set.
2. If there is an access control violation when accessing an `ARTIMPP` service, a non-terminal client will not get an error message like "Access control violation" immediately, but waits until a time out occurs You must check `ULOG` to get a detailed error report.

### MQ Application Limitations

1. Only Commit mode 0 (`COMMIT_THEN_SEND`) is supported. ARTIMS will always handle the transaction as Commit mode 0 no matter what the Commit mode value is set in `MQIIH`.
2. Authentication with the RACF password or passticket is not supported.
3. MFS transaction is not supported.
4. Conversation is not supported.
5. Transaction code specified in the input message cannot be a command.
6. When Tuxedo MQ Adapter detects an access control violation, it will put original message into Dead Letter Queue. There will be no report message in the reply queue. You can also find the error report in the `ULOG` file.

### ARTIMS Persistent Message Support

ART IMS supports persistent message only for programs using `ALT PCB`. For the program switch via `ALT PCB`, when the target transaction is a persistent transaction, the message will be put into the /Q of that transaction. For how to define a persistent transaction, please refer to the imsresource.desc section.

For persistent message support, we differentiate the `ARTIMPP` into two running mode. One is `ARTIMPP` in normal mode, one is `ARTIMPP` in persistent mode. For how to define the two `ARTIMPP` server mode, please refer to `ARTIMPP` configuration section.

`ARTIMPP` in normal mode will advertise transactions as services and handle the normal service request from front end, such as terminal request, request from `ARTIGW`.The service request is scheduled by Tuxedo framework and is passed via Tuxedo IPC queue.

`ARTIMPP` in persistent mode will not advertise any services. It will monitor every /Q for the persistent transaction whose `CLASS` belong meet the" `-l class_list`" parameter of the `ARTIMPP`. It gets the message from the /Q of the persistent transaction and execute corresponding program for the transaction.

ARTIBMPT is also a server that is related to persistent message support. The transaction oriented `BMP` program that `ARTIBMPT` serves must only be persistent transaction. For what is "transaction oriented `BMP`“, please refer to `ARTIBMPT` configuration section. In transaction oriented `BMP` program, the GU operation will get message from the /Q of the transaction.

## Server Configurations

Table 18 Lists the server configuration processes and commands.

**Table 18 Server Configuration Processes and Commands**

| Name | Description |
|---|---|
| `ARTICTL` | Used to join 3270 terminal to ART IMS Runtime |
| `ARTIMPP` | Service handler and container for TP type COBOL/C programs |
| `ARTIMPP_ORA` | Same as `ARTIMPP`. However, it requires the Oracle database as RM |
| `ARTIBMP` | Program container for BATCH type COBOL/C programs. |
| `ARTIBMP_ORA` | Same as `ARTIBMP`. However, it requires the Oracle database as RM. |

**Table 18 Server Configuration Processes and Commands (Continued)**

| Name | Description |
|---|---|
| ARTIBMPT | An Oracle Tuxedo server that handles transaction oriented batch programs. |
| ARTIADM | An Oracle Tuxedo server responsible for the administration of ART IMS Runtime. |
| ARTITERM | Acts as messenger between `ARTICTL` and `ARTIMPP` located in different domains. |
| ARTIGW | An Oracle Tuxedo server that acts as a bridge between non-terminal clients and the ARTIMPP server. |
| ODBAPROX | A socket server on z/OS and is to communicate with ARTIMS servers through TCP/IP. |

## ARTICTL

### Name

`ARTICL` - Used to join 3270 terminal to ART IMS Runtime.

### Description

You must specify the `MAXWSCLIENTS` parameter in the `MACHINES` section of the UBBCONFIG file. `MAXWSCLIENTS` is the only parameter that has special significance for `ARTICTL`. `MAXWSCLIENTS` tells the Oracle ART at boot time how many access slots to reserve exclusively for 3270 terminals.

For `MAXWSCLIENTS`, specify the maximum number of 3270 terminal that may connect to a node. The default is 0. If not specified, terminal may not connect to the machine being described.

The syntax is `MAXWSCLIENTS=number`.

### Synopsis:

```
ARTICTL SRVGRP=”identifier”
                SRVID=”number”
CLOPT="[servopts options] -- -n netaddr -L pnetaddr [-S ssladdr] [-m minh]
[-M maxh] [-x session-per-handler] [-z mine] [-Z maxe]"
```

```
<~runChNum>
```

## Parameter(s)

**-n netaddr**

This address specifies where TN3270 terminal emulators connect to ARTICTL subsystem. The address is a string in standard internet URL format. For example:

//computer:4000 designates port 4000 on machine computer. Character, 1-256, A-Za-z0-9[/:-]. Mandatory option.

**-L pnetaddr**

This address is used by the ARTICTL subsystem internally between TCPL and CTLH. The address is a string in standard internet URL format. For example: //computer1:4001 designates port 4000 on machine computer. Character, 1-256, A-Za-z0-9[/:-]. Mandatory option.

**[-m minh]**

The minimum number of handler processes that will be started by ARTICTL, minh is a number from 1 to 255, its default value is 1. The actual number of handler processes will always be between `minh` and **`maxh`** based on system load.

**Note:** Although `minh` is a number from 1 to 255, but it still should be equal to or smaller than (`FD_SETSIZE - 24`) according to the system resources limits. `FD_SETSIZE` means the maximum number of files that a process can have open at any time. The value can be acquired via system command `ulimit -n`.

**[-M maxh]**

The maximum number of handler processes started by `ARTICTL`, `maxh` is a number from 1 to the 1000; the default value is 1000. The actual number of handler processes is always between `minh` and `maxh` based on system load.

**Note:** Although `maxh` is a number from 1 to 1000, it should be equal to or smaller than (`FD_SETSIZE - 24`) according to the system resources limits. `FD_SETSIZE` means the maximum number of files that a process can have open at any time. The value can be acquired via system command `ulimit -n`.

**[-x session-per-handler]**

The number of sessions a CTLH can maintain concurrently in ARTICTL subsystem.

Numeric, 1-255. Default value is 32.

**[-S ssladdr]**

Specifies where 3270 terminal emulators connect to ARTICTL via SSL. The address is a string in standard internet URL format. For example: `//computer:5000` designates port

5000 on machine called “computer.” Character, `1-256, A-Za-z0-9[/:-]`. **[-S ssladdr]** is mandatory if `-n` option is not specified.

**-z minencryptbits**

This option specifies the minimum level of encryption required when a network link is being established between a terminal and the `ARTICTL` handler. 0 means no encryption, while 40, 56, 128, and 256 specify the length (in bits) of the encryption key. If this minimum level of encryption cannot be met, link establishment fails. The default is 0. This option is ignored if `-s` option is not specified.

**–Z maxencryptbits**

This option specifies the maximum level of encryption allowed when a network link is being established between a workstation client and the workstationhandler. 0 means no encryption, while 40, 56, 128, and 256 specify the length (in bits) of the encryption key. The default is 128 for LLE and 256 for SSL. This option is available only if Oracle Tuxedo Security (either 56-bit or 128/256-bit) is installed.

This option will be ignored if `-s` option is not specified.

### Example(s)

```
*MACHINES
DEFAULT:
MAXWSCLINETS = 20
...
*SERVERS
ARTICTL SRVGRP="MFSGRP"
SRVID=1000
RESTART=Y GRACE=0
CLOPT="-- -n //hostname:4000 -L //hostname:4002 -m 1 -M 10"
```

## ARTIMPP

### Name

`ARTIMPP` - Service handler and container for TP type COBOL/C programs.

### Description

`ARTIMPP` is a Tuxedo server to act as both service handler and container for COBOL/C programs of TP type. There are two running modes for `ARTIMPP`, one is `ARTIMPP` in normal mode (without `-p` in `CLOPT`), another is `ARTIMPP` in persistent mode (with `-p` in `CLOPT`).

`ARTIMPP` in normal mode invokes corresponding COBOL/C program according to the service request received from front end (request from terminal, `ARTIGW`).

`ARTIMPP` in persistent mode will monitor /Q for persistent transaction whose class is defined in the "`-l class_list`" parameter in `CLOPT` for the `ARTIMPP`. It will get the message from the /Q and invoke corresponding COBOL/C program.

## Synopsis:

```
ARTIMPP SRVGRP="identifier"
                SRVID="number"
CLOPT="[servopts options] -- -l class_list[-p][-x parameter list for DB
plugin]"
```

## Parameter(s)

**[-l class_list]**

Specifies a list of transaction class, e.g. “1,3,5”; or a class range, e.g.“1-3”; or all classes, i.e *. The services whose class is specified in the `class_list` are advertised by `ARTIMPP` in normal mode.

**-p**

`ARTIMPP` is in persistent mode.`ARTIMPP` in persistent mode will not advertise any services/transactions.

**[-x]**

Indicates the server where the Database plug-in is to be used, the remaining parameter list following "-x" is passed to `db_init()`.

For the Oracle IMS/DB solution, the parameter list is as follows:

```
-o host:port:dra
```

This is the parameter required by Oracle plug-in for IMS/DB.

`host`

Hostname or ipv4 address of ODBA proxy to connect to.

`port`

Port of ODBA proxy for receiving ODBA request.

`dra`

Name of the DRA table in which the IMS/DB system to be accessed is defined.
E.g., `CLOPT="-A --  -x -o zosmachine:1234:BEA1"`

**Notes:** When `ARTIMPP` server is configured in persistent mode in the `UBBCONFIG` file and persistent transaction is configured in `imsresource.desc`, `TMQUEUE` server must also be configured (before `ARTIMPP`), in the `UBBCONFIG` file according to the /Q configuration in `imsresource.desc`.

Before starting ART IMS, you must also create /Q according to the information in `imsresource.desc`.

### Limitation(s)

For a persistent transaction that may issue `ROLB` or `ROLL`, the transaction could only be handled by one `ARTIMPP` in persistent mode server. That is, the `CLASS` definition of the transaction (defined in `imstrans.desc`) could only match one `ARTIMPP` in persistent mode server `-l` parameter.

## ARTIMPP_ORA

### Description

`ARTIMPP_ORA` has all the functionalities of `ARTIMPP`. It can also support an Oracle database used as an external resource manager (RM). It uses on some libraries provided by Oracle database. In order to use this environment variable it with an Oracle database, the RM section must be configured correctly in the `UBBCONFIG` file.

## ARTIBMP

### Name

`ARTIBMP` - Program container for BATCH type COBOL/C programs.

### Description

`ARTIBMP` is an Oracle Tuxedo server to act as the program container for COBOL/C programs of BATCH type, it invokes corresponding COBOL/C program according to the program name received.

### Synopsis:

```
ARTIBMPSRVGRP=”identifier”
                    SRVID=”number”
CLOPT="[servopts options] -- [-x parameter list for DB plugin]"
```

### Parameter(s)

**[-x]**
: Indicates the server where the Database plug-in is to be used, the remaining parameter list following "-x" is passed to `db_init()`.

For the Oracle IMS/DB solution, the parameter list is as follows:

```
-o host:port:dra
```

This is the parameter required by Oracle plug-in for IMS/DB.

`host`
: Hostname or ipv4 address of ODBA proxy to connect to.

`port`
: Port of ODBA proxy for receiving ODBA request.

`dra`
: Name of the DRA table in which the IMS/DB system to be accessed is defined. E.g., `CLOPT="-A --  -x -o zosmachine:1234:BEA1"`

## ARTIBMPT

### Name

`ARTIBMPT` - An OracleTuxedo server that handles transaction oriented batch programs.

### Description

Transaction oriented `BMP` program should be served by `ARTIBMPT` and triggered via `DFSRRC00` with `${IN}` parameter.

A transaction oriented `BMP` program is a program that is defined in imstrans.desc and also defined in `imsapps.desc` with a `TYPE=BATCH`.

The transaction oriented `BMP` program must be persistent transaction, it must be defined in `imsresource.desc`.

`ARTIBMPT` server only handle the transaction oriented BMP programs.

### Synopsis

```
ARTIMPP SRVGRP="identifier" SRVID="number"
CLOPT="[servopts options] -- -l class_list -x parameter list for DB plugin"
```

### Parameter(s)

**[-l class_list]**
: Specifies a list of transaction class, e.g. "1,3,5"; or a class range, e.g."1-3"; or all classes, i.e *. The services whose class is specified in the class_list are advertised by ARTIBMPT.

For the Oracle IMS/DB solution, the parameter list is as follows:

`-o host:port:dra`

This is the parameter required by Oracle plug-in for IMS/DB.

`host`
: Hostname or ipv4 address of ODBA proxy to connect to.

`port`
: Port of ODBA proxy for receiving ODBA request.

`dra`
: Table name which specifies the IMS/DB to connect to; this parameter is optional; if it's configured, all the DB operations are performed through ODBA, otherwise all DB operations are through actual DB implementation on open systems. The DRA table name must be uppercase and 4 bytes long.

**Note:** When `ARTIBMPT` is configured in `UBBCONFIG` file and there is transaction oriented `BMP` transaction which is configured in `imsresource.desc`, `TMQUEUE` server must be also configured in `UBBCONFIG` file according to the /Q'configuration in `imsresource.desc`.

### Limitation(s)

For a transaction oriented `BMP` program that may issue `ROLB` or `ROLL`, the program could only be handled by one `ARTIBMPT` server.

That is, the `CLASS` definition of the transaction (defined in imstrans.desc) could only match one `ARTIBMPT` server "`-l class_list`" parameter.

## ARTIBMP_ORA

### Description

`ARTIBMP_ORA` has all the functionalities of `ARTIBMP`. It can also support an Oracle database used as an external resource manager (RM). It uses on some libraries provided by Oracle database. In order to use this environment variable it with an Oracle database, the RM section must be configured correctly in the `UBBCONFIG` file.

## ARTIADM

### Name

ARTIADM - An Oracle Tuxedo server responsible for the administration of ART IMS Runtime.

### Description

In a distributed target environment, this server can be configured on each node to achieve the configuration propagation. With these servers, the configuration files only need to be configured on the master node, and the administration servers propagate the configuration files to each slave node.

When starting up, the administration server running on the master node reads in all the configuration files located in directory `${ART_IMS_CONFIG}`. When each administration server running on a slave node starts up, it communicates with the administration server on the master node and fetches the contents of the configuration files.

The administration server on the slave node then writes to the corresponding configuration files in directory `${ART_IMS_CONFIG}` on the slave node. New configuration files are created if none exist. Configuration file synchronization function is optional, by default this function is disabled

### Synopsis

```
ARTIADM SRVGRP=”identifier”
              SRVID=”number”
CLOPT="[servopts options]"
```

### Parameter(s)

**[-s]**

Enables configuration synchronization function, only usefull for a slave node. If set, the slave node will try to get configuration files from master node at startup.

## ARTITERM

### Name

ARTITERM - Acts as messenger between ARTICTL and ARTIMPP located in different domains.

### Description

In cross-domain environment, `ARTITERM` server is used to act as messenger between `ARTICTL` and `ARTIMPP` located in different domains. `ARTITERM` provides a special service for `ARTIMPP` so that `ARTIMPP` can pass data to `ARTITERM`, which in turn passes the data to `ARTICTL`.

### Synopsis:

```
ARTITERM SRVGRP=”identifier”

SRVID=”number”

CLOPT=””
```

## ARTIGW

### Name

`ARTIGW` - An Oracle Tuxedo server working as a bridge between non-terminal client and the ARTIMPP server.

### Description

`ARTIGW` is an Oracle Tuxedo server that acts as a bridge between non-terminal clients and the `ARTIMPP` server. Its main duties are as follows:

- Advertises separated services to handle the requests from non-terminal Oracle Tuxedo clients and requests from MQ applications.
- Message Mapping.

  For MQ application request messages, it converts an MQ message to a format that can be used by `ARTIMPP`. For reply messages, it converts an `ARTIMPP` reply message to an MQ message.

  For non-terminal Oracle Tuxedo client request messages, `ARTIGW` plays a role in transferring client FML32 buffers to a message format that the program needs and sends the message to MPP. It then decodes the MPP message and then sends a standard FML32 buffer to the client.
- Session Management.

  Session management is used to associate the asynchronous ARTIMPP reply with the original ARTIGW client requests.
- Session Management.

A session management is used to associate the asynchronous reply from ARTIMPP with original request from clients of ARTIGW.

### Synopsis:

```
ARTIGWSRVGRP="identifier"

SRVID="number"

CLOPT="[servopts options] [-m mq_service_name] [-s tuxclt_service_name] [-D
trace_level]"
```

### Parameter(s)

**mq_service_name**
: Specifies the service name advertised by server, which is dedicated for message handling for MQ application. It is an optional parameter, no default service name `<IMSGW_MQ_SVC>` is advertised if this parameter is not present.

**tuxclt_service_name**
: specifies the service name advertised by server, which is dedicated for message handling for non-terminal tuxedo client. It is an optional parameter, no default service name `<IMSGW_MQ_SVC>` is advertised if this parameter is not present.

**[-D trace_level]**
: Enables debug mode, trace is located at $APPDIR/log. Currently, the value of `trace_level` can be 0, 1 or 2. There are no significant differences with these values in this feature.

**Note:** Both the `mq_service_name` and `tuxclt_service_name` cannot begin with `"<domainid>_"`. Otherwise `ARTIGW` cannot get the response message correctly. Here `<domainid>` is the ID of the domain which `ARTIMPP` belongs to

## ODBAPROX

### Name

`ODBAPROX` - is a socket server on z/OS and is to communicate with `ARTIMS` servers through TCP/IP.

### Description

`ODBA` proxy is a socket server to communicate with ARTIMS servers through TCP/IP. `ODBAPROX` is developed to communicate with the programs in ARTIMS and perform database operations on behalf of these programs

### Synopsis:

```
ODBAPROX -h host -l command_port -p odba_port -n max_handler_num [-D]
```

### Parameters:

**[-h]**

Specifies the host (hostname or ipv4 address) where the ODBA proxy is running.

**[-l]**

Specifies the port for receiving command from external utility.

**[-p]**

Specifies the port for receiving odba request.

**[-n]**

Specifies the maximum number of handlers to be started.

**[-D]**

Enables debugging info be printed in stdout

For more information, see Using ODBA Proxy in the Oracle Tuxedo Application Runtime for IMS Users Guide.

## Security Configuration

### Authentication Configuration

In Tuxedo, each type of security mechanism requires that every user provide an application password as part of the process of joining the Tuxedo ATMI application, but In ART IMS, it has been removed in order to keep the same behavior as IMS resides on z/OS. User should keep application password as NULL. For more information on how to configure Tuxedo application password, please refer to Tuxedo documentation. The USER_AUTH and ACL/Mandatory ACL security mechanism requires that each user must provide a valid username and password to join the ART IMS runtime. The per-user password must match the password associated with the user name stored in a file named tpusr. Client name is not used. The checking of per-user password against the password and user name in tpusr is carried out by the Tuxedo authentication service AUTHSVC, which is provided by the Tuxedo authentication server AUTHSVR. For more information on how to configure Tuxedo USER_AUTH and ACL/Mandatory ACL authentication, please refer to Tuxedo documentation.

For more information, see Using Security in ATMI Applications, in the Oracle Tuxedo Users Guide.

## SSL Configuration

ARTIMS uses the following existing UBBCONFIG file parameters to configure information about SSL identification strings and the location of SSL certificate encryption passwords:

- SEC_PRINCIPAL_NAME
- SEC_PRINCIPAL_LOCATION
- SEC_PRINCIPAL_PASSVAR

For more information, see Using Security in ATMI Applications, in the Oracle Tuxedo Users Guide.

## Environment Variables

- **IMSDIR**

  An environment variable containing the root path (absolute path), of the installed ARTIMS subsystem. It is a mandatory environment variable if ARTICTL is used to be connected from

  terminal.

- **ART_IMS_DB**

  Container path where GSAM files are located.

- **ART_IMS_CONFIG**

  An environment variable required by ART IMS to specify the absolute path where the configuration files are located, such as *.desc and *.psb. This environment variable is manadtory for: ARTIMPP, ARTIMPP_ORA, ARTIBMP, ARTIBMP_ORA, ARTIBMPT, ARTIADM.

- **ART_IMS_FMT**

  An environment variable required by ARTICTL to specify the absolute path where the control block files which generated via MFSGEN are located. It is a series of paths similar to PATH environment variable, the separator is ":". If this variable is not specified, the PATH APPDIR is used. It is a mandatory environment variable for ARTICTL if MFS is used.

- **COBPATH**

  An environment variable required by Microfocus COBOL environment. It defines one or more directories to search COBOL programs to be loaded dynamically. Its usage is similar to Unix PATH. It is a mandatory environment variable for Microfocus COBOL

- **COB_LIBRARY_PATH**

If you are using COBOL-IT, `COB_LIBRARY_PATH` is required by COBOL-IT to define the search order for COBOL programs. It defines one or more directories to search COBOL programs to be loaded dynamically. Its usage is similar to Unix PATH. It is a mandatory environment variable for COBOL-IT.

- `INTERCODE`

  Specifies which encoding type of inbound data is used. The value could be any encoding type used in universal platform. If this variable is not specified, ASCII is used. If this variable is specified, then `EXTERCODE` should be specified as well.

- `EXTERCODE`

  Specifies which encoding type of outbound data is used. The value could be any EBCDIC encoding type used in z/OS platform. If this variable is not specified, IBM-37 will be used. If this variable is specified, then `INTERCODE` should be specified as well.

- `ART_IMSLOGDIR`

  Specify the directory where all the record log files are located. Record log file is used by `CHKP (Symbolic)` and `XRST`. If not specified, the `ART_IMSLOGDIR` default value is `$APPDIR/IMSLOGDIR`. In MP mode, if the program wants to share the record log file among machines in an Oracle Tuxedo domain, `ART_IMSLOGDIR` should point to an `NFS` directory which can be accessed by machines in the Oracle Tuxedo domain.

## Commands and Parameters

Table 19 lists the commands and associated parameters that can be input on 3270 terminal and be processed by ARTIMS.

**Table 19 3270 Terminal Commands and Parameters**

| Table 20 Command | Table 21 Shortening | Table 22 Parameter |
|---|---|---|
| `/EXIT` | `/EXI` | None |

<~runChNum>

Table 19 3270 Terminal Commands and Parameters

| Table 20 Command | Table 21 Shortening | Table 22 Parameter |
|---|---|---|
| `/Format` | `/Forma,`<br>`/Form,`<br>`/For` | `modname` |
| `/Sign` | `/Sig` | `None`<br>`Userid Passwd`<br>`On`<br>`On Userid Passwd`<br>`Off` |

## Configuration Files

All the configuration files in this section are case insensitive for key and non-literal values, for example `bool (yes|no)` and `enum`. Literal values and their cases are kept. Comment line should be prefixed with "*".

The configuration files are as follows:

- Transaction Definition - imstrans.desc
- Application Definition - imsapps.desc
- Persistent Transaction Definition - imsresource.desc
- Database Definition - imsdbs.desc
- PSB Definition - $appname.psb
- Segments Definition - segments.desc
- Segment Definition - $segname.desc

The general format for configuration files is as follows.

**Listing 6 General Configuration File Format**

```
[section name]
Field1=value1
Field2=value2
```

```
….
[section name]
….
[section name]
…
```

## Transaction Definition - imstrans.desc

Table 23 shows an example configuration file with field names mapped from TRANSACT MACRO of IMS on z/OS

**Table 23 Section Name: [imstran]**

| Field | Type | Value | Description | Field in TRANSACT |
|---|---|---|---|---|
| NAME | X(1..8) | Mandatory | Transaction Code | CODE |
| SPA_SIZE | Integer | [16..32767] | SPA size | SPA |
| RESPONSE | Bool | Yes\|No | Whether response is required for the transaction code specified in "NAME" field, default is No | MSGTYPE |
| EDIT | enum | UC/ULC | Whether the messages are converted to upper case automatically, default is UC | EDIT |
| APPNAME | X(1..8) | Mandatory | The name of the COBOL application program that processes the transaction code specified in "NAME" field | N/A |
| CLASS | Integer | [1..999] | The class of the transaction code, default is 1 | MSGTYPE |

## Application Definition - imsapps.desc

Table 24 shows an example configuration file with field names mapped from APPLCTN MACRO of IMS on z/OS.

<~runChNum>

**Table 24 Section Name: [imsapp]**

| Field | Type | Value | Description | Source in APPLCTN |
|---|---|---|---|---|
| `NAME` | `X(1..8)` | `Mandatory` | Application Name | `N/A` |
| `PGMTYPE` | `Enum` | `TP\|BATCH` | TP for MPP, BATCH for BMP and BMPT, default is TP | `PGMTYPE` |
| `LANG` | `Enum` | `COBOL\|C` | COBOL for cobol program, C for c program, default is COBOL | `LANG` |

## Persistent Transaction Definition - imsresource.desc

Every transaction that is defined in this file is a persistent transaction. Messages for the persistent transaction via program switch is put into /Q. You must create the /Q for every persistent transaction in corresponding queue space configured in this file with the queue name equal to the transaction name before ART IMS is booted. Table 25 list the `imsresource.desc` field names.

**Table 25 Section Name: [imsresource]**

| Field | Type | Value | Description | Field in TRANSACT |
|---|---|---|---|---|
| `QSPACE` | `X(1..16)` | `Mandatory` | Qspace name | |
| `TRANNAMES` | `X(1..1024)` | `Mandatory` | The persistent transaction names. The transaction name could be separated by comma, e.g: TRAN1, TRAN2. Every transaction name could not exceeds 8 bytes. | `N/A` |

Listing 7 shows a script example to create queue space and queues for your reference; you can customerize the script to adapt to the real requirement. For more information, see Oracle Tuxedo /Q guides.

**Listing 7 Create Queue Space Example Script**

```
qmadmin ${ARTIMS QSPACE_DEVICE} <<!end
crdl . . .
qspacecreate . . .
qcreate TRAN11 fifo none 2 30 80% 0 ""
qcreate TRAN12 fifo none 2 30 80% 0 ""
!end
--->
qmadmin ${ARTIMS QSPACE_DEVICE} <<!
echo
crdl ${ARTIMS QSPACE_DEVICE} 0 10000
qspacecreate
${QUEUE_SPACENAME}
22839
5000
50
1000
1000
10000
errque
y
16
qopen ${QUEUE_SPACENAME}
qcreate TRAN11 fifo none 2 30 80% 0% ""
qcreate TRAN12 fifo none 2 30 80% 0% ""
qcreate errque fifo none 2 30 80% 0% ""
q
!
```

For persistent transactions that issue `ROLB` or `ROLL`, the retry count for creating the transaction queue should be set to a relatively large number ( up to `2147483647`).

**Note:** It is suggested that you set the retry count to a number that is more than twice the number that a particular message enters a persistent transaction.

## Database Definition - imsdbs.desc

`imsdbs.desc` is located under `$ART_IMS_CONFIG`.

Some `imsdbs.desc` field configurations are mapped from some DBD statement of IMS on z/OS. For persistent transactions that issue `ROLB` or `ROLL`, the retry count for creating the transaction queue should be set to a relatively large number (the largest number could up to 2147483647).

**Note:** It is suggested that the retry count is set to a number that is more than twice the number that a particular message enters a persistent transaction.

**Table 26 Section Name: [imsdb]**

| Field | Type | Value | Description | Source in DBD |
|---|---|---|---|---|
| NAME | X(1..8) | database name | database Name | NAME |
| ACCESS | Enum | GSAM\|MSDB\|DEDB\|HDAM\|HIDAM\|HISAM\|HSAM\|PHDAM\|PHIDAM\|PSINDEX\|SHSAM\|SHISAM | `GSAM` means `GSAM DB` | ACCESS |
| Following fields are only applicable to `ACCESS=GSAM`, will be ignored if `ACCESS != GSAM` | | | | |
| DD1 | X(1..8) | Literal String | Input File Name. If this name is defined in JCL with the same DD name, the real input file is decided by the `DSNNAME` associated with the DD name in JCL. Otherwise, the real input file is `$ART_IMS_DB/Input file name.` | N/A |

**Table 26 Section Name: [imsdb]**

| Field | Type | Value | Description | Source in DBD |
|---|---|---|---|---|
| DD2 | X(1..8) | Literal String | Output File Name.If this name is defined in JCL with the same DD name, the real output file is decided by the `DSNNAME` associated with the DD name in JCL. Or else, the real output file is `$ART_IMS_DB/Output File Name.` | N/A |
| MINRECORD | Integer | Positive Integer | Minimum record length if `RECFM=V`, its value range is `1~268435455.` | N/A |
| MAXRECORD | Integer | Positive Integer | Maximum record length if `RECFM=V`, its value range is `1~268435455`. | N/A |
| RECFM | Enum | F\|V | F: Fixed Record Length<br>V: Variable Record Length | N/A |
| RECORD | Integer | Positive Integer | Record Length if `RECFM=F`, its value range is `2~32579` | N/A |

## PSB Definition - $appname.psb

`$appname is` the name of a COBOL application program with type of TP defined in imsapps.desc, `$appname.psb` is the PSB definition file corresponding to it. For application program with type of BATCH, `$appname.psb` is not used and the PSB must be provided by the script that calls `DFSRRC00`.

Table 27 shows an example configuration file with field names mapped from PCB statement for IMS on z/OS.

**Table 27 Section Name: [imspcb]**

| Field | Type | Value | Description | Source in PCB |
|---|---|---|---|---|
| NAME | X(1..8) | blank or transaction code name | If the type is TP, this field represents a Transaction Code, only transaction code is supported for alternate PCB It is mandatory if `modify = no`, and optional if `modify = yes`.<br>If the type is DB, this field represents the DB name. This field must be configured for a `GSAM PCB`, but optional for a DB PCB, please refer to `PROCSEQ` field for details. | NAME |
| TYPE | enum | TP\|GSAM\|DB | TP means Alternate PCB,<br>GSAM means PCB for GSAM DB<br>DB means PCB for DEDB | TYPE |
| LIST | Bool | Yes\|No | Specifies whether the named PCB is included in the PCB list passed to the application program at entry, must together with the `LABER=` parameter | LIST |
| Following fields are only applicable to TYPE=TP, i.e. alternate PCB, will be ignored if configured but `TYPE!=TP` | | | | |
| MODIFY | Bool | Yes\|No | Whether this PCB is modifiable, default is no | MODIFY |
| EXPRESS | Bool | Yes\|No | Whether it is an express PCB, default is no | EXPRESS |
| LABEL | X(8) | YES | This parameter is required for DB PCBs while using ODBA, and also required for alternate PCBs if AIBTDLI interface is used to call DL/I. | PCBNAME |

**Table 27 Section Name: [imspcb]**

| Field | Type | Value | Description | Source in PCB |
|---|---|---|---|---|
| PROCSEQ | X(8) | Indexing Database name | If this field is configured, it should be filled in the first 8 bytes of DB PCB; otherwise, the value specified by NAME= should be filled in the first 8 bytes of DB PCB. At least one of NAM= and PROCSEQ= must be configured for a DB PCB. | PROCSEQ |
| PROCOPT | X(4) | GSAM: one of G\|L\|GS\|LS<br>DEDB: One or Combination of A\|G\|I\|R\|D\|P\|O\|N\|T\|E\|L\|GS\|LS\|H | This field defines the access permission for the associated database. This field is only valid when TYPE=GSAM\|DB, and is ignored if configured but TYPE=TP.<br>GSAM: G\|GS - Get Only; L\|LS - Get and Append<br>DEDB: TBD<br>DEDB: ARTIMS servers do not check the validity of PROCOPT, which is migrated from IMS on z/OS and only used by DB plug-in | PROCOPT |
| Following fields are only applicable to TYPE=DB, i.e. GSAM PCB, will be ignored if configured but TP!=DB | | | | |
| SB | Enum | COND\|NO | Specifies whether this PCB should be buffered. | SB |
| POS | Enum | SINGLE\|MULTIPLE | Specifies single or multiple positioning for the logical data structure. | POS |
| KEYLEN | int | Positive integer | Specifies bytes of the longest concatenated key for a hierarchic path of sensitive segments. | KEYLEN |
| MSDB | bool | YES\|NO | Specifies the MSDB commit view. | VIEW |
| SENSEG | X(8) | Literal String | Specifies the SENSEG name belongs to this pcb, must be unique in current PSB file. | |

**Table 27 Section Name: [imspcb]**

| Field | Type | Value | Description | Source in PCB |
|---|---|---|---|---|
| Section Name: [$SEGSEG ] | | | The section name is defined in imspcb section through SENSEG item. | |
| NAME | X(8) | Literal String | Specifies segment name. | SENSEG - NAME |
| PARENT | X(8) | Literal String\|0 | The name of the segment parent. | SENSEG - PARENT |
| PROCOPT | X(4) | One or Combination of A\|G\|I\|R\|D\|P\|O\|E\|L\|GS\|LS\|H | Indicates the processing options valid for use of this sensitive segment, the SENSEG PROCOPT overrides the PCB PROCOPT | SENSEG - PROCOPT |
| SSPTR | Struct array | One or Combination of interger,R\|U linked with semicolon | Specifies the subset pointer number and the sensitivity for the pointer. | SENSEG - SSPTR |
| INDICES | X(8) | Literal String | Specifies which secondary indexes contain search fields that are used to qualify SSAs for an indexed segment type. | SENSEG - INDICES |
| SENFLD | X(8) | Literal String | Specifies the SENFLD name belongs to this senseg, must be unique in current PSB file. | |
| Section Name: [$SENFLD ] | X(8) | | The section name is defined in senseg section through SENFLD item. | |

Table 27 Section Name: [imspcb]

| Field | Type | Value | Description | Source in PCB |
|---|---|---|---|---|
| NAME | X(8) | Literal String | Specifies field name. | SENFLD - NAME |
| START | Int | Positive integer [1-32767] | Specifies the starting position of this field relative to the beginning of the segment. | SENFLD - START |
| REPLACE | bool | YES\|NO | Specifies whether or not this field can be altered on a replace call. | SENFLD - REPLACE |

## Segments Definition - segments.desc

segments.desc defines the segments within a database. One database (except the GSAM database), has one segments.desc, which is under `$ART_IMS_CONFIG/db/$dbname`.

The fields in segments.desc are mapped from SEGM statement of DBD.

Table 28 segments.desc

| Field | Type | Value | Description | Source in SEGM |
|---|---|---|---|---|
| NAME | X(1..8) | Mandatory | Segment Name | NAME |
| BYTES | Integer | Mandatory | Maximum Length of the segment, 4~32760 | BYTES |
| SEGPGM_A2E | X(1..128) | Optional | COBOL Program name used to convert segment data from open system to Mainframe | N/A |
| SEGPGM_E2A | X(1..128) | Optional | COBOL Program name used to convert segment data from Mainframe to open system | N/A |

**Table 28 segments.desc**

| Field | Type | Value | Description | Source in SEGM |
|---|---|---|---|---|
| `SSAPGM_A2E` | `X(1..128)` | Optional | COBOL Program name used to convert qualified SSA for the segment from open system to Mainframe | `N/A` |
| `KFAPGM_E2A` | `X(1..128)` | Optional | COBOL Program name used to convert Key Feedback area for the segment from Mainframe to open system | `N/A` |

**Notes:** For variable length segment, the BYTES definition is mapped from SEGM statement (e.g., `BYTES= (max bytes,min bytes))`, max bytes must be greater or equal to min bytes. A variable length segment must starts with a 2-byte field, which defines the length of the segment including the 2-byte length field.

For `SEGPGM_A2E`, `SEGPGM_E2A` and `SSAPGM_A2E`, `KFAPGM_E2A`:

1. If any of the upper four parameters is not defined in segments.desc, $segname.desc must exist and $segname.desc will be used to do data converting as described later.

2. `SEGPGM_A2E` and `SEGPGM_E2A`.

`SEGPGM_A2E` and `SEGPGM_E2A` must be both defined or both not defined together. When `SEGPGM_A2E` and `SEGPGM_E2A` are defined, the ODBA Plugin uses `SEGPGM_A2E`/ `SEGPGM_E2A` to do segment data converting, not use the `$segname.desc` to perform segment data converting even if there is `$segname.desc`.

When `SEGPGM_A2E` and `SEGPGM_E2A` are not defined, the ODBA plug-in uses the FIELDS definition in `$segname.desc` to perform segment data converting.

3. `SSAPGM_A2E`

When `SSAPGM_A2E` is defined, the ODBA plug-in uses the defined COBOL program to do qualified SSA converting for this segment.

When `SSAPGM_A2E` is not defined, the ODBA Program uses the `KEY` Field type definition in `$segname.desc` to convert the `KEY` value in the SSA for this segment.

4. `KFAPGM_E2A`.

When KFAPGM_E2A is defined, the ODBA plug-in uses the defined COBOL program to do data converting for Key Feedback area for this segment.

If KFAPGM_E2A is not defined, ODBA program uses the FBAFIELD definition in $segname.desc to do data converting for Key feedback area for this segment.

For how to generate and compile the upper COBOL programs, please refer to buffer converting in Oracle Tuxedo Application Rehosting Workbench User Guide and Oracle Tuxedo Application Rehosting Workbench Reference Guide.

Put the compiled converting program under COBPATH (for Microfocus) or COB_LIBRARY_PATH (for CIT) before booting ART IMS servers.

## Segment Definition - $segname.desc

$segname.desc defines the fields within a segment. $segname.desc only exist for databases with access type of neither GSAM nor MSDB defined in imsdbs.desc, $segname.desc is located under $ART_IMS_CONFIG/db/$dbname.

**Table 29 $segname.desc**

| [imsdb]Field | Type | Value | Description | Source in SEGM |
|---|---|---|---|---|
| NAME | X(1..8) | Mandatory | Field Name | NAME |
| START | Integer | Mandatory | Offset of the field, inside the segment, 0~length of segment - 4 | START |
| BYTES | Integer | Mandatory | Length of the field, 4~32760 | BYTES |

**Table 29 $segname.desc**

| [imsdb]Field | Type | Value | Description | Source in SEGM |
|---|---|---|---|---|
| `TYPE` | `Enum` | `Mandatory` | C: Alpha-Numeric string, requires conversion.<br>P: Packed Decimal, conversion not required.<br>X: Hexadecimal, requires conversion.<br>M: Mixed type, used when a FIELD contains different types of sub pieces. Requires conversion. | `TYPE` |

Table 29 $segname.desc

| [imsdb]Field | Type | Value | Description | Source in SEGM |
|---|---|---|---|---|
| `FORMAT` | `X(1...512)` | `Optional` | Only needed (mandatory) for `TYPE=M`. The configuration rule for this format is as follows: `format=PIECE1-LEN,PIECE1-TYPE;PIECE2-LEN,PIECE2-TYPE;PIECE3-LEN,PIECE3-TYPE`. For example: `format=3,P;4,C;3,p`. Please note the following: 1. The `PIECE-TYPE` must be `C/P/X`. 2. Tailing - is not allowed. 3. The format string must cover all bytes in the field. | `N/A` |

The field's type definition is not only from FIELD statement of DBD, user also needs to define the field's type according to its usage in COBOL program.

If you do not define the type for a field, the default field type is C

Table 30 shows the Field Definition mapping table according to field usage in the COBOL program.

Table 30 Field Definition Mapping Table

| COBOL Picture | Description | IMS Type |
|---|---|---|
| PIC X | Alph-numeric character display | C |
| PIC 9 | Numeric display | C |
| PIC S9 | Signed numeric display | C |
| PIC S9 COMP-3 | Packed decimal | P |
| PIC S9 COMP;<br>PIC S9 COMP-4 | Binary | X |

The conversation/translating rule is as follows:

- Type C, requires ASCII/EBCDIC translation.
- Type P, does not require translation. (Both ASCII/EBCDIC translation and endian translation are not done. This for COMP-3 data area.)
- Type H, requires endian translation.

At the completion of a retrieval or `ISRT` call, the Key Feedback Area is returned from ODBA Proxy. We reserve one special FIELD whose name is `FBAFIELD` to convert Key Feedback Area in DB PCB.

A segment concatenated key is made up of the keys of each of its parents and its own key. Key formats are positioned left to right, starting with the key format of the root segment and following the hierarchic path.

This special `FIELD(FBAFIELD)` defined in `$segment` must defined the format of the concatenated key of the segment. The Key FeedBack Area will be converted according to the definition of this field for the segname.

Listing 8 shows an example definition in `$segname.desc`.

**Listing 8 Example Definition**

```
[field]
NAME=FBAFIELD
START=0
BYTES=11
TYPE=M
FORMAT=5,P;6,C
```

`START` should be 0.

`BYTES` defines the total length of the KEY FeedBack Area, that is the concatenated key total length.

`TYPE` defines the concatenated key's type. If the concatenated key has different type, the `TYPE` should be set to `M`.

`FORMAT` should define the concatenated key format if the `TYPE=M`.

If the special `FIELD(FBAFIELD)` is not defined in `$ segname.desc`, the KEY FeedBack Area is converted as `TYPE C` by default for the segname.

**Note:** For search key field in SSA, its field name must be the same as the Search KEY FIELD name defined in DBD and the name used in the SSA.

## COBOL Runtime Support

ARTIMS support `SYSIN/SYSOUT` redirection for `ACCEPT/DISPLAY` statement in ART IMS batch COBOL program in Microfocus environment. To support this, ARTIMS add a new file handler named "`ARTEXTFH`". No support for COBOL IT environment now.

To use this feature, user should do the following actions:

1. While compiling user COBOL program with Microfocus COBOL compiler, the following options should be added:

   ```
   INDD
   OUTDD
   CALLFH("ARTEXTFH")
   ```

2. Before running a batch program, environment variables `DD_SYSIN` and `DD_SYSOUT` should be set and used to specify `SYSIN/SYSOUT` files. If artbatch is used to trigger an IMS job, this usually would be set.
3. If a new BMP server is need to be rebuilt, a new library file named “`libimsextfh.so`” should be linked, user could refer `$IMSDIR/obj/Makefile.svrs` for reference.

## See Also

- Oracle ARTIMS Users Guide