Oracle Tuxedo Application Runtime for CICS

User Guide

11*g* Release 1 (11.1.1.3.0)

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Oracle Tuxedo Application Runtime for CICS User Guide, 11*g* Release 1 (11.1.1.3.0)

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CHAPTER 1

Introduction to CICS Runtime

Introduction to the CICS Runtime Environment

Purpose

This guide provides explanations and instructions for configuring and using Oracle Tuxedo Application Runtime for CICS (CICS Runtime) when developing and running On Line Transaction Processing (OLTP) applications on a UNIX/Linux platform.

This guide describes the steps required to implement and perform COBOL CICS transactions, whether they are migrated from z/OS CICS or newly written for UNIX applications.

To illustrate this purpose, the User Guide provides a detailed description of the deployment and administration of the Simple Application in a UNIX environment.

This guide helps you to:

- Configure CICS Runtime software.
- Declare components to CICS Runtime.
- Run a CICS Application.

How This Book Is Organized

This guide is divided into three main chapters:

- ?$paratext>? on page 2-1: introduces the general principles of the CICS Runtime.

- ?$paratext>? on page 3-1: describes how to set parameters to make CICS Runtime operational before implementing CICS applications.
- ?$paratext>? on page 4-1: details how to configure the CICS Runtime to use CICS applications including examples moving from simple to more-and-more complex cases.

Additionally,

- ?$paratext>? on page 5-1: contains information describing the .desc files used by the different CICS Runtime servers.

CHAPTER 2

Overview of the CICS Runtime

General Architecture

In a z/OS environment, CICS is used to establish transactional communications between end-users and compiled programs via screens.

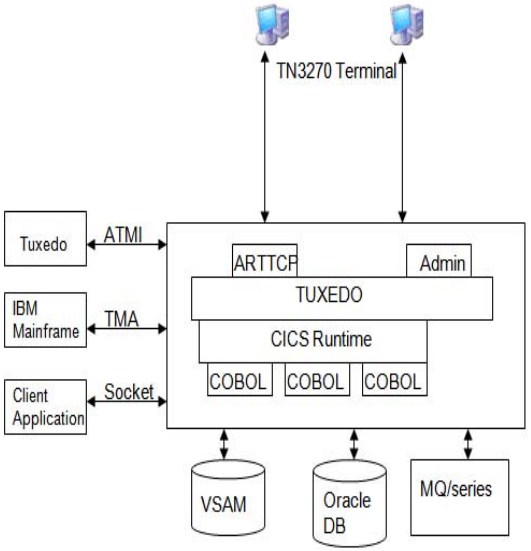
CICS is a middleware that implements the control and integrity of shared resources, providing developers with a bag of API (EXEC CICS … END-EXEC statements) to dialog with CICS inside programs mainly developed on z/OS in COBOL, PL1 and Assembler languages.

Once all the components of z/OS CICS applications (COBOL programs and data) are migrated to a UNIX/linux platform using Oracle Tuxedo Application Runtime Workbench, CICS Runtime enables them to be run unchanged using an API emulation on top of the native Tuxedo features.

On a UNIX platform, Tuxedo performs many of the functions performed by CICS on a z/OS platform concerning the integrity of resources and data used in transactional exchanges, including those used for applications that are distributed across several machines. However, Tuxedo does not manage some specific native CICS z/OS features such as screen map handling. To provide these features on the target platform, CICS Runtime acts as a technical layer, located between Tuxedo and the converted CICS applications.

The following schema describes the global architecture of CICS Runtime.

Figure 2-1 Oracle Tuxedo Application Runtime for CICS Architecture



CICS Runtime is composed of two major parts:

- CICS Runtime Preprocessor and CICS Runtime library
- CICS Runtime Tuxedo Servers and their Resource Configuration Files

The CICS Runtime Library

In z/OS CICS applications, all the interactions with the resources managed by CICS are made thru the `EXEC CICS` API.

A CICS Preprocessor transforms these statements into calls to CICS library:

Listing 2-1 z/OS CICS Calls

```
*EXEC CICS
*     RECEIVE MAP    ('RTSAM10')
```

```
   *             MAPSET ('RTSAM10')
   *             INTO   (RTSAM10I)
   *END-EXEC.
   MOVE ' xxxxxxxxxxxx00203   ' TO DFHEIV0
   MOVE 'RTSAM10' TO DFHC0070
   MOVE 'RTSAM10' TO DFHC0071
   CALL 'DFHEI1' USING DFHEIV0 DFHC0070
                       RTSAM10I DFHDUMMY DFHC0071.
```

On UNIX, the CICS Runtime Preprocessor transforms these EXEC CICS into calls to the CICS Runtime library:

Listing 2-2 CICS Runtime Calls

```
*EXEC CICS
  *     RECEIVE MAP    ('RTSAM10')
  *             MAPSET ('RTSAM10')
  *             INTO   (RTSAM10I)
  *END-EXEC.
   INITIALIZE KIX--INDICS
   MOVE LOW-VALUE TO KIX--ALL-ARGS
   . . .
   ADD 1 TO KIX--ARGS-NB
   SET KIX--INDIC-MAPSET(KIX--ARGS-NB) TO TRUE
   MOVE 'RTSAM10' TO KIX--MAPSET OF KIX--BMS-ARGS
   ADD 1 TO KIX--ARGS-NB
   SET KIX--INDIC-MAP(KIX--ARGS-NB) TO TRUE
   MOVE 'RTSAM10' TO KIX--MAP OF KIX--BMS-ARGS
```

```
CALL "KIX__RECEIVE_MAP" USING KIX--INDICS KIX--ALL-ARGS
```

The CICS Runtime Tuxedo Servers

The CICS Runtime Tuxedo servers are used to manage CICS features not natively present in Tuxedo.

Some of these servers are mandatory in order to make CICS Runtime available, others are optional depending on the usage of specific EXEC CICS statements in CICS Applications.

Mandatory Servers

- The Terminal Connection servers (TCP servers: `ARTTCPH` and `ARTTCPL` servers): manage user connections and sessions to CICS applications thru 3270 terminals or emulators.
- The Connection server `ARTCNX`: manages the user session and some technical transactions relative to security (CSGM: Good Morning Screen, CESN: Sign On, CESF: Sign off).
- The Synchronous Transaction server `ARTSTRN`: manages standard synchronous CICS transactions that can run simultaneously.
- The Administration server (`ARTADM`): required for CICS Runtime administration

Optional Servers

- The Synchronous Transaction servers `ARTSTR1`: manages CICS synchronous transaction applications that can not run simultaneously but only sequentially (one at a time).
- The Asynchronous Transaction servers `ARTATRN` and `ARTATR1`: are similar to the `ARTSTRN` and `ARTSTR1` but for asynchronous transactions started by `EXEC CICS START TRANSID` statements.
- The TS Queue servers `ARTTSQ`, `TMQUEUE` and `TMQFORWARD`: manage the use of CICS Temporary Storage Queues - files managed by CICS thru specific commands.
- The TD Queue servers `ARTTDQ`: centralizes the TD Queue operations management requested by applications.
- The Distributed Program Link server `ARTDPL`: runs DPL programs.
- Converse Management server `ARTCTRN` and `ARTCTR1`.

Server Configuration

The CICS Runtime Tuxedo servers are configured in:

1. The ubbconfig file once compiled to the tuxconfig file, is the file read by Tuxedo at start up that defines all the servers to be launched and their parameters.
2. The CICS Runtime resource configuration files for the CICS resources managed by CICS Runtime servers are declared.

The CICS Runtime Resource Configuration Files

Reminder about z/Os Resource Management

On z/OS, all the technical components used by CICS applications (terminals, transactions, programs, maps, files …) are named CICS resources and must be declared to CICS using a dedicated configuration file called CSD.

Each resource declared must belong to a resource Group name. This enables a set of resources bound together constituting a technical or a functional application to be managed (install, delete, copy to anther CSD...).

Once created, one or more CICS groups can be declared in a CICS List name. All or part of these List names are given to CICS at startup to install their CICS groups, and thus make available all the resources defined in these groups.

CICS Runtime Resource Management

CICS Runtime manages only a subset of the resource types previously defined in the CICS CSD file on z/OS. Each resource type definition of this subset is stored inside its own dedicated Resource Configuration file. All these files are located in the same UNIX directory.

The Group name notion is kept to preserve the same advantages as on the z/OS platform. For this purpose, each resource defined in the configuration files must belong to a CICS Group name.

CICS Runtime manages the following resources:

- Tranclasses (`transclasses.desc` file)

  This file contains all the distinct Transaction classes (Tranclasses) referenced by the CICS Transactions. In CICS Runtime, a Tranclass is a feature defining whether several instances of the same transaction can be run simultaneously or sequentially.

- Transactions (`transactions.desc` file)

A transaction is a CICS feature allowing a program to be run indirectly thru a transaction code either manually from a 3270 screen or from another COBOL CICS program.

A transaction belongs to a transaction class in order to define whether this transaction must be run exclusively.

- Programs (`programs.desc` file)

  This file contains a list of all COBOL or C programs invoked thru `EXEC CICS START`, `LINK` or `XCTL` statements.

- TS Queue Model (`tsqmodel.desc` File)

  Contains all the TS Queue models referenced by TS Queues used in the CICS programs.

  A TS Queue model defines properties that complete or replace those defined in the CICS API that manages Temporary Storage Queues. The names of these TS Queues must match a mask defined in the TS Queue model. In CICS Runtime, these models are mainly used to define whether TS Queues are recoverable or not.

- Mapsets (mapsets.desc file)

  This file contains all the mapsets referenced by the CICS applications. A mapset is a CICS resource, but also a physical component containing one or more screens (maps) used in the exchanges between CICS applications and end-users.

  These resources are used through dedicated CICS statements like `EXEC CICS SEND MAP` or `RECEIVE MAP` inside COBOL programs.

- Typeterms (typeterms.desc file)

  Contains all of the 3270 terminal types supported by the CICS Runtime TCP servers.

- Enqmodel (enqmodel.desc)

  defines named resources for which the EXEC CICS ENQ and EXEC CICS DEQ commands have a sysplex-wide scope.

- File (files.desc)

  defines the physical and operational characteristics of files

- Extra TDQUEUE (tdqextra.desc)

  Defines the attributes of extra transient data queues

- Intra TDQUEUE (tdqintra.desc)

  Defines the attributes of intra transient data queues

Note: ART CICS Runtime provides the `tcxcsdcvt` utility to automatically convert the CICS CSD file to CICS Runtime resource configuration files. For more information, see Oracle Tuxedo Application Runtime for CICS CSD Converter.

CHAPTER 3

Initial Configuration of the CICS Runtime

CICS Runtime Configuration

Before installing a CICS application, certain technical variables and paths must be defined in order to create the CICS Runtime environment.

These operations must be completed before configuring individual CICS applications for use with CICS Runtime.

CICS Runtime uses the following files:

- The UNIX System `~/.profile` file to centralize values and paths used by the CICS Runtime for its own needs or for Tuxedo.
- The Tuxedo `envfile` which contains parameters, variables and paths used by Tuxedo.
- The Tuxedo `ubbconfig` file to declare all the required CICS Runtime Tuxedo servers.
- The CICS Runtime resource configuration files used by the CICS Runtime Tuxedo servers.

The UNIX ~/.profile File

For UNIX users, most required variables are defined in the `.profile` file that centralizes all of the common variables and paths used by a user for commands and applications.

Set up in this file all of the common variables and paths that will be used later in the different configuration files required by CICS Runtime or by the other technical software or middleware invoked by it (Oracle, Tuxedo, MQ Series …).

This file should then be exported.

Set the following variables in the initial settings of ~/.profile file

Table 3-1 .profile Variables

Variable	Value	Usage	Variable usage
TUXDIR	Set up at Installation time	Compulsory. Directory containing the Installed Oracle Tuxedo product.	TUXEDO
TUXCONFIG	Set up at Installation time	Compulsory. Full path name of the Tuxedo tuxconfig file	TUXEDO
KIXDIR	Set up at Installation time	Compulsory. Absolute path of the directory containing the CICS Runtime product	CICS Runtime
APPDIR	${KIXDIR}/bin	Compulsory. Directory containing the CICS Runtime Servers Binaries	CICS Runtime
KIXCONFIG	Set up at Installation time	Compulsory. Directory where the Resources Configuration Files of the CICS Runtime are located	CICS Runtime
KIX_TS_DIR	Set up at Installation time	Compulsory. Directory used for the non-recoverable CICS Queue TS.	CICS Runtime

Listing 3-1 .profile file Initial Settings Example

```
export TUXDIR=/product/TUXEDO11GR1# Directory containing the Installed
Tuxedo product

export TUXCONFIG=${HOME}/SIMAPP/config/tux/tuxconfig# Full path name of the
Tuxedo tuxconfig file

export KIXDIR=${HOME}/KIXEDO# Absolute path of the  CICS Runtime product
directory

export APPDIR=${KIXDIR}/bin # Directory containing  the  CICS Runtime
Servers Binaries
```

```
export KIXCONFIG=${HOME}/SIMAPP/config/resources  # Directory for resources
files (*.desc)
export KIX_TS_DIR=${HOME}/SIMAPP/KIXTSDIR# Directory for TS no recovery
```

The Tuxedo System Files

The Tuxedo Envfile File

This envfile contains variables and paths used by Tuxedo and CICS Runtime. These parameters should be set in addition to those set by the Tuxedo Administrator.

Set the following variables in the initial settings of the envfile file:

Table 3-2 envfile Variables

Variable	Value	Usage
LC_MESSAGES	C	UNIX formats of informative and diagnostic messages
OBJECT_MODE	64	UNIX 64 bits architecture
APPDIR	${APPDIR}	TUXEDO environment.
TUXCONFIG	${TUXCONFIG}	TUXEDO environment
USER_TRACE	SID	TUXEDO environment. Trace Type (one per user)
KIXCONFIG	${KIXCONFIG}	CICS Runtime directory containing its resource files
PATHTS	${KIX_TS_DIR}	CICS Runtime directory used for the unrecoverable Temporary Storage

Listing 3-2 envfile Initial Settings Example

```
# <TUXDIR>
#       Refers to the location where you installed TUXEDO.  The default
#       location is "/usr/tuxedo".
#
```

```
# <APPDIR>
#       Refers to the fully qualified directory name where your application
#       runs (i.e., the location of the libraries, mapdefs, and MIB files).
#
# <TUXCONFIG>
#       Refers to the fully qualified binary version of the TUXEDO
#       configuration file.  (This is usually the "tuxconfig" in the $APPDIR
#       directory.)
#
# Copyright ï¿½1998, BEA Systems, Inc., all rights reserved.
#-------------------------------------------------------------------------
-
# TUXEDO environment
APPDIR=${KIXDIR}/bin
CONFDIR=${APPHOME}/config/tux
TUXCONFIG=${CONFDIR}/tuxconfig
FLDTBLDIR32=${KIXDIR}/src
FIELDTBLS32=msgflds32
OBJECT_MODE=64

#resource files directory
KIXCONFIG=${APPHOME}/config/resources

# Command executable paths
HAB_TRAN=none

# Other environment
LC_MESSAGES=C
```

```
# End
```

The Tuxedo ubbconfig File

Some CICS Runtime Tuxedo servers are absolutely needed while others can be optionally started but are not absolutely necessary at this time.

The Mandatory Servers

These servers must be started to run CICS Runtime and verify that the initial settings are correct by being able to display the CICS Runtime Good Morning screen (Host Connection Welcome Screen).

- The Terminal Control Program Listener (`ARTTCPL` server) is needed because it establishes communication between end-users and CICS Runtime applications thru maps displayed on 3270 terminals or emulators.
- The Connection Server (`ARTCNX` server) is also required because it offers technical connections services during the user connection and disconnection phases. It is also used to display the CICS system transactions CICS Runtime Good Morning screen thru the System Transaction CSGM.
- The Administration Server (`ARTADM` server) is needed to replicate resources files for all other servers.

The Optional Servers

These servers do not need to be launched because they are only used by CICS applications not yet installed.

To not start these servers, comment-out the corresponding line in your ubbconfig file before recompiling.

- The Synchronous Transaction Servers (`ARTSTRN` and `ARTSTR1`) that manage synchronous transaction CICS applications
- The Asynchronous Transaction Servers (`ARTATRN` and `ARTATR1`) that manage asynchronous transaction CICS applications.
- The Temporary Storage Server (`ARTTSQ` server) that manage TS QUEUES used in COBOL CICS programs.

- The Tuxedo /Q TMQUEUE and TMQFORWARD servers that are only used for delayed CICS Transactions

Listing 3-3 ubbconfig Initial Server Configuration Example

```
*SERVERS

ARTTCPL SRVGRP=TCP00

                SRVID=101

                CLOPT="-o /home2/work9/demo/Logs/TUX/sysout/stdout_tcp -e
/home2/work9/demo/Logs/TUX/sysout/stderr_tcp -- -M 4 -m 1 -L //deimos:2994
-n //deimos:2992"


ARTADM      SRVGRP=ADM00

            SRVID=3000

            SEQUENCE=1

            MIN=1 MAX=1

            CLOPT="-o /home2/work9/trf/Logs/TUX/sysout/stdout_adm -e
/home2/work9/trf/Logs/TUX/sysout/stderr_adm -r --"


ARTCNX     SRVGRP=GRP01

            SRVID=15

            CONV=Y

            MIN=1 MAX=1 RQADDR=QCNX015 REPLYQ=Y

            CLOPT="-o /home2/work9/demo/Logs/TUX/sysout/stdout_cnx -e
/home2/work9/demo/Logs/TUX/sysout/stderr_cnx -r --"
```

Where:

***SERVERS**
Is the Tuxedo ubbconfig keyword indicating server definitions.

For the ARTTCPL server:

SRVGRP
Is the Tuxedo Group Name to which ARTTCPL belongs.

SRVID
Is the identifier of a ARTTCPL Tuxedo Server.

CLOPT
Is a quoted text string passed to the server containing its parameters.

-o
Indicates the file is used for the standard output messages of the server.

-e
Indicates the file is used for the error output messages of the server.

-M 4
Indicates the maximum number of TCPL handler processes is 4.

-m 1
Indicates that the minimum number of TCPL handler processes is 1.

-L //deimos:2994
Indicates the internal URL address used by TCPL and TCPH for their own communication.

-n //deimos:2992
Indicates the URL address where the TN3270 terminals connect to TCPL.

For the ARTADM server:

SRVGRP
Is the Oracle Tuxedo group name to which ARTADM belongs.

SRVID
Is the identifier of a Tuxedo Server of ARTADM.

SEQUENCE=1
This line is mandatory. It indicates this server must be started first.

MIN=1 and MAX=1
Indicates that only one instance of this server must be run.

CLOPT

Is a quoted text string passed to the server containing its parameters.

-o

Indicates the file is used for standard output messages of the server.

-e

Indicates the file is used for error output messages of the server.

-r

Is a Tuxedo parameter used to produce statistical reports.

For the ARTCNX server:

SRVGRP

Is the Tuxedo Group Name to which ARTCNX belongs.

SRVID

Is the identifier of a Tuxedo Server of ARTCNX.

CONV=Y

Indicates that this server operates in a conversational mode.

MIN=1 and MAX=1

Indicates that only one instance of this server must be run.

REPLYQ=Y

Indicates that this server will respond.

RQADDR=QCNX015

Name of the Tuxedo queue used for the responses.

CLOPT

Is a quoted text string passed to the server containing its parameters.

-o

Indicates the file is used for the standard output messages of the server.

-e

Indicates the file is used for the error output messages of the server.

-r

Is a Tuxedo parameter used to produce statistical reports.

The Mandatory Server Groups

To be started, a Tuxedo Server must be defined in a Tuxedo Server Group previously defined in the ubbconfig file. As the ARTTCPL and ARTCNX servers are mandatory, verify that their groups are defined, present and not commented-out, in the ubbconfig file.

In our example, ARTTCPL belongs to the Tuxedo Server Group TCP00 (SRVGRP=TCP00) and ARTCNX belongs to the Server Group (SRVGRP=GRP01); therefore the ubbconfig file contains these two Server Group definitions in the following example:

Listing 3-4 Server Group Definitions

```
*GROUPS
DEFAULT:    LMID=KIXR
# Applicative groups
TCP00           LMID=KIXR
                GRPNO=1
                TMSCOUNT=2

ADM00           GRPNO=5
GRP01
   GRPNO=11
   ENVFILE="/home2/work9/demo/config/tux/envfile"
```

Where:

***GROUPS**
Tuxedo ubbconfig Keyword indicating definitions of Servers Groups.

LMID=
Name of the CICS.

GRPNO=
Tuxedo Group.

TMSCOUNT=
Number of Tuxedo Transaction Manager Servers.

ENVFILE
Path of the Tuxedo envfile.

The Optional Server Groups

These groups are used to contain the optional servers. The first group is used by the Tuxedo Server Servers Groups: `ARTSTRN`, `ARTSTR1`, `ARTATRN`, `ARTATR1`, `ARTTSQ` used by CICS Applications. The second one is used only for TS QUEUE management.

The CICS Runtime Resource Configuration Files

All of the following files must exist in the `${KIXCONFIG}` path, even when empty, for CICS Runtime to be operational.

The Mandatory Populated Files

1. The `typeterms.desc` Configuration File

   This file used by the TCP servers, describes the different kinds of terminals used with a 3270 terminal or emulator.

Listing 3-5 typeterm Description Example

```
[typeterm]
name=IBM-3279-5E
color=YES
defscreencolumn=80
defscreenrow=24
description="IBM 327x family terminal"
hilight=YES
logonmsg=YES
outline=NO
swastatus=ENABLED
```

```
uctran=NO

userarealen=0
```

Where

[typeterm]
Keyword to define a terminal type.

name=
Type of terminal.

color=YES
Indicates whether the terminal uses extended color attributes.

defscreencolumn= 80
Number of columns of the terminal.

defscreenrow=24
Number of rows of the terminal

description="…"
Comment about the terminal.

hilight=YES
Indicates that this terminal supports the highlight feature.

logonmsg=YES
Indicates that "Good Morning" (CSGM) transaction is automatically started on the terminal at logon time.

outline=NO
Indicates that this terminal does not support field outlining.

swastatus=ENABLED
Indicates that this terminal type is available for use by the system.

uctran=NO
Indicates that the lowercase alphabetic characters are not to be translated to uppercase

userarealen=0
The terminal control table user area (TCTUA) area size for the terminal.

2. The `mapsets.desc` Configuration File

This file must contain at least the following definition to start the CSGM transaction and see the `Good Morning` screen.

Listing 3-6 mapsets.desc Example

```
[mapset]
name=ABANNER
filename=<KIXDIR>/sysmap/abanner.mpdef
```

Where:

name=
Is the logical mapset name used inside the programs in the `EXEC CICS SEND/RECEIVE MAP`(map name) `MAPSET`(mapset name) … `END-EXEC` statements.

filename=
Is the physical path containing the binary file resulting from the compilation of a mapset file source coded in a CICS z/OS BMS format.

Note: For the particular case of the ABANNER system mapset, the filename is located under the `${KIXDIR}` directory. The bracketed text `<KIXDIR>` must be replaced by the value of the `${KIXDIR}` variable of your UNIX `~/.profile` system file.

In our example the result will be:

Listing 3-7 mapsets.desc Example with ${TUXDIR} Substitution

```
[mapset]
name=ABANNER
filename=/product/art11gR1/Cics_RT/sysmap/abanner.mpdef
```

The Optional Initially Populated Files

All the following files can be initially left empty:

1. The transclasses.desc Configuration File
2. The transactions.desc Configuration file
3. The programs.desc Configuration File
4. The tsqmodel.desc Configuration File
5. The mapsets.desc Configuration File

The contents and use of these files is described later.

Note: If these files are left empty, when Tuxedo launches the CICS Runtime servers, some error messages `"CMDTUX_CAT:1685: ERROR:` Application initialization failure" could be displayed after the boot message of the `ARTSTRN, ARTSTR1, ARTATRN` and `ARTATR1` servers indicating that the CICS Runtime considers this to be an anomaly.

The real number and type of servers displaying these messages depends on the servers initially launched by your `ubbconfig` file.

In this case, the servers concerned will not be mounted.

For the moment, ignore these error messages, they do not impact the Initial Setting.

Verifying the Initial Setting Configuration

Using the Tuxedo tmadmin psr Commands

Once all the files have been modified (and compiled for the ubbconfig), stop and restart Tuxedo to take their modifications into account.

The first control is to check that they are individually correctly accepted by Tuxedo and Oracle by a visual control of the boot messages of the Tuxedo CICS Runtime Tuxedo servers.

Once this first check is made, you can enter the Tuxedo `tmadmin psr` command to check that all the CICS Runtime servers are running and that their messages conform to the Tuxedo documentation and this document.

When the mandatory servers `ARTADM`, `ARTTCPL`, and `ARTCNX` *only* are started, the following messages are displayed:

Listing 3-8 tmadmin psr **Command Example**

```
# tmadmin
```

```
tmadmin - Copyright (c) 2007-2010 Oracle.
Portions * Copyright 1986-1997 RSA Data Security, Inc.
All Rights Reserved.
Distributed under license by Oracle.
Tuxedo is a registered trademark.

> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
---------      ----------  --------      -- ------ --------- ---------------
BBL             200933      KIXR           0      1        50 (  IDLE )
ARTTCPL 00001.00101 TCP00        101      0         0 (  IDLE )
ARTCNX         QCNX015     GRP01          15      3       150 (  IDLE )

> quit
#
```

Note: The BBL Server is a Tuxedo System Server which can be compared to a CICS server on z/OS.

Using the Tuxedo tmadmin psc Commands

You can also check that the required Tuxedo services are running using the `tmadmin psc` command.

These services should include the System Transactions managed by CICS Runtime:

- CSGM: The Good Morning Screen
- CESN: Sign On transaction
- CESF: Sign Off transaction

Listing 3-9 tmadmin psc **Command Example**

```
# tmadmin
tmadmin - Copyright (c) 2007-2010 Oracle.
Portions * Copyright 1986-1997 RSA Data Security, Inc.
All Rights Reserved.
Distributed under license by Oracle.
Tuxedo is a registered trademark.

> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
authfail     cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESF         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESN         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CSGM         cnxsvc       ARTCNX    GRP01     15       KIXR       2 AVAIL
disconnect   cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
connect      cnxsvc       ARTCNX    GRP01     15       KIXR       1 AVAIL

> quit
#
```

Note: From a certain point of view, this Tuxedo command is equivalent to the z/OS CICS system transaction `CEMT I TRAN(…)` which allows you to display the available transactions in a given z/OS CICS environment.

Using the CSGM CICS Good Morning Transaction

Once this first audit is made, you can access CICS Runtime with a 3270 Terminal or Emulator using the following URL address `${HOSTNAME}:${TCPNETADDR}`.

Where:

${HOSTNAME}

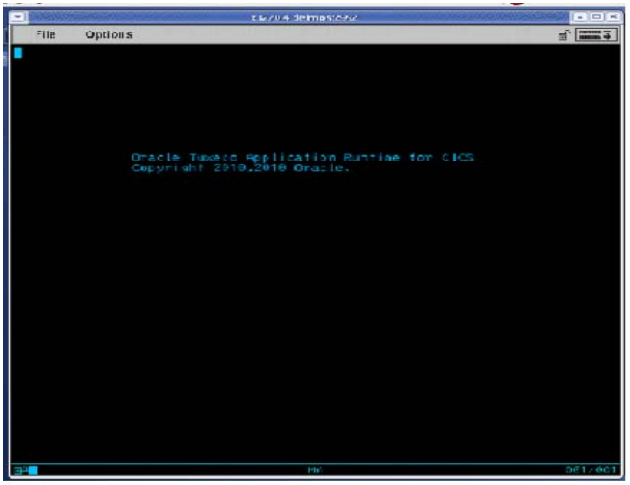
Is the System UNIX variable containing the name of the UNIX machine on which you are running CICS Runtime.

${TCPNETADDR}

Is the port number specified by the -n parameter of the ARTTCP server in the Oracle Tuxedo UBBCONFIG file.

The following screen is displayed on a UNIX X11 Window after running the command # x3270 deimos:2992:

Figure 3-1 Screen After Running the Command #3270 deimos:2992



Successfully displaying this screen signifies you can continue implementing CICS applications using CICS Runtime.

CHAPTER 4

Implementing CICS Applications

This chapter contains the following sections:

Presentation of the z/OS Simple Application

Introduction

This application was initially developed on a z/OS platform implementing COBOL programs used in batch and CICS contexts with VSAM and QSAM files and DB2 tables.

Data was unloaded from z/OS and converted and reloaded on a UNIX platform using Oracle Tuxedo Application Rehosting Workbench.

The language components were converted or translated from z/OS to UNIX by Oracle Tuxedo Application Rehosting Workbench.

These components use two major Oracle Tuxedo Application components, Batch Runtime and CICS Runtime, to emulate the technical centralized features of their original z/OS environment. Here, we will focus on the particular case of the CICS Runtime implementing COBOL Programs using CICS statements and DB2 statements.

This Simple Application manages the customers of a company thru a set of classical functions like creation, modification and deletion.

Description of the CICS Simple Application Components

All of the CICS components are declared with the same name, in the z/OS CICS CSD File. All of the resource declarations are made inside a z/OS CICS GROUP named `PJ01TERM`. This group is declared in the z/OS CICS LIST `PJ01LIST` used by CICS at start up to be automatically installed.

Mapsets

Table 4-1 Simple Application Mapsets

Name	Description
`RSSAM00`	Customer maintenance entry menu
`RSSAM01`	Customer data inquiry screen
`RSSAM02`	Customer data maintenance screen (create, update and delete customer)
`RSSAM03`	Customer list screen

Programs

Table 4-2 Simple Application Programs

Name	Description
RSSAT000	Customer maintenance entry program
RSSAT001	Customer data inquiry program
RSSAT002	Customer data maintenance program (new customer, update and delete customer)
RSSAT003	Customer list program

Transactions Codes

Table 4-3 Simple Application Transactions Codes

Name	Description
SA00	Main entry transaction code (program RSSAT000)
SA01	Customer inquiry (program RSSAT001)
SA02	Customer maintenance (program RSSAT002)
SA03	Customer list (program RSSAT003)

VSAM File

Table 4-4 Simple Application VSAM File

DDName	DataSetName	Description
ODCSF0	PJ01AAA.SS.VSAM.CUSTOMER	VSAM Main Customer File

Configuring a Standard CICS Application With CICS Runtime

The first example uses the CICS Simple File-to-Oracle application which uses only a z/OS VSAM File converted into a UNIX Oracle Table.

In our example, all of the UNIX components resulting from platform migration are stored in the `trf` directory.

The COBOL programs and BMS mapsets should be compiled and available as executable modules in the respective directories `${HOME}/trf/cobexe` and `${HOME}/trf/MAP_TCP`.

CICS Simple File-to-Oracle Application UNIX Components

COBOL Program Files

The `${HOME}/trf/cobexe` directory contains the Simple Application CICS executable programs:

- `${HOME}/trf/cobexe/RSSAT000.gnt`
- `${HOME}/trf/cobexe/RSSAT001.gnt`
- `${HOME}/trf/cobexe/RSSAT002.gnt`
- `${HOME}/trf/cobexe/RSSAT003.gnt`

The Mapset Files

The `${HOME}/trf/MAP_TCP` directory contains the Simple Application Data z/OS BMS mapsets compiled:

- `${HOME}/trf/MAP_TCP/RSSAM00.mpdef`
- `${HOME}/trf/MAP_TCP/RSSAM01.mpdef`
- `${HOME}/trf/MAP_TCP/RSSAM02.mpdef`
- `${HOME}/trf/MAP_TCP/RSSAM03.mpdef`

CICS Runtime Configuration

For a standard application, in addition to the initial settings, the following CICS resources in the same Group must be implemented:

- Basic CICS transactions (synchronous and simultaneous).
- COBOL Programs without SQL statements, CICS TS queues.
- Mapsets.
- VSAM file (logical name and associated data accessors).

To configure these resources:

1. Declare these resources in their respective CICS Runtime Resource Configuration File.
2. Configure the CICS Runtime Tuxedo Servers Groups and Servers to manage these resources. See Reference for a full description of which configuration files are used with each server.

Declaring CICS Resources to the CICS Runtime

Each resource is declared in the file corresponding to its type (program, transaction …). Each resource defined in a resource file must belong to a group.

In the following examples using the CICS Simple File-to- Oracle Application, we will use the CICS Runtime Group name `SIMPAPP` and all our `*.desc` files will be located in the `${home}/trf/config/resources` directory.

Note: In these configuration files, each line beginning with a "#" is considered as a comment and is not processed by CICS Runtime

Declaring CICS Transactions Codes

These declarations are made by filling the `transactions.desc` file for each transaction you have to implement.

For each transaction you have to declare in a csv format

1. The name of the transaction (mandatory).
2. The CICS Runtime Group name (mandatory).
3. A brief description of the transaction (optional, at least one blank).
4. The name of the program started by this transaction (mandatory).

In the File-to-Oracle Simple Application example, we have to declare four transactions: `SA00`, `SA01`, `SA02` and `SA03` in the `SIMPAPP` Group, starting the corresponding COBOL programs `RSSAT000`, `RSSAT001`, `RSSAT002` and `RSSAT003`.

Once filled, the transactions.desc file looks like this:

Listing 4-1 Simple Application transactions.desc File

```
#Transaction Name ;Group Name ; Description ;Program Name
SA00;SIMPAPP; Home Menu Screen of the Simple Application;RSSAT000
```

```
SA01;SIMPAPP; Customer Detailed Information Screen of the Simple
Application;RSSAT001

SA02;SIMPAPP; Customer Maintenance Screen of the Simple
Application;RSSAT002

SA03;SIMPAPP; Customer List of the Simple Application;RSSAT003
```

Declaring a CICS COBOL Program

All the programs used by the transactions previously declared, directly or indirectly through `EXEC CICS` statements like `LINK, XCTL, START` … must be declared in the same Group.

These declarations are made in the `programs.desc` file for each program to implement.

For each program you have to declare in a csv format:

1. The name of the program (mandatory)
2. The CICS Runtime Group name (mandatory)
3. A brief description of the program (optional, at least one blank)
4. The language in which the program is written COBOL (default)

In our Simple Application example, the only programs needed are `RSSAT000`, `RSSAT001`, `RSSAT002` and `RSSAT003` which are all coded in the COBOL language

Once filled, the programs.desc file looks like this:

Listing 4-2 Simple Application programs.desc File

```
#PROGRAM;GROUP;DESCRIPTION;LANGUAGE;

RSSAT000;SIMPAPP; Home Menu Program of the Simple Application ;COBOL

RSSAT001;SIMPAPP; Customer Detailed Information Program of the Simple
Application ;COBOL

RSSAT002;SIMPAPP; Customer Maintenance Program of the Simple Application

RSSAT003;SIMPAPP; Customer List of the Simple Application ;COBOL
```

Note: Nothing is declared in the language field of RSSAT002, meaning that the LANGUAGE of this program is COBOL by default.

Declaring CICS Mapsets

To converse with end-users thru 3270 terminals or emulators, declare to CICS Runtime all of the physical mapsets (`*.mpdef` file) used in the COBOL programs previously defined thru the specific `EXEC CICS` statements described above in this document.

These declarations are made by filling the `mapsets.desc` file for each mapset you have to implement.

The input format of each of your mapset definitions must respect the following format description:

1. On the first free physical line, type the [`mapset`] keyword.
2. On the next line, enter the keyword `name=` followed by the name of your mapsets.
3. On the next line, enter the keyword `filename=` followed by the physical path of your physical mapsets (`.mpdef` file).

In our Simple Application example, the mapsets used in our COBOL programs are `RSSAM00`, `RSSAM01`, `RSSAM02` and `RSSAM03`.

Once filled, the mapsets.desc file looks like this:

Listing 4-3 Simple Application mapsets.desc File

```
[mapset]

name=ABANNER

filename=<KIXDIR>/sysmap/abanner.mpdef [mapset]

name=RSSAM00

filename=<HOME>/demo/MAP_TCP/RSSAM00.mpdef

[mapset]

name=RSSAM01

filename=<HOME>/demo/MAP_TCP/RSSAM01.mpdef

[mapset]
```

```
name=RSSAM02

filename=<HOME>/demo/MAP_TCP/RSSAM02.mpdef

[mapset]

name=RSSAM03

filename=<HOME>/demo/MAP_TCP/RSSAM03.mpdef
```

Note: The `mapsets.desc` file does not accept UNIX variables, so a fully expanded path must be provided in this file.

- `<KIXDIR>`: must be replaced by the value of the `${KIXDIR}` variable of the `~/.profile`.
- `<HOME>`: must be replaced by the value of the `${HOME}` variable of the `~/.profile`.

Declaring ISAM Files Resulting From a z/OS VSAM File Conversion

Previously, before declaring one or more files to CICS Runtime, all the physical components, files, accessor programs, COBOL Copybooks etc. must have been generated by the Oracle Tuxedo Application Rehosting Workbench Data components.

Among all the components built or converted by the Oracle Tuxedo Application Rehosting Workbench Data components, only accessor programs on converted VSAM files are used by CICS Runtime. The reason is that, once migrated, no file can be directly accessed. The file can only be accessed indirectly through an accessor program dedicated to the management of this file (one and only one accessor program per source file).

The Simple Application uses only the CUSTOMER Oracle table, resulting from the Oracle Tuxedo Application Rehosting Workbench Data Conversion of the z/OS VSAM KSDS file `PJ01AAA.SS.VSAM.CUSTOMER`.

So, for our File-to-Oracle application example, we have only one accessor, `RM_ ODCSF0` (RM for Relational Module), to declare to CICS Runtime.

Note: `ODCSF0` represents the logical name previously defined in CICS that pointed to the physical file name `PJ01AAA.SS.VSAM.CUSTOMER`. Consequently, it is also the only file name known from the CICS COBOL program to access this file by `EXEC CICS` statements.

To Declare the ISAM Migrated Files:

1. Modify the Tuxedo envfile adding a new variable, if not already present, describing all the VSAM/ISAM files used in the programs previously defined.

   For our Simple Application example the following line must be entered, (for simplicity, we have located the file in the same place as the ubbconfig, envfile and tuxconfig files but this is not mandatory.

   ```
   DD_VSAMFILE=${HOME}/trf/config/tux/desc.vsam
   ```

2. If the file does not exist, physically create the `desc.vsam` file at the indicated location.

3. Modify the `desc.vsam` file by adding a new line describing the different information fields used by the accessor in a "csv" format for each accessor/file used.

For our Simple Application example, the following line is entered:

Listing 4-4 Simple Application ISAM File Declaration

```
#DDname;Accessor;DSNOrganization;Format;MaxRecordLength;KeyStart;KeyLength

ODCSF0;ASG_ ODCSF0;I;F;266;1;6
```

Where:

ODCSF0
Is the Data Description Name (logical name) used in the EXEC CICS Statements.

RM_ODCSF0
Is the name of the accessor program managing the access to the Oracle table resulting from the data conversion of the former VSAM File .

I
The Data Set Name organization is indexed

F
Fixed, all the records have the same fixed length format.

266
Maximum record length.

1

Key position in the file (1 means first column or first character).

6

Key length.

Modifying the CICS Runtime Tuxedo Servers

To manage CICS application transactions, in addition to the servers previously defined:

1. Implement the CICS Runtime Tuxedo Server `ARTSTRN`.

   This server manages only basic CICS Runtime transactions, those that are the most often used: synchronous (not delayed) and simultaneous (not only one at a time).

2. Indicate to CICS Runtime to start only the transactions belonging to the `SIMPAPP` CICS Runtime Group name.

The following example of a `*SERVERS` section of the Tuxedo `ubbconfig` file shows the configuration of a `ARTSTRN` server.

Listing 4-5 Simple Application CICS Runtime Server Tuxedo Configuration

```
*SERVERS

…

ARTSTRN    SRVGRP=GRP02

            SRVID=20

            CONV=Y

            MIN=1 MAX=1 RQADDR=QKIX110 REPLYQ=Y

            CLOPT="-o /home2/work9/demo/Logs/TUX/sysout/stdout_strn -e
/home2/work9/demo/Logs/TUX/sysout/stderr_strn -r -- -s KIXR -l SIMPAPP "

…
```

Where

***SERVERS**

Tuxedo ubbconfig Keyword indicating a Server Section definition.

SRVGRP
Is the Tuxedo Group Name to which ARTSTRN belongs.

SRVID
Is the identifier of a Tuxedo Server of ARTSTRN.

CONV=Y
Indicates that this server operates in a conversational mode.

MIN=1 and MAX=1
Indicates that only one instance of this server must be run.

REPLYQ=Y
Indicates that this server will respond.

RQADDR=QCNX015
Name of the Tuxedo queue used for the responses.

CLOPT
Is a quoted text string passed to the server containing its parameters.

-o
Indicates the file used for the standard output messages of the server.

-e
Indicates the file used for the error output messages of the server.

-r
Is a Tuxedo parameter used to provide statistical reports.

-s KIXR
Indicates the CICS Runtime name where the KIXR transaction is run.

-l SIMAPP
Indicates that only the transaction of the SIMAPP group are to be selected.

Modifying the CICS Runtime Tuxedo Servers Groups

To be started, the ARTSTRN server must be defined in a Tuxedo Server Group previously defined (and not commented) in the ubbconfig file.

In our example, ARTSTRN belong to the Tuxedo Server Group GRP02 (SRVGRP=GRP02).

Listing 4-6 Simple Application CICS Runtime Tuxedo Servers Groups Example:

```
*GROUPS

…

GRP02

    GRPNO=12

    ENVFILE="/home2/work9/demo/config/tux/envfile"

    TMSNAME="TMS_ORA"

…
```

Where

***GROUPS**
Tuxedo ubbconfig Keyword indicating a Server Section Group section definition.

GRPNO=
Tuxedo Group.

ENVFILE=
Path of the Tuxedo envfile.

TMSNAME=
Name of the Tuxedo Transaction Manager Server executable.

Verifying the CICS Application Installation

Using the Tuxedo tmadmin psr Commands

Enter the Tuxedo `tmadmin psr` command to check that all of the CICS Runtime required servers (`ARTTCPL`, `ARTCNX`, and `ARTSTRN`) are running and that their messages conform to the Tuxedo documentation and this document.

Listing 4-7 tmadmin psr Simple Application Installation Check

```
# tmadmin
```

```
tmadmin - Copyright (c) 2007-2010 Oracle.
Portions * Copyright 1986-1997 RSA Data Security, Inc.
All Rights Reserved.
Distributed under license by Oracle.
Tuxedo is a registered trademark.

> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
---------      ----------  --------      -- ------ --------- ---------------
BBL             200933      KIXR           0      2       100 (  IDLE )
ARTTCPL 00001.00101 TCP00        101      0         0 (  IDLE )
ARTCNX         QCNX015     GRP01          15      2       100 (  IDLE )
ARTSTRN        QKIX110     GRP02          20      6       300 (  IDLE )

> quit
#
```

Using the Tuxedo tmadmin psc Commands

Another possible check can be made by entering the Tuxedo `tmadmin psc` command to display all the different Tuxedo Services running.

In addition to the CICS Runtime System transactions/services (`CSGM`, `CESN`, `CESF` …), you can now see the transaction codes of your CICS Runtime application `SA00`, `SA01`, `SA02` and `SA03`

Listing 4-8 tmadmin psc Simple Application Installation Check

```
# tmadmin
tmadmin - Copyright (c) 2007-2010 Oracle.
Portions * Copyright 1986-1997 RSA Data Security, Inc.
```

```
All Rights Reserved.
Distributed under license by Oracle.
Tuxedo is a registered trademark.

> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
authfail     cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESF         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESN         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CSGM         cnxsvc       ARTCNX    GRP01     15       KIXR       1 AVAIL
disconnect   cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
connect      cnxsvc       ARTCNX    GRP01     15       KIXR       1 AVAIL
SA03         kixsvc       ARTSTRN   GRP02     20       KIXR       3 AVAIL
SA02         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA01         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA00         kixsvc       ARTSTRN   GRP02     20       KIXR       3 AVAIL

> quit
#
```

Using the CICS Runtime Application

Before using the CICS application, you have to populate the ISAM files accessed by your application.Then, access CICS Runtime with a 3270 Terminal or Emulator, with a UNIX x3270 command. It should be:

```
# x3270 ${HOSTNAME}:${TCPNETADDR}
```

Where:

${HOSTNAME}

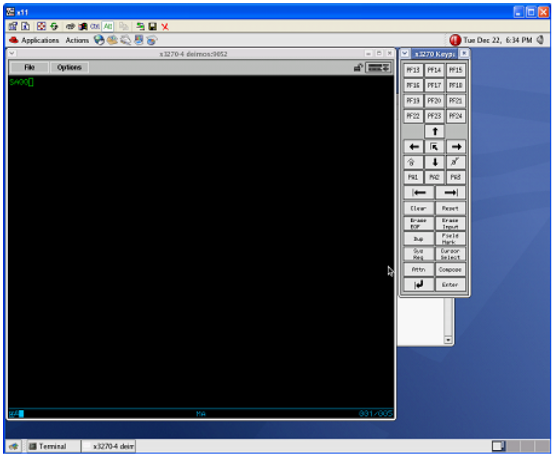
Is the System UNIX variable containing the name of the UNIX machine on which you are running CICS Runtime.

${TCPNETADDR}

Is the port number for your UNIX 3270 emulator set up by your Tuxedo Administrator at installation time in the ubbconfig file.

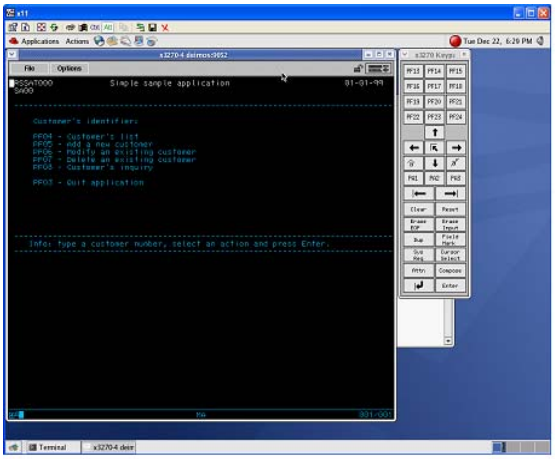
1. You will receive the Good Morning Message.
2. Clear it by pressing the `Clear` key of your 3270 emulator keypad.
3. Type the main transaction code `SA00` (of your CICS Runtime application) in the top left corner:

Figure 4-1 Simple Application transaction Code Entry



4. The main menu of the application is displayed:

Figure 4-2 Simple Application Main Menu



5. Navigate through the screens of the application to check that they are displayed without errors.

Presentation of Simple Application on COBOL-IT / BDB

Based on BDB with XA protocol, the CICS COBOL programs compiled by COBOL IT can access the indexed ISAM files which are converted from Mainframe VSAM files through the ART Workbench. The following sections describes the configurations should be done in ART CICS Runtime to enable this application.

Configuring ubbconfig File in CICS Runtime

Add the MRM parameter in the group entry of *GROUPS and *RMS section in Tuxedo `ubbconfig` file. See the following example:

Listing 4-9 Adding MRM Parameter in ubbconfig File Example

```
*GROUPS

GRP02

GRPNO=12

MRM=Y
```

```
*RMS

MRMG_RM1

SRVGRP=GRP02

RMID=15

TMSNAME="TMS_BDB"

OPENINFO="BERKELEY-DB:/home2/work10/data"
```

Where:

***GROUPS**
Tuxedo ubbconfig keyword indicating the definitions of Servers Groups.

GRPNO
Indicates the Tuxedo Group.

MRM= Y
Indicates that this server group can support multiple resource managers.

***RMS**
Tuxedo ubbconfig keyword indicating the definitions of resource managers.

MRMG_RM1
Indicates the logical name of RMS entry.

SRVGRP
Indicates the name of the group associated with this RM.

RMID
Indicates the unique ID number of this RM in the group. ID number must be between 1 and 31.

TMSNAME
Indicates the name of the transaction manager server associated with the group specified by `SRVGRP`.

OPENINFO
Indicates the resource manager dependent information needed when opening resource manager for the associated group.

Building BDB TMS Server

Add the following text in `$TUXDIR/udataobj/RM` to build the BDB TMS server:

```
# BDB

BDB_HOME=/opt/cobol-it-64-bdb

BERKELEY-DB:db_xa_switch:-L/opt/cobol-it-64-bdb/lib -ldb-5.2

Build  BDB TMS

buildtms -r -v BERKELEY-DB -o $APPDIR/TMS_BDB
```

Exporting Variables Before Booting Up ART Servers

Export the following variables explicitly before booting up the ART servers:

- `DD_VSAMFILE`

  ```
  export DD_RBDB02=${DATA}/MTWART.ES.SFI.RCIBDB02.BDB0122
  ```

  `RBDB02` is the logical file name.

- `COB_ENABLE_XA`

  ```
  export COB_ENABLE_XA=1
  ```

Implementing Synchronous CICS Transactions With a Limited Number of Parallel Instances

In some particular cases, the number of transactions bearing the same transaction code running simultaneously has to be limited, for performance constraints for example.

On z/OS, this limit cannot be defined in the transaction resource itself but is defined in a distinct resource named TRANCLASS (transaction class) that contains a specific `MAXACTIVE` parameter describing the maximum number of concurrent instances of the same transaction.

To link a transaction to a transaction class, to inherit its parameters, especially the `MAXACTIVE` parameter, the z/OS CICS transaction resource has a TRANCLASS field containing the name of the TRANCLASS resource.

This instance management is performed differently on UNIX with CICS Runtime. The maximum number of transactions running concurrently is defined by the number of servers offering the same transaction. This maximum number and the minimum number are indicated respectively in

the MAX and MIN parameters of the ARTSTRN definition in the *SERVERS section of the Tuxedo file ubbconfig.

It means that the maxactive parameter is not taken in account to manage these limits except in the following very particular case:

The Special Case of Transaction Classes With MAXACTIVE=1

The MAXACTIVE=1 is really an exception in this management because it indicates that no concurrent transaction belonging to these kind of transaction classes can be run simultaneously.

To manage this very particular case of sequential transactions, a Tuxedo CICS Runtime feature must be configured

Modification of the ubbconfig File for Sequential Transactions

All of the transactions linked to transactions classes with a MAXACTIVE superior or equal to 2 are managed by the CICS Runtime Tuxedo Server ARTSTRN and do not required modifying anything else. For the transactions with a MAXACTIVE parameter set to 1, an CICS Runtime Tuxedo Server named ARTSTR1 is dedicated to their specific management.

To activate this server, modify the ubbconfig file to add this server in the *SERVERS section:

Listing 4-10 Adding a ARTSTR1 Server to ubbconfig

```
*SERVERS

…

ARTSTR1     SRVGRP=GRP02

             SRVID=200

             CONV=Y

             MIN=1 MAX=1

             CLOPT="-o /home2/work9/demo/Logs/TUX/sysout/stdout_str1 -e
/home2/work9/demo/Logs/TUX/sysout/stderr_str1 -r -- -s KIXR -l SIMPAPP"

…
```

Where:

***SERVERS**
Tuxedo ubbconfig Keyword indicating a Server Section definition.

SRVGRP
Is the Tuxedo Group Name to which ARTSTR1 belongs.

SRVID
Is the identifier of a ARTSTR1 Tuxedo Server.

CONV=Y
Indicates that this server operates in a conversational mode.

MIN=1 and MAX=1
Are mandatory and indicate that only one instance of this server must run.

CLOPT
Is a quoted text string passed to the server containing the parameters:

-o
Indicates the file used for the standard output messages of the server.

-e
Indicates the file used for the error output messages of the server.

-r
Is a Tuxedo parameter used to produce statistical reports.

-s
KIXR indicates the CICS Runtime name where the KIXR transaction is run.

-l SIMAPP
Indicates that only the transaction of the SIMAPP group are to be selected.

Note: All of the CICS Runtime Transaction Servers (`ARTSTRN, ARTSTR1, ARTATRN` and `ARTATR1`) share the same CICS Runtime Transaction Group Servers, no modifications are required to the ubbconfig Server Group Section (*GROUPS).

Modifying the tranclasses.desc File

For ART CICS, concurrent transactions do not really need to be bound to transactions classes with `MAXACTIVE` parameters superior or equal to two because parallelism is the default behavior.

For sequential transactions, it is mandatory because it is the only way to declare these transactions to CICS Runtime. Declare specific transaction classes defined with a `MAXACTIVE=1` parameter.

Like the other CICS Runtime resources, this one must belong to an CICS Runtime Group name. For each TRANCLASS, declare in a csv format:

1. The name of the transaction class (mandatory)
2. The CICS Runtime Group name (mandatory)
3. A brief description of the transaction class (optional, at least one blank)
4. The maximum number of the same transaction to RUN (MAXACTIVE).

Note: The MAXACTIVE parameter should be understood like a binary switch:

- MAXACTIVE=1 <=> Sequential transaction class (mandatory).
- MAXACTIVE>1 (all the values are at this step equivalent) <=> Concurrent transaction (optional).

Examples:

```
TRCLASS1;SIMPAPP  ; Tranclass with maxactive set to 1; 1

TRCLASS2;SIMPAPP  ; Tranclass with maxactive set to 2; 2

TRCLAS10;SIMPAPP  ; Tranclass with maxactive set to 10; 10
```

The first transclass `TRCLASS1` has is maxactive parameter equal to 1, indicating that all the transaction belonging to this transclass must be managed sequentially by the `ARTSTR1`.

The two last tranclasses, `TRCLASS2` and `TRCLASS10`, are in fact similar because their maxactive parameters are superior to 1 indicating that the transactions belonging to these tranclasses can run concurrently managed by the `ARTSTRN` server.

Note: These two last definitions are optional. Their absence has the same meaning.

Modifying the transactions.desc File

In addition to the first four mandatory fields of this csv format file (Transaction name, Group name, Description, Program name), you must add a twelfth field: TRANCLASS (Transaction Class name).

The TRANCLASS field must be separated from the Program field by eight semicolon characters (';') with at least one blank between each of them.

In our example, let us suppose that the CICS Runtime Simple Application must have the following MAXACTIVE limits:

- SA00: MAXACTIVE=0

- SA01: MAXACTIVE=1
- SA02: MAXACTIVE=2
- SA03: MAXACTIVE=10

Then these transactions must be linked to the following tranclasses that we have previously defined:

- SA00: none
- SA01: TRCLASS1
- SA02: TRCLASS2
- SA03: TRCLAS10

Once modified, the `transactions.desc` file will look like this:

Listing 4-11 Example transactions.desc File

```
#Transaction Name ;Group Name ; Description ;Program Name

SA00;SIMPAPP; Home Menu Screen of the Simple Application;RSSAT000

SA01;SIMPAPP; Customer Detailed Information Screen of the Simple ;
Application;RSSAT001; ; ; ; ; ; ; ;TRCLASS1

SA02;SIMPAPP; Customer Maintenance Screen of the Simple
Application;RSSAT002; ; ; ; ; ; ; TRCLASS2

SA03;SIMPAPP; Customer List of the Simple Application;RSSAT003; ; ; ; ; ; ;
; TRCLASS10
```

Notes:

- No modification is made to `SA00` meaning that no transaction class is associated with this transaction code. It means that this transaction is not associated with a MAXACTIVE=1 parameter and so is not sequential.
- `SA02` and `SA03` are associated to transaction classes, respectively TRCLASS2 and TRCLASS10, defined with MAXACTIVE >= 2. Knowing that these transactions are not required, the result would be the exactly the same if `SA02` and `SA03` were defined like SA00 without transaction classes.

- SA01, which can run sequentially, is the only one where the transaction class field is mandatory. Verify that its associated transaction class, TRCLASS1, is really defined with a MAXACTIVE=1.

Checking the ARTSTR1 Configuration

Using the Tuxedo tmadmin psr Commands

The ARTSTR1, is shown below:

Listing 4-12 Checking the ARTSTR1 Server with the tmadmin psr Commands

```
# tmadmin
tmadmin - Copyright (c) 2007-2010 Oracle.
Portions * Copyright 1986-1997 RSA Data Security, Inc.
All Rights Reserved.
Distributed under license by Oracle.
Tuxedo is a registered trademark.

> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
---------      ----------  --------      -- ------ --------- ---------------
ARTSTR1        00012.00200 GRP02        200      0         0 (  IDLE )
BBL             200933      KIXR           0      3       150 (  IDLE )
ARTTCPL 00001.00101 TCP00        101      0         0 (  IDLE )
ARTCNX         QCNX015     GRP01         15      0         0 (  IDLE )
ARTSTRN        QKIX110     GRP02         20      0         0 (  IDLE )

> quit
#
```

Using the Tuxedo tmadmin psc Commands

No new service or transaction should appear.

In our example where ARTSTRN was the only server running, we can see that nothing changed when ARTSTR1 is also activated.

Listing 4-13 Checking the ARTSTRN Server with the tmadmin psc Commands

```
# tmadmin
tmadmin - Copyright (c) 2007-2010 Oracle.
Portions * Copyright 1986-1997 RSA Data Security, Inc.
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> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
authfail     cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESF         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESN         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CSGM         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
disconnect   cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
connect      cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
SA03         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA02         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA01         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA00         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
```

```
> quit
#
```

Implementing Asynchronous CICS Non-Delayed Transactions

These transactions are launched by specifics `CICS EXEC CICS START TRANSID` requests coded in the CICS programs that are not using `DELAY` or `TIME` parameters to delay their execution.

If at least one of your programs contains this kind of statement, install, and activate some new features of CICS Runtime Tuxedo Severs without changing any other settings.

Modifying the Tuxedo ubbconfig File to Manage Asynchronous Transactions

The file is modified in the same manner as for the `ARTSTRN` and the `ARTSTR1` servers, except the "s" (synchronous) character used to prefix the name of these servers should be replaced by the "a" (asynchronous) character.

Using Parallel Asynchronous Transactions

To use parallel asynchronous transactions, with a `MAXACTIVE` parameter strictly superior to one, the dedicated server is the `ARTATRN`. Please refer to the section describing the installation of the `ARTSTRN` server to install the `atrn_server`.

To check your settings you can use also the tmadmin psr and psc commands.

For the Simple Application example we can see that:

- The psr command shows that a new server is running `ARTATRN`.
- The psc command shows that five new services are running, one is dedicated to the asynchronous transaction while each synchronous transaction (`SA00` to `SA03`) is duplicated (`ASYNC_SA00` to `ASYNC_SA03`) to allow them to run in an asynchronous mode.

Listing 4-14 tmadmin Commands Showing Parallel Asynchronous Transactions

```
# tmadmin
```

```
tmadmin - Copyright (c) 2007-2010 Oracle.
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Tuxedo is a registered trademark.

> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
---------      ----------  --------      -- ------ --------- --------------
ARTSTR1        00012.00200 GRP02        200      0         0 (  IDLE )
BBL            200933      KIXR           0      4       200 (  IDLE )
ARTTCPL        00001.00101 TCP00        101      0         0 (  IDLE )
ARTCNX         QCNX015     GRP01         15      0         0 (  IDLE )
ARTSTRN        QKIX110     GRP02         20      0         0 (  IDLE )
ARTATRN        QKIXATR     GRP02         30      0         0 (  IDLE )

> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
authfail     cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESF         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESN         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CSGM         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
disconnect   cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
connect      cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
SA03         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA02         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
```

```
SA01          kixsvc       ARTSTRN   GRP02     20        KIXR        0 AVAIL
SA00          kixsvc       ARTSTRN   GRP02     20        KIXR        0 AVAIL
ASYNC_QUEUE   ASYNC_QUEUE  ARTATRN   GRP02     30        KIXR        0 AVAIL
ASYNC_SA03    atrsvc       ARTATRN   GRP02     30        KIXR        0 AVAIL
ASYNC_SA02    atrsvc       ARTATRN   GRP02     30        KIXR        0 AVAIL
ASYNC_SA01    atrsvc       ARTATRN   GRP02     30        KIXR        0 AVAIL
ASYNC_SA00    atrsvc       ARTATRN   GRP02     30        KIXR        0 AVAIL

> quit
{deimos:work9}-/home2/work9/demo/config/tux#{deimos:work9}-/home2/work9/de
mo/config/tux#
```

Using Non-Parallel Asynchronous Transactions

To use non-parallel asynchronous transactions, with a `MAXACTIVE` parameter exactly equal to one, the dedicated server is `ARTATR1`.

Please refer to the section describing the reasons and the installation of the `ARTSTR1` server to install the `ARTSTR1` server.

To check your setting, you can use also the Tuxedo tmadmin psr and psc commands

For the Simple Application example we can see that:

- The psr command shows that a new server is running `ARTATR1`.
- The psc command shows that no new services are running.

Listing 4-15 tmadmin Commands Showing non-parallel Asynchronous Transactions

```
# tmadmin
tmadmin - Copyright (c) 2007-2010 Oracle.
Portions * Copyright 1986-1997 RSA Data Security, Inc.
All Rights Reserved.
```

```
Distributed under license by Oracle.
Tuxedo is a registered trademark.

> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
---------      ----------  --------      -- ------ --------- --------------
ARTATR1        00012.00300 GRP02        300      0         0 (  IDLE )
ARTSTR1        00012.00200 GRP02        200      0         0 (  IDLE )
BBL             200933      KIXR           0      4       200 (  IDLE )
ARTTCPL 00001.00101 TCP00        101      0         0 (  IDLE )
ARTCNX         QCNX015     GRP01          15      0         0 (  IDLE )
ARTSTRN        QKIX110     GRP02          20      0         0 (  IDLE )

> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
authfail     cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESF         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESN         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CSGM         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
disconnect   cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
connect      cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
SA03         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA02         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA01         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA00         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
```

```
> quit
#
```

Implementing Asynchronous CICS Delayed Transactions

These transactions are launched when `ASYNC_QSPACE for EXEC START` is set with option `INTERVAL` or `PROTECT`.

If at least one of your programs contains this kind of statement, you need to install and activate some new features of the CICS Runtime Tuxedo Severs without making any other changes to your other settings.

These new features are:

1. The creation of a Tuxedo /Q Queue Space named `ASYNC_QSPACE`.
2. The creation of a Tuxedo /Q Queue named `ASYNC_QUEUE` in `ASYNC_QSPACE`.
3. The activation of the `TMQUEUE` and `TMQFORWARD` servers dedicated to these asynchronous transactions.

Creating the Tuxedo /Q Features

CICS Runtime provides a UNIX script that creates all the Tuxedo /Q components: `mkqmconfig.sh`.

1. Before using the script, define and export in your UNIX `~./.profile` file:

   - The `QMCONFIG` variable `QMCONFIG`- containing the full directory path that stores the Tuxedo /Q Queue Space `ASYNC_QSPACE`.
   - The `KIX_QSPACE_IPCKEY` variable - containing the IPC Key for the Queue Space.

     Examples of ~/.profile variables and values:

     ```
     export QMCONFIG=${HOME}/trf/config/tux/kixqspace
     export KIX_QSPACE_IPCKEY=200955
     ```

2. Execute `mkqmconfig.sh` from the command line to create the Tuxedo /Q features.

Modifying the Tuxedo ubbconfig File to Manage the Tuxedo /Q Queue

1. The GQUEUE Server Group must be added to the ubbconfig file in the *GROUP section.

Listing 4-16 Simple Application Tuxedo Queue ubbconfig Example

```
*GROUPS

…

# /Q

GQUEUE       GRPNO=1000

             TMSNAME=TMS_QM TMSCOUNT=2


OPENINFO="TUXEDO/QM:/home2/work9/demo/config/tux/kixqspace:ASYNC_QSPACE"

…
```

Where:

***GROUPS**
Tuxedo ubbconfig Keyword indicating definitions of Servers Groups.

GRPNO=
Tuxedo Group.

TMSCOUNT=
Number of Tuxedo Transaction Manager Servers.

TMSNAME
Name of the Tuxedo Transaction Manager Server executable.

OPENINFO=
Indicates to the Tuxedo /Q Transaction Manager QM, the QSPACE name to manage and its UNIX absolute path.

2. Then, two servers, TMQUEUE and TMQFORWARD, must be added to the ubbconfig file in the *SERVERS section.

Listing 4-17 Simple Application ubbconfig `TMQUEUE` and `TMQFORWARD` Example

```
*SERVERS
…
# /Q
TMQUEUE      SRVGRP=GQUEUE
             SRVID=1010
             GRACE=0 RESTART=Y CONV=N MAXGEN=10
             CLOPT="-s ASYNC_QSPACE:TMQUEUE -- "
TMQFORWARD
             SRVGRP=GQUEUE
             SRVID=1020
             GRACE=0 RESTART=Y CONV=N MAXGEN=10
             CLOPT="-- -n -i 2 -q ASYNC_QUEUE"
…
```

Where:

***SERVERS**
Tuxedo ubbconfig Keyword indicating a Server Section definition.

SRVGRP
Is the Tuxedo Group Name which the server belongs to.

SRVID
Is the identifier of a Tuxedo Server.

MAXGEN=10
Specifies that the process can have up to 10 server restarts.

GRACE=0
Means there is no limit interval to contain the number of server restarts.

CONV=N

Indicates that this server operates in a non-conversational mode.

CLOPT

Is a quoted text string passed to the server containing its parameters.

Using the `tmadmin psr` and `psc` commands check that four new servers and two new services are running:

Listing 4-18 Simple Application `TMQUEUE` and `TMQFORWARD` tmadmin Example

```
# tmadmin
tmadmin - Copyright (c) 2007-2010 Oracle.
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Tuxedo is a registered trademark.

> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
---------      ----------  --------      -- ------ --------- --------------
ARTATR1        00012.00300 GRP02        300      0         0 (  IDLE )
ARTSTR1        00012.00200 GRP02        200      0         0 (  IDLE )
BBL            200933      KIXR           0      4       200 (  IDLE )
ARTTCPL        00001.00101 TCP00        101      0         0 (  IDLE )
ARTCNX         QCNX015     GRP01         15      0         0 (  IDLE )
TMS_QM         GQUEUE_TMS  GQUEUE     30001      0         0 (  IDLE )
TMS_QM         GQUEUE_TMS  GQUEUE     30002      0         0 (  IDLE )
TMQUEUE        01000.01010 GQUEUE      1010      0         0 (  IDLE )
TMQFORWARD     01000.01020 GQUEUE      1020      0         0 (  IDLE )
ARTSTRN        QKIX110     GRP02         20      0         0 (  IDLE )
```

```
ARTATRN       QKIXATR     GRP02          30      0          0 (  IDLE )

> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
TMS          TMS          TMS_QM     GQUEUE 30001       KIXR       0 AVAIL
TMS          TMS          TMS_QM     GQUEUE 30002       KIXR       0 AVAIL
ASYNC_QSPACE TMQUEUE      TMQUEUE    GQUEUE  1010       KIXR       0 AVAIL
authfail     cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESF         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESN         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CSGM         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
disconnect   cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
connect      cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
SA03         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA02         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA01         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA00         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
ASYNC_QUEUE  ASYNC_QUEUE  ARTATRN   GRP02     30       KIXR       0 AVAIL
ASYNC_SA03   atrsvc       ARTATRN   GRP02     30       KIXR       0 AVAIL
ASYNC_SA02   atrsvc       ARTATRN   GRP02     30       KIXR       0 AVAIL
ASYNC_SA01   atrsvc       ARTATRN   GRP02     30       KIXR       0 AVAIL
ASYNC_SA00   atrsvc       ARTATRN   GRP02     30       KIXR       0 AVAIL

> quit
#
```

Implementing CICS Application Using Temporary Storage (TS) Queues

These transactions use CICS programs containing `EXEC CICS` requests relative to CICS Temporary Storage Queues.

The statements used are `EXEC CICS WRITEQ TS … END-EXEC`, `EXEC CICS READQ TS … END-EXEC`, `EXEC CICS DELETEQ TS … END-EXEC`.

If at least one of your programs contains one of these statements, install and activate the new features of CICS Runtime without changing your other settings.

To manage TS Queues, activate the `ARTTSQ` CICS Runtime Tuxedo Server.

- To activate this server, add this server to the `*SERVERS` section of the Tuxedo ubbconfig file:

Listing 4-19 Activating the ARTTSQ in the ubbconfig File

```
*SERVERS

…

ARTTSQ      SRVGRP=GRP02

             SRVID=40

             MIN=1 MAX=1

             CLOPT="-o /home2/work9/demo/Logs/TUX/sysout/stdout_tsq -e
/home2/work9/demo/Logs/TUX/sysout/stderr_tsq -r -- -s KIXR -l SIMPAPP"

…
```

Where:

***SERVERS**
Tuxedo ubbconfig Keyword indicating a Server Section definition.

SRVGRP
Is the Tuxedo Group Name to which `ARTTSQ` belongs.

SRVID

Is the identifier of a Tuxedo Server of `ARTTSQ`.

MIN=1 and MAX=1

Indicates that only one instance of this server must be run.

CLOPT

Is a quoted text string passed to the server containing its parameters:

-o

Indicates the following file is used for the standard output messages of the server.

-e

Indicates the following file is used for the error output messages of the servers.

-r

Is a Tuxedo parameter used to have statistical reports.

-s KIXR

Indicates the CICS Runtime name where the transaction runs is KIXR.

-l SIMAPP

Indicates that only the components of the SIMAPP group are to be selected at start up.

Use the Tuxedo `tmadmin psr` and `psc` commands to check that the server is running and that six new services are published:

Listing 4-20 Checking ARTTSQ Server and Services are Running

```
# tmadmin
tmadmin - Copyright (c) 2007-2010 Oracle.
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> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
```

```
---------      ----------  --------      -- ------ --------- --------------
ARTATR1        00012.00300 GRP02        300      0         0 (  IDLE )
ARTSTR1        00012.00200 GRP02        200      0         0 (  IDLE )
BBL            200933      KIXR           0      3       150 (  IDLE )
ARTTCPL        00001.00101 TCP00        101      0         0 (  IDLE )
ARTCNX         QCNX015     GRP01         15      0         0 (  IDLE )
ARTSTRN        QKIX110     GRP02         20      0         0 (  IDLE )
ARTTSQ         00012.00040 GRP02         40      0         0 (  IDLE )

> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
authfail     cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESF         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESN         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CSGM         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
disconnect   cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
connect      cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
SA03         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA02         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA01         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA00         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
TSM00004_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00003_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00002_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00001_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00000_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
```

```
TSQUEUE      tsqsvc       ARTTSQ    GRP02     40        KIXR        0 AVAIL

> quit
{deimos:work9}-/home2/work9/demo/config/tux#
```

Implementing Unrecoverable TS Queues

For unrecoverable TS Queues, no integrity is guaranteed by CICS Runtime concerning their content. For example, if an abend occurs at any point during a CICS transaction, work done on this TS is not rolled-back to the last consistency point.

TS Queues are stored in a sequential file in a dedicated directory defined in the `KIX_TS_DIR` UNIX environment variable. This variable is defined and then exported from the `~/.profile` UNIX System File:

```
KIX_TS_DIR=${HOME}/trf/KIXTSDIR
```

Modify the Tuxedo ubbconfig file to activate the new `ARTTSQ` server dedicated to their management.

Implementing Recoverable TS Queues

For these TS Queues, CICS Runtime guarantees the integrity of their content. For example, if an abend occurs at any point during a CICS transaction, they are rolled-back to the last consistency point, if all is in order, their content is committed to become a new consistency point. These TS Queues are stored in Oracle Tables to benefit from the RDBMS integrity management.

Concerning the TS Queue, there is an enhanced behavior for reading a recoverable TS Queue.

On source CICS z/OS, CICS enqueuing is not invoked for READQ TS commands, thereby making it possible for one task to read a temporary storage queue record while another is updating the same record. To avoid this, use explicit enqueuing on the temporary storage queues so that concurrent executing tasks can read and change queues with the same temporary storage identifier.

This behavior also allows one transaction to see or read a record freshly written in a recoverable TS Queue, even before it is committed, and after its rollback.

On target we don't have this limitation, but in particular:

- A reading transaction is not able to see a record that is just added and not yet committed.
- A reading transaction is not able to see a modification to the record that is not yet committed.

To Use Recoverable TS Queues

To use recoverable TS Queues you need to define an Oracle Table to contain the TS Queues. CICS Runtime provides a UNIX script to create all these tables: `crtstable_Oracle`.

1. Before using the script define and export from your UNIX `~./.profile` file
   - The `ORA_USER` variable containing the user ID used to connect to Oracle.
   - The `ORA_PASSWD` variable containing the associated password.

     Examples of ~/.profile variables and values:

     ```
     export ORA_USER="Oracle_User_1"
     export ORA_PASSWD="Oracle_Pswd_1"
     ```
2. Once the variables have been set, execute the `crtstable_Oracle` script.
3. Then, modify the Tuxedo ubbconfig file to modify the Server Group used by ARTTSQ to establish the connection to Oracle in the `*GROUPS` section.

Listing 4-21 Example of the *GROUP Section of the Tuxedo ubbconfig File Concerning the Derver Group GRP02 used by the ARTTSQ Server.

```
*GROUPS
…
GRP02
   GRPNO=12
   ENVFILE="/home2/work9/demo/config/tux/envfile"
   TMSNAME="TMS_ORA"
OPENINFO="Oracle_XA:Oracle_XA+Acc=P/work9/work9+SesTm=600+LogDir=/home2/wo
rk9/demo/Logs/TUX/xa+DbgFl=0x20"
…
```

Where:

***GROUPS**
Tuxedo ubbconfig Keyword indicating definitions of Servers Groups.

GRPNO=
Tuxedo Group number.

TMSNAME=
Name of the Tuxedo Transaction Manager Server executable.

OPENINFO=
Parameters send to the `Oracle_XA Manager`.

4. Use the Tuxedo psr and psc commands to check that Oracle is available; three new servers and three new services should be indicated:

Listing 4-22 Simple Application Check For Recoverable TS Queues

```
# tmadmin
tmadmin - Copyright (c) 2007-2010 Oracle.
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> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
---------      ----------  --------      -- ------ --------- --------------
ARTATR1        00012.00300 GRP02        300      0         0 (  IDLE )
ARTSTR1        00012.00200 GRP02        200      0         0 (  IDLE )
BBL            200933      KIXR           0      4       200 (  IDLE )
ARTTCPL        00001.00101 TCP00        101      0         0 (  IDLE )
TMS_ORA        GRP02_TMS   GRP02      30001      0         0 (  IDLE )
```

```
TMS_ORA       GRP02_TMS   GRP02      30002      0         0 (  IDLE )
TMS_ORA       GRP02_TMS   GRP02      30003      0         0 (  IDLE )
ARTCNX        QCNX015     GRP01         15      0         0 (  IDLE )
ARTSTRN       QKIX110     GRP02         20      0         0 (  IDLE )
ARTTSQ        00012.00040 GRP02         40      0         0 (  IDLE )

> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
TMS          TMS          TMS_ORA    GRP02  30001       KIXR       0 AVAIL
TMS          TMS          TMS_ORA    GRP02  30002       KIXR       0 AVAIL
TMS          TMS          TMS_ORA    GRP02  30003       KIXR       0 AVAIL
authfail     cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESF         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESN         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CSGM         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
disconnect   cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
connect      cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
SA03         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA02         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA01         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA00         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
TSM00004_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00003_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00002_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00001_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00000_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
```

```
TSQUEUE      tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL

> quit
#
```

Managing TD Queue Intrapartititions

Presentation of the Mechanism on Source Platform

Transient Data Control

The CICS transient data control facility provides a generalized queuing facility. Data can be queued (stored) for subsequent internal or external processing. Selected data, specified in the application program can be routed to or from predefined symbolic transient data queues: either intrapartition or extrapartition.

Transient data queues are intrapartition if they are associated with a facility allocated to the CICS region and extrapartition if the data is directed to a destination that is external to the CICS region. Transient data queues must be defined and installed before the first reference by an application program.

You can:

- Write data to a transient data queue (`WRITEQ TD` command).
- Read data from a transient data queue (`READQ TD` command).
- Delete an intrapartition transient data queue (`DELETEQ TD` command).

Note: In this document we concentrate exclusively on intrapartition TD queues.

Intrapartition Transient Data Queues

Intrapartition refers to data on direct-access storage devices for use with one or more programs running as separate tasks. Data directed to or from these internal queues is referred to as intrapartition data; it must consist of variable-length records.

When data is written to the queue by a user task, the queue can be used subsequently as input data by other tasks within the CICS region. All access is sequential, governed by read and write

pointers. Once a record has been read, it cannot be read subsequently by another task. Intrapartition data may ultimately be transmitted upon request to the terminal or retrieved sequentially from the output dataset.

Typical uses of intrapartition data include:

- Message switching.
- Broadcasting.
- Database access.
- Routing of output to several terminals (for example, for order distribution).
- Queuing of data (for example, for assignment of order numbers or priority by arrival).
- Data collection (for example, for batched input from 2780 Data Transmission Terminals)

There are three types of intrapartition transient data queues:

Non-recoverable
: Non-recoverable intrapartition transient data queues are recovered only on a warm start of CICS. If a unit of work (UOW) updates a non-recoverable intrapartition queue and subsequently backs out the updates, the updates made to the queue are not backed out.

Physically recoverable
: Physically recoverable intrapartition transient data queues are recovered on warm and emergency restarts. If a UOW updates a physically recoverable intrapartition queue and subsequently backs out the updates, the updates made to the queue are not backed out.

Logically recoverable
: Logically recoverable intrapartition transient data queues are recovered on warm and emergency restarts. If a UOW updates a logically recoverable intrapartition queue and subsequently backs out the changes it has made, the changes made to the queue are also backed out. On a warm or an emergency restart, the committed state of a logically recoverable intrapartition queue is recovered. In-flight UOWs are ignored.

Automatic Transaction Initiation (ATI)

For intrapartition queues, CICS provides the option of automatic transaction initiation (ATI).

A basis for ATI is established by the system programmer by specifying a non-zero trigger level for a particular intrapartition destination. When the number of entries (created by WRITEQ TD commands issued by one or more programs) in the queue reaches the specified trigger level, a transaction specified in the definition of the queue is automatically initiated. Control is passed to

a program that processes the data in the queue; the program must issue repetitive READQ TD commands to deplete the queue.

When the queue has been emptied, a new ATI cycle begins. That is, a new task is scheduled for initiation when the specified trigger level is again reached, whether or not execution of the earlier task has ended. The exact point at which a new ATI cycle begins depends on whether or not the queue is defined as logically recoverable. If the queue is defined with a RECOVSTATUS of No or Physical, the new ATI cycle begins when the queue is read to QZERO. But if the queue is defined with a recoverability attribute of Logical, the new ATI cycle begins only after the task terminates after having read the queue to QZERO.

If an automatically initiated task does not empty the queue, access to the queue is not inhibited. The task may be normally or abnormally ended before the queue is emptied (that is, before a QZERO condition occurs in response to a `READQ TD` command). If the contents of the queue are to be sent to a terminal, and the previous task completed normally, the fact that QZERO has not been reached means that trigger processing has not been reset and the same task is reinitiated. A subsequent WRITEQ TD command does not trigger a new task if trigger processing has not been reset.

Presentation of the Mechanism on Target Platform

Tuxedo /Q

Tuxedo /Q offers a robust and versatile queuing system with the same capabilities as TD queues and more.

Queues can be defined as recoverable or not, and triggering with a few different options is also available. The management of errors is much more sophisticated, and will simplify error management in case of ATI transaction failures on target.

Architecture Design

Table 4-5 Source to Target Mapping

Source Element	Target Correspondence
TD Queue intrapartition	Tuxedo /Q Queue.
Associated transaction (TRANID)	Associated transaction offered by an ATR server.

Table 4-5 Source to Target Mapping

Source Element	Target Correspondence
Trigger level	Trigger level.
Recoverability: No|Physical|Logical	Similar levels available as on target, but with different configuration principles.

The CICS verbs READQ TD, WRITEQ TD and DELETEQ TD (applied to intrapartition queues), now read, write or delete from a Tuxedo /Q queue. (tpenqueue and tpdequeue) in terms of tuxedo vocabulary.

If the Queue is logically recoverable, these actions are done in the current UOW, else they are done atomically, independently of the current UOW.

For information, inside CICS Runtime, this is done by adding the TPNOTRAN flag to operations on non-logically recoverable queues.

Triggering

In case of triggering, like in native CICS, a transaction will be automatically triggered, this transaction having to read the corresponding queue and process accordingly the messages.

In CICS Runtime these asynchronous transactions are offered and processed by a dedicated server type ARTATR, with either of its two variants ARTATR1 and ARTATRN.

These servers process all asynchronous transactions, more precisely, transactions submitted by START TRANSID, or by automatic Transaction Invocation related to td queue intrapartition.

In this case a specific CICS Runtime client, TDI_TRIGGER, is used to launch the corresponding asynchronous transaction, when the trigger level is reached.

Runtime CICS Configuration of TD Queue Intrapartition

CICS Runtime Resource Declaration

Every CICS-like resource in CICS Runtime, is declared using a dedicated configuration file stored in directory `${KIXCONFIG}`.

TD Queue extrapartition and TD Queue intrapartition resource declaration share very few arguments, and are semantically very different objects, even if using the same API for read and write operations.

This is the reason why, in CICS Runtime, we have separated TD Queue extrapartition resource configuration and TD Queue intrapartition resource configuration into two different resource files.

Intrapartition queues are declared in the file `tdqintra.desc`, described in *Oracle Tuxedo Application Runtime for CICS Reference Guide*.

The important attributes are:

TDQUEUE(name)
: The queue name, exactly identical to the queue name in the source configuration, This name must be the same as the name of the queue inthe Tuxedo /Q configuration.

RECOVSTATUS(status)
: Only the status NO or LOGICAL, are accepted, the difference between the two modes impacts the treatment of WRITEQ TD and READQ TD, more precisely LOGICAL making them part of the current UOW, while NO makes them atomic operations independent of the current UOW.

  The difference between NO or PHYSICAL, is not defined in the resource configuration file but will be implemented using native tuxedo /Q configuration parameters, mapping to persistent /Q or non persistent.

TRANSID and TRIGGERLEVEL
: In the current release are documentary only in `tdqintra.desc`, it is their value in /Q configuration which is taken in account.

QSPACENAME
: New argument needed for /Q: defining into which QSPACE the current /Q is stored. This argument is mandatory and must match the QSPACENAME into which the actual /Q queue is physically stored.

/Q Configuration for TD Queue Intrapartition in CICS Runtime

For detailed and accurate information on `qmadmin` and /Q configuration *Using the ATMI /Q Component* in the Tuxedo documentation.

The script `mk_td_qm_config.sh` distributed with CICS Runtime provides an example of qspace creation and then of queue creation and configuration into /Q, to be used for TD intrapartition queues.

This script uses three environment variables, which must be set according to your environment:

- KIX_TD_QSPACE_DEVICE: must contain the filename of the physical file containing the /Q database for TD queues.
- KIX_TD_QSPACE_NAME: contains the name of the logical QSPACE to create, which will contains the queues.
- KIX_TD_QSPACE_IPCKEY: a specific key which must be unique on the machine for the IPC used by the instance of /Q.

The creation of the device (KIX_TD_QSPACE_DEVICE) and of the QSPACE are very standard, we will not detail them.

The interesting part is related to queue configuration.

A qopen QspaceName command, to open the qspace which will contain the queues must be made before the creation of any queue. The QspaceName must match the QSPACENAME in the resource declaration of these queue(s).

Below is an example of an interactive queue creation using qmadmin, where the questions asked by qmadmin are in normal font, while the entries typed in by the user are in bold.

Listing 4-23 qopen Dialog

```
qopen TD_QSPACE
qcreate
Queue name: TEST
Queue order (priority, time, expiration, fifo, lifo): fifo
Out-of-ordering enqueuing (top, msgid, [default=none]): none
Retries [default=0]: 5
Retry delay in seconds [default=0]: 0
High limit for queue capacity warning (b for bytes used, B for blocks used,
 % for percent used, m for messages [default=100%]): 5m
Reset (low) limit for queue capacity warning [default=0%]: 0m
Queue capacity command: "TDI_TRIGGER -t S049"
```

In a script an exact equivalent to this manual entry would be:

Listing 4-24 qopen Script

```
qopen TD_QSPACE

qcreate TEST fifo none 3 0 5m 0m "TDI_TRIGGER -t S049"
```

qopen Parameters

TD_QSPACE

The `QspaceName` must match the `QSPACENAME` in the resource declaration of these queue(s).

Queue name

The name of the queue must match exactly the name provided in the resource declaration.

Queue order

The default dequeuing order when reading the queue, the setting corresponding to TD intra native behavior is: `fifo`.

Out-of-ordering enqueuing

Not meaningful unless some application is using native /Q interface to write into these queue; for Runtime CICS only usage to set it to is: `none`

Retries

Defines the number of times a message will be put back on the queue in case of abort of the UOW having read this queue, to avoid resubmitting again and again an ATI transaction which fails because of a bad message, set this number to a reasonable number.

When this number is reached, or at the first abort if you set it to zero, the message will be removed from this queue and put onto the error queue for further analysis.

Retry delay in seconds

If retries is not null, defines a delay before putting a record back on its queue, in case of rollback, the recommended value with Runtime CICS is the default value 0.

High limit for queue capacity warning

This is the much more flexible equivalent of the trigger level of TD queues. For a setting compatible with TD queues, set it to the trigger level and express it in number of

messages. For example: 0m to suspend triggering, or 5m for a trigger level of 5 messages in the queue.

Reset (low) limit for queue capacity warning

This is the down level to be reached before resetting the trigger for the upper limit, for compatibility with TD queue behavior, it should be set to 0, (QZERO) which is the reset value for TD queues in CICS.

Queue capacity command:

This is the command to be launched when the trigger level is reached, in CICS Runtime it should be set to: `TDI_TRIGGER -t TRID`. Where TRID is the Transaction identifier of the transaction to trigger which should match the TRANSID of the resource configuration.

Tip: ATR servers when processing an ATI, know whether the transaction reached QZERO or not, and whether it was a success or a rollback. So if QZERO is not reached, they resubmit the transaction in the same manner as on the source platform.
But now it is the number of retries which will replace the ATIFACILITY parameter and will govern the fact that a rollbacked TD queue record will be resubmitted or not.
It is a progress compared with the source is that now the administrator can decide the number of resubmissions, and get the faulty messages on an error queue.

Implementing Distributed Program Link (DPL)

For several reasons, on z/OS, the Distributed Program Link function enables a local CICS program (the client program) to call another CICS program (the server program) in a remote CICS region via `EXEC CICS LINK` statements. CICS Runtime supports this feature used in multi-CICS architecture like MRO among migrated regions.

To Detect That DPL Is Needed

Unless you wish to use the DPL in a UNIX written application, check the technical specificities of the z/OS application

1. Check on z/OS, using the CEDA system transaction, if at least one remote program is defined in the z/OS CICS CSD file. Such programs have some of their fields of the `REMOTE ATRIBUTES` section filed:

Listing 4-25 Checking for Remote Programs

```
  DEF PROGR
  OVERTYPE TO MODIFY                                    CICS RELEASE = 0610
   CEDA  DEFine PROGram(         )
    PROGram      ==>
    Group        ==>
    DEscription  ==>
....
REMOTE ATTRIBUTES
 DYnamic      ==> No                No ! Yes
 REMOTESystem ==> XXXX
 REMOTEName   ==> YYYYYYYY
 Transid      ==> ZZZZ
 EXECUtionset ==> Dplsubset         Fullapi ! Dplsubset
```

Where (CICS default values are underlined):

DYNAMIC(YES|NO)
The following parameters cannot be overridden in the CICS LINK API. This field is only relevant for DPL use when it is set to NO and the three following fields are empty.

REMOTESYSTEM(name)
Remote CICS region name. An empty field is not relevant with `DYNAMIC(YES)`

REMOTENAME(name)
Remote server program name. An empty field is not relevant with `DYNAMIC(YES)` because the default is the client program name (PROGram ==>).

TRANSID(name)
Remote mirror transaction. An empty field is not relevant with `DYNAMIC(YES)` because the default is the mirror system transaction CSMI.

EXECUTIONSET(FULLAPI|DPLSUBSET)

The DPL cannot use the full CICS API but only a subset. The DPLSUBSET parameter indicates explicit usage of a DPL subset of the CICS API, but note that this subset may also be sufficient to execute LINK in a non-DPL context without errors. On the other hand, this field may contain FULLAPI in a DPL context but does not ensure that no "Invalid Request errors" will follow if non-DPL API are used.

As described above, in some cases, the Remote Attributes declaration may not exist or can be incomplete. The reason is that these fields establish only some of the default values, some of the previous parameters in bold in the example are not provided in the `EXEC CICS LINK` API.

2. Then check in the programs, inside the `EXEC CICS LINK` API:
   - If the names of the programs called in this order match the names of programs defined in the CSD with remote attributes partially or fully informed.
   - If these statement contain at least one of the optional remote parameters shown in italics in the following CICS LINK API (the others fields are not relevant for DPL).

Listing 4-26 CICS LINK API For DPL

```
EXEC CICS  LINK PROGRAM(…)
   COMMAREA(…)
   LENGTH(…)
   DATALENGTH(…)
   RETCODE(…)
   SYSID(XXXX) : Remote CICS region name
   SYNCONRETURN : Used for remote CICS syncpoint or rollback
   TRANSID(XXXX) : Remote mirror transaction instead of the CSMI default
   INPUTMSG(…)
   INPUTMSGLEN(…)
END-EXEC
```

Modifying the Tuxedo ubbconfig File to Manage the DPL

If at least one of your programs use the DPL, install and activate the ARTDPL server without changing your other settings.

To activate this server, modify your ubbconfig file to add this server to the *SERVERS section of the Tuxedo ubbconfig file. This server belongs to the same Server Group as the Transactions Servers (ARTSTRN, ARTSTR1, ARTATRN, ARTATR1).

Listing 4-27 ubbconfig File Example of a *SERVERS Section Describing the ARTDPL Server.

```
*SERVERS

…

ARTDPL      SRVGRP=GRP02

             SRVID=500

             CONV=N

             MIN=1 MAX=1 RQADDR=QKIXDPL REPLYQ=Y

             CLOPT="-o /home2/work9/demo/Logs/TUX/sysout/stdout_dpl -e
/home2/work9/demo/Logs/TUX/sysout/stderr_dpl -r -- -s KIXD -l SIMPAPP"

…
```

Where:

***SERVERS**
Tuxedo ubbconfig Keyword indicating a Server Section definition.

SRVGRP
Is the Tuxedo Group Name to which ARTDPL belongs.

SRVID
Is the identifier of a Tuxedo Server of ARTDPL.

CONV=N
Indicates that this server operates in a non-conversational mode.

MIN=1 and MAX=1
Indicates that only one instance of this server must be run.

REPLYQ=Y
Indicates that this server will respond.

RQADDR=QKIXDPL
Name of the Tuxedo queue used for the responses.

CLOPT
Is a quoted text string passed to the server containing its parameters:

-o
Indicates the following file is used for the standard output messages of the server.

-e
Indicates the following file is used for the error output messages of the server.

-r
Is a Tuxedo parameter used to provide statistical reports.

-s KIXD
Indicates the CICS Runtime name where the KIXD transaction is run.

-l SIMAPP
Indicates that only the components of the SIMPDPL group are to be selected at start up.

Use the Tuxedo `tmadmin psr` and `psc` commands to check that this server is running and that no new service is published:

Listing 4-28 tmadmin Commands to Check ARTDPL Server

```
# tmadmin

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```

```
> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
---------      ----------  --------      -- ------ --------- --------------
ARTDPL         QKIXDPL     GRP02        500      0         0 (  IDLE )
ARTATR1        00012.00300 GRP02        300      0         0 (  IDLE )
ARTSTR1        00012.00200 GRP02        200      0         0 (  IDLE )
BBL             200933      KIXR          0      5       250 (  IDLE )
TMS_QM          GQUEUE_TMS  GQUEUE     30001      0         0 (  IDLE )
TMS_ORA         GRP02_TMS   GRP02      30001      0         0 (  IDLE )
ARTTCPL 00001.00101 TCP00        101      0         0 (  IDLE )
TMS_QM          GQUEUE_TMS  GQUEUE     30002      0         0 (  IDLE )
TMS_ORA         GRP02_TMS   GRP02      30002      0         0 (  IDLE )
TMS_ORA         GRP02_TMS   GRP02      30003      0         0 (  IDLE )
TMQUEUE         01000.01010 GQUEUE      1010      0         0 (  IDLE )
ARTCNX         QCNX015     GRP01         15      0         0 (  IDLE )
TMQFORWARD      01000.01020 GQUEUE      1020      0         0 (  IDLE )
ARTSTRN        QKIX110     GRP02         20      0         0 (  IDLE )
ARTATRN        QKIXATR     GRP02         30      0         0 (  IDLE )
ARTTSQ         00012.00040 GRP02         40      0         0 (  IDLE )

> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
TMS          TMS          TMS_QM     GQUEUE 30001       KIXR       0 AVAIL
TMS          TMS          TMS_ORA    GRP02  30001       KIXR       0 AVAIL
TMS          TMS          TMS_QM     GQUEUE 30002       KIXR       0 AVAIL
TMS          TMS          TMS_ORA    GRP02  30002       KIXR       0 AVAIL
```

```
TMS           TMS           TMS_ORA     GRP02   30003        KIXR        0 AVAIL
ASYNC_QSPACE  TMQUEUE       TMQUEUE     GQUEUE  1010         KIXR        0 AVAIL
authfail      cnxsvc        ARTCNX     GRP01      15        KIXR        0 AVAIL
CESF          cnxsvc        ARTCNX     GRP01      15        KIXR        0 AVAIL
CESN          cnxsvc        ARTCNX     GRP01      15        KIXR        0 AVAIL
CSGM          cnxsvc        ARTCNX     GRP01      15        KIXR        0 AVAIL
disconnect    cnxsvc        ARTCNX     GRP01      15        KIXR        0 AVAIL
connect       cnxsvc        ARTCNX     GRP01      15        KIXR        0 AVAIL
SA03          kixsvc        ARTSTRN    GRP02      20        KIXR        0 AVAIL
SA02          kixsvc        ARTSTRN    GRP02      20        KIXR        0 AVAIL
SA01          kixsvc        ARTSTRN    GRP02      20        KIXR        0 AVAIL
SA00          kixsvc        ARTSTRN    GRP02      20        KIXR        0 AVAIL
ASYNC_QUEUE   ASYNC_QUEUE   ARTATRN    GRP02      30        KIXR        0 AVAIL
ASYNC_SA03    atrsvc        ARTATRN    GRP02      30        KIXR        0 AVAIL
ASYNC_SA02    atrsvc        ARTATRN    GRP02      30        KIXR        0 AVAIL
ASYNC_SA01    atrsvc        ARTATRN    GRP02      30        KIXR        0 AVAIL
ASYNC_SA00    atrsvc        ARTATRN    GRP02      30        KIXR        0 AVAIL
TSQUEUE       tsqsvc        ARTTSQ     GRP02      40        KIXR        0 AVAIL

> quit
#
```

Declaring Remote Programs in CICS Runtime

To allow an application to use distributed programs called in `EXEC CICS LINK` statements, these programs must be declared to CICS Runtime.

1. To declare REMOTE programs which can only use the DPL Subset of the CICS API:

– In the `programs.desc` file, set `REMOTESYSTEM` (the 7th field of the csv format dataset), to remote `SYSID` name (`KIXD` in sample of Listing 4-27).

The default is `local (empty field)`, meaning that local programs are declared because they can use the FULL CICS API.

In our Simple Application example, if we suppose that `RSSAT000`, `RSSAT001` are remote and `RSSAT002` and `RSSAT003` are local, then the `programs.desc` file is set to:

Listing 4-29 Simple Application programs.desc Configuration of Remote Programs

```
#PROGRAM;GROUP;DESCRIPTION;LANGUAGE;EXECKEY;STATUS;REMOTESYSTEM;REMOTENAME

RSSAT000;SIMPAPP;Home Menu Program of Simple Application;COBOL;
;ENABLE;KIXD

RSSAT001;SIMPAPP;Customer Detailed Inf Program of Simple Application;COBOL;
;ENABLE;KIXD

RSSAT002;SIMPAPP;Customer Maintenance Program of the Simple
Application;COBOL; ;ENABLE

RSSAT003;SIMPAPP;Customer List of the Simple Application;COBOL; ;ENABLE
```

2. Shutdown and reboot Tuxedo.
3. Using the Tuxedo `tmadmin psr` and `psc` commands, check that new services for DPL programs are published and managed by `ARTDPL`: `KIXD_RSSAT0001` and `KIXD_RSSAT0003`.

   Note: To avoid problems with homonyms, these distributed services have their names composed of the Tuxedo `DOMAINID` defined in the ubbconfig and the name of the program they manage.

Listing 4-30 Using tmadmin Commands to Check DPL Services

```
{deimos:work9}-/home2/work9/demo/Logs/TUX/sysout# tmadmin

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```

```
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> psr
Prog Name      Queue Name  Grp Name      ID RqDone Load Done Current Service
---------      ----------  --------      -- ------ --------- ---------------
ARTDPL        QKIXDPL     GRP02        500      0         0 (  IDLE )
ARTATR1       00012.00300 GRP02        300      0         0 (  IDLE )
ARTSTR1       00012.00200 GRP02        200      0         0 (  IDLE )
BBL            200933      KIXR           0      5       250 (  IDLE )
TMS_QM         GQUEUE_TMS  GQUEUE     30001      0         0 (  IDLE )
TMS_ORA        GRP02_TMS   GRP02      30001      0         0 (  IDLE )
ARTTCPL 00001.00101 TCP00        101      0         0 (  IDLE )
TMS_QM         GQUEUE_TMS  GQUEUE     30002      0         0 (  IDLE )
TMS_ORA        GRP02_TMS   GRP02      30002      0         0 (  IDLE )
TMS_ORA        GRP02_TMS   GRP02      30003      0         0 (  IDLE )
TMQUEUE        01000.01010 GQUEUE      1010      0         0 (  IDLE )
ARTCNX        QCNX015     GRP01         15      0         0 (  IDLE )
TMQFORWARD     01000.01020 GQUEUE      1020      0         0 (  IDLE )
ARTSTRN       QKIX110     GRP02         20      0         0 (  IDLE )
ARTATRN       QKIXATR     GRP02         30      0         0 (  IDLE )
ARTTSQ        00012.00040 GRP02         40      0         0 (  IDLE )

> psc
Service Name Routine Name Prog Name  Grp Name  ID    Machine  # Done Status
------------ ------------ ---------  --------  --    -------  ------ ------
KIXD_RSSAT0+ dplsvc       ARTDPL    GRP02    500       KIXR       0 AVAIL
```

```
KIXD_RSSAT0+ dplsvc       ARTDPL    GRP02    500       KIXR       0 AVAIL
TMS          TMS          TMS_QM     GQUEUE 30001       KIXR       0 AVAIL
TMS          TMS          TMS_ORA    GRP02  30001       KIXR       0 AVAIL
TMS          TMS          TMS_QM     GQUEUE 30002       KIXR       0 AVAIL
TMS          TMS          TMS_ORA    GRP02  30002       KIXR       0 AVAIL
TMS          TMS          TMS_ORA    GRP02  30003       KIXR       0 AVAIL
ASYNC_QSPACE TMQUEUE      TMQUEUE    GQUEUE  1010       KIXR       0 AVAIL
authfail     cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESF         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CESN         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
CSGM         cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
disconnect   cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
connect      cnxsvc       ARTCNX    GRP01     15       KIXR       0 AVAIL
SA03         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA01         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
SA00         kixsvc       ARTSTRN   GRP02     20       KIXR       0 AVAIL
ASYNC_QUEUE  ASYNC_QUEUE  ARTATRN   GRP02     30       KIXR       0 AVAIL
ASYNC_SA03   atrsvc       ARTATRN   GRP02     30       KIXR       0 AVAIL
ASYNC_SA01   atrsvc       ARTATRN   GRP02     30       KIXR       0 AVAIL
ASYNC_SA00   atrsvc       ARTATRN   GRP02     30       KIXR       0 AVAIL
TSM00004_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00003_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00002_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00001_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSM00000_TSQ tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
TSQUEUE      tsqsvc       ARTTSQ    GRP02     40       KIXR       0 AVAIL
```

```
> quit
# .
```

To see full details on the truncated values displayed, you can use the Tuxedo verbose command.

To reduce the scope of the services listed to only those managed by `ARTDPL` (SRVID=500), use the Tuxedo `psc` command followed with the `-i srvid` parameter to restrict the display to a particular server id.

In our example, the srvid of the ARTDPL server is 500 as displayed just above.

Listing 4-31 Using tmadmin Commands to Check Specific DPL Service in Verbose Mode

```
# tmadmin
tmadmin - Copyright (c) 2007-2010 Oracle.
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> verbose
Verbose now on.

> psc -i 500
      Service Name: KIXD_RSSAT003
      Service Type: USER
      Routine Name: dplsvc
         Prog Name: /home2/work9/KIXEDO/bin/ARTDPL
        Queue Name: QKIXDPL
        Process ID: 1327244, Machine ID: KIXR
```

```
          Group ID: GRP02, Server ID: 500
      Current Load: 50
  Current Priority: 50
  Current Trantime: 30
 Current Blocktime: 0
 Current BUFTYPECONV: 0
     Requests Done: 0
    Current status: AVAILABLE

      Service Name: KIXD_RSSAT001
      Service Type: USER
      Routine Name: dplsvc
         Prog Name: /home2/work9/KIXEDO/bin/ARTDPL
        Queue Name: QKIXDPL
        Process ID: 1327244, Machine ID: KIXR
          Group ID: GRP02, Server ID: 500
      Current Load: 50
  Current Priority: 50
  Current Trantime: 30
 Current Blocktime: 0
 Current BUFTYPECONV: 0
     Requests Done: 0
    Current status: AVAILABLE

> quit
#
```

Implementing CICS Common Work Area (CWA)

On z/OS, the CWA is a common storage area defined in memory for a CICS region that programs can use to save and exchange data between themselves as long as this CICS region is running.

This area is addressed thru a pointer delivered by the CICS statement `EXEC CICS ADDRESS CWA`. If you find this CICS statement in your application, you have to implement this feature in CICS Runtime.

Listing 4-32 COBOL Example of CWA Usage

```
LINKAGE SECTION.
01  COMMON-WORK-AREA.
    03  APPL-1-ID           PIC X(4).
    03  APPL-1-PTR          USAGE IS POINTER.
    03  APPL-2-ID           PIC X(4).
    03  APPL-2-PTR          USAGE IS POINTER.
PROCEDURE DIVISION.
. . .
    END-EXEC.
* Set up addressability to the CWA
    EXEC CICS ADDRESS
              CWA(ADDRESS OF COMMON-WORK-AREA)
    END-EXEC.
```

After the CICS ADDRESS CWA, the address of the COBOL group named COMMON-WORK-AREA is set to the address of the CWA allocated by CICS, meaning that COMMON-WORK-AREA maps and refines this memory area. The total amount of this shared memory is fixed and defined at CICS start up.

To Replicate CICS ADDRESS CWA Functionality in CICS Runtime

1. Contact your z/OS CICS Administrator to know the size of memory implemented. (For your information this value is defined with the parameter WRKAREA of the DFHSIT. The default value is 512 bytes and the size can vary from 0 to 3584 bytes). Another way is to calculate the biggest size of the data record contained in the programs addressing the CWA.

2. Modify your `~/.profile` UNIX system file to export a new CICS Runtime variable, `KIX_CWA_SIZE`, and set it to the value found in the `WRKAREA` of the `DFHSIT`. If this variable is not declared, note that the default value is 0 and the authorized interval from 0 to 32760 bytes.

   Example:

   ```
   KIX_CWA_SIZE=512
   ```

3. Modify your `~/.profile` UNIX system file to export a new CICS Runtime variable, `KIX_CWA_IPCKEY`, and valorize it to a Unix IPC key to define the cross memory segment used as CWA.

   Example:

   ```
   KIX_CWA_ IPCKEY=200944
   ```

4. Restart Tuxedo to take all these changes into account.

Implementing a CICS Transaction Work Area (TWA)

On z/OS, the TWA is a common storage area defined in memory for a CICS region that programs can use to save and exchange data between themselves during the execution time of one CICS transaction. In other words, this TWA can only be accessed by the programs participating in the transaction. This area is addressed thru a pointer delivered by the CICS statement `EXEC CICS ADDRESS TWA`. If you find an EXEC CICS ADDRESS TWA statement in your application, you have to implement this feature in CICS Runtime.

Listing 4-33 A COBOL Example of Use of the TWA

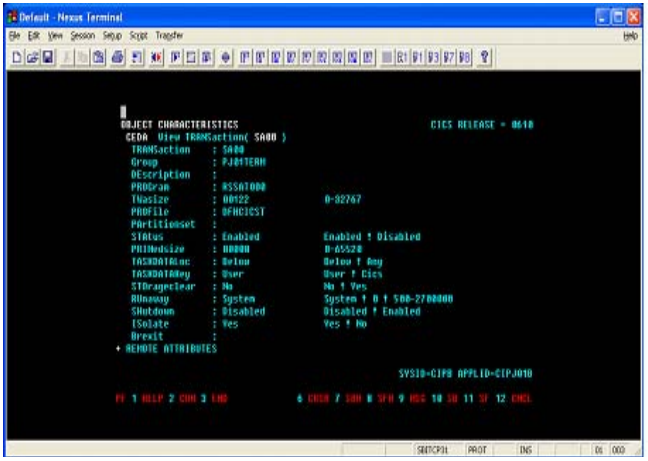
```
LINKAGE SECTION.

01  TRANSACTION-WORK-AREA.

    03  APPL-1-ID           PIC X(4).

    03  APPL-1-PTR          USAGE IS POINTER.

    03  APPL-2-ID           PIC X(4).
```

```
    03  APPL-2-PTR          USAGE IS POINTER.
PROCEDURE DIVISION.
. . .
    END-EXEC.
* Set up addressability to the TWA
    EXEC CICS ADDRESS
              TWA(ADDRESS OF TRANSACTION-WORK-AREA)
    END-EXEC.
```

After the `CICS ADDRESS TWA`, the address of the COBOL group named `TRANSACTION-WORK-AREA` is set to the address of the TWA allocated by CICS, meaning that `TRANSACTION -WORK-AREA` maps and refines this memory area. The total amount of this shared memory is defined for each transaction in the z/OS `CSD` configuration file in the field `TWasize`.

The next screen shows the result of a z/OS `CEDA` system transaction where the `TWasize` parameter is set to 122 for the `SA00` transaction code:

Figure 4-3 z/OS ceda System Transaction Example



To replicate this functionality in CICS Runtime:

1. Modify the CICS Runtime `transactions.desc` file to report the needed amount of TWA memory (`TWasize>0`).
2. For each transaction using programs with `CICS ADDRESS TWA` statements, modify the `transactions.desc` file to declare its `TWasize` in the sixteenth field of this csv format file.

Table 4-6 TWA Size Values Associated to Each Transaction Code of the Simple Application

Transaction	TWA Size
SA00	0
SA01	100
SA02	200
SA03	300

Listing 4-34 Configuration of TWA in the transactions.desc File

```
#Transaction;Group;Description;Program; ; ; ; ; ; ;Status; ; ; ;Tranclass
;TWA Size
SA00;SIMPAPP;pg for simpapp;RSSAT000; ; ; ; ; ; ;ENABLED
SA01;SIMPAPP;pg for simpapp;RSSAT001; ; ; ; ; ; ;ENABLED; ; ; ; ;100
SA02;SIMPAPP;pg for simpapp;RSSAT002; ; ; ; ; ; ;ENABLED; ; ; ; ;200
SA03;SIMPAPP;pg for simpapp;RSSAT003; ; ; ; ; ; ;ENABLED; ; ; ; ;300
```

Note: Nothing is indicated for the SA00 transaction that had a TWA size equal to zero.

3. Restart the CICS Runtime Tuxedo servers, the modifications can be seen in the different stderr files of the servers involved in the transaction management (ARTSTRN, ARTSTR1, ARTATRN and ARTATR1)

Listing 4-35 stderr_strn TWA Example

```
|---------------------------------|
| TRANSACTIONS loaded : <   4>    |
```

```
|-------------------------------------------|----|-|-|---|-|-|---------
-|-----|-|--------|-----|---|
|    |         |                           |    |C|C|   |R|R|         |
|T|        |     |   |
|TRAN|  GROUP   |           PROGRAM          |ALIA|M|O|PRI|E|E|  STATUS
|TASK |R|  TRAN  | TWA |MAX|
|    |         |                           |    |D|N|   |S|S|         |DATA
|A|  CLASS | SIZ |ACT|
|    |         |                           |    |S|F|   |S|T|         |KEY
|C|        |     |IVE|
|----|----------|-----------------------------|----|-|-|---|-|-|---------
-|-----|-|--------|-----|---|
|SA00|SIMPAPP   |RSSAT000                     |    |N|N|001|N|N|ENABLED
|USER |Y|        |00000|999|
|SA01|SIMPAPP   |RSSAT001                     |    |N|N|001|N|N|ENABLED
|USER |Y|        |00100|999|
|SA02|SIMPAPP   |RSSAT002                     |    |N|N|001|N|N|ENABLED
|USER |Y|        |00200|999|
|SA03|SIMPAPP   |RSSAT003                     |    |N|N|001|N|N|ENABLED
|USER |Y|        |00300|999|
```

Implementing CICS Transaction Trigger Monitor (ARTCKTI)

The ART CICS Transaction Trigger Monitor (ARTCKTI) behaves the same as the CICS CKTI transaction. It listens on one or multiple WebSphere MQ initiation queues, retrieves trigger messages when a trigger event occurs, and then forwards the trigger messages to the target transaction.

Work Flow

ARTCKTI is a standalone Oracle Tuxedo server. The ARTCKTI server behaves as follows:

1. Monitor one or multiple WebSphere MQ initiation queues.

   One server instance can only monitor WebSphere MQ initiation queues within the same WebSphere MQ queue manager. The queues in different WebSphere MQ queue managers should be monitored by separate ARTCKTI server instances.

2. When trigger message has arrived, the ARTCKTI server retrieves the message.

3. Retrieve the transaction ID from the trigger message.

4. Transfer the trigger message from structure MQTMC to MQTMC2.

   Since MQTMC has many fields, it is always too complicated to send the structure as the parameter of EXEC CICS START call. MQTMC2 is used in CKTI to pass the structure as data to the START request for the trigger monitor.

5. Invoke the target transaction, and send the MQTMC2 data.

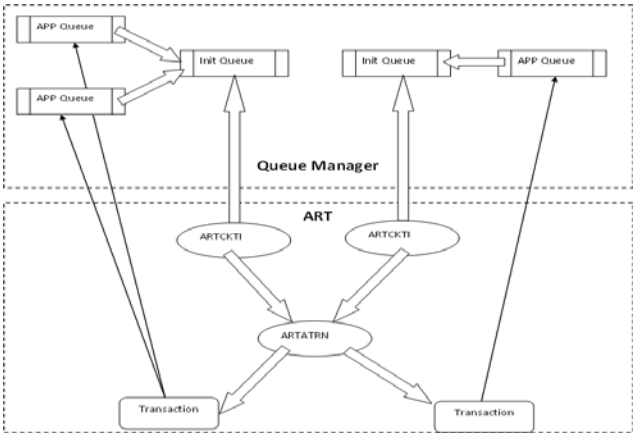
   Since CICS CKTI transaction starts the target transaction with asynchronized call (EXEC CICS START), the ARTCKTI server also starts the target transaction with asynchronized call (Tuxedo tpacall).

6. User transaction retrieves the trigger message by CICS RETRIEVE, and performs operations on the WebSphere MQ application queue.

   If the user transaction does not retrieve the message or the triggered transaction is not available, WebSphere MQ no longer sends trigger message in this condition. A new trigger message is issued until the WebSphere MQ initiation queue is reopened or a new trigger condition is met.

   Figure 4-4 illustrates the behavior.

Figure 4-4 WebSphere MQ Trigger Condition



Command Configuration

ARTCKTI accepts the following parameters for the ubbconfig file.

- **`-i trigger_interval`**: specifies the maximum time (in milliseconds) that the ARTCKTI server waits for a message to arrive at the WebSphere MQ initiation queue.
- **`-s retry_interval`**: specifies the retry interval for ARTCKTI to reconnect to WebSphere MQ queue manager or reopen WebSphere MQ initiation queue upon failure.
- **`-m queue_manager_name`**: specifies the name of the WebSphere MQ queue manager to be monitored.
- **`-q queue1,queue2,.....`**: specifies the name of the WebSphere MQ initiation queue to be monitored.

CICS Runtime Logs

Tuxedo System Log

Like other Tuxedo applications, CICS Runtime is managed by Tuxedo that records certain events and problems in a dedicated system log.

This log is the standard Tuxedo User Log (ULOG) whose name is contained in the system variable `ULOGPFX` of the Tuxedo `ubbconfig` file.

Example:

```
ULOGPFX="/home2/work9/demo/Logs/TUX/log/ULOG"
```

The CICS Runtime Server Logs

When declaring a service in the Tuxedo `ubbconfig` file, each server has CLOPT options defined including two files:

- -o option for stdout (normal messages)

  The name of this file is `stdout_<server name>` without the `ART` prefix.

  For example: the `ARTSTRN` server has a standard output named `stdout_strn`.

- -e option for stderr (error messages)

  The name of this file is `stderr_<server name>` without the `ART` prefix.

  For example: the `ARTSTRN` server has an error output named `stderr_strn`.

The different stdout and stderr message files for each CICS Runtime server are:

Table 4-7 Message Files by Server

Server name	-o standard output file	-e standard error file
ARTTCPL	stdout_tcp	stderr_tcp
ARTCNX	stdout_cnx	stderr_cnx
ARTSTRN	stdout_strn	stderr_strn
ARTSTR1	stdout_str1	stderr_str1
ARTATRN	stdout_atrn	stderr_atrn
ARTATR1	stdout_atr1	stderr_atr1
ARTTSQ	stdout_tsq	stderr_tsq
ARTDPL	stdout_dpl	stderr_dpl

Note: In the stderr file of a server all the configuration files mounted are described. The stderr file contains not only the error messages concerning problems encountered when the servers are booted but also information about the different resources loaded. Specifically you will find:

- The groups of resources installed depending on the `-l` list parameter of each CICS Runtime server.
- The resources successfully installed and available for use (remember that an installed resource may be disabled for use) depending on the valorization of each `.desc` configuration file.

Listing 4-36 Example of the stdout_strn Just After Start Up for a ARTSTRN Server

```
Groups loaded: <0001>
|----------|
|  GROUP   |
|----------|
|SIMPAPP   |
|----------|
ARTSTRN: Read config done
|-------------------------------------------------|
| TRANCLASS loaded : <   2>                       |
|-------------------------------------------------|
|           TRANCLASS          |  GROUP   |MAXACTIVE|
|------------------------------|----------|---------|
|TRCLASS1                      |SIMPAPP   |      001|
|TRCLASS2                      |SIMPAPP   |      002|
|-------------------------------------------------|
|-------------------------------------------------|
| PROGRAMS loaded : <   4>                        |
|-----------------------------------------------------------------|
|            PROGRAM           |  GROUP   |LANGUAGE|EXEC|  STATUS  |
|                              |          |        |KEY |          |
|------------------------------|----------|--------|----|----------|
```

```
|RSSAT000                       |SIMPAPP   |COBOL   |USER|ENABLED   |
|RSSAT001                       |SIMPAPP   |COBOL   |USER|ENABLED   |
|RSSAT002                       |SIMPAPP   |COBOL   |USER|ENABLED   |
|RSSAT003                       |SIMPAPP   |COBOL   |USER|ENABLED   |
|-------------------------------------------------------------------|
|---------------------------------|
| TRANSACTIONS loaded : <   4>    |
|-------------------------------------------|----|-|-|---|-|-|---------
-|-----|-|--------|-----|---|
|   |        |                           |    |C|C|   |R|R|         |
|T|        |     |   |
|TRAN|  GROUP   |           PROGRAM           |ALIA|M|O|PRI|E|E|  STATUS
|TASK |R|  TRAN  | TWA |MAX|
|   |        |                           |    |D|N|   |S|S|         |DATA
|A|  CLASS | SIZ |ACT|
|   |        |                           |    |S|F|   |S|T|         |KEY
|C|        |     |IVE|
|----|----------|-----------------------------|----|-|-|---|-|-|---------
-|-----|-|--------|-----|---|
|SA00|SIMPAPP   |RSSAT000                     |    |N|N|001|N|N|ENABLED
|USER |Y|        |00000|999|
|SA01|SIMPAPP   |RSSAT001                     |    |N|N|001|N|N|ENABLED
|USER |Y|        |00000|999|
|SA02|SIMPAPP   |RSSAT002                     |    |N|N|001|N|N|ENABLED
|USER |Y|        |00000|999|
|SA03|SIMPAPP   |RSSAT003                     |    |N|N|001|N|N|ENABLED
|USER |Y|        |00000|999|
|-------------------------------------------------------------------------
---------------------------|
Warning: zero TSQMODEL loaded!!
```

```
FILES<FILE> lineNo(1) skipping Record: Group not to load
FILES<FIC3> lineNo(4) skipping Record: Group not to load
```

We can note in this example that

- One group (SIMPAPP) is selected with the `-l` option
- Four configurations files are used: transactions, tranclasses, programs and tsqmodels.
- Information on the successful loading of these resources (`Warning: zero TSQMODEL loaded`).
- The detail of the resources loaded and their explicit characteristics (name, group, description …) even default/implicit values were used in the .desc file leaving the fields filed with space(s).

Disabling and Enabling Programs

Sometimes, problems are encountered in a program that significantly impacts your system and the program must be eliminated urgently by prohibiting end-users from running it. In the immediate, this helps temporarily to stabilize the system giving time to analyze and solve the dysfunction.

As on z/OS, CICS Runtime allows to disable a program. A program is disabled by modifying the CICS Runtime configuration file programs.desc. This file contains a dedicated field, the STATUS field, to indicate if a program is DISABLED or ENABLED (status by default).

See also dynamic administration of CICS resources information in the *Oracle Tuxedo Application Runtime for CICS Reference Guide*.

Disabling Programs

To switch your transaction from enabled to disabled, you have to modify the seventh field of this csv file, to change the previous value from an implicit (" " space(s)) or an explicit `ENABLED` status to the explicit `DISABLED` status.

After shutting down and booting the CICS Runtime Tuxedo servers, your modifications of one or more programs will be taken in account.

If you disable a program, when somebody wants to use it, the error messages displayed depend on the way that the application handles CICS errors.

Listing 4-37 Example Simple Application SA02 COBOL Program Set to DISABLED in programs.desc

```
#PROGRAM;GROUP;DESCRIPTION;LANGUAGE; ; ;STATUS

RSSAT000;SIMPAPP; Home Menu Program of the Simple Application ;COBOL

RSSAT001;SIMPAPP; Customer Detailed Information Program of the Simple
Application ;COBOL; ; ;ENABLED;

RSSAT002;SIMPAPP; Customer Maintenance Program of the Simple
Application;COBOL; ; ;DISABLED;

RSSAT003;SIMPAPP; Customer List of the Simple Application ;COBOL
```

Enabling Programs

To enable a program, you have only to do the opposite, changing the STATUS field from `DISABLED` to `ENABLED` or " " (at least one space).

After shutting down and booting the CICS Runtime Tuxedo servers, your modifications of one or more programs take effect.

Checking the Change in Program Status

If you consult the logs of the different transactions servers or the CICS Runtime you will note the modification of the modified status in the `stderr_*` logs.

Just after the start up of this server, the logs shows (in italics) that this program is disabled.

Listing 4-38 Log Report Showing Program Status

```
Groups loaded: <0001>

|----------|

|  GROUP   |

|----------|

|SIMPAPP   |

|----------|
```

```
ARTSTRN: Read config done
|-------------------------------------------------|
| TRANCLASS loaded : <   2>                       |
|-------------------------------------------------|
|           TRANCLASS          |  GROUP   |MAXACTIVE|
|------------------------------|----------|---------|
|TRCLASS1                      |SIMPAPP   |      001|
|TRCLASS2                      |SIMPAPP   |      002|
|-------------------------------------------------|
|-----------------------------------------------|
| PROGRAMS loaded : <   4>                      |
|-----------------------------------------------------------------------|
|            PROGRAM           |  GROUP   |LANGUAGE|EXEC|  STATUS   |
|                              |          |        |KEY |           |
|------------------------------|----------|--------|----|-----------|
|RSSAT000                      |SIMPAPP   |COBOL   |USER|ENABLED    |
|RSSAT001                      |SIMPAPP   |COBOL   |USER|ENABLED    |
|RSSAT002                      |SIMPAPP   |COBOL   |USER|DISABLED   |
|RSSAT003                      |SIMPAPP   |COBOL   |USER|ENABLED    |
|-----------------------------------------------------------------------|
|---------------------------------|
| TRANSACTIONS loaded : <   4>    |
|-----------------------------------------|----|-|-|---|-|-|---------
-|-----|-|--------|-----|---|
|    |         |                          |    |C|C|   |R|R|         |
|T|        |     |   |
|TRAN|  GROUP   |            PROGRAM           |ALIA|M|O|PRI|E|E|  STATUS
|TASK |R|  TRAN   | TWA |MAX|
```

```
|    |         |                              |    |D|N|   |S|S|         |DATA
|A|  CLASS | SIZ |ACT|
|    |         |                              |    |S|F|   |S|T|         |KEY
|C|        |     |IVE|
|----|----------|------------------------------|----|-|-|---|-|-|---------
-|-----|-|--------|-----|---|
|SA00|SIMPAPP   |RSSAT000                       |    |N|N|001|N|N|ENABLED
|USER |Y|        |00000|999|
|SA01|SIMPAPP   |RSSAT001                       |    |N|N|001|N|N|ENABLED
|USER |Y|        |00000|999|
|SA02|SIMPAPP   |RSSAT002                      |    |N|N|001|N|N| ENABLED
|USER |Y|        |00000|999|
|SA03|SIMPAPP   |RSSAT003                       |    |N|N|001|N|N|ENABLED
|USER |Y|        |00000|999|
|-------------------------------------------------------------------------
---------------------------|
Warning: zero TSQMODEL loaded!!
```

Removing and Adding Applications for CICS Runtime

Sometimes, you want to delete an application from a given machine either to definitely delete all its components or to move them to another machine. If all the resources used by your application were defined in one or more resource groups dedicated to your application, you have only to suppress these groups from CICS Runtime and eventually install them elsewhere.

Each CICS Runtime Tuxedo Server reads a list of groups to be selected and installed at start up, contained in its CLOPT options after the `-l` parameter. To remove or add group(s) from an application, you have only to remove or add theses groups from this list for each CICS Runtime Tuxedo server.

Your modifications on one or more programs take effect after shutting down and booting up the CICS Runtime Tuxedo servers.

Listing 4-39 Example of Application in ARTSTRN Server

```
ARTSTRN     SRVGRP=GRP02
             SRVID=20
             CONV=Y
             MIN=1 MAX=1 RQADDR=QKIX110 REPLYQ=Y
             CLOPT="-o /home2/work9/demo/Logs/TUX/sysout/stdout_strn
             -e /home2/work9/demo/Logs/TUX/sysout/stderr_strn -r -- -
             s KIXR -l SIMPAPP"
```

If you want to add one or more groups, you have to concatenate these new groups to those previously defined, separating them with a ":" character.

Listing 4-40 Example of Adding group1 and group2 in ARTSTRN Server

```
ARTSTRN     SRVGRP=GRP02
             SRVID=20
             CONV=Y
             MIN=1 MAX=1 RQADDR=QKIX110 REPLYQ=Y
             CLOPT="-o /home2/work9/demo/Logs/TUX/sysout/stdout_strn
             -e /home2/work9/demo/Logs/TUX/sysout/stderr_strn -r -- -
             s KIXR -l SIMPAPP:GROUP1:GROUP2"
```

If you want to remove groups, you remove them from the `-l` lists when they are present, leaving only one `:` character between the remaining groups.

Listing 4-41 Example of Removing group1 in ARTSTRN Server

```
ARTSTRN     SRVGRP=GRP02
```

```
SRVID=20

CONV=Y

MIN=1 MAX=1 RQADDR=QKIX110 REPLYQ=Y

CLOPT="-o /home2/work9/demo/Logs/TUX/sysout/stdout_strn

-e /home2/work9/demo/Logs/TUX/sysout/stderr_strn -r -- -

s KIXR -l SIMPAPP:GROUP2"
```

Notes:

- When the groups are removed, all the resources of these groups are only logically suppressed. If you want also to suppress them physically, you have to delete all the lines of the CICS Runtime resource configuration files containing the group names.
- When the groups are added, all the resources of theses groups must be present in the different CICS Runtime resource configuration files under the group names. To avoid future problems, do not omit to declare resources in a group because they are already declared in groups from other applications.
- When groups are added or removed, be careful to indicate the same list of groups in each CICS Runtime server.

Reference

Cross Reference of .desc Configuration Files Used by CICS Runtime Servers

The following table lists the configuration `.desc` files used per each CICS Runtime server. The value of 1 at the intersection of a server and a file means that they are linked.

Table 5-1 Resources Configuration " .desc " File

Servers	FILES	PROGRAMS	TRANCLASSES	TRANSACTIONS	TSQMODEL	Total
ARTATR1	1	1	1	1	1	5
ARTATRN	1	1	1	1	1	5
ARTDPL					1	1
ARTSTR1	1	1	1	1	1	5
ARTSTRN	1	1	1	1	1	5
ARTTSQ					1	1
Total	4	4	4	4	6	22

CHAPTER 6

Oracle Tuxedo Application Runtime for CICS CSD Converter

This chapter contains the following topics:

Overview

The administration of CICS Runtime is based on Oracle Tuxedo native tools with the addition of a limited number of configuration tables for features that are specific to CICS. In CICS configurations, resources are currently defined in the CICS system definition file (CSD).

The `tcxcsdcvt` tool (located in the `$KIXDIR/tools` directory), maps the CSD file to resource descriptive files (including transaction, transaction class, program, files, TS Queue, ENQ, TD Queue extra partition, TD Queue intra partition, mapset, and typeterm).

This tool is used to set the target CSD file in argument, and the translated resource configuration files resides in current directory by default. You can also specify other target directories to store the configuration files.

Resource Definition Online (RDO) Mapping

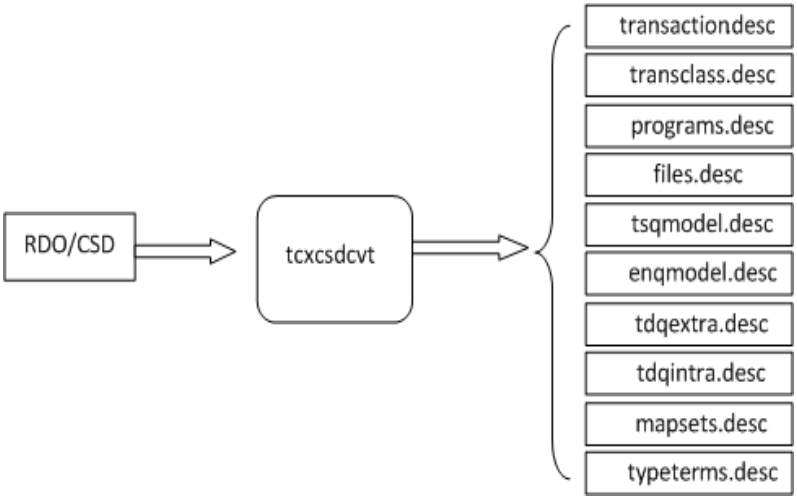
Resource Definition Online (RDO) Mapping consists of two parts:

1. Files conversion from RDO/CSD on z/OS to resource configuration files of all types on universal platform, such as transactions, programs, mapsets and etc.

2. For each types, tool `tcxcsdcvt` reads the value of all fields, and then generates a record in the corresponding resource configuration file. For more information, see"CICS Runtime Configuration Files" of CICSREF.

Figure 6-1depicts the file data stream model.

Figure 6-1 File Data Stream Model



Tables 1~10 describe detailed correspondence between RDO/CSD and target resource configuration files, which have ".desc" as suffix mentioned above. These mappings include:

- TRANCLASS Mapping
- PROGRAM Mapping
- FILE Mapping
- Journaling Attributes in FILE Mapping
- TSQUEUE MODEL Mapping
- ENQMODEL Mapping
- TDQUEUE Extra Partition Mapping
- TDQUEUE Intra Partition Mapping
- MAPSET Mapping

- TYPETERM Mapping

Note: Since some field names are new options added in CICS Runtime Configuration Files, they are not defined or supported by RDO/CSD. To mark these attributes "----" is used.

Table 6-1 TRANCLASS Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
TRANCLASS	TRANCLASS	Name of the transaction class.
GROUP	GROUP	The group notion of CICS allowing a group of related resources to be declared and instantiated or not by a CICS system when starting.
DESCRIPTION	DESCRIPTION	A small textual comment zone for description of the resource.
MAXACTIVE	MAXACTIVE	Defines the degree of parallelism of execution.

Table 6-2 PROGRAM Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
PROGRAM	PROGRAM	Name of the program.
GROUP	GROUP	The group notion of CICS allowing a group of related resources to be declared and instantiated or not by a CICS system when starting.
DESCRIPTION	DESCRIPTION	A small textual comment zone for description of the resource.
LANGUAGE	LANGUAGE	The language of the program, required to know how to communicate with it.
EXECKEY	EXECKEY	Reserved for future use. Concerns memory protection of CICS shared structures.
STATUS	STATUS	Specifies the program status.

Table 6-2 PROGRAM Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
REMOTESYSTEM	REMOTESYSTEM	Specifies that the program is not offered locally but in a DPL server.
REMOTENAME	REMOTENAME	Specifies for a DPL program the name of the program on the distant site.

Table 6-3 FILE Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
FILE	FILE	Name of the file; logical name of the file used in EXEC CICS related to this file.
GROUP	GROUP	The group notion of CICS allowing a group of related resources to be declared and instantiated or not by a CICS system when starting.
DESCRIPTION	DESCRIPTION	A small textual comment zone for description of the resource.
DISPOSITION	DISPOSITION	Specifies the disposition of this file.
DSNAME	DSNAME	Specifies the data set name to be used for this file.
JOURNAL	JOURNAL	Specifies whether you want automatic journaling for this file.
KEYLENGTH	KEYLENGTH	Specifies the length in bytes of the logical key of records in remote files, and in coupling facility data tables that are specified with LOAD (NO).
OPENTIME	OPENTIME	Specifies when the file is opened.
READINTEG	READINTEG	Specifies the level of read integrity required for files defined with RLSACCESS (YES).

Table 6-3 FILE Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
RECORDSIZE	RECORDSIZE	Specifies the maximum length in bytes of records in a remote file or a coupling facility data table.
REMOTENAME	REMOTENAME	Specifies the name of the file on the remote system.
REMOTESYSTEM	REMOTESYSTEM	On source, specifies the name of the connection that links the local system to the remote system where the file resides. On the target platform, will be used only in case of file shipping to another system, either another TUXEDO system or native CICS system.
STATUS	STATUS	Specifies the initial status of the file following a CICS initialization.

Table 6-4 Journaling Attributes in FILE Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
JNLADD	JNLADD	Specifies if you want the add operations recorded on the journal nominated by the JOURNAL attribute.
JNLREAD	JNLREAD	Specifies the read operations you want recorded on the journal nominated by the JOURNAL attribute.
JNLSYNCREAD	JNLSYNCREAD	Specifies whether you want the automatic journaling records, written for READ operations to the journal, to be synchronous.

Table 6-4 Journaling Attributes in FILE Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
JNLSYNCWRITE	JNLSYNCWRITE	Specifies whether you want the automatic journaling records, written for WRITE operations to the journal, to be synchronous.
JNLUPDATE	JNLUPDATE	Specifies whether you want REWRITE and DELETE operations recorded on the journal.

Table 6-5 TSQUEUE MODEL Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
TSMODEL	TSMODEL	Name of the TS Queue model.
GROUP	GROUP	The group notion of CICS allowing a group of related resources to be declared and instantiated or not by a CICS system when starting.
DESCRIPTION	DESCRIPTION	A small textual zone for description of the resource.
LOCATION	LOCATION	Specifies the kind of storage to use: file or memory.
PREFIX XPREFIX	PREFIX XPREFIX	Specifies the character string that is to be used as the prefix for this model.
RECOVERY	RECOVERY	Specifies whether or not queues matching this model are to be recoverable.
POOLNAME	POOLNAME	Specifies the 8-character name of the shared TS pool definition that you want to use with this TSMODEL definition.

Table 6-5 TSQUEUE MODEL Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
REMOTE_SYSTEM	REMOTESYSTEM	On source platform, specifies the name of the connection that links the local system to the remote system where the temporary storage queue resides. On the target platform, used only in case of TS shipping to another system, either another TUXEDO system or native CICS system.
REMOTEPREFIX XREMOTEPREFIX	REMOTEPREFIX XREMOTEPREFIX	Specifies the character string that is to be used as the prefix on the remote system. The prefix may be up to 16 characters in length
SECURITY	SECURITY	Specifies whether security checking is to be performed for queues matching this model.

Table 6-6 ENQMODEL Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
ENQMODEL	ENQMODEL	Name of the ENQ model.
GROUP	GROUP	The group notion of CICS allowing a group of related resources to be declared and instantiated or not by a CICS system when starting.
DESCRIPTION	DESCRIPTION	A small textual zone for description of the resource.
ENQNAME	ENQNAME	Specifies the 1 to 255-character resource name.

Table 6-6 ENQMODEL Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
ENQSCOPE	ENQSCOPE	If omitted or specified as blanks, matching enqueue models will have a local scope, else they will have a global scope
STATUS	STATUS	E = Enabled; D = Disabled.

Table 6-7 TDQUEUE Extra Partition Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
TDQUEUE	TDQUEUE	Specifies the 1- to 4-character name of a transient data queue.
GROUP	GROUP	The group notion of CICS allowing a group of related resources to be declared and instantiated or not by a CICS system when starting.
DESCRIPTION	DESCRIPTION	A small textual zone for description of the resource.
DDNAME	DDNAME	Specifies a 1-to 8-character value that may refer to a data set defined in the startup JCL.
DISPOSITION	DISPOSITION	Specifies the disposition of the data set (MOD; OLD; SHR).
ERRORPTION	ERRORPTION	(UNSUPPORTED) Specifies the action to be taken if an I/O error occurs.
OPENTIME	OPENTIME	(UNSUPPORTED) Specifies the initial status of the data set.
RECORDFORMAT	RECORDFORMAT	Specifies the record format of the data set.
PRINTCONTROL	PRINTCONTROL	(UNSUPPORTED) Specifies the control characters to be used.

Table 6-7 TDQUEUE Extra Partition Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
RECORDSIZE	RECORDSIZE	Specifies the record length in bytes.
TYPEFILE	TYPEFILE	Specifies the type of data set the queue is to be associated with an input or output dataset.
DSNAME	DSNAME	Specifies the name of the file that is to be used to store records written to this extra partition queue.
SYSOUTCLASS	SYSOUTCLASS	(UNSUPPORTED) Specify the class of the SYSOUT data set.
TRT	----	Allow integrators and customers to make their own specific implementation of extra-partition queues.

Table 6-8 TDQUEUE Intra Partition Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
TDQUEUE	TDQUEUE	Specifies the 1- to 4-character name of a transient data queue.
GROUP	GROUP	The group notion of CICS allowing a group of related resources to be declared and instantiated or not by a CICS system when starting.
DESCRIPTION	DESCRIPTION	A small textual zone for description of the resource.
RECOVSTATUS	RECOVSTATUS	Specifies if the queue is logically recoverable or not.
TRANSID	TRANSID	Specifies the name of the transaction that is to be automatically initiated when the trigger level is reached.

Table 6-8 TDQUEUE Intra Partition Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
TRIGGERLEVEL	TRIGGERLEVEL	Specifies the number of records to be accumulated before a task is automatically initiated to process them.
USERID	USERID	Specifies the userid you want CICS to use for security checking when verifying the trigger-level transaction specified in the TRANSID field.
WAIT	WAIT	(INACTIVE field) Accepted only in the resource loading.
WAITACTION	WAITACTION	(INACTIVE field) Accepted only in the resource loading.
QSPACENAME	----	Specify the name of the tuxedo /Q QSPACE into which this queue is physically stored.
TRT	----	Allow integrators and customers to make their own specific implementation of intra-partition queues.

Table 6-9 MAPSET Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
NAME	MAPSET	Name of the MAPSET.
GROUP	GROUP	Installation group name.
DESCRIPTION	DESCRIPTION	A general description of the MAPSET resource.
RESIDENT	RESIDENT	YES=preload. NO=load on first use.
swastatus	STATUS	Sets the status of the resource, to specify if it is available.

Table 6-9 MAPSET Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
Usage	USAGE	Specifies the caching scheme to be used once the MAPSET is loaded.
FILENAME	----	Specifies the physical (binary) file name of the mapset, which is generated by the `tcxmapgen` utility (refer to section).

Table 6-10 TYPETERM Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
NAME	TYPETERM	Name of the `typeterm`.
GROUP	GROUP	The group notion of CICS allowing a group of related resources to be declared and instantiated or not by a CICS system when starting.
DESCRIPTION	DESCRIPTION	A small textual zone for description of the resource.
color	COLOR	Designates extended color attributes.
defscreencolumn	DEFSCREEN (rows, columns)	Number of columns of the default screen size.
defscreenrow	DEFSCREEN (rows, columns	Number of rows of the default screen size.
hilight	HILIGHT	Indicates whether a terminal supports the highlight feature.
logonmsg	LOGONMSG	Indicates whether the "Good Morning" (CSGM) transaction is automatically started on the terminal.
outline	OUTLINE	Indicates whether the terminal supports field outlining.
swastatus	STATUS	Specifies the resource status (whether available).

Table 6-10 TYPETERM Mapping

Field Name in ART FOR CICS	Resource Attribute in RDO/CSD	Description
uctran	UCTRAN	Specify whether translate lowercase alphabetic characters to uppercase, or only translate the transaction ID from lowercase to uppercase, or not translate any characters.
userarealen	USERAREALEN	The terminal control table user area (TCTUA) area size for the terminal.
INTERCODE	----	Specifies which encoding type of inbound data is used.
EXTERCODE	----	Specifies which encoding type of outbound data is used.
SOSI	SOSI	Specifies whether mixed EBCDIC and double-byte character set (DBCS) is supported.
PROGSYMBOLS	PROGSYMBOLS	Specifies whether the programmed symbol (PS) facility is supported.

APPENDIX A

UDB Linking

Installation Time UDB Linking

The file `makefile_intg` is provided as an example to help you generate a runtime linked with UDB, you can adapt it for other uses (partial linking with UDB, linking with DB2 connect, etc.).

CICS Runtime servers can be linked with an Oracle database or a UDB (LUW) database using a makefile named `makefile_intg`. This makefile detects the database that you are using thru the following environment variables: `DB2DIR` or `ORACLE_HOME`.

- If `DB2DIR` exists, the makefile links the servers with UDB libraries instead of the Oracle libraries, binds or rebinds the impacted servers and builds the `TMS_UDB`.
- Remark1 for ARTTSQ: ARTTSQ server uses a specific module for UDB or Oracle access, so in the makefile there is not only the database library changes, but also the linking of `kix_tsrecov_UDB or kix_tsrecov_Oracle to build the ARTTSQ server.`
- Remark 2 for ARTTSQ, if you have recoverable TS Queues, and are using UDB then you need to create the TS queue table for UDB. This should be done by using the script `crtstable_UDB` instead of the script crtstable_Oracle
- If `ORACLE_HOME` exists, the makefile links or relinks the servers with Oracle libraries and builds the `TMS_ORA`.
- If both variables (`DB2DIR` and `ORACLE_HOME`) exist or neither of these variables exist, the makefile stops and publishes a clear error message.

You can also change the `DATABASE` variable in the `makefile_intg` file to force the UDB or Oracle linking, as shown in the following example:

Listing A-1 Setting the Database Variable

```
#DATABASE=$(DATABASE_U)$(DATABASE_O)

DATABASE=UDB
```

Rebuilding Servers for UDB

The servers delivered are built to be used with Oracle, to rebuild these servers for UDB:

1. Check that the `DB2DIR` variable is set .
2. Check that the `ORACLE_HOME` variable is **not** set (or change the makefile).
3. Open the `tools` directory.
4. Run `make -f makefile_intg all`

Note: For UDB linking, make sure that you have the following line in the Tuxedo RM file:

```
UDB_XA:db2xa_switch_std:-L${DB2DIR}/lib64 -ldb2
```

Rebuilding ART Servers for CICS

You need to rebuild the ART CICS servers in case of updates on one of the following components:

- Major OS version
- Tuxedo
- RDBMS: Oracle or UDB
- WebSphere MQ
- Cobol compiler: Micro Focus or Cobol IT
- C++ compiler

Rebuilding the ART CICS Servers

Use the provided tool "`makefile_intg`" and do the following:

1. Open the `tools` directory of your ART installation.
2. Check that the variables used in the `makefile_intg` are set in your environment.
3. Run `make -f makefile_intg all`

APPENDIX C

External CICS Interface (EXCI)

Overview

The external CICS interface is an application programming interface which enables a non-CICS program running in MVS to:

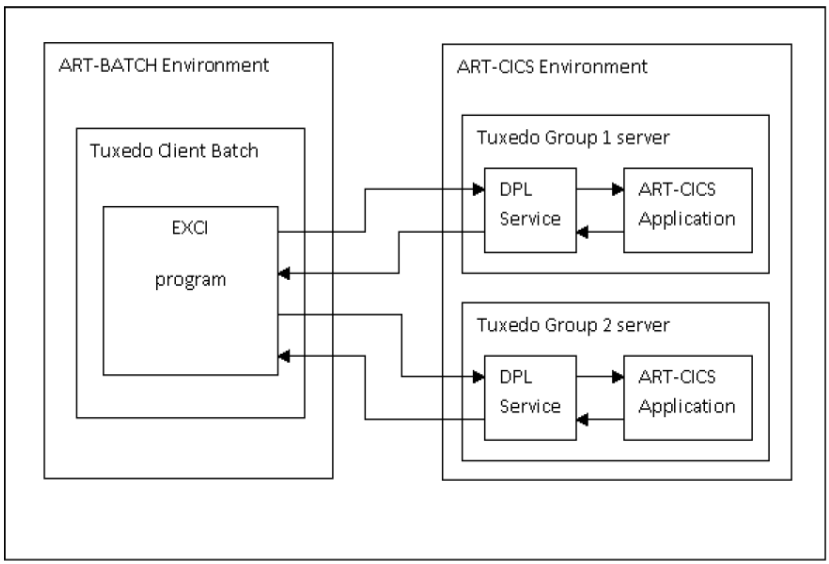
- Allocate and open sessions to a CICS system, and issue DPL requests on these sessions.
- Call a server program running in a CICS environment, pass and receive data by means of a communications area.

The external CICS interface provides two forms of programming interface:

- The `EXCI CALL` interface, which consists of six commands that allow you to:
  - Allocate and open sessions to a CICS system from non-CICS programs running under the MVS.
  - Issue DPL requests on these sessions from the non-CICS programs.
  - Close and release the sessions on completion of the DPL requests.
- The `EXEC CICS` interface, which provides a single composite command (`LINK PROGRAM() APPLID()`) that performs all six commands of the `EXCI CALL` interface in one invocation.

EXCI in Oracle Tuxedo Application Runtime

Figure C-1 EXCI in ART



Each `EXCI ART CICS` program must be defined as a DPL service in the `resource/program.desc` file. The seventh column must contain the `CICS SYSID`, and the service is advertised with the name: `<SYSID>_<PROGRAM>`.

If all DPL requests are done with `SYNCONRETURN` and not under the RRMS control, no Resource Manager is required in the Tuxedo Client. The initialization is done during the first EXCI request process and the Tuxedo session is terminated at the end of the client process.

If RRMS is used or one DPL request is done without `SYNCONRETURN`, the Tuxedo Client process must be built with one Resource Manager. At the initialization, the Resource Manager is opened and the transaction is begun at the beginning of the Client process. If one of these steps is not successful, the Client process aborts. At the normal end of the client process, the transaction is committed if it was not explicitly done by the client program (`RSSCMIT`). At the abnormal end of the client process, the transaction is rolled back. In each of these cases the Resource Manager is closed and the Tuxedo session is terminated.

Supported EXCI Interface

The EXCI precompiler option must be used for CICS client batch program.

The precompiler supports `EXCI CALL` or only one CICS command, `EXEC CICS LINK` with the next described options.

In case of `EXEC CICS LINK`, the `RETCODE` command option is mandatory with `EXCI` but forbidden with `NOEXCI`, and the `APPLID` option is `EXCI` specific. Without `EXCI` the `SYSID` option can be used.

With the EXCI precompiler option neither `DFHEIBLK` nor `DFHCOMMAREA` is generated as `PROCEDURE DIVISION USING` parameter.

The EXCI precompiler option is set by inserting a COBOL comment line containing from the seventh column:

```
*KIX--OPTION EXCI
```

before `IDENTIFICATION DIVISION` line.

Precompiler Controls

- `PROGRAM()` and `RETCODE()` are required for the `LINK` command in EXCI.
- `SYSID` is not recognized in EXCI.
- `COMMAREA` must be present if `LENTGH` or `DATALENGTH` is present.
- `EXCI CICS LINK` is the only recognized command in EXCI.

Access Authorization

The Tuxedo configuration `SECURITY` level drives the access authorization.

The `MT_EXCIAPPPROFILE` environment variable provides the application profile file name generated by the `genappprofile ARTKIX` tool. The default file name is `$HOME/.EXCIappProfile`.

In DPL service, the `EXEC CICS ASSIGN USERID()` command returns:

- `$USER` environment variable in the EXEC interface
- `USERID` value passed to the DPL request function of the CALL interface

See ART Batch Runtime documentation for more details.

ART-KIX Implementation

The programs linked via the EXCI interface are advertised by the DPL KIX server. They are named as <program>_<sysid>, where <program> is the linked program name (option PROGRAM(<program>) of EXCI EXEC interface), and <sysid> is the CICS system ID.

The EXCI interface uses the <applid> CICS application ID to address the appropriate CICS region. The relationship between <applid> and <sysid> is made via a specific DPL server service named <applid>_info.

The -a user parameter value of the DPL server command line (CLOPT) is used as <applid> value for the _info service.

If the <applid> is omitted by the client (without APPLID(<applid>) EXCI EXEC interface option), the default_info service is called. This service is advertised by the first DPL booted server.

The _info service returns the <sysid> associated to the server by the -s user parameter of the server command line.

ART Restrictions

Common EXCI Interfaces ART Restrictions

- The TRANSID has no meaning. There is no control on it. It is only passed to the DPL service in the EIBTRNID field in DFHEIBLK structure.
- The COMMAREA length is limited to 32763 bytes.

EXCI CALL Interface ART Restrictions

- Only VERSION-1 is supported.
- The initial user USER-NAME is only used to generate a user-token without any control.
- The DPL UOWID is kept for compatibility only, and is not set and tested.
- The PIPE-TYPE has no meaning. The recognized values for PIPE-TYPE are only X'00' and (X'C3' or X'D8') (X'C3' and X'D8' are the possible ASCII values for X'80' EBCDIC depending code-page). On other value the response code is set to 12 and the reason code to 498.

- The recognized values for SYNC-TYPE are only X'00' and (X'C3' or X'D8') (X'C3' and X'D8' are the possible ASCII values for X'80' EBCDIC depending code-page). On other value the response code is set to 12 and the reason code to 499.

EXCI EXEC Interface ART Restrictions

The DFHXCRM replaceable-module is not treated.

SRRCMIT/SRRBACK Functions

The SRRCMIT and SRRBACK functions are available. ATRCMIT and ATRBACK functions are not supported.

SRRCMI and SRRBACK fuctions must be coded as:

```
01  SRR-RETCODE              PIC 9(8) COMP-5.
CALL "SRRCMIT" USING SRR-RETCODE
CALL "SRRBACK" USING SRR-RETCODE
```