CH15: The CICS Time Machine
Version 2.5

User Guide

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This edition applies to Version 2.5 of SupportPac CH15 (The CICS Time Machine) and to all subsequent releases and modifications until otherwise indicated in new editions.

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The CICS Time Machine

Version 2.5

This version of the CH15 CICS Time Machine SupportPac provides programs to run the CICS Time Machine under all currently supported releases of CICS Transaction Server:

- CICS TS 4.1
- CICS TS 4.2
- CICS TS 5.1
- CICS TS 5.2
- CICS TS 5.3

The source code for the Time Machine Global User Exit programs is also provided in this version of the SupportPac. This will allow you to generate the exit programs required to run the Time Machine under previous or future releases of CICS Transaction Server.

Overview

The CICS Time Machine is a tool which makes it easier for you to test time dependent CICS applications. It gives you the ability to change the time and date used by your CICS application programs, enabling you to test how the applications will behave at particular times or dates, in the future or past. The date and time can be set to specific values or the time can be adjusted by a positive or negative delta.

Situations where the Time Machine could be useful include:

- Testing function that executes at an unsociable time of day.
- Testing applications whose operation will change on a certain date because of new legal regulations.
- Testing the effect of communications between CICS systems in different time zones.

The CICS Time Machine uses XEIIN, XEIOUT and XPCFTCH, Global User Exit programs to create a virtual 'application' time zone for applications within a CICS Transaction Server region, while the rest of the z/OS image and the CICS software itself still use the real 'system' time. The exit programs provide conversion between the two time zones where times are passed from CICS to the application and vice-versa.

The Time Machine only has to take action for a small subset of the CICS API and SPI. The commands that are modified fall into two categories, depending on whether the time parameter is passed in to CICS from the application or is passed out of CICS back to the application.

The *TIME IN* commands are:

```
EXEC CICS START TRANSID(trn) TIME(hhmmss)...
EXEC CICS START TRANSID(trn) AT...
EXEC CICS DELAY TIME(hhmmss)...
EXEC CICS DELAY UNTIL...
EXEC CICS POST TIME(hhmmss)...
EXEC CICS POST AT...
EXEC CICS ROUTE TIME(hhmmss)...
EXEC CICS ROUTE AT...
```

For each of these commands the Time Machine modifies the supplied time so that the event is scheduled to occur at the supplied time within the 'application' time zone rather than at that time in the 'system' time zone.

The *TIME OUT* commands are:

        EXEC CICS ASKTIME
        EXEC CICS ASKTIME ABSTIME(time)

For each of these commands the Time Machine updates the EIBTIME and EIBDATE fields with the current time and date in the 'application' time zone. If the ABSTIME argument has been specified on the command, the Time Machine returns a value which represents the absolute time in the 'application' time zone.

        EXEC CICS INQUIRE REQID TIME() ...
        EXEC CICS INQUIRE REQID AT HOURS() MINUTES() SECONDS() ...

For these commands the Time Machine adjusts the returned time values to show the time in the 'application' time zone at which the ICE is scheduled to expire.

        EXEC CICS INQUIRE TASK() ATTACHTIME() ...

For this command the Time Machine adjusts the returned time value to show the time in the 'application' time zone at which the task was attached.

        EXEC CICS INQUIRE CLASSCACHE STARTTIME() ...

For this command the Time Machine adjusts the returned time value to show the time in the 'application' time zone at which the current shared class cache was started.

        EXEC CICS INQUIRE ATOMSERVICE()
        EXEC CICS INQUIRE BUNDLE()
        EXEC CICS INQUIRE CONNECTION()
        EXEC CICS INQUIRE CORBASERVER(
        EXEC CICS INQUIRE DB2CONN
        EXEC CICS INQUIRE DB2ENTRY()
        EXEC CICS INQUIRE DB2TRAN()
        EXEC CICS INQUIRE DJAR()
        EXEC CICS INQUIRE DOCTEMPLATE()
        EXEC CICS INQUIRE ENQMODEL()
        EXEC CICS INQUIRE EVENTBINDING()
        EXEC CICS INQUIRE FILE()
        EXEC CICS INQUIRE IPCONN()
        EXEC CICS INQUIRE JOURNALMODEL()
        EXEC CICS INQUIRE JVMSERVER()
        EXEC CICS INQUIRE LIBRARY()
        EXEC CICS INQUIRE MQCONN
        EXEC CICS INQUIRE MQINI()
        EXEC CICS INQUIRE PIPELINE()
        EXEC CICS INQUIRE PROCESSTYPE()
        EXEC CICS INQUIRE PROFILE()
        EXEC CICS INQUIRE PROGRAM()

```
EXEC CICS INQUIRE REQUESTMODEL()
EXEC CICS INQUIRE TCPIPSERVICE()
EXEC CICS INQUIRE TDQUEUE()
EXEC CICS INQUIRE TRANCLASS()
EXEC CICS INQUIRE TRANSACTION()
EXEC CICS INQUIRE TSMODEL()
EXEC CICS INQUIRE URIMAP()
EXEC CICS INQUIRE WEBSERVICE()
EXEC CICS INQUIRE XMLTRANSFORM()
```

For each of these commands the Time Machine adjusts the returned time values for the DEFINETIME(), CHANGETIME() and INSTALLTIME() command options to show the time in the 'application' time zone at which the resource was defined, last changed and installed respectively.

Version 2.5 of the CICS Time Machine provides support for the following releases of CICS:
• CICS Transaction Server for z/OS Version 4 Release 1 (CICS TS 4.1)
• CICS Transaction Server for z/OS Version 4 Release 2 (CICS TS 4.2)
• CICS Transaction Server for z/OS Version 5 Release 1 (CICS TS 5.1)
• CICS Transaction Server for z/OS Version 5 Release 2 (CICS TS 5.2)
• CICS Transaction Server for z/OS Version 5 Release 3 (CICS TS 5.3)

Installation

All the files which make up the SupportPac are shipped in the file **ch15.zip**. This file should be downloaded to a PC and unzipped to extract all contained files.

The following files should be produced:

readme.txt	Brief introduction
ch15.c41	Load library for CICS TS 4.1 CH15 SupportPac programs
ch15.c42	Load library for CICS TS 4.2 CH15 SupportPac programs
ch15.c51	Load library for CICS TS 5.1 CH15 SupportPac programs
ch15.c52	Load library for CICS TS 5.2 CH15 SupportPac programs
ch15.c53	Load library for CICS TS 5.3 CH15 SupportPac programs
ch15.samp	Sample source code library for CICS TS 4.1 → 5.2
ch15.samp.cts53	Sample source code library for CICS TS 5.3 only
ch15.pdf	PDF version of User Guide (this document)

The six library files are unloaded partitioned datasets created by the TSO TRANSMIT command. These files should be transferred to your target z/OS system as sequential binary files and the partitioned datasets should be recreated using the TSO RECEIVE command, for example:

- **receive indsname(ch15.c52)**

Five partitioned datasets should be generated as follows:

TMCV2.CTSnn.LOAD - load library containing all required CH15 SupportPac programs:

note: nn should be replaced with your CICS version suffix

- TMCCNTL - Time Machine Control Program
- TMCSCRN - Program for CTMC transaction
- TMCMAP1 - BMS map for CTMC transaction
- TMCDELTA - PLT program to apply time delta
- TMCNEWDT - PLT program to change date
- TMCXEIIN - XEIIN exit program
- TMCXEIOU - XEIOUT exit program
- TMCXPCFT - XEPCFTCH exit program

TMCV2.SAMP - containing the following seven members:
- ASMEXIT - Sample JCL to assemble and link-edit exit programs
- TMCCOMMA - Assembler copybook for TMCCNTL commarea
- TMCCOPYA - Assembler copybook for user exit GWA
- TMCDEFNS - Sample CICS resource definitions
- TMCXEIIN - Assembler source code of XEIIN exit program
- TMCXEIOU - Assembler source code of XEIOUT exit program
- TMCXPCFT - Assembler source code of XPCFTCH exit program

The member TMCDEFNS in TMCV2.SAMP contains DFHCSDUP control statements for adding the Time Machine resource definitions to your CICS System Definition data set (CSD). You will need to

modify the list name in the ADD statement in TMCDEFNS so that the TMCGRP resource definition group is added to a group list used by your CICS at system initialization. After you have edited TMCDEFNS, you should use it as input to DFHCSDUP to update your CSD.

TMCDEFNS contains a definition for the Time Machine transient data queue called CTMC. The TMCCNTL program attempts to write a message to this TD queue whenever it is invoked to change the date and time. If the CTMC TD queue is not defined, TMCCNTL continues processing but the message is lost.

To make the Time Machine programs available to your CICS system you must either add a DD statements for TMCV2.CTSnn.LOAD library for your level of CICS to the DFHRPL concatenation in your CICS startup JCL or copy the Time Machine programs to a library which is already defined in the DFHRPL concatenation.

If you wish to use the CICS Time Machine with a release of CICS Transaction Server prior to CICS TS 4.1, or with any future release of CICS TS, you can use the sample JCL in member ASMEXIT of TMCV2.SAMP to assemble the source code of the Time Machine exit programs TMCXEIIN, TMCXEIOU and TMCXPCFT (which are also in TMCV2.SAMP) against the appropriate CICS SDFHMAC library and link-edit them into a load library. You should then use the modules from this library, rather than any of the supplied TMCV2.CTSnn.LOAD libraries, in your DFHRPL concatenation. If used with a future release of CICS Transactio Server, the exits will supply exactly the same function as for CICS TS 4.1 and any new time-dependent CICS commands introduced by the new release will not be supported by the Time Machine until a new release of the SupportPac is issued.

Operation

The CICS Time Machine basically consists of four programs. The control program, TMCCNTL, is common for all CICS releases. The three exit programs, TMCXEIIN, TMCXEIOU and TMCXPCFT, which run at the CICS XEIIN, XEIOUT and XPCFTCH Global User Exit points, are CICS TS release dependent.

TMCCNTL is linked to by a program which passes it data in a commarea. This data consists of a time and date to be used in the 'application' time zone, a time offset and offset direction indicator, or a value which indicates that applications should resume using the 'system' time and date. TMCCNTL enables the exit programs at the appropriate exit points when the date/time is to be changed and disables the exit programs to make applications resume using the 'system' date/time. TMCCNTL dynamically determines which exit programs to enable/disable according to the CICS release under which it is running.

While the exit programs are enabled they perform the following functions:

TMCXEIIN
Modifies times specified on EXEC CICS START, DELAY, POST and ROUTE commands.

TMCXEIOU
Modifies the EIBTIME, EIBDATE and ABSTIME values returned for EXEC CICS ASKTIME commands.
Modifies the times returned by EXEC CICS INQUIRE REQID commands.
Modifies the time returned by EXEC CICS INQUIRE TASK() ATTACHTIME() commands.
Modifies the time returned by EXEC CICS INQUIRE CLASSCACHE STARTTIME() commands.
Modifies the time returned by EXEC CICS INQUIRE *resource_type* INSTALLTIME() commands.

TMCXPCFT
Modifies EIBTIME and EIBDATE at transaction initiation before control is given to the first application program of a task.

Invoking the Time Machine

As well as the basic Time Machine programs, TMCCNTL and the exit programs, the Time Machine package also includes the following simple applications to enable/disable the Time Machine.

1. **TMCDELTA** - a program to adjust the time by a given delta at CICS initialization.
2. **TMCNEWDT** - a program to set the date to a given value at CICS initialization.
3. **CTMC** - a 3270 based transaction to set the date and time to any valid value or to resume use of system date and time.

Using TMCDELTA to adjust the time at CICS initialization

The TMCDELTA program is designed to be invoked during the third phase of CICS Post Initialization processing. It allows you to change the time in your CICS system by a specified offset as soon as the CICS system is started.

To use TMCDELTA you need to specify an entry for it in the PI PLT used by your CICS system. The time offset is specified via the INITPARM CICS system initialization parameter and has the form, *INITPARM=(TMCDELTA='shhmm')*, where 's' is '+' or '-' indicating the direction of time shift, and 'hhmm' is the interval by which the time is to be offset in hours and minutes. If the data passed to TMCDELTA via the INITPARM is invalid, or if TMCDELTA receives a non-zero return code from TMCCNTL, TMCDELTA writes a message to the system console to notify you of the error.

Using TMCNEWDT to adjust the date at CICS initialization

The TMCNEWDT program is designed to be invoked during the third phase of CICS Post Initialization processing. Its function is to change the date without changing the time of day.

To use TMCNEWDT you need to specify an entry for it in the PI PLT used by your CICS system. The date is specified via the INITPARM system initialization parameter and has the form, *INITPARM=(TMCNEWDT='ddmmyyyy')*. If the data passed to TMCNEWDT via the INITPARM is invalid, or if TMCNEWDT receives a non-zero return code from TMCCNTL, TMCNEWDT writes a message to the system console to notify you of the error.

Using the CTMC transaction

This transaction is designed be run from a 3270 type terminal with a 24x80 screen. It provides a very simple method of changing the date and time. To use the transaction just type the transaction identifier CTMC then press Enter. In response, a panel similar to that shown below is displayed.

To change the date and/or time, simply modify the relevant input fields and press Enter. If a valid date and time are entered, the display will change to show 'System is using MODIFIED date/time'. If any of the fields are invalid, the fields in error will be highlighted and an error message will be displayed.

To resume using the current (i.e. system) date and time in your CICS system, press PF6. The display will change to show 'System is using CURRENT date/time'.

```
CTMC    VERSION 2.5              CICS Time Machine              Applid IV5A70A2



   Modify date and/or time, then press Enter to make change.


                      Date
                         Day  :    22   (01-31)
                         Month:    03   (01-12)
                         Year :  2016   (1900-2099)


                      Time
                         Hours  : 19   (00-23)
                         Minutes: 35   (00-59)



   System is using MODIFIED date/time.


   Press PF6 to restore current date and time.



 (C) Copyright IBM Corp.   1996, 2015
 F3=Exit  F6=Restore
```

Figure 1. CTMC screen

Writing your own interface to the Time Machine

As well as using the supplied sample programs to invoke the Time Machine, you can write your own interface to TMCCNTL. TMCCNTL can be invoked by EXEC CICS LINK from an application program written in any language supported by CICS Transaction Server. It must be passed a commarea of at least 16 bytes. The data passed in the commarea determines the function TMCCNTL is to perform.

TMCCNTL can be invoked to perform the following functions:

- Set time and date to specific values
- Adjust time by a specific offset
- Reset to use 'system' time and date

TMCCNTL will fully validate the data passed in the commarea and return a code of 0008 in the commarea if the data is invalid.

If no commarea is passed to TMCCNTL or the passed commarea is less than 16 bytes, TMCCNTL will issue a 'CTMC' transaction abend.

If the CTMC transient data destination has been defined in your CICS system, TMCCNTL will issue one of the following messages as appropriate when the Time Machine exit programs are enabled or disabled.

> TMCCNTL01 *date time applid* Date/Time set by user *userid* to *dd/mm/yyyy hh:mm*
> TMCCNTL02 *date time applid* Date/Time reset by user *userid* to system values

Setting time and date to specific values

To set the time and date to specific values you must pass TMCCNTL a commarea with the following format:

> 4 bytes character time (hhmm)
> 8 bytes character date (ddmmyyyy)
> 4 bytes character Time Machine return code

The time value should be a valid time in hhmm format in the range 0000-2359.

The date value should be a valid date in ddmmyyyy format in the range 01011900-31122099 (i.e. Between 1st January 1900 and 31st December 2099).

Adjusting time by a specific offset

To adjust the time by a positive or negative delta you must pass TMCCNTL a commarea with the following format:

> 4 bytes character time (hhmm)
> 1 byte character sign (+ or -)
> 7 bytes filler
> 4 bytes character Time Machine return code

The time value should be a valid time in hhmm format in the range 0000-2359.

The sign value should be either '+' or '-' to indicate whether the time offset should be added to or subtracted from the current time.

Resetting to 'system' time and date

To make applications resume using the 'system' time and date you must pass TMCCNTL a commarea with the following format:

    4 bytes nulls (X'00000000')
    8 bytes filler
    4 bytes character Time Machine return code

The first four bytes of the commarea must be set to nulls.

Commarea layout

TMCCOMMA in the TMCV2.SAMP data set contains the following Assembler language definitions for the TMCCNTL commarea.

```
      ****************************************************************
      * Storage layout for COMMAREA to be passed to CICS Time Machine   **
      * control program TMCCNTL.                                        **
      ****************************************************************
      TMCCOMM  DS  0CL16   CICS Time Machine COMMAREA
      TMCTIME  DS  0CL4    New Time (hhmm)
      TMCHOURS DS   CL2
      TMCMINS  DS   CL2
      TMCSIGN  DS  0CL1    Sign for time delta (+ or -)
      TMCDATE  DS  0CL8    New Date (DDMMYYYY)
      TMCDAY   DS   CL2
      TMCMONTH DS   CL2
      TMCYEAR  DS   CL4
      TMCRESP  DS   CL4     Response from Time Machine
```

Return codes

TMCCNTL returns a four byte character code to the calling program in bytes 13-16 of the commarea. The return code values have the following meanings:

    0000 - Normal
    0008 - Invalid data in commarea
    0012 - Another update to Time Machine already in progress
    0016 - Exit program not defined to CICS or not in DFHRPL
    0020 - Authorization failure
    0024 - Error while disabling exit program

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Restrictions

The CICS Time Machine operates with the following restrictions:

Events scheduled before time change

Events that have already been scheduled prior to the 'application' time zone being established or altered by the Time Machine will not be rescheduled.

Seconds cannot be modified

The value for seconds cannot be modified and is always the same for both 'application' and 'system' time zones.

CICS Time Machine programs are not threadsafe

The CICS Time Machine programs are not threadsafe. This means that when a program that is defined as threadsafe and that is executing on an open TCB invokes a threadsafe CICS command which causes one of the Time Machine global user exit programs to be invoked, CICS switches back to the QR TCB before giving control to the exit program. When the user exit program completes processing, CICS switches back to the open TCB to continue processing the threadsafe CICS command. The TCB switching may have a detrimental effect on application performance.

Sending your comments to IBM

If you have any comments or questions regarding this SupportPac, please use the Feedback button on the right-side of the download page.
Please include the following information in any communication:

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