IBM Debug Tool for z/OS

Program number 5655-W70

Tutorial

This is the tutorial for IBM Debug Tool for z/OS®, one of the IBM zSeries® problem determination tools.

Debug Tool tutorial

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Debugging CICS® Applications

- Starting the debugger using the DTCN transaction
  - Creating a DTCN profile
  - Working with DTCN profiles
- Creating and editing a DTCN profile using the GUI plug-in
- Starting the debugger using the CADP transaction
  - Creating a CADP profile
  - Working with CADP profiles

This section describes using Debug Tool with CICS programs, using the DTCN transaction to define profiles that will start the debugger when your application runs. You will see how to create a DTCN profile, and how to work with your profile.

Start the Debug Tool DTCN transaction

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DTCN

Enter

Use the DTCN transaction to set a trigger that will start the debugger when your application runs

Log on to the CICS system where the application will run

Clear the screen, and enter DTCN

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First, log on to the CICS system where the application will run. Clear the screen, type "DTCN" and press Enter.

Specify the combination of resources that will trigger the debugger

```
DTCN              Debug Tool CICS Control - Primary Menu          CICSACB3
                          * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id    ==> Z002
 Transaction Id ==>
 LoadMod::>CU(s) ==>            ::>              ==>          ::>
                 ==>            ::>              ==>          ::>
                 ==>            ::>              ==>          ::>
                 ==>            ::>              ==>          ::>
 User Id        ==> DNET074
 NetName        ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type   ==> MFI                    MFI, TCP
 Port Number    ==>                        TCP Port
 Display Id     ==> Z002

Generated String:   TEST(ALL,'*',PROMPT,'MFI%Z002:*')

Repository String: No string currently saved in repository

Profile Status:    No Profile Saved. Press PF4 to save current settings.

PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

Identify the trigger combination

Specify where the debugger will be displayed

Your terminal and user ID are the defaults

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   The DTCN primary menu is displayed, where you can define your debugging profile. On the top half of the screen, specify information about the application that you want to debug. You can specify the name of the CICS terminal where the transaction will run, the transaction ID, up to eight program names, the user ID, and other identifiers. Your current terminal id and your user id are filled in by DTCN automatically. Use any combination of these fields to identify the conditions that, when they all occur, will trigger the debugger.

   In the middle part of the screen, specify where you want the debugger to be displayed. Specify a CICS terminal ID if you want to use the terminal interface, or the IP address of your workstation for the GUI debugger. By default, your current CICS terminal ID is filled in automatically as the location for where the debugger will be displayed.

Specify the combination of resources that will trigger the debugger

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- The debugger will trigger when all of the resource names are matched
  - If any Loadmod ::> CU combinations are coded, at least one must match

- You can specify up to eight load module / CU pairs
  - Loadmod is the name known to CICS, such as a load module name, initial program in a transaction or a program that is XCTL'd or LINKed to.
  - CU (compile unit) is the name known to the compiler. Examples are the COBOL PROGRAM-ID or the PL/I main PROCEDURE name.
  - They are not necessarily the same

```
Select the combination of resources to debug (see
 Terminal Id      ==> Z002
 Transaction Id   ==>
 LoadMod::>CU(s)  ==> *         ::> CDAT1
                  ==> DS500     ::> *
                  ==> DLA25     ::> DLA25
                  ==> JSH00*    ::> MRM900
 User Id          ==>
 NetName          ==>
```

Wildcards * and ? can be used in resource names

The profile determines when the debugger will start. When a program runs in CICS, if all of the resource names match, the debugger will trigger. For example. If you specify a terminal id, a user id, and a program name, all three must match.

  Notice the fields titled: LoadMod and CUs. The LoadMod is the name known to CICS. It is the name of a load module, which could be the first program that runs in a transaction, or a program called with a an XCTL or LINK. The CU is a compile unit, which is the name known to the compiler. For example it is the name of the COBOL "program id" or the PL/I main procedure.

 You can specify up to eight pairs of load modules and CUs. You can use asterisks and question marks as wildcards in the names. Notice that you can code an asterisk as one of the names. For example, you can code the load module name and specify asterisk in the CU field. Then the profile will trigger if there is a match on the load module name, regardless of the program name. If you specify any load module and CU combinations, at least one of them must match for the profile to trigger.

- You can be specific about the trigger. For example:

```
Select the combination of resources to debug (see
 Terminal Id     ==> Z002
 Transaction Id  ==> CDAT
 LoadMod::>CU(s) ==> CDAT1     ::> CDAT1
                 ==>           ::>
                 ==>           ::>
                 ==>           ::>
 User Id         ==> DNET074
 NetName         ==>
```

This example will only trigger for a specific combination of resources

- Or you can have a more generic combination

```
Select the combination of resources to debug (see
 Terminal Id     ==>
 Transaction Id  ==>
 LoadMod::>CU(s) ==> *         ::> CDAT*
                 ==> *         ::> ABC*
                 ==> *         ::> X*
                 ==>           ::>
 User Id         ==>
 NetName         ==>
```

Use caution! This example will trigger regardless of the user ID, terminal, or transaction.

When you define the conditions that will trigger the debugger, you can be very specific. In the top example, when an application runs on a terminal named Z002 in a transaction called CDAT, and a program receives control named CDAT1 that resides in a load module also named CDAT1, and the user ID is DNET074, then and only then will Debug Tool trigger. By being specific, you can be assured that you do not trap other people's transactions.

But you can also use a more generic combination. In the second example the debugger will be triggered when any program that starts with CDAT, ABC, or X runs. Notice the use of wildcards in the load module and program name fields. Also notice that the other fields are left blank. Since the terminal ID is left blank, this profile will trap programs running on any terminal, and even transactions not running on a terminal. Since the transaction ID is blank, the programs can be running in any transaction ID, and the blank user ID means that it will trap programs for all users. Use caution when you have a generic profile like this one, because you can trap other people's transactions, whether you intend to or not.

- You can debug someone else's transaction

```
Select the combination of resources to debug (see
 Terminal Id    ==>
 Transaction Id ==>
 LoadMod::>CU(s) ==> *          ::> CDAT1
                ==>           ::>
                ==>           ::>
                ==>           ::>
 User Id        ==> OTHERGUY
 NotName        ==>
```

You can debug someone else's transaction by coding their user ID or terminal or both

- To debug a background transaction, the terminal ID must be blank

```
Select the combination of resources to debug (see
 Terminal Id    ==>
 Transaction Id ==> BT01
 LoadMod::>CU(s) ==> *          ::> BGP001
                ==>           ::>
                ==>           ::>
                ==>           ::>
 User Id        ==>
 NotName        ==>
```

A background transaction is a transaction that does not use a 3270 terminal

You can trap another person's transaction on purpose. In the first example, notice that someone else's user ID is specified in the User ID field. This profile will only trap transactions initiated by user id "otherguy" when they run program CDAT1.

You can also debug a background CICS transaction. A background transaction is a transaction that was not initiated from a CICS terminal. For example, transactions that are initiated by an external web service, and transactions initiated from MQ Series are often background transactions. The only thing to remember is to leave the terminal ID blank. That is all there is to it. Use any other combination of available identifiers to debug the transaction you want.

Specifying the debug display device

- You can name a CICS terminal

```
Select type and ID of debug display device
 Session Type    ==> MFI              MFI, TCP
 Port Number     ==>                  TCP Port
 Display Id      ==> Z002
```

The MFI (mainframe interface) option displays the debugger on a CICS terminal

- Or you can connect to a GUI debugging interface:

```
Select type and ID of debug display device
 Session Type    ==> TCP              MFI, TCP
 Port Number     ==> 8001             TCP Port
 Display Id      ==> 98.76.54.234
```

The TCP option specifies the workstation address for a remote GUI debugger

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   You specify where you want the debugger to be displayed when the profile is triggered. By default, it will display on your CICS terminal. A setting of "MFI", which stands for mainframe interface, in the Session Type field specifies that you want to use the 3270 terminal interface. You can change the terminal id in the "display id" field, if you want the debugger to display on a different terminal. This allows you to run a transaction on one terminal, and have the debugger display on a another one.

   To use the graphical debugging interface, specify "TCP" in the Session Type field, and enter the IP address of your workstation and the listener port of the GUI debugging software that is installed and running on your workstation.

Identify the resource combination, and save the profile with F4

```
DTCN              Debug Tool CICS Control - Primary Menu          CICSACB3
                          * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id    ==> Z002
 Transaction Id ==>
 LoadMod::>CU(s) ==> *           ::> CDAT1           ==>           ::>
                ==>              ::>                 ==>           ::>
                ==>              ::>                 ==>           ::>
                ==>              ::>                 ==>           ::>
 User Id        ==> DNET074
 NetName        ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type   ==> MFI                    MFI, TCP
 Port Number    ==>                        TCP Port
 Display Id     ==> Z002

Generated String:   TEST(ALL,'*',PROMPT,'MFI%Z002:*')

Repository String: No string currently saved in repository

Profile Status:    No Profile Saved. Press PF4 to save current settings.

PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

When this combination occurs, the debugger will start

The debugger will display on this terminal

F4

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After you set up your debugging profile, save it by pressing F4. Notice that the F4 key is set to "Save".

The profile has been saved
F3 to exit

```
DTCN                Debug Tool CICS Control - Primary Menu           CICSACB3
                              * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id    ==> Z002
 Transaction Id ==>
 LoadMod::>CU(s) ==> *         ::> CDAT1         ==>           ::>
                 ==>           ::>               ==>           ::>
                 ==>           ::>               ==>           ::>
                 ==>           ::>               ==>           ::>
 User Id        ==> DNET074
 NetName        ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type   ==> MFI              MFI, TCP
 Port Number    ==>                  TCP Port
 Display Id     ==> Z002

Generated String:  TEST(ALL,'*',PROMPT,'MFI%Z002:*')

Repository String: TEST(ALL,'*',PROMPT,'MFI%Z002:*')

Profile Status:   Active. Press PF5 to Inactivate.              F3
EQA2514I Debug Tool profile saved
PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

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   The profile was saved. Notice the "Debug Tool profile saved" message. This profile will trigger as soon as program CDAT1 runs from terminal Z002, which is the current terminal, and the id of the user running the transaction is DNET074. Debug Tool will be displayed on the same terminal, Z002. At this point, you are ready. F3 is pressed to exit from the DTCN transaction.

Now, do whatever you need to do to run your application to create the conditions specified in the profile that will start the debugger. In this case, the sample transaction CDAT is run.

The DTCN profile triggered the debugger when the application ran

```
COBOL    LOCATION: CDAT1 ENTRY
Command ===>                                              Scroll ===> PAGE
MONITOR -+----1----+----2----+----3----+----4----+----5----+----6- LINE: 0 OF 0
****************************** TOP OF MONITOR ******************************
**************************** BOTTOM OF MONITOR ****************************




SOURCE: CDAT1 ----1----+----2----+----3----+----4----+----5----+ LINE: 2 OF 576
        2          PROGRAM-ID. CDAT1.
        3      *    CICS / DEBUG TOOL DEMO PROGRAM
        4      *
        5      *    THIS PROGRAM WILL RECEIVE A DATE AND COVERT THE DATE TO
        6      *    AN INTEGER IN A CALLED PROGRAM TO DETERMINE DAYS FROM
        7      *    CURRENT DATE.
LOG 0----+----1----+----2----+----3----+----4----+----5----+---- LINE: 28 OF 30
0028 IBM Debug Tool Version 10 Release 1 Mod 0
0029 12/29/2009  8:15:08 PM
0030 5655-V50: Copyright IBM Corp. 1992, 2009
PF  1:?        2:STEP       3:QUIT       4:LIST       5:FIND       6:AT/CLEAR
PF  7:UP       8:DOWN       9:GO        10:ZOOM      11:ZOOM LOG  12:RETRIEVE
```

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Because the profile was matched, the debugger was started. In this example, based on the settings in the profile, it displayed on the same terminal. From here, you can set breakpoints, monitor variables, and follow the program flow into subprograms. When the application writes messages or maps to the screen, those messages will appear. The debugger will share the screen with the application.

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Debugging CICS Applications

- Starting the debugger using the DTCN transaction
  - Creating a DTCN profile
  - Working with DTCN profiles
  - Setting the current terminal ID in a DTCN profile
- Creating and editing a DTCN profile using the GUI plug-in
- Starting the debugger using the CADP transaction
  - Creating a CADP profile
  - Working with CADP profiles
  - Setting the current terminal ID in a CADP profile

Next, you will see how to work with your DTCN profile.

DTCN

```
 DTCN              Debug Tool CICS Control - Primary Menu           CICSACB3
                          * VSAM storage method *
 Select the combination of resources to debug (see Help for more information)
  Terminal Id    ==> Z002
  Transaction Id ==>
  LoadMod::>CU(s) ==> *          ::> CDAT1          ==>          ::>
                 ==>             ::>                ==>          ::>
                 ==>             ::>                ==>          ::>
                 ==>             ::>                ==>          ::>
  User Id        ==> DNET074
  NetName        ==>
  IP Name/Address ==>
 Select type and ID of debug display device
  Session Type   ==> MFI                  MFI, TCP
  Port Number    ==>                      TCP Port
  Display Id     ==> Z002

 Generated String:  TEST(ALL,'*',PROMPT,'MFI%Z002:*')

 Repository String: TEST(ALL,'*',PROMPT,'MFI%0076:*')

 Profile Status:    Active. Press PF5 to Inactivate.

 PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

Enter

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The DTCN transaction is entered, and the primary menu is displayed, showing the existing profile settings.

Use function keys to control the profile and display options panels

```
DTCN              Debug Tool CICS Control - Primary Menu           CICSACB3
                           * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id      ==> Z002
 Transaction Id   ==>
 LoadMod::>CU(s)  ==> *          ::> CDAT1          ==>          ::>
                  ==>            ::>                ==>          ::>
                  ==>            ::>                ·            ::>
                  ==>            ::>                ·            ::>
 User Id          ==> DNET074
 NetName          ==>
 IP Name/Address  ==>
Select type and ID of debug display device
 Session Type     ==> MFI                  MFI, TCP
 Port Number      ==>                      TCP Port
 Display Id       ==> Z002

Generated String:   TEST(ALL,'*',PROMPT,'MFI%Z002:*')

Repository String:  TEST(ALL,'*',PROMPT,'MFI%0076:*')

Profile Status:     Active. Press PF5 to Inactivate.

PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

You can delete the profile with F6
Or it can be toggled active and inactive with the F5 key

F8 displays advanced options

F8

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Notice the function key settings. You can delete the profile by pressing the F6 key, or you can toggle the profile active and inactive with F5. That way, you can turn it off when you do not need it, then reactivate it later. F7 shows a list of DTCN profiles defined on the system. F9 displays the TEST option panel, and F8 displays the advanced options panel. The F8 key is pressed.

The advanced options panel

```
DTCN              Debug Tool CICS Control - Advanced Options       CICSACB3

Select advanced program interruption criteria:

Commarea Offset  ==> 0
Commarea Data    ==>

Container Name   ==>
Container Offset ==> 0
Container Data   ==>

URM Debugging    ==> NO




Default offset and data representation is decimal/character.
See Help for more information.



PF1=HELP 2=GHELP 3=RETURN
```

> You can use data passed in the commarea or containers to help identify programs that you want to debug

> URM=YES allows debugging of CICS user replaceable modules

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That displayed the advanced options panel, where you can specify additional resource values. Enter one or more of these if you need to have more granular criteria to trigger the debugger only for specific instances of your program. You can specify a data value that must be present in the commarea at a specific offset, or you can specify a data value at a specific offset in a named container.

Typically, these are only used in cases where a combination of terminal, transaction, program, and user id are not specific enough, and the profile might trigger for the wrong instance of a transaction. For example, this can happen with background transactions that are started from other systems or web-based applications. Applications and interfaces often communicate through the commarea or a container.

Additional trigger conditions can be specified

```
DTCN              Debug Tool CICS Control - Advanced Options        CICSACB3

Select advanced program interruption criteria:

Commarea Offset  ==> 25
Commarea Data    ==> ABC123

Container Name   ==>
Container Offset ==> 0
Container Data   ==>

URM Debugging    ==> NO




Default offset and data representation is decimal/character.
See Help for more information.

                                                                   F3

PF1=HELP 2=GHELP 3=RETURN
```

Use these options for more control over which programs and transactions trigger the debugger

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In this example, the data value "ABC123" must be present in the commarea starting in the 25th byte, in addition to the resources specified for the transaction, program, user id, and other identifiers. F3 is pressed to return.

The F9 key displays the options panel

```
DTCN              Debug Tool CICS Control - Primary Menu         CICSACB3
                           * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id     ==> Z002
 Transaction Id  ==>
 LoadMod::>CU(s) ==> *          ::> CDAT1          ==>          ::>
                 ==>            ::>                ==>          ::>
                 ==>            ::>                ==>          ::>
                 ==>            ::>                ==>          ::>
 User Id         ==> DNET074
 NetName         ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type    ==> MFI               MFI, TCP
 Port Number     ==>                   TCP Port
 Display Id      ==> Z002

Generated String:   TEST(ALL,'*',PROMPT,'MFI%Z002:*')

Repository String:  TEST(ALL,'*',PROMPT,'MFI%0076:*')

Profile Status:    Active. Press PF5 to Inactivate.                    ┌──────┐
                                                                       │  F9  │
PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

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The profile is displayed again. Notice the line titled "Repository string". This is the TEST option that will be passed to Language Environment at run time to start the debugger. You can change the sub-options of the TEST option. To do that, press F9.

The DTCN options panel is displayed

```
DTCN                 Debug Tool CICS Control - Menu 2              CICSACB5


Select Debug Tool options

Test Option     ==> TEST              Test/Notest
Test Level      ==> ALL               All/Error/None
Commands File   ==> *
Prompt Level    ==> PROMPT
Preference File ==> *


EQAOPTS File    ==>


Any other valid Language Environment options
==>
```

When a profile is matched, DTCN invokes the debugger by passing a TEST option to Language Environment when the program runs.

This panel is used to specify sub-options for the TEST option.

```
PF1=HELP 2=GHELP 3=RETURN
```

A screen is displayed where you can make changes to the sub-options of the TEST option that will be used to start the debugger.

LE TEST options can be specified

```
DTCN              Debug Tool CICS Control - Menu 2              CICSACB5

Select Debug Tool options

Test Option    ==> TEST              Test/Notest
Test Level     ==> ALL               All/Error/None
Commands File  ==> *
Prompt Level   ==> PROMPT
Preference File => DNET074.ADLAB.FILES(DTPREF2)

EQAOPTS File   ==>

Any other valid Language En
==>

        F3


PF1=HELP 2=GHELP 3=RETURN
```

In this example, a preferences file (a script that runs when the debugger starts) is specified

```
-IPT- BROWSE    DNET074.ADLAB.FILES(DTPREF2) - 01.01
Command ===>
******************************** Top of Data ********
SET DEFAULT SCROLL CSR ;
SET AUTOMONITOR ON BOTH;
SET WARNING OFF;
SET TEST ERROR;
SET DEFAULT LISTINGS(TEST.SYSDEBUG, PROD.SYSDEBUG );
SET PF16 "MONITOR" = MONITOR LOCAL %CU LIST CURSOR ;
******************************** Bottom of Data ******
```

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For example, you can run a script by entering the name of a script file in either the "preference file" or "commands file" fields. In this example, a preference file is specified. When the debugger starts, the specified script will run automatically. After the script completes, the debugger will be displayed. F3 is pressed to return.

**Returned to the DTCN primary menu,
F7 shows a list of profiles**
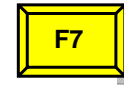
```
DTCN              Debug Tool CICS Control - Primary Menu            CICSACB3
                            * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id     ==> Z002
 Transaction Id  ==>
 LoadMod::>CU(s)  ==> *           ::>  CDAT1            ==>            ::>
                 ==>           ::>                   ==>            ::>
                 ==>           ::>                   ==>            ::>
                 ==>           ::>                   ==>            ::>
 User Id         ==> DNET074
 NetName         ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type    ==> MFI                 MFI, TCP
 Port Number     ==>                     TCP Port
 Display Id      ==> Z002

Generated String:   TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(DTPREF2)')

Repository String: TEST(ALL,'*',PROMPT,'MFI%0076:*')

Profile Status:    Active. Press PF5 to Inactivate.

PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

F7

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Notice that the F7 key is set to "SHOW". F7 is pressed.

A list of DTCN profiles is displayed

Line commands

```
DTCN                Debug Tool CICS Control - All Sessions            CICSACB3

Overtype "_" with "D" to delete, "A" to activate, "I" to inactivate a profile.

   Owner    Sta Term Tran   User Id     NetName   Applid    Display Id

  DNET070  ACT Z002 ____    DNET070     _____  CICSACB3 Z002

           LoadMod::>CU(s) CDAT1     ::> *              _____  ::> _____
                           _____  ::> _____       _____  ::> _____
                           _____  ::> _____       _____  ::> _____
                           _____  ::> _____       _____  ::> _____
           IP Name/Addr    _____


_ DNET074  ACT 0076 ____    DNET074     _____  CICSACB3 0076

           LoadMod::>CU(s) *         ::> CDAT1            _____  ::> _____
                           _____  ::> _____       _____  ::> _____
                           _____  ::> _____       _____  ::> _____
                           _____  ::> _____       _____  ::> _____
           IP Name/Addr    _____

PF1=HELP 2=GHELP 3=RETURN 7=BACK 8=FORWARD
```

F3

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That displayed a list of profiles on the CICS system. Profiles for all users are displayed. In this example, there are profiles entered by other users in the system. From here, you can Delete, Inactivate, and Activate profiles with "D", "I", and "A" line commands. F3 is pressed to return.

If changes have been made, press F4 to save them

```
DTCN                Debug Tool CICS Control - Primary Menu            CICSACB3
                              * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id     ==> Z002
 Transaction Id  ==>
 LoadMod::>CU(s) ==> *           ::> CDAT1          ==>           ::>
                 ==>             ::>                ==>           ::>
                 ==>             ::>                ==>           ::>
                 ==>             ::>                ==>           ::>
 User Id         ==> DNET074
 NetName         ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type    ==> MFI                 MFI, TCP
 Port Number     ==>                     TCP Port
 Display Id      ==> Z002

Generated String:  TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(DTPREF2)')

Repository String: TEST(ALL,'*',PROMPT,'MFI%0076:*')

Profile Status:    Active. Press PF5 to Inactivate.               F4

PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

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If you made changes to the profile, you can save them. Notice that F4 is set to "Save". F4 is pressed.

Changes to the profile were saved
F3 to exit

```
DTCN               Debug Tool CICS Control - Primary Menu          CICSACB3
                             * VSAM storage method *
 Select the combination of resources to debug (see Help for more information)
  Terminal Id    ==> Z002
  Transaction Id ==>
  LoadMod::>CU(s) ==> *          ::> CDAT1          ==>          ::>
                  ==>            ::>                ==>          ::>
                  ==>            ::>                ==>          ::>
                  ==>            ::>                ==>          ::>
  User Id         ==> DNET074
  NetName         ==>
  IP Name/Address ==>
 Select type and ID of debug display device
  Session Type    ==> MFI                 MFI, TCP
  Port Number     ==>                     TCP Port
  Display Id      ==> Z002

 Generated String:   TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(DTPREF2)')

 Repository String: TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(DTPREF2)')

 Profile Status:    Active. Press PF5 to Inactivate.            F3
 EQA2514I Debug Tool profile saved
 PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

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That saved the profile. The next time a program runs and all of the resource specifications match, the debugger will be started by passing the TEST option to Language Environment at the right time.

Profile retention and tie-breaking

- How long is a DTCN profile retained?
  - It depends on the storage method for DTCN profiles chosen by the installer
    - Notice that one of these messages is displayed on your DTCN primary menu:
      - * VSAM storage method * (profiles are stored in a VSAM file), or
      - * TSQ storage method *   (profiles are stored in temp storage queues)
  - When the TSQ storage method is in use:
    - Profiles are deleted automatically when the user logs off and disconnects from CICS
  - When the VSAM storage method is in use:
    - Profiles are retained until they are explicitly deleted

- What if multiple profiles match an application?
  - The oldest profile is used

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When you enter a new profile, how long is it retained? The answer depends on how the person who installed Debug Tool set up the DTCN repository – whether your profiles are saved in a file or in a temporary storage queue.

On the DTCN menu, the storage method is displayed as either "VSAM storage method" or "TSQ storage method". If the TSQ (temporary storage queue) method is used, profiles are deleted automatically when the user logs off and disconnects from CICS. However, when the VSAM storage method is used, profiles are retained permanently until you delete them. Even after CICS regions are restarted.

When a program runs in CICS, it is possible that more than one profile can be matched. If that happens, the oldest profile triggers, and all other profiles are ignored.

- If a profile is defined on a terminal owning region (TOR), is it active in the application owning region (AOR) where the application will run?
    - If the DTCN profile repository is shared between multiple CICS regions, a profile entered on one region is also active in all other sharing regions
    - If the DTCN profile repository is not shared, then a profile is only active in the CICS region where it is entered
    - DTCN profile repository sharing is controlled by the installer
        - The repository can be a VSAM file or temp storage queue
        - Either type can be shared or not shared

It is not unusual for CICS regions to be configured to work together. A common configuration is for one CICS region to serve as a terminal owning region, or TOR. When you log on, your CICS terminal is connected to the TOR. But programs run on different regions, called application owning regions, or AORs.

The person who installs Debug Tool can configure the system so that the DTCN profile repository is shared between your CICS regions. If that is done, you can define DTCN profiles in the TOR, and the debugger will still trigger for programs running in AORs.

However, if the profiles are not shared, then a profile is only active in the region where it is entered.

The installer decides whether DTCN profiles are shared between CICS regions.

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Routing in a multi-region CICS environment

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- Is it necessary to route (using a CRTE transaction) to the region where the application will run before debugging?
  - You can be connected to a terminal-owning region (TOR) and debug a program or transaction running in a separate application-owning region (AOR), if both of the following have been configured:
    1. The DTCN repository is shared between the TOR and the AOR
    2. The CICS administrator has installed a CICS "terminal not found" exit in the AOR
       - The exit allows the debugger (running in the AOR) to display on your terminal in the TOR
       - Note: when using a remote GUI debugger, the "terminal not found" exit is not needed
  - If either of the above requirements is not configured, then you must either:
    - Log on directly to the region where the application will run, or
    - Connect to the application region using a CRTE transaction
      - For example, after connecting to the TOR, clear the screen and enter: CRTE SYSID=ABCD (where ABCD is the CICS ID of the AOR)

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On some systems you can enter your DTCN profile in the terminal owning region, and the debugger will trigger even if the target program runs in a different CICS region. But on other systems, you must log on directly to the application region, or route to the application region where the program will run, before defining your DTCN profile. You can route from one region to another with the CICS "CRTE" transaction.

Whether you need to route or not depends on how the person who installed Debug Tool configured it on your system. If the DTCN repository is shared between the various CICS regions, then you do not need to route to the region where the application will run before creating your DTCN profile. To complete the shared repository configuration, the installer must also install a CICS "terminal not found" exit if you plan to use the 3270 terminal interface.

If the repository is shared, you can define your profile in the terminal owning region, and it will trigger even when the program runs in a different region. If the repository is not shared, you must route or log on to the application region before defining your DTCN profile. Ask your system programmer or help desk if the DTCN repository is shared in your CICS systems.

Debug Tool tutorial

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Debugging CICS Applications
- Starting the debugger using the DTCN transaction
  - Creating a DTCN profile
  - Working with DTCN profiles
  - Setting the current terminal ID in a DTCN profile
- Creating and editing a DTCN profile using the GUI plug-in
- Starting the debugger using the CADP transaction
  - Creating a CADP profile
  - Working with CADP profiles
  - Setting the current terminal ID in a CADP profile

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Next, you will see how to update a DTCN profile to refer to a new terminal.

Change the terminal ID in your profile if it has changed

- This is a consideration if DTCN profiles on your system are retained

- When you log off and back on to CICS, your terminal ID may change
  - The terminal IDs in your profile will not match your new terminal ID

- This example shows how to update the profile with your new terminal ID

If DTCN profiles are retained on your system, your profile will remain available even after you log off. DTCN profiles are retained if the VSAM storage method was configured by the installer.

When you log off and back on to CICS, your terminal id may change, and then your new terminal id does not match the terminal id in your profile. This example shows how to update your existing profile with your new terminal id.

DTCN

```
DTCN              Debug Tool CICS Control - Primary Menu          CICSACB3
                        * VSAM storage method *
 Select the combination of resources to debug (see Help for more information)
  Terminal Id    ==> Z002
  Transaction Id ==>
  LoadMod::>CU(s) ==> *         ::> CDAT1         ==>         ::>
                 ==>            ::>               ==>         ::>
                 ==>            ::>               ==>         ::>
                 ==>            ::>               ==>         ::>
  User Id        ==> DNET074
  NetName        ==>
  IP Name/Address ==>
 Select type and ID of debug display device
  Session Type   ==> MFI                MFI, TCP
  Port Number    ==>                    TCP Port
  Display Id     ==> Z002

  Generated String:  TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(DTPREF2)')

  Repository String: TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(DTPREF2)')

  Profile Status:    Active. Press PF5 to Inactivate.
  EQA2520W Terminal mismatch. Press PF10 to set to current terminal.
  PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

Enter

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In this example, a DTCN profile had been created. Then later, the user logged off of CICS. And then some time after that the user logged back on.

The DTCN transaction is entered, and the primary menu is displayed, showing the existing profile settings. Notice the message: "Terminal mismatch", which means that at least one of the terminal ids in the profile does not match the current terminal id. Notice that a mismatched terminal id is highlighted.

A message indicates a terminal mismatch

```
DTCN                Debug Tool CICS Control - Primary Menu           CICSACB3
                          * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id     ==> Z002
 Transaction Id  ==>
 LoadMod::>CU(s) ==> *          ::> CDAT1          ==>          ::>
                 ==>            ::>                ==>          ::>
                 ==>            ::>                ==>          ::>
                 ==>            ::>                ==>          ::>
 User Id         ==> DNET074
 NetName         ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type    ==> MFI                  MFI, TCP
 Port Number     ==>                      TCP Port
 Display Id      ==> Z002

Generated String:   TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(DTPREF2)')

Repository String: TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(      )')

 Profile Status:     Active. Press PF5 to Inactivate.
 EQA2520W Terminal mismatch. Press PF10 to set to current terminal.
PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

Place the cursor on the mismatched terminal ID and press F10

F10

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The "terminal id" field identifies the terminal where a program must run for the profile to trigger. Place your cursor on the terminal id, and press F10.

**The terminal ID was updated,
a second mismatching terminal ID was highlighted**

```
DTCN             Debug Tool CICS Control - Primary Menu          CICSACB3
                        * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id      ==> 0092
 Transaction Id   ==>
 LoadMod::>CU(s) ==> *         ::> CDAT1          ==>          ::>
                  ==>          ::>                ==>          ::>
                  ==>          ::>                ==>          ::>
                  ==>          ::>                ==>          ::>
 User Id          ==> DNET074
 NetName          ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type     ==> MFI              MFI, TCP
 Port Number      ==>                  TCP Port
 Display Id       ==> Z002

 Generated String:   TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(DTPREF2)')


 Repository String:  TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(    )

 Profile Status:     Active. Press PF5 to Inactivate.
 EQA2520W Terminal mismatch. Press PF10 to set to current terminal.
 PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

Place the cursor on the other mismatched terminal ID and press F10 again

F10

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That changed the terminal id to the current terminal.

   The "display id" field controls where the debugger will be displayed. This field is highlighted now, which flags it as a mismatched terminal. Place your cursor on the display id, and press F10.

Both terminal IDs were updated,
press F4 to save the updated profile

```
DTCN              Debug Tool CICS Control - Primary Menu          CICSACB3
                          * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id     ==> 0092
 Transaction Id  ==>
 LoadMod::>CU(s) ==> *          ::> CDAT1          ==>          ::>
                 ==>            ::>                 ==>          ::>
                 ==>            ::>                 ==>          ::>
                 ==>            ::>                 ==>          ::>
 User Id         ==> DNET074
 NetName         ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type    ==> MFI                 MFI, TCP
 Port Number     ==>                     TCP Port
 Display Id      ==> 0092

Generated String:   TEST(ALL,'*',PROMPT,'MFI%0092:DNET074.ADLAB.FILES(DTPREF2)')

Repository String: TEST(ALL,'*',PROMPT,'MFI%Z002:DNET074.ADLAB.FILES(DTPREF2)')

Profile Status:    Active. Press PF5 to Inactivate.                [F4]

PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

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That changed the display id to the current terminal. Now the terminal identifiers have been set to the current terminal id. Press F4 to save the changes to the profile.

Changes to the profile were saved
F3 to exit

```
DTCN              Debug Tool CICS Control - Primary Menu          CICSACB3
                           * VSAM storage method *
Select the combination of resources to debug (see Help for more information)
 Terminal Id     ==> 0092
 Transaction Id  ==>
 LoadMod::>CU(s) ==> *          ::> CDAT1         ==>           ::>
                 ==>            ::>               ==>           ::>
                 ==>            ::>               ==>           ::>
                 ==>            ::>               ==>           ::>
 User Id         ==> DNET074
 NetName         ==>
 IP Name/Address ==>
Select type and ID of debug display device
 Session Type    ==> MFI               MFI, TCP
 Port Number     ==>                   TCP Port
 Display Id      ==> 0092

Generated String:   TEST(ALL,'*',PROMPT,'MFI%0092:DNET074.ADLAB.FILES(DTPREF2)')

Repository String: TEST(ALL,'*',PROMPT,'MFI%0092:DNET074.ADLAB.FILES(DTPREF2)')

Profile Status:     Active. Press PF5 to Inactivate.          F3
EQA2514I Debug Tool profile saved
PF1=HELP 2=GHELP 3=EXIT 4=SAVE 5=ACT/INACT 6=DEL 7=SHOW 8=ADV 9=OPT 10=CUR TRM
```

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The profile has been saved, and now you can run the target program from your current terminal to create the causes to match the profile and start the debugger.

That is the end of this section, which described how to start the debugger for CICS programs by using the DTCN transaction.

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