CICS TS Tutorial -- Transaction Dump Analysis

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THANK YOU VERY MUCH!!

Agenda

- Introduction
  - Important Dump Information
  - What is an ASRA Dump?
    - Program Checks
  - PSW
- The Big COBOL Picture
  - Major Control Blocks
    - DSA
    - TGT
- Types of Dumps
  - System Dumps
  - Transaction Dumps
- Analyzing a Transaction Dump
  - Cancelation Information
  - PSW
  - Computing the Program Offset to Identify the Failing Instruction
  - BLW/BLL Cells
  - Locating the Failing Field(s)
  - Cookbooks
- Closing

Introduction

- This presentation describes a methodology that can be used to debug a program check (ASRA) in a COBOL program using a transaction dump
- Some of the information provided can be used to debug transaction dumps in other programs

Important Dump Information

- PSW – contains reference to where the program failed
- Registers at the time of the cancellation
- The failing program
- The failing instruction as per PSW
- The data involved in the cancelation
- The address of the last EXEC CICS issued
- Information if LINK was used
- Symptom string

What Is an ASRA Dump?

- An ASRA is CICS' equivalent to a program check transaction dump (S0Cn cancelation)
- The initial cancelation is taken as a system abend AP0001 or SR0001
  - The internal code is AKEA because the cancelation is intercepted by the Kernel Domain
- The difference between an AP or SR system dump depends on the execution key assigned to the task
  - Key 8 (CICS) → AP0001
  - Key 9 (User) → SR0001
- As a result that you will receive both a system and transaction dump, it is probably a good idea to suppress the AP0001/SR0001 system dumps to reduce overhead

Program Checks

- Program Check codes:
  - 01 Operation Exception (*)
  - 02 Privileged Operation Exception
  - 03 Execute Exception
  - 04 Protection Exception (*)
  - 05 Addressing Exception
  - 06 Specification Exception
  - 07 Data Exception (*)
  - 08 Fixed Point Overflow Exception
  - 09 Fixed Point Divide Exception (*)
  - 0A Decimal Overflow Exception
  - 0B Decimal Divide Exception (*)
  - 0C HFP Exponent Overflow Exception
  - 0D HFP Exponent Underflow Exception
  - 0E HFP Significance Exception
  - 0F HFP Floating Point Divide Exception

  Note: * indicate most common to debug

Program Checks

- There are program checks associated with virtual storage addressing exceptions which are treated as protection exceptions (S0C4)
  - 0010 Segment-translation exception
  - 0011 Page-translation exception
  - 0038 ASCE-type exception
  - 0039 Region-first-translation exception
  - 003A Region-second-translation exception
  - 003B Region-third-translation exception
- The cancelations appear as 0C4 RC=nn where “nn’ is the program check code
- It is important to remember that in these types of program checks, the PSW address is actually pointing to the instruction that caused the program check
  - This is different for all the other program checks that occur in the system including a S0C4 RC=04 which point to the next sequential instruction

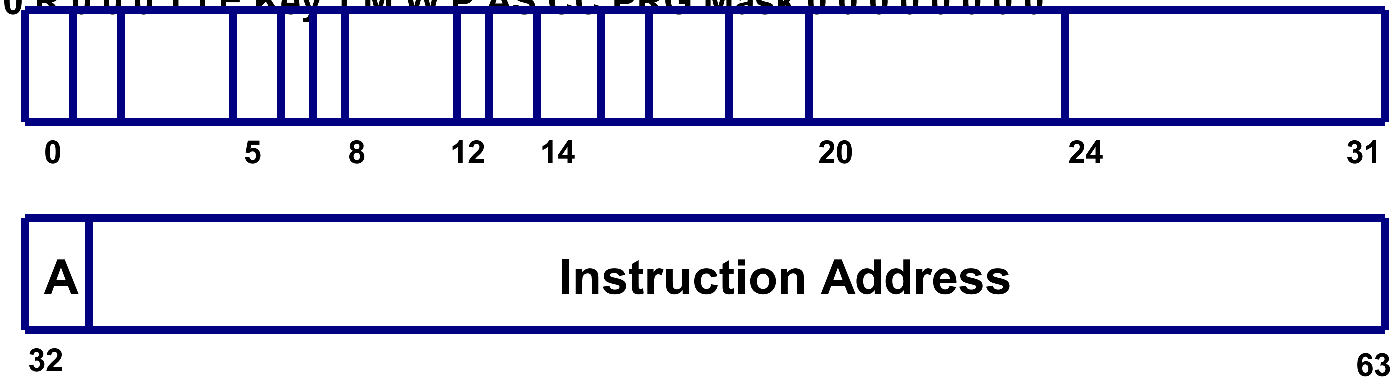
Program Status Word

- The Program Status Word (PSW) is the most important control block (hardware) in a dump
- Some of the things that the PSW provides:
  - The address of the next sequential instruction for execution
    - ➢ There are some exceptions that are discussed later
  - Provides the current protection key being used by the program
  - Provides some masks for interrupts
  - Indicates if we are in problem or supervisory state
  - Current condition code
  - Access mode (Primary, Access Register, etc.)
  - Indicates if we are in wait or execution state
  - Program mask
- PSW can be either 8 (31-bits address) or 16 bytes (64-bits address) long
  - The PSW is presented in the 8 byte format because programs can only execute below the bar
  - Data is the only thing that can be placed above the bar

Program Status Word

- **ESA/390 PSW**

- 0 R 0 0 0 T I E Key 1 M W P AS CC PRG Mask 0 0 0 0 0 0 0 0

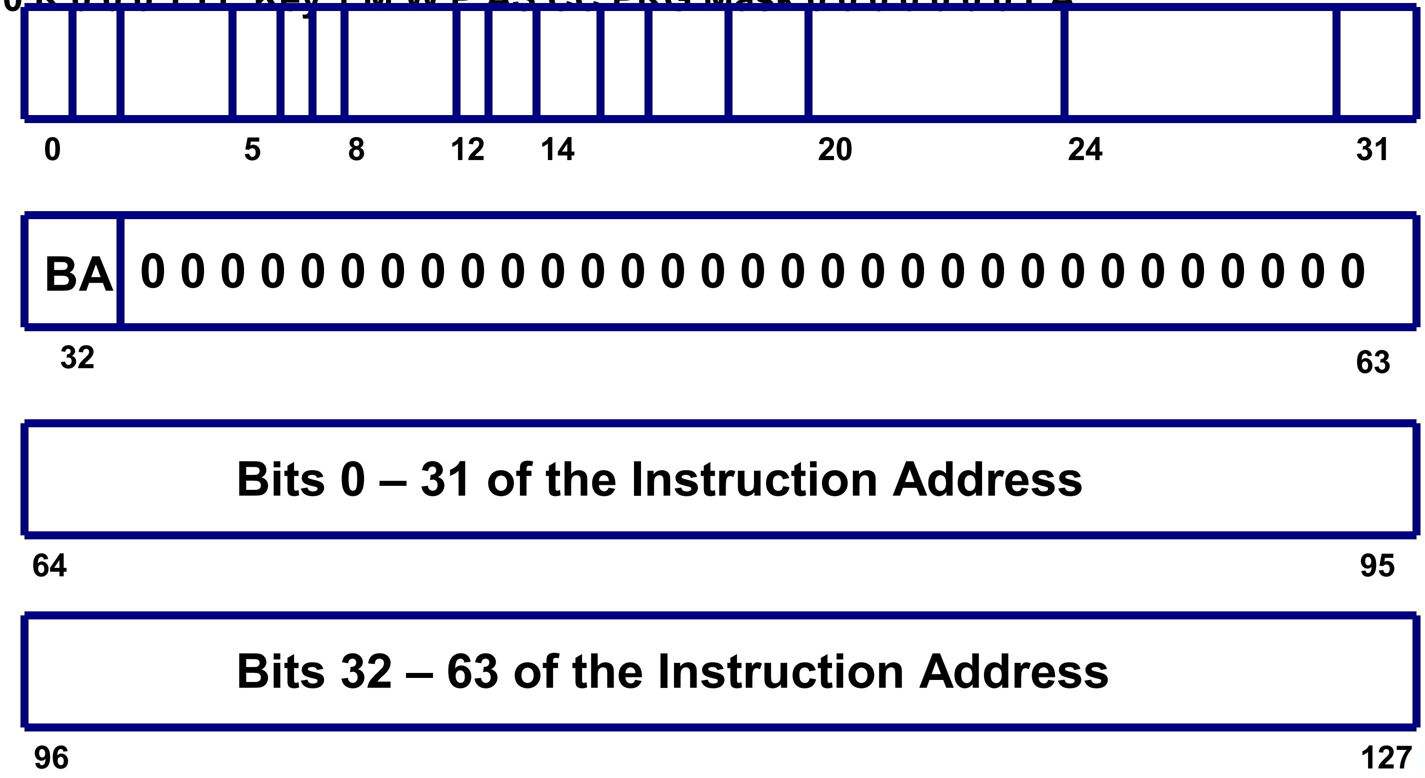


Bit 12 – indicates ESA/390 Mode

Bit 32 – Addressing Mode (1 = 31-bit addressing)

Program Status Word

- **z/Architecture PSW (Bit 12 = 0)**
- **0 R 0 0 0 T I E Key 1 M W P AS CC PRG Mask 0 0 0 0 0 0 0 EA**



Program Status Word

- z/Architecture PSW (Bit 12 = 0)
  - R → Program Event Recording (PER)
  - T → Dynamic Address Translation (on)
  - I → I/O Mask
  - E → External Mask
  - PSW Key → Executing Key
  - M → Machine Mask
  - P → Problem (1) Supervisory (0) State
  - Access Mode → Primary, Secondary, Home or AR
  - CC → Condition Code
  - Program Mask → FP or Decimal Overflow, Exponent Underflow or Significance
  - EA → Extended Addressing mode
  - BA → Basic Addressing Mode

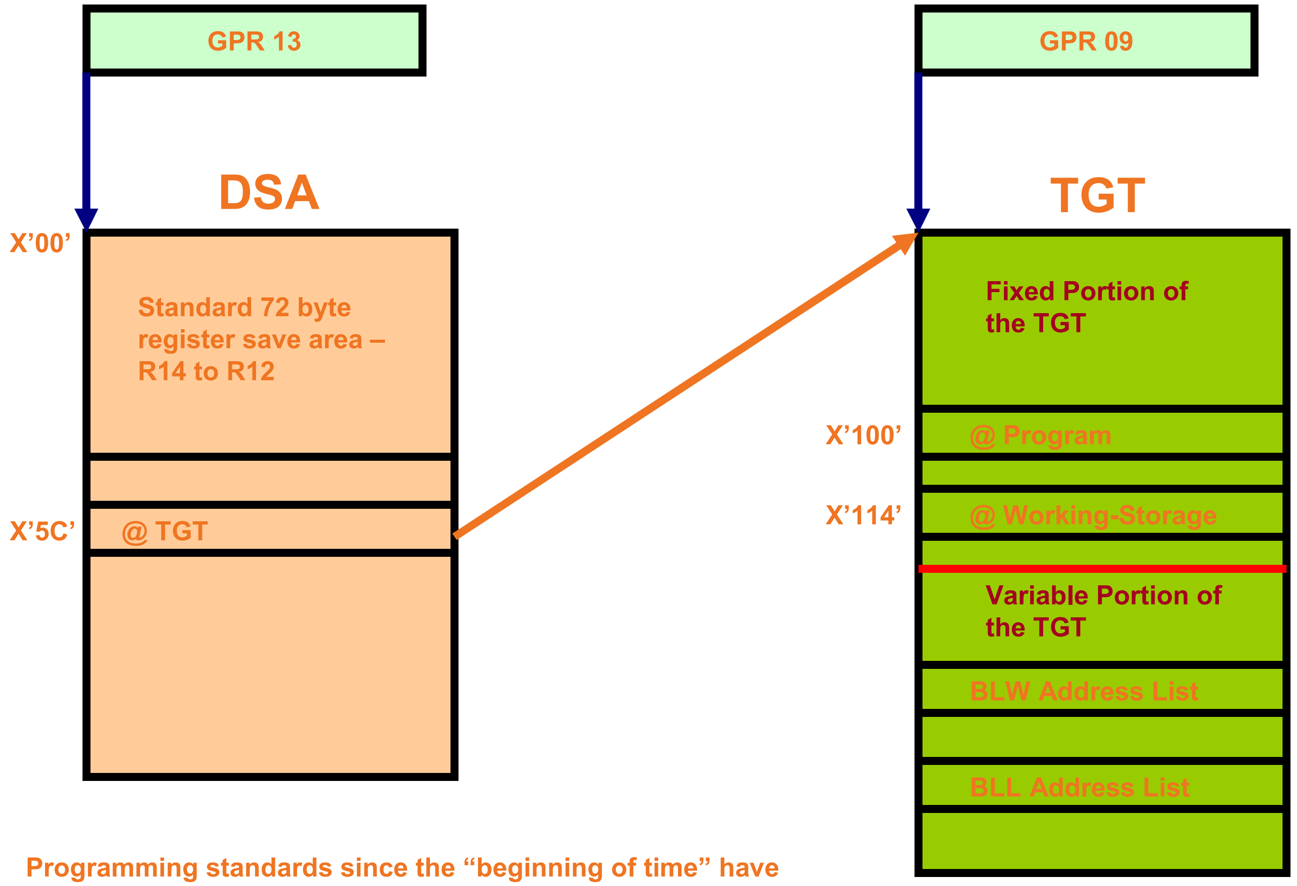
Program Status Word

- z/Architecture PSW (Bit 12 = 0)
  - Addressing Modes EA and BA
    - ➢00 → 24-Bit Addressing Mode
    - ➢01 → 31-Bit Addressing Mode
    - ➢10 → Invalid
    - ➢11 → 64-Bit Addressing Mode

The Big COBOL Picture

- To debug a COBOL program you need to access two major COBOL control blocks
  - DSA – Dynamic Save Area that contains the COBOL program's registers and a pointer to the TGT
  - TGT – Task Global Table that contains the address of the program and the BLW/BLL cells which address the areas used by the program

The Big COBOL Picture



Programming standards since the "beginning of time" have designated GPR 13 to point to the current save area

Dynamic Storage Area

```
*** DSA MEMORY MAP ***
            DSALOC

            00000000  REGISTER SAVE AREA
            0000004C  STACK NAB (NEXT AVAILABLE BYTE)
            00000058  ADDRESS OF INLINE-CODE PRIMARY DSA
            0000005C  ADDRESS OF TGT
            00000060  ADDRESS OF CAA
            00000080  XML PARSE WORK AREA ANCHOR
            00000084  SWITCHES
            00000088  CURRENT INT. PROGRAM OR METHOD NUMBER
            0000008C  ADDRESS OF CALL STATEMENT PROGRAM NAME
            00000090  CALC ROUTINE REGISTER SAVE AREA
            000000C4  ADDRESS OF FILE MUTEX USE COUNT CELLS
            000000C8  PROCEDURE DIVISION RETURNING VALUE

             *** VARIABLE PORTION OF DSA ***

            000000D0  BACKSTORE CELLS FOR SYMBOLIC REGISTERS
            000000E0  VARIABLE-LENGTH CELLS
            000000F8  VARIABLE NAME (VN) CELLS FOR PERFORM
            00000130  PERFORM SAVE CELLS
            00000170  TEMPORARY STORAGE-2

TGT      WILL BE ALLOCATED FOR 00003F40 BYTES
SPEC-REG WILL BE ALLOCATED FOR 0000007E BYTES
WRK-STOR WILL BE ALLOCATED FOR 00F44255 BYTES
DSA      WILL BE ALLOCATED FOR 00000270 BYTES
CONSTANT GLOBAL TABLE FOR DYNAMIC STORAGE INITIALIZATION AT LOCATION 002868
INITD CODE FOR DYNAMIC STORAGE INITIALIZATION BEGINS AT LOCATION 002A80 FOR LENGTH 0000C4
```

Register Save Area is a standard operating system save area where the registers are saved GPR 14 to GPR 12 at an offset of +X'0C' into the save area

Task Global Table

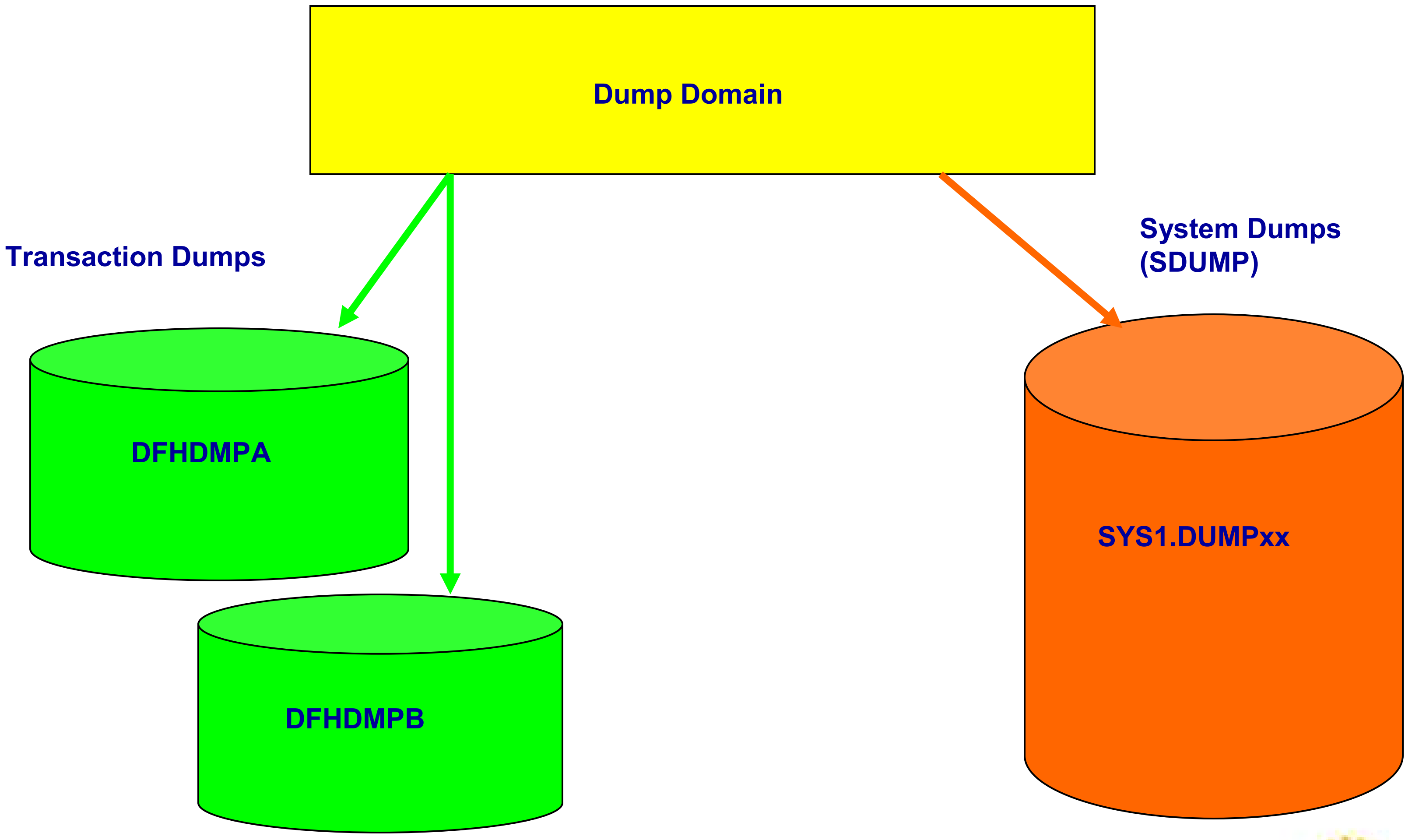
```
*** TGT MEMORY MAP ***
         TGTLOC

         000000  RESERVED - 72 BYTES
         000048  TGT IDENTIFIER
         00004C  RESERVED - 4 BYTES
         000050  TGT LEVEL INDICATOR
         000051  RESERVED - 3 BYTES
         000054  32 BIT SWITCH
         000058  POINTER TO RUNCOM
         00005C  POINTER TO COBVEC
         000060  POINTER TO PROGRAM DYNAMIC BLOCK TABLE
         000064  NUMBER OF FCB'S
         000068  WORKING-STORAGE LENGTH
         00006C  RESERVED - 4 BYTES
         000070  ADDRESS OF IGZESMG WORK AREA
         000074  ADDRESS OF 1ST GETMAIN BLOCK (SPACE MGR)
         000078  RESERVED - 2 BYTES
         00007A  RESERVED - 2 BYTES
         00007C  RESERVED - 2 BYTES
         00007E  MERGE FILE NUMBER
         000080  ADDRESS OF CEL COMMON ANCHOR AREA
         000084  LENGTH OF TGT
         000088  RESERVED - 1 SINGLE BYTE FIELD
         000089  PROGRAM MASK USED BY THIS PROGRAM
         00008A  RESERVED - 2 SINGLE BYTE FIELDS
         00008C  NUMBER OF SECONDARY FCB CELLS
         000090  LENGTH OF THE ALTER VN(VNI) VECTOR
         000094  COUNT OF NESTED PROGRAMS IN COMPILE UNIT
         000098  DDNAME FOR DISPLAY OUTPUT
         0000A0  RESERVED - 8 BYTES
         0000A8  POINTER TO COM-REG SPECIAL REGISTER
         0000AC  RESERVED - 52 BYTES
         0000E0  ALTERNATE COLLATING SEQUENCE TABLE PTR.
         0000E4  ADDRESS OF SORT G.N. ADDRESS BLOCK
         0000E8  ADDRESS OF PGT
         0000EC  RESERVED - 4 BYTES
         0000F0  POINTER TO 1ST IPCB
         0000F4  ADDRESS OF THE CLLE FOR THIS PROGRAM
         0000F8  POINTER TO ABEND INFORMATION TABLE
         0000FC  POINTER TO TEST INFO FIELDS IN THE TGT
         000100  ADDRESS OF START OF COBOL PROGRAM
         000104  POINTER TO ALTER VNI'S IN CGT
         000108  POINTER TO ALTER VN'S IN TGT
         00010C  POINTER TO FIRST PBL IN THE PGT
         000110  POINTER TO FIRST FCB CELL
         000114  WORKING-STORAGE ADDRESS
         000118  POINTER TO FIRST SECONDARY FCB CELL
         00011C  POINTER TO STATIC CLASS INFO BLOCK 1
         000120  POINTER TO STATIC CLASS INFO BLOCK 2

*** VARIABLE PORTION OF TGT ***

         000124  TGT OVERFLOW AREA ADCONS
         000130  BASE LOCATORS FOR SPECIAL REGISTERS
         000138  BASE LOCATORS FOR WORKING-STORAGE
         003E4C  BASE LOCATORS FOR LINKAGE-SECTION
         003E58  CLLE ADDR. CELLS FOR CALL LIT. SUB-PGMS.
         003F2C  INTERNAL PROGRAM CONTROL BLOCKS
```

Types of Dumps



System Dumps

- Processed using IPCS
  - Will be reviewed in another section
- The DSN are now pre-defined by the system programmer
- Allocate sufficient space to capture CICS dumps especially for large systems and RLS systems that may require multiple regions to be dumped
- Check the sizing with each new CICS release that is installed (MAXSPACE)

Transaction Dumps

- Transaction dumps are sent to the data set named DFHDMPA or DFHDMPB
  - These files are defined at start-up
  - Can be automatically or manually switched
  - Should be properly sized for installation dump activity
  - Specific dump codes can be suppressed by using CEMT SET TRD transaction
  - To obtain a transaction dump, the dump data set should be closed and a batch procedure should be executed

Transaction Dumps

- Sample JCL and batch procedure

```
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help

EDIT       ACT.CTREK.V42.TEST.SOURCE(DFHDUMP) - 01.08      Columns 00001 00072
Command ===>                                                  Scroll ===> CSR
****** ***************************** Top of Data ******************************
000100 //DFHDU670 JOB CTREK,'SISTEMAS',
000300 //             NOTIFY=&SYSUID.,REGION=0M,
000400 //             CLASS=A,MSGCLASS=X,MSGLEVEL=(1,1)
000500 //STEP1    EXEC PGM=DFHDU670,PARM=''
000600 //STEPLIB  DD DSN=CICSTS42.CICS.SDFHLOAD,DISP=SHR
000700 //DFHDMPDS DD DISP=SHR,DSN=CICSTS42.CICS.DFHDMPA
000800 //DFHTINDX DD SYSOUT=X
000900 //DFHPRINT DD SYSOUT=X,DCB=BLKSIZE=133
001000 //SYSPRINT DD SYSOUT=X
001010 //SYSIN    DD *
001200  END
001300 /*
****** **************************** Bottom of Data ****************************



 F1=Help      F2=Split     F3=Exit      F5=Rfind     F6=Rchange   F7=Up
 F8=Down      F9=Swap     F10=Left     F11=Right    F12=Retrieve
. . . . . . . . . . . . . . . . . . . . . . . . . . .
```

Transaction Dumps

- Transaction dumps provide a snapshot at the time the cancelation occurred
- There are many control blocks printed most of which are not used or undocumented
- The following charts review those segments of the dump which are important in debugging

Cancelation Information

Cancel Code

Transaction Canceling

```
CICSTS42  --- CICS TRANSACTION DUMP ---  CODE=ASRA  TRAN=UTSM  ID=1/0002  DATE=11/07/17  TIME=17:18:27  PAGE  1
SYMPTOMS= AB/UASRA PIDS/5655S9700 FLDS/DFHABAB RIDS/UVPUTSM
CICS LEVEL = 0670
PSW & REGISTERS AT TIME OF INTERRUPT
PSW          079D0000  9BAB90F6  00060007  00000000
REGS 0-7       1AA5F3C8  1AA5A4F0  1BE000C0  1BE00040     1CD420C0  1AA500D0  1CD430C0  1BE00248
REGS 8-15      1BAB815C  1AA5B570  1AA5E570  1BAB8B9C     1BAB811C  1AA5A380  9BAB90E2  00000000
EXECUTION KEY     9
The transaction was in Basespace mode
COMMAND REGISTERS AT LAST EXEC
REGS 0-7       1AA5F3C8  1AA5A4F0  1BE000C0  1BE00040     1CD420C0  1AA500D0  1CD430C0  1BE00248
REGS 8-15      1BAB815C  1AA5B570  1AA5E570  1BAB8B9C     1AA584C8  1AA5A380  9BAB90E2  00000000
```

Possible program causing the cancelation

PSW Information

Registers when the ABEND occurred

Storage Protect Key of cancelling task

Registers at last EXEC CICS

The type of CICS cancelation is provided on the first line via a code (e.g., ASRA) followed by the transaction that was involved. The Symptoms String usually identifies the program CICS believes was in control when the error occurred.

The PSW and the contents of the registers when the cancelation occurred are very important because the PSW tells you where the error occurred and the registers tell you where the important COBOL control blocks are located. In the case of a protection exception you may want to know in what key you were executing when the error occurred. In addition to the PSW information you want to annotate the information in the full word following the PSW that indicates the length of the instruction that caused the cancelation and will be used to adjust the PSW address (first half word) and the type of cancelation (second half word)

The registers at the last EXEC Command may be important when debugging loops

PSW Adjustment

- Adjust the PSW address by the length of the instruction causing the cancelation
  - PSW Address 9BAB90F6
  - Adjustment - 6
  - Actual Abend 9BAB90F0

The PSW in a transaction dump is normally pointing to the Next Instruction to be executed – exceptions are covered on the next page

PSW Adjustment

- There are times when the PSW is actually pointing to the instruction that caused the Program Check
- These cases are usually reported as S0C4 cancelations with a reason code:
  - 0010 Segment-translation exception
  - 0011 Page-translation exception
  - 0038 ASCE-type exception
  - 0039 Region-first-translation exception
  - 003A Region-second-translation exception
  - 003B Region-third-translation exception
- In these cases he PSW points to the instruction that caused the cancelation and does not require a PSW adjustment

Computing the Program Offset

- Now that you have the address where the cancelation occurred, you now need to determine the program involved and the offset into the program where the cancelation occurred
- The information on the 1st page identified a possible program candidate – UVPUTSM
- This is the program which CICS believed had control when the cancelation occurred
- However, CICS is not aware of any internal CALLs the program might have made

Computing the Offset

- There are several places where you can find the program address
  - COBOL Program’s TGT + X’100’
  - Module Listing at the end of the dump
  - The Program Information in the dump
  - KE Stack owned by DFHPGPG using the PLCB information (not recommended)
  - Find the CICS calculated offset in STCA (not recommended)

Using the TGT

GPR 09

1AA5B570

```
0000073A0    LINES TO 00007440 SAME AS ABOVE                                                                                                  1AA5B4F0
000007460    00000000 00000000 F3E3C7E3 00000000  06000000 68030260 1AA5B1B8 0007809C   *........3TGT...........-.v......*   1AA5B5B0
000007480    1AA5F4B0 00000000 00F44255 00000000  00000000 1BE00030 00000000 00000000   *.v4......4......................*   1AA5B5D0
0000074A0    1AA584C8 00003F40 00000000 00000000  00000000 00000001 E2E8E2D6 E4E34040   *.vdH... ................SYSOUT  *   1AA5B5F0
0000074C0    C9C7E9E2 D9E3C3C4 00000000 00000000  00000000 00000000 00000000 00000000   *IGZSRTCD........................*   1AA5B610
0000074E0    00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000   *................................*   1AA5B630
000007500    00000000 00000000 1BAB811C 00000000  1AA5F49C 1AA5B490 1BAB8B0C 00000000   *..........a......v4..v..........*   1AA5B650
000007520    1BAB8020 1BAB8198 1AA5F49C 1BAB8154  00000000 1BE000C0 00000000 00000000   *......aq.v4...a.................*   1AA5B670
000007540    00000000 1AA5C570 1AA5D570 1AA5E570  00000000 1BE00040 1BE000C0 1BE010C0   *.....vE..vN..vV........ ........*   1AA5B690
000007560    1BE020C0 1BE030C0 1BE040C0 1BE050C0  1BE060C0 1BE070C0 1BE080C0 1BE090C0   *.......... .......-.............*   1AA5B6B0
000007580    1BE0A0C0 1BE0B0C0 1BE0C0C0 1BE0D0C0  1BE0E0C0 1BE0F0C0 1BE100C0 1BE110C0   *......................0.........*   1AA5B6D0
0000075A0    1BE120C0 1BE130C0 1BE140C0 1BE150C0  1BE160C0 1BE170C0 1BE180C0 1BE190C0   *.......... .......-.............*   1AA5B6F0
```

The entry point of the COBOL program can be found at TGT + X'100'. There are several ways of locating the TGT. A simple way is using the contents of GPR 09. You can verify if the address in GPR 09 is pointing the TGT by looking at the interpreted part of the dump and see if the '3TGT' eye-catcher.

Program EP Address = X'1AA5B570' + X'100' = X'1AA5B670'

Using Module Listing

```
------ MODULE INDEX -----
LOAD PT.    NAME     ENTRY PT   LENGTH          LOAD PT.    NAME     ENTRY PT   LENGTH          LOAD PT.    NAME
ENTRY PT   LENGTH
1ADE5000  DFHZNAC   1ADE5114  0000BAE0
1ADF1000  DFHWBXN   1ADF1028  00006730
1ADF7800  DFHEDAP   1ADF7828  00002128
1ADF9A00  DFHCESC   1ADF9A28  000015F0
1ADFB000  DFHEMTP   1ADFB028  00002158
1AE00000  CEEPLPKA  1AE00000  001F48F8
1AFF5000  DFHEITSP  1AFF5000  000089E0
1B000000  CEEEV003  1B000000  005525E8
1B553000  DFHWBTC   1B553000  0002E638
1B581700  DFHZATMF  1B581728  00000868
1B582000  DFHLUP    1B582028  00010160
1B592200  DFHEDAD   1B592228  0003E8A8
1B5D2000  DFHEITMT  1B5D2000  00017170
1B600000  CEEEV011  1B600000  001A5A00
1B7A6000  DFHAMP    1B7A6114  00039C80
1B800000  DFHCCNV   1B800028  001D3E18
1B9D3F00  DFHEMTD   1B9D3F28  00028700
1BA00000  EZACIC20  1BA00028  00000688
1BA00690  EZACIC21  1BA006B8  00001968
1BA02000  KVPTREI   1BA02020  00002F50
1BA16000  KVPTREH   1BA16028  000043F8
1BAB8000  UVPUTSM   1BAB8020  00003798
1BABB7A0  UVMTEST   1BABB7A0  00003BB0
END OF CICS TRANSACTION DUMP
```

The module listing provides the program names currently in the CICS system. The program was identified in the Symptom String as UVPUTSM. You need to scan the module list to locate the program identified on the first page of the dump.

Using Program Information

```
PROGRAM INFORMATION FOR THE CURRENT TRANSACTION
   Number of Levels 00000001
INFORMATION FOR PROGRAM AT LEVEL 00000001 of 00000001
Program Name      UVPUTSM      Invoking Program CICS
   Load Point       1BAB8000     Program Length   00003798
   Entry Point      9BAB8020     Addressing Mode  AMODE 31
   Language Defined COBOL        Language Deduced COBOL II
   Commarea Address 00000000     Commarea Length  00000000
   Execution Key    USER         Data Location    ANY
   Concurrency      QUASIRENT    Api              CICSAPI
   Runtime          LE370
   Environment      User application
```

Using the DFHPGPG Information

- Can be located by doing a find
  - F DFHPGPLCB – locate the one for the CICS identified program (UVPUTSM)

```
000000320   B5800000 00000000 01000100 0A020000  1A8387A0 17910068 00606EC4 C6C8D7C7   *.................cg..j...->DFHPG*   1A8398D0
000000340   D7D3C3C2 40404040 00000000 E4E5D7E4  E3E2D440 1ABCDB70 1BAB8000 9BAB8020   *PLCB    ....UVPUTSM ............*   1A8398F0
000000360   00003798 1A9979FC A0020000 00000000  00000000 00000000 00000000 00000000   *...q.r..........................*   1A839910
000000380   00000000 C3C9C3E2 40404040 00000000  00000000 00000000 A8000000 1BAB8000   *....CICS    ............y.......*   1A839930
0000003A0   9BAB8020 00003798 1A9979FC 80000000  00000000 00000001 1ABCDB70 E4E5D7E4   *.......q.r..................UVPU*   1A839950
```

Program Load Point

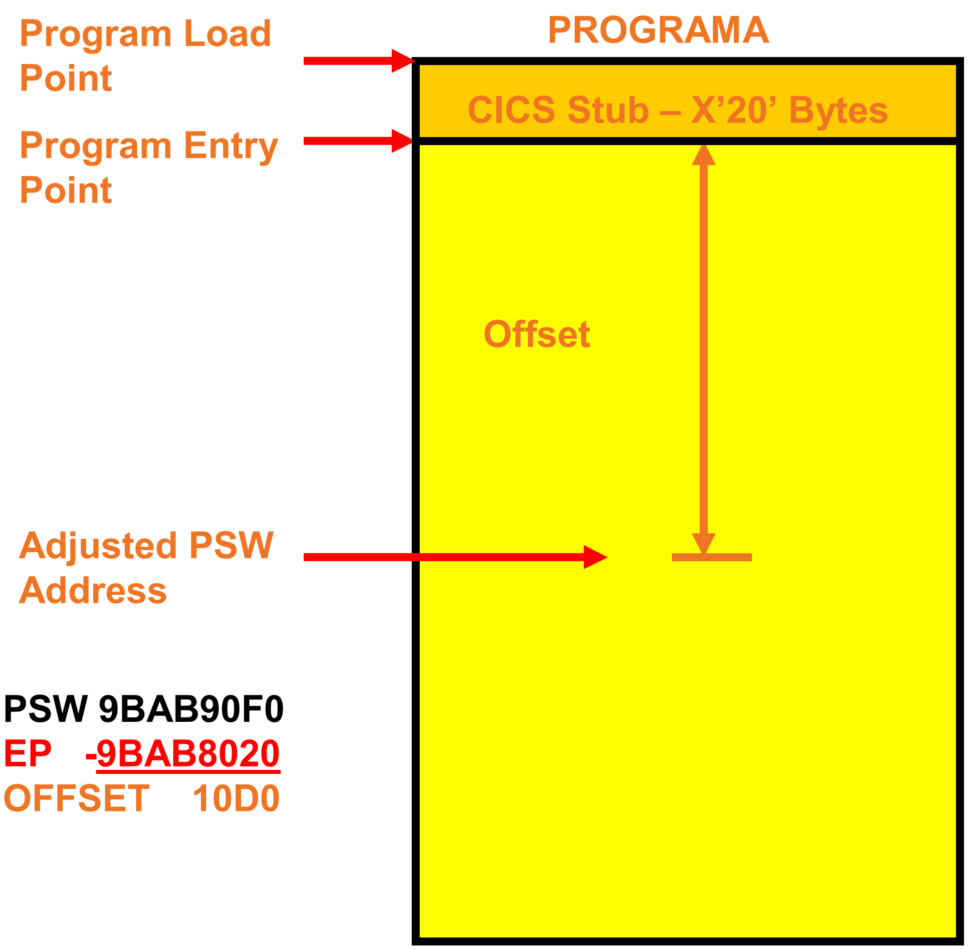
Program Entry Point

Note: The difference between the Entry Point and the Load Point is the CICS Stub at the beginning of the program which in this case is X'20' bytes long

CICS Stub – X'20' Bytes Long

```
UVPUTSM
PROGRAM STORAGE                            ADDRESS 1BAB8000 TO 1BABB797     LENGTH 00003798
00000000   C4C6C8E8 C3F6F5F0 58F0021C 58F0F0D0  58F0F014 58F0F00C 58FF000C 07FF0000   *DFHYC650.0...00..00..00.........*   1BAB8000
00000020   47F0F028 00C3C5C5 00000270 00000014  47F0F001 98CEAC00 1BAB80D6 00000000   *.00..CEE.........00.q......O....*   1BAB8020
00000040   00000000 00000000 90ECD00C 4110F038  98EFF04C 07FF0000 1BAB8020 00000000   *..............0.q.0<............*   1BAB8040
00000060   1BABA858 1BAB80CE 1BAB8020 1BAB8DA4  1BABAC58 1BAB80EA 00104001 00000008   *..y............u.......... .....*   1BAB8060
00000080   E4E5D7E4 E3E2D440 F2F0F1F1 F0F7F1F1  F1F1F0F0 F0F3F0F4 F0F1F0F0 04740000   *UVPUTSM 2011071111000304010 0....*   1BAB8080
```

Computing the Offset



```
PSW 9BAB90F0
EP  -9BAB8020
OFFSET  10D0
```

The offset is simply the distance from the beginning of the program to where the cancelation occurred

Entry Point – beginning of the program

PSW – where the cancelation occurred

Compute Offset = Adjusted PSW Address minus the Entry Point Address

Once you have the offset, you need to look at the program compilation listing

Offset Using the STCA

```
TASK CONTROL AREA (SYSTEM AREA)
000000000    00000000 00000000 0000148C 194FFE30  0000009D 00000000 00000000 00000000   *................................*   195E3200
000000020    00000000 00000000 00000000 00000000  1AA5A380 00000000 00000000 00000000   *.................vt.............*   195E3220
000000040    00000000 00000000 00000000 00000000  00400000 00000000 00000000 00000000   *................. ..............*   195E3240
000000060    00000000 C1E2D9C1 00000000 195E34E4  00000000 00000000 195E3380 1AA584C8   *....ASRA.....;.U.........;...vdH*   195E3260
000000080    1AA50128 1AA50580 00000000 00000000  00000000 00000000 E4E3E2D4 1A8F1570   *.v...v..................UTSM....*   195E3280
0000000A0    00000000 00000000 E4E3E2D4 00000000  00000000 00000000 C1E2D9C1 00000000   *........UTSM............ASRA....*   195E32A0
0000000C0    1A906008 00000000 00000000 00000000  00000000 00000000 00000000 00000000   *..-.............................*   195E32C0
0000000E0    00000000 00000000 E4E5D4E3 C5E2E340  1BABB7A0 5018FEFF 00000000 00000000   *........UVMTEST ................*   195E32E0
000000100    00000000 00000000 195E356C 00000000  00000000 00000000 00000000 00000000   *.........;......................*   195E3300
000000120    00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000   *................................*   195E3320
000000140    00000000 0802006D 1AA50008 00000000  00000000 00000000 00000000 00000000   *.........v......................*   195E3340
000000160    E4E5D7E4 E3E2D440 F0C3F761 C1D2C5C1  000010F6 00020781 00000000 00000000   *UVPUTSM 0C7/AKEA...6...a........*   195E3360
```

Program Name

MVS/CICS Abend Code

CICS Computed Offset

The CICS computed offset is based on the Program Load Point and does not adjust the PSW by the length of the instruction causing the cancelation. In order to get the correct displacement you need to subtract the CICS stub length and the length of the instruction causing the program check

CICS Determined Offset (STCA)	000010F6
Minus Length of Instruction Causing Cancelation	6
Minus Length of CICS Stub	20
Real Offset in program	000010D0

Locating the Failing Instruction

Now that you have determined the offset into the program where the error occurred, go to the COBOL program listing of the identified program (UVPUTSM) and locate the Procedure Division Map

The Procedure Division Map comes into two flavors:

-- Assembler Listing

-- Condensed Listing

Locate the instruction that cancelled using the offset – identify the source sequence #

Offset where the program cancelled

```
002069   ADD
   0010D0   FA20 2256 87AF         AP    598(3,2),1967(1,8)     WS-DUMP                  PGMLIT AT +1907
   0010D6   F822 2256 2256         ZAP   598(3,2),598(3,2)      WS-DUMP                  WS-DUMP
```

Source Program Sequence Number

Field that probably caused the S0C7

Literal being used – probably not the cause of the S0C7

Using the source sequence number of the instruction that caused the cancelation, go to the source listing looking for 002069

Locating the Source Instruction

Using the sequence number from the Procedure Division Map find the source instruction that caused the program check – find the instruction at 002069

```
002069        ADD  +1        TO   WS-DUMP.         123

000123        05  WS-DUMP        PIC S9(5)        COMP-3.      BLW=00000+256,0000026 3P
```

BLW assigned to this field

Length and type of field

Displacement from assigned BLW

Note: No VALUE clause specified. Further analysis of the Procedure Division shows that the field was not initialized. Result = S0C7

Locating the Data in the Dump

- Data in a COBOL program are either in the WORKING-STORAGE of the LINKAGE Section of the program
- Addressing in the hardware requires a base register for every 4 KB of data or instructions
- The addressing of the areas is accomplished by using:
  - BLW – Base Locator for Working Storage
  - BLL – Base Locator for Linkage Storage
- These addressing cells are kept in the variable section of the TGT

Task Global Table

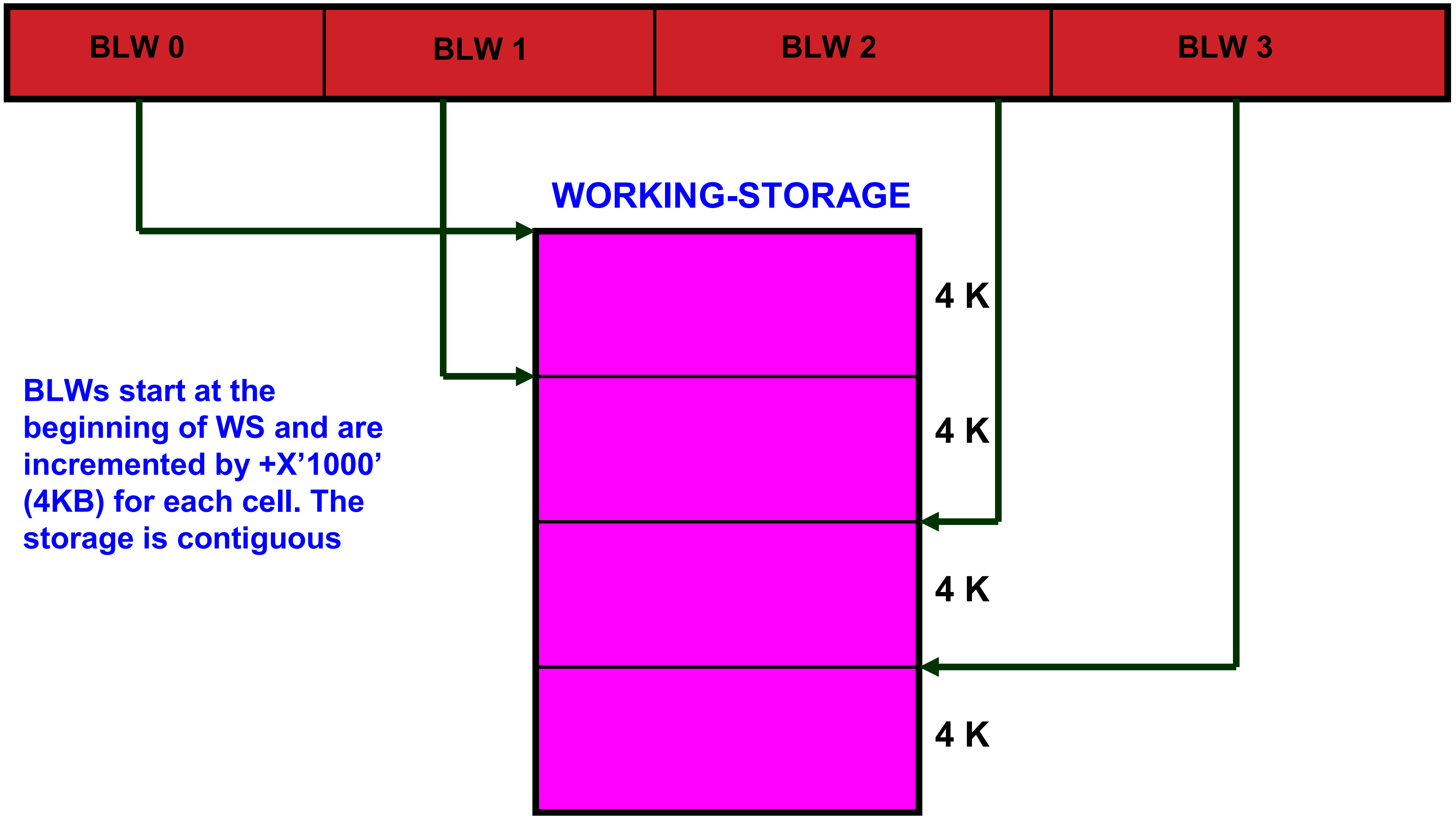
```
*** TGT MEMORY MAP ***
          TGTLOC

          000000  RESERVED - 72 BYTES
          000048  TGT IDENTIFIER
          00004C  RESERVED - 4 BYTES
          000050  TGT LEVEL INDICATOR
          000051  RESERVED - 3 BYTES
          000054  32 BIT SWITCH
          000058  POINTER TO RUNCOM
          00005C  POINTER TO COBVEC
          000060  POINTER TO PROGRAM DYNAMIC BLOCK TABLE
          000064  NUMBER OF FCB'S
          000068  WORKING-STORAGE LENGTH
          00006C  RESERVED - 4 BYTES
          000070  ADDRESS OF IGZESMG WORK AREA
          000074  ADDRESS OF 1ST GETMAIN BLOCK (SPACE MGR)
          000078  RESERVED - 2 BYTES
          00007A  RESERVED - 2 BYTES
          00007C  RESERVED - 2 BYTES
          00007E  MERGE FILE NUMBER
          000080  ADDRESS OF CEL COMMON ANCHOR AREA
          000084  LENGTH OF TGT
          000088  RESERVED - 1 SINGLE BYTE FIELD
          000089  PROGRAM MASK USED BY THIS PROGRAM
          00008A  RESERVED - 2 SINGLE BYTE FIELDS
          00008C  NUMBER OF SECONDARY FCB CELLS
          000090  LENGTH OF THE ALTER VN(VNI) VECTOR
          000094  COUNT OF NESTED PROGRAMS IN COMPILE UNIT
          000098  DDNAME FOR DISPLAY OUTPUT
          0000A0  RESERVED - 8 BYTES
          0000A8  POINTER TO COM-REG SPECIAL REGISTER
          0000AC  RESERVED - 52 BYTES
          0000E0  ALTERNATE COLLATING SEQUENCE TABLE PTR.
          0000E4  ADDRESS OF SORT G.N. ADDRESS BLOCK
          0000E8  ADDRESS OF PGT
          0000EC  RESERVED - 4 BYTES
          0000F0  POINTER TO 1ST IPCB
          0000F4  ADDRESS OF THE CLLE FOR THIS PROGRAM
          0000F8  POINTER TO ABEND INFORMATION TABLE
          0000FC  POINTER TO TEST INFO FIELDS IN THE TGT
          000100  ADDRESS OF START OF COBOL PROGRAM
          000104  POINTER TO ALTER VNI'S IN CGT
          000108  POINTER TO ALTER VN'S IN TGT
          00010C  POINTER TO FIRST PBL IN THE PGT
          000110  POINTER TO FIRST FCB CELL
          000114  WORKING-STORAGE ADDRESS
          000118  POINTER TO FIRST SECONDARY FCB CELL
          00011C  POINTER TO STATIC CLASS INFO BLOCK 1
          000120  POINTER TO STATIC CLASS INFO BLOCK 2

*** VARIABLE PORTION OF TGT ***

          000124  TGT OVERFLOW AREA ADCONS
          000130  BASE LOCATORS FOR SPECIAL REGISTERS
          000138  BASE LOCATORS FOR WORKING-STORAGE
          003E4C  BASE LOCATORS FOR LINKAGE-SECTION
          003E58  CLLE ADDR. CELLS FOR CALL LIT. SUB-PGMS.
          003F2C  INTERNAL PROGRAM CONTROL BLOCKS
```

COBOL Address Cells--BLW



BLWs start at the beginning of WS and are incremented by +X’1000’ (4KB) for each cell. The storage is contiguous

Locating the BLW Cells

GPR09 → 1AA5B570

```
000007380   00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000   *................................*   1AA5B4D0
0000073A0   LINES TO 00007440 SAME AS ABOVE                                                                                1AA5B4F0
000007460   00000000 00000000 F3E3C7E3 00000000  06000000 68030260 1AA5B1B8 0007809C   *........3TGT...........-.v......*   1AA5B5B0
000007480   1AA5F4B0 00000000 00F44255 00000000  00000000 1BE00030 00000000 00000000   *.v4......4......................*   1AA5B5D0
0000074A0   1AA584C8 00003F40 00000000 00000000  00000000 00000001 E2E8E2D6 E4E34040   *.vdH... ................SYSOUT  *   1AA5B5F0
0000074C0   C9C7E9E2 D9E3C3C4 00000000 00000000  00000000 00000000 00000000 00000000   *IGZSRTCD........................*   1AA5B610
0000074E0   00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000   *................................*   1AA5B630
000007500   00000000 00000000 1BAB811C 00000000  1AA5F49C 1AA5B490 1BAB8B0C 00000000   *..........a......v4..v..........*   1AA5B650
000007520   1BAB8020 1BAB8198 1AA5F49C 1BAB8154  00000000 1BE000C0 00000000 00000000   *......aq.v4...a.................*   1AA5B670
000007540   00000000 1AA5C570 1AA5D570 1AA5E570  00000000 1BE00040 1BE000C0 1BE010C0   *.....vE..vN..vV........ ........*   1AA5B690
000007560   1BE020C0 1BE030C0 1BE040C0 1BE050C0  1BE060C0 1BE070C0 1BE080C0 1BE090C0   *.......... .......-.............*   1AA5B6B0
000007580   1BE0A0C0 1BE0B0C0 1BE0C0C0 1BE0D0C0  1BE0E0C0 1BE0F0C0 1BE100C0 1BE110C0   *......................0.........*   1AA5B6D0
0000075A0   1BE120C0 1BE130C0 1BE140C0 1BE150C0  1BE160C0 1BE170C0 1BE180C0 1BE190C0   *.......... .......-.............*   1AA5B6F0
0000075C0   1BE1A0C0 1BE1B0C0 1BE1C0C0 1BE1D0C0  1BE1E0C0 1BE1F0C0 1BE200C0 1BE210C0   *......................0..S...S..*   1AA5B710
0000075E0   1BE220C0 1BE230C0 1BE240C0 1BE250C0  1BE260C0 1BE270C0 1BE280C0 1BE290C0   *.S...S...S ..S...S-..S...S...S..*   1AA5B730
000007600   1BE2A0C0 1BE2B0C0 1BE2C0C0 1BE2D0C0  1BE2E0C0 1BE2F0C0 1BE300C0 1BE310C0   *.S...S...S...S...S...S0..T...T..*   1AA5B750
000007620   1BE320C0 1BE330C0 1BE340C0 1BE350C0  1BE360C0 1BE370C0 1BE380C0 1BE390C0   *.T...T...T ..T...T-..T...T...T..*   1AA5B770
000007640   1BE3A0C0 1BE3B0C0 1BE3C0C0 1BE3D0C0  1BE3E0C0 1BE3F0C0 1BE400C0 1BE410C0   *.T...T...T...T...T...T0..U...U..*   1AA5B790
000007660   1BE420C0 1BE430C0 1BE440C0 1BE450C0  1BE460C0 1BE470C0 1BE480C0 1BE490C0   *.U...U...U ..U...U-..U...U...U..*   1AA5B7B0
000007680   1BE4A0C0 1BE4B0C0 1BE4C0C0 1BE4D0C0  1BE4E0C0 1BE4F0C0 1BE500C0 1BE510C0   *.U...U...U...U...U...U0..V...V..*   1AA5B7D0
0000076A0   1BE520C0 1BE530C0 1BE540C0 1BE550C0  1BE560C0 1BE570C0 1BE580C0 1BE590C0   *.V...V...V ..V...V-..V...V...V..*   1AA5B7F0
0000076C0   1BE5A0C0 1BE5B0C0 1BE5C0C0 1BE5D0C0  1BE5E0C0 1BE5F0C0 1BE600C0 1BE610C0   *.V...V...V...V...V...V0..W...W..*   1AA5B810
0000076E0   1BE620C0 1BE630C0 1BE640C0 1BE650C0  1BE660C0 1BE670C0 1BE680C0 1BE690C0   *.W...W...W ..W...W-..W...W...W..*   1AA5B830
000007700   1BE6A0C0 1BE6B0C0 1BE6C0C0 1BE6D0C0  1BE6E0C0 1BE6F0C0 1BE700C0 1BE710C0   *.W...W...W...W...W...W0..X...X..*   1AA5B850
000007720   1BE720C0 1BE730C0 1BE740C0 1BE750C0  1BE760C0 1BE770C0 1BE780C0 1BE790C0   *.X...X...X ..X...X-..X...X...X..*   1AA5B870
000007740   1BE7A0C0 1BE7B0C0 1BE7C0C0 1BE7D0C0  1BE7E0C0 1BE7F0C0 1BE800C0 1BE810C0   *.X...X...X...X...X...X0..Y...Y..*   1AA5B890
000007760   1BE820C0 1BE830C0 1BE840C0 1BE850C0  1BE860C0 1BE870C0 1BE880C0 1BE890C0   *.Y...Y...Y ..Y...Y-..Y...Y...Y..*   1AA5B8B0
```

Remember the address of where WS starts is at a displacement of TGT + X'114' and has be equal to the contents of where you locate BLW 0

TGT Address	1AA5B570
BLW Disp. In TGT	138
Location of BLW in TGT	1AA5B6A8

Data Division—WS

Displacement from the assigned BLW

BLW assigned to the field

Length

```
000019              DATA DIVISION.
000020
000021              WORKING-STORAGE SECTION.
000022
000023                  COPY                     KVCCPYW.
000024C             01  KVEW-COPYRIGHT.                                             BLW=00000+000          0CL246
000025C                 05  FILLER                 PIC X(160)   VALUE               BLW=00000+000,0000000  160C
000026C                 '*V6R2M005*  COPYRIGHT 2001 C\TREK CORPORATION.  ALL RIGHTS R
000027C             -   'ESERVED.  NO PART OF THIS PROGRAM AND/OR DOCUMENTATION MAY B
000028C             -   'E REPRODUCED IN ANY FORM OR BY ANY MEANS'.
000029C                 05  FILLER                 PIC X(86)    VALUE               BLW=00000+0A0,00000A0  86C
000030C                 ', WITHOUT PERMISSION IN WRITING FROM C\TREK CORPORATION.
000031C             -   '                          '.
000032
000033              01  WS-COMMON-VARIABLES.                                        BLW=00000+0F8          0CL310
000034                  05  WS-CEDF-AREA.                                           BLW=00000+0F8,0000000  0CL144
000035                      10  CEDF-WORK-AREA      PIC X(120).                     BLW=00000+0F8,0000000  120C
000036                      10  CEDF-TGT-BIN        PIC S9(8)            COMP.      BLW=00000+170,0000078  4C
000037                      10  CEDF-TGT-CHAR       PIC X(8).                       BLW=00000+174,000007C  8C
000038                      10  CEDF-HLLSA-BIN      PIC S9(8)            COMP.      BLW=00000+17C,0000084  4C
000039                      10  CEDF-HLLSA-CHAR     PIC X(8).                       BLW=00000+180,0000088  8C
```

Length

Assigned BLW Cell

Displacement from the 01 Level

Displacement from the BLW Cell

BLW displacements are given in Hexadecimal and will be the actual value used in the instruction

Locate the Failing Field

- **The instruction that failed indicated that the bad data was in a field called ‘WS-DUMP’**
- **The information from the listing gave us the details we needed to locate the field in the dump**

```
000123  05  WS-DUMP     PIC S9(5)  COMP-3. BLW=00000+256,0000026 3P
```

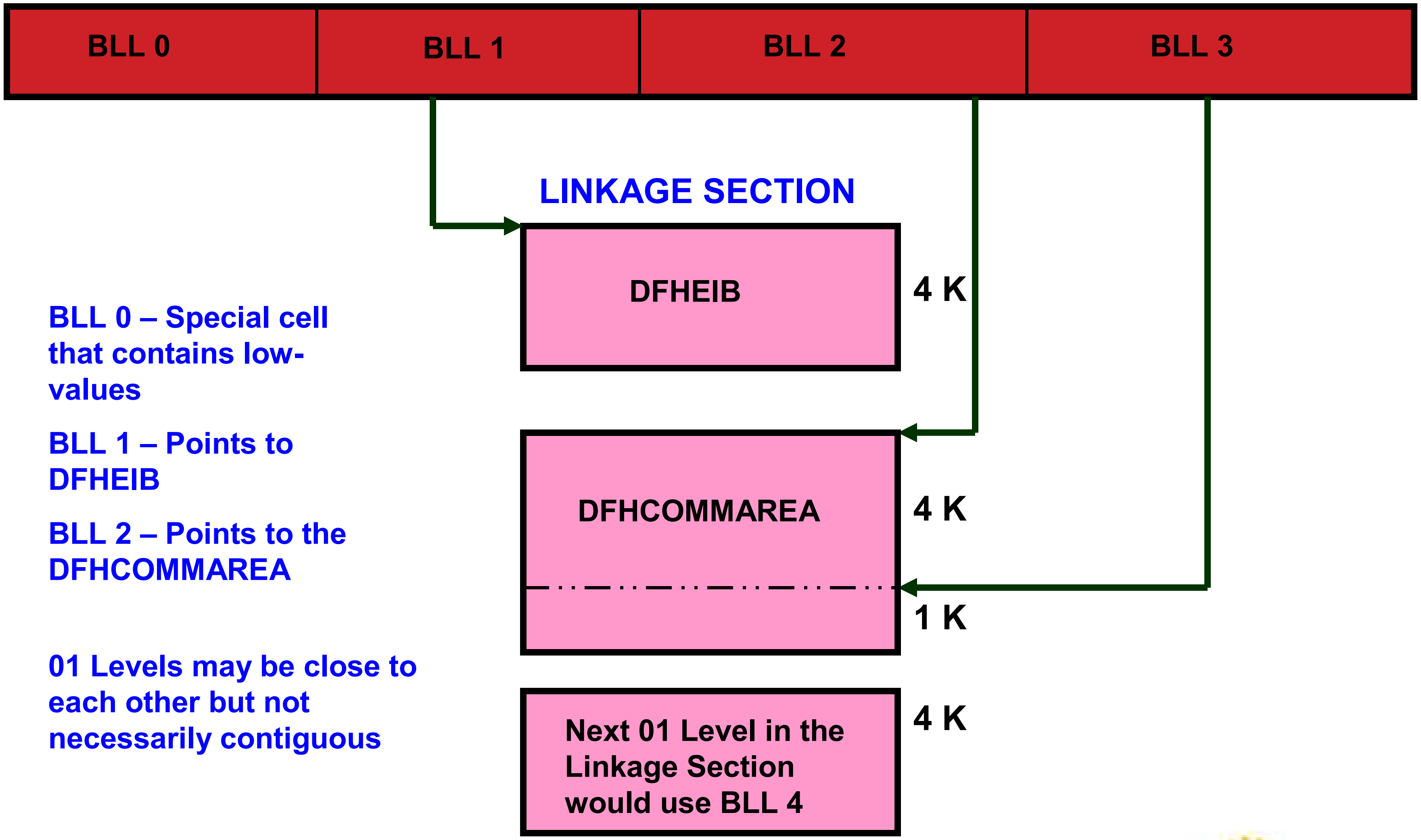
BLW 0	1BE000C0
DISPLACEMENT	256
LOCATION OF FIELD	1BE00316
LENGTH	3 BYTES PACKED

Locating the Failing Field

```
•     -TRANSACTION STORAGE-USER31              ADDRESS 1BE00000 TO 1CD4432F    LENGTH 00F44330
•     000000000   E4F0F0F0 F0F1F4F8 C8C1D5C3 1AA56798  1AA56798 00000000 1BE00008 00000000   *U0000148HANC.v.q.v.q............*   1BE00000
•     000000020   00F44320 00000000 1BE00008 00F44300  00F442F1 00000000 00000000 00000000   *.4...........4...4.1............*   1BE00020
•     000000040   00000000 00000000 00000000 00000000  00000000 00000000 C9C7E9E2 D9E3C3C4   *........................IGZSRTCD*   1BE00040
•     000000060   00000000 00000000 00000000 00000000  00000000 00000000 E2E8E2D6 E4E34040   *........................SYSOUT  *   1BE00060
•     000000080   00000000 00000000 0E000000 00000000  0F000000 00000000 00000000 00000000   *................................*   1BE00080
•     0000000A0   40404040 40404040 40404040 40404040  40404040 40404040 40404040 40400000   *                              ..*   1BE000A0
•     0000000C0   5CE5F7D9 F1D4F0F0 F15C4040 C3D6D7E8  D9C9C7C8 E340F2F0 F1F040C3 E0E3D9C5   **V7R1M001*  COPYRIGHT 2010 C.TRE*   1BE000C0
•     0000000E0   D240C3D6 D9D7D6D9 C1E3C9D6 D54B4040  C1D3D340 D9C9C7C8 E3E240D9 C5E2C5D9   *K CORPORATION.  ALL RIGHTS RESER*   1BE000E0
•     000000100   E5C5C44B 4040D5D6 40D7C1D9 E340D6C6  40E3C8C9 E240D7D9 D6C7D9C1 D440C1D5   *VED.  NO PART OF THIS PROGRAM AN*   1BE00100
•     000000120   C461D6D9 40C4D6C3 E4D4C5D5 E3C1E3C9  D6D540D4 C1E840C2 C540D9C5 D7D9D6C4   *D/OR DOCUMENTATION MAY BE REPROD*   1BE00120
•     000000140   E4C3C5C4 40C9D540 C1D5E840 C6D6D9D4  40D6D940 C2E840C1 D5E840D4 C5C1D5E2   *UCED IN ANY FORM OR BY ANY MEANS*   1BE00140
•     000000160   6B40E6C9 E3C8D6E4 E340D7C5 D9D4C9E2  E2C9D6D5 40C9D540 E6D9C9E3 C9D5C740   *, WITHOUT PERMISSION IN WRITING *   1BE00160
•     000000180   C6D9D6D4 40C3E0E3 D9C5D240 C3D6D9D7  D6D9C1E3 C9D6D54B 40404040 40404040   *FROM C.TREK CORPORATION.        *   1BE00180
•     0000001A0   40404040 40404040 40404040 40404040  40404040 40400000 00000000 00000000   *                      ..........*   1BE001A0
•     0000001C0   00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000   *................................*   1BE001C0
•     0000001E0   LINES TO 00000220 SAME AS ABOVE                                                                                1BE001E0
•     000000240   00000000 00000000 00350000 00000035  19911904 981C00FF 00000000 00000000   *.................j..q...........*   1BE00240
•     000000260   00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000   *................................*   1BE00260
•     000000280   LINES TO 000002A0 SAME AS ABOVE                                                                                1BE00280
•     0000002C0   00000000 00000000 00000000 00000000  C2000000 00000000 00000000 00F9F9F9   *................B............999*   1BE002C0
•     0000002E0   F9F9F9F9 F9F00000 00000F00 00000000  00000000 00000000 00000000 00000000   *999990..........................*   1BE002E0
•     000000300   00000000 00000000 00000000 D5404040  40404040 40400000 00000000 00000000   *............N         ..........*   1BE00300
•     000000320   007D6D6A 7EE6E788 7F6C6E6B F1F2F3F4  F5F6F7F8 F97A7B7C C1C2C3C4 C5C6C7C8   *.'..=WXh..>,123456789:..ABCDEFGH*   1BE00320
•     000000340   C94A4B4C 00000000 00000000 00000000  00000000 00000000 00000000 00000000   *I..<............................*   1BE00340
•     000000360   00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000   *................................*   1BE00360
•     000000380   LINES TO 00000AC0 SAME AS ABOVE                                                                                1BE00380
•     000000AE0   00000000 00000000 00000000 40404040  40404040 40000000 0000E4E3 D3400000   *............         .....UTL ..*   1BE00AE0
```

The field contains low-values which is why the program check occurred

COBOL Address Cells--BLL



BLL 0 – Special cell that contains low-values

BLL 1 – Points to DFHEIB

BLL 2 – Points to the DFHCOMMAREA

01 Levels may be close to each other but not necessarily contiguous

Locating the BLL Cells

GPR09 → **1AA5B570**

```
000007380    00000000 00000000 00000000 00000000   00000000 00000000 00000000 00000000   *................................*   1AA5B4D0
0000073A0    LINES TO 00007440 SAME AS ABOVE                                                                                   1AA5B4F0
000007460    00000000 00000000 F3E3C7E3 00000000   06000000 68030260 1AA5B1B8 0007809C   *........3TGT...........-.v......*   1AA5B5B0
000007480    1AA5F4B0 00000000 00F44255 00000000   00000000 1BE00030 00000000 00000000   *.v4......4......................*   1AA5B5D0
0000074A0    1AA584C8 00003F40 00000000 00000000   00000000 00000001 E2E8E2D6 E4E34040   *.vdH... ................SYSOUT  *   1AA5B5F0
0000074C0    C9C7E9E2 D9E3C3C4 00000000 00000000   00000000 00000000 00000000 00000000   *IGZSRTCD........................*   1AA5B610
0000074E0    00000000 00000000 00000000 00000000   00000000 00000000 00000000 00000000   *................................*   1AA5B630
000007500    00000000 00000000 1BAB811C 00000000   1AA5F49C 1AA5B490 1BAB8B0C 00000000   *..........a......v4..v..........*   1AA5B650
000007520    1BAB8020 1BAB8198 1AA5F49C 1BAB8154   00000000 1BE000C0 00000000 00000000   *......aq.v4...a.................*   1AA5B670
000007540    00000000 1AA5C570 1AA5D570 1AA5E570   00000000 1BE00040 1BE000C0 1BE010C0   *.....vE..vN..vV........ ........*   1AA5B690
000007560    1BE020C0 1BE030C0 1BE040C0 1BE050C0   1BE060C0 1BE070C0 1BE080C0 1BE090C0   *..........  .......-............*   1AA5B6B0
```

SNIP

```
00000B240    1CD3A0C0 1CD3B0C0 1CD3C0C0 1CD3D0C0   1CD3E0C0 1CD3F0C0 1CD400C0 1CD410C0   *.L...L...L...L...L...LO..M...M..*   1AA5F390
00000B260    1CD420C0 1CD430C0 1CD440C0 00000000   1AA500D0 00000000 00000000 00000000   *.M...M...M ......v..............*   1AA5F3B0
00000B280    00000000 00000000 00000000 00000000   00000000 00000000 00000000 00000000   *................................*   1AA5F3D0
```

BLL0 – Unused

BLL1 – DFHEIB

BLL2 -- COMMAREA

TGT Address	1AA5B570
BLL Disp. In TGT	3E4C
Location of BLL in TGT	1AA5F3BC

BLL0

Data Division—LS

Assigned BLL Cell

```
LINKAGE SECTION.

01  dfheiblk.                                                   BLL=00001+000          0CL85
02    eibtime   comp-3 pic s9(7).                               BLL=00001+000,0000000  4P
02    eibdate   comp-3 pic s9(7).                               BLL=00001+004,0000004  4P
02    eibtrnid  pic x(4).                                       BLL=00001+008,0000008  4C
02    eibtaskn  comp-3 pic s9(7).                               BLL=00001+00C,000000C  4P
02    eibtrmid  pic x(4).                                       BLL=00001+010,0000010  4C
02    dfheigdi  comp pic s9(4).                                 BLL=00001+014,0000014  2C
02    eibcposn  comp pic s9(4).                                 BLL=00001+016,0000016  2C
02    eibcalen  comp pic s9(4).                                 BLL=00001+018,0000018  2C
02    eibaid    pic x(1).                                       BLL=00001+01A,000001A  1C
02    eibfn     pic x(2).                                       BLL=00001+01B,000001B  2C
02    eibrcode  pic x(6).                                       BLL=00001+01D,000001D  6C
02    eibds     pic x(8).                                       BLL=00001+023,0000023  8C
02    eibreqid  pic x(8).                                       BLL=00001+02B,000002B  8C
02    eibrsrce  pic x(8).                                       BLL=00001+033,0000033  8C
02    eibsync   pic x(1).                                       BLL=00001+03B,000003B  1C
02    eibfree   pic x(1).                                       BLL=00001+03C,000003C  1C
02    eibrecv   pic x(1).                                       BLL=00001+03D,000003D  1C
02    eibfil01  pic x(1).                                       BLL=00001+03E,000003E  1C
02    eibatt    pic x(1).                                       BLL=00001+03F,000003F  1C
02    eibeoc    pic x(1).                                       BLL=00001+040,0000040  1C
02    eibfmh    pic x(1).                                       BLL=00001+041,0000041  1C
02    eibcompl  pic x(1).                                       BLL=00001+042,0000042  1C
02    eibsig    pic x(1).                                       BLL=00001+043,0000043  1C
02    eibconf   pic x(1).                                       BLL=00001+044,0000044  1C
02    eiberr    pic x(1).                                       BLL=00001+045,0000045  1C
02    eiberrcd  pic x(4).                                       BLL=00001+046,0000046  4C
02    eibsynrb  pic x(1).                                       BLL=00001+04A,000004A  1C
02    eibnodat  pic x(1).                                       BLL=00001+04B,000004B  1C
02    eibresp   comp pic s9(8).                                 BLL=00001+04C,000004C  4C
02    eibresp2  comp pic s9(8).                                 BLL=00001+050,0000050  4C
02    eibrldbk  pic x(1).                                       BLL=00001+054,0000054  1C
01  DFHCOMMAREA                 PIC X.                          BLL=00002+000          1C
```

Addressing LS

- The DFHEIB and DFHCOMMAREA are provided addressability via:

- PROCEDURE DIVISION using dfheiblk dfhcommarea.

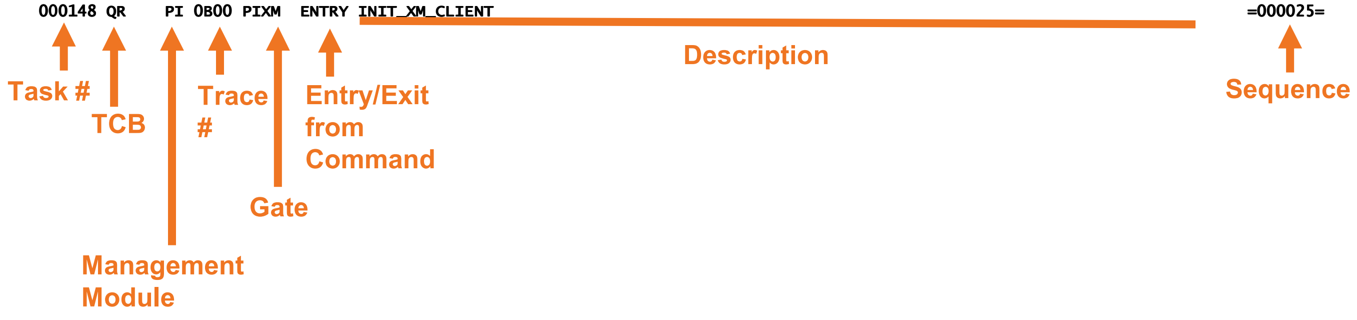
- As a BLL Cell is required for each 4 KB of data, any 01 level field that is more than 4 KB in size will receive a BLL Cell for every 4 KB of storage rounded up

What About the Trace?

- The Internal Trace Table can be used to obtain additional information
  - In the case of a program check, sufficient information was provided in the transaction dump that can be used to resolve the problem
  - However, there may be cases where you could use the Trace Table to see if a prior error occurred that may have led to the program check
- Two types of Trace Entries
  - Abbreviated Trace entry
  - Full Trace entry
- Exception entries can be found by issuing
  - F   *EXC*
  - There may be several *EXC* entries

Sample Trace Table

```
== TRACE ENTRIES FOR DUMPING TRANSACTION ==
INTERNAL TRACE TABLE SIZE (0002097152)
REQUESTED TRANSACTION DUMP TRACE TABLE SIZE (0000524288)
ALLOCATED TRANSACTION DUMP TRACE TABLE SIZE (0000524288)
000148 QR    AP EA00 TMP   ENTRY LOCATE                PFT,DFHCICST                                                          =000001=
000148 QR    AP EA01 TMP   EXIT  LOCATE                PFT,DFHCICST,1A8FEF00,NORMAL                                          =000002=
000148 QR    AP 0591 APXM  EXIT  INIT_XM_CLIENT/OK                                                                           =000003=
000148 QR    AP 1790 TFXM  ENTRY INIT_XM_CLIENT        1A8F1570 , 02A00000                                                   =000004=
000148 QR    XM 1001 XMIQ  ENTRY SET_TRANSACTION       TERMINAL,1A8F1570                                                     =000005=
000148 QR    XM 1002 XMIQ  EXIT  SET_TRANSACTION/OK                                                                          =000006=
000148 QR    AP 1791 TFXM  EXIT  INIT_XM_CLIENT/OK     0000000E,00000000,YES,NO                                              =000007=
000148 QR    US 0401 USXM  ENTRY INIT_TRANSACTION_USER 0000000E,YES                                                          =000008=
000148 QR    DD 0301 DDLO  ENTRY LOCATE                1950BB70,1A83993C,USD2,0000000E                                       =000009=
000148 QR    DD 0302 DDLO  EXIT  LOCATE/OK             19C01C00 , 1A2C4BFD                                                   =000010=
000148 QR    XS 0401 XSXM  ENTRY ADD_TRANSACTION_SECURITY 325167F0 , 0000000E                                                =000011=
000148 QR    XS 0402 XSXM  EXIT  ADD_TRANSACTION_SECURITY/OK                                                                 =000012=
000148 QR    US 0402 USXM  EXIT  INIT_TRANSACTION_USER/OK 19C01C1F , 19C03090,0                                              =000013=
000148 QR    DS 0002 DSAT  ENTRY SET_PRIORITY          1                                                                     =000014=
000148 QR    DS 0003 DSAT  EXIT  SET_PRIORITY/OK       1                                                                     =000015=
000148 QR    KE 0201 KEDD  ENTRY INQUIRE_ANCHOR        0000002C                                                              =000016=
000148 QR    KE 0202 KEDD  EXIT  INQUIRE_ANCHOR/OK     19581000                                                              =000017=
000148 QR    KE 0201 KEDD  ENTRY INQUIRE_ANCHOR        00000010                                                              =000018=
000148 QR    KE 0202 KEDD  EXIT  INQUIRE_ANCHOR/OK     00041900                                                              =000019=
000148 QR    DP 0900 DPXM  ENTRY INIT_XM_CLIENT                                                                              =000020=
000148 QR    DP 0901 DPXM  EXIT  INIT_XM_CLIENT/OK                                                                           =000021=
000148 QR    RM FA01 RMUC  ENTRY CREATE_UOW            NO,BACKWARD,0                                                         =000022=
000148 QR    RM 0209 RMUC  EVENT Remote_UOW_id_created 1A11E4E2C1E2C4E5F0F24BC1C3E2E6F0F2F0F515B8B9E5DE700001                =000023=
000148 QR    RM FA02 RMUC  EXIT  CREATE_UOW/OK                                                                               =000024=
000148 QR    PI 0B00 PIXM  ENTRY INIT_XM_CLIENT                                                                              =000025=
```



ASRA Trace Entry

Abbreviated Trace Entry

```
000148 QR    AP 1949 APLI  EVENT RETURN-FROM-LE/370    Program_Check_Recovery 00000004 UVPUTSM                  =000168=
000148 QR    AP 0790 SRP   *EXC* PROGRAM_CHECK                                                                  =000169=
```

Sequence Number

Full Trace Entry

ILC and Program Check Code

KERR Entry

PSW

Registers 0 – 15

```
AP 0790 SRP  *EXC* - PROGRAM_CHECK

            TASK-00148 KE_NUM-0094 TCB-QR   /007D3A28 RET-995AA066 TIME-17:18:24.9976783781 INTERVAL-00.0000028437       =000169=
              1-0000  F0C3F761 C1D2C5C1 018600C7 00000000  C4C6C8C1 D7D3C9F1 00000000 19BB0300  *0C7/AKEA.f.G....DFHAPLI1........*
                0020  00000000 195E3100 00000000 1A7FD800  32[illegible]1A200 00000001 00000000 FFFFFFFF  *.....;......."Q...s..............*
                0040  079D0000 80000000 00000000 1BAB90F6  00060007 00000000 00000000 7F4FF000  *...............6............"|0.*
                0060  90800000 00000000 00000000 1AA5F3C8  00000000 1AA5A4F0 00000000 1BE000C0  *.............v3H.....vu0.....\.{*
                0080  00000000 1BE00040 00000000 1CD420C0  00000000 1AA500D0 00000000 1CD430C0  *.....\. .....M.{.....v.}.....M.{*
                00A0  00000000 1BE00248 00000000 1BAB815C  00000000 1AA5B570 00000000 1AA5E570  *.....\........a*.....v.......vV.*
                00C0  00000000 1BAB8B9C 00000000 1BAB811C  00000000 1AA5A380 00000000 9BAB90E2  *..............a......vt........S*
                00E0  00000000 00000000 9686E57A 00000002  00000000 00000000 00000000 00000000  *........ofV:....................*
                0100  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000  *................................*
                0120  00000000 00000000 079D0000 80000000  00000000 1BAB90F6 00060007 00000000  *.....................6........*
                0140  00000000 7F4FF000 90800000 00000000  00000000 1AA5F3C8 00000000 1AA5A4F0  *...."|0..............v3H.....vu0*
                0160  00000000 1BE000C0 00000000 1BE00040  00000000 1CD420C0 00000000 1AA500D0  *.....\.{.....\. .....M.{.....v.}*
                0180  00000000 1CD430C0 00000000 1BE00248  00000000 1BAB815C 00000000 1AA5B570  *.....M.{.....\........a*.....v..*
                01A0  00000000 1AA5E570 00000000 1BAB8B9C  00000000 1BAB811C 00000000 1AA5A380  *.....vV...............a......vt.*
                01C0  00000000 9BAB90E2 00000000 00000000  9686E57A 00000002 00000000 00000000  *.......S........ofV:............*
                01E0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000  *................................*
                0200  00000000 00000000 00000000 00000000  C815B8B9 F247470D 00000000 00000000  *................H...2...........*
                0220  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000  *................................*
                0240  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000  *................................*
                0260  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000  *................................*
                0280  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000  *................................*
                02A0  00000000 00000000 00000000 00000000  00000000 000845A0 1932F1B8 0000148C  *.........................1.....*
                02C0  00000000 00000000                                                        *........
```

Note: PSW is 64-bit format and GPR are 64-bits

CICS TS Trace Entries

ASRA Debugging Cookbook

- **PART 1**
  - **Determine the type of program check that occurred (e.g., S0C7, S0C4 etc.)**
  - **Review the information on the first page of the dump**
    - **Transaction Id**
    - **PSW information and associated registers**
      - ***Get the PSW address and the instruction length of the failing instruction***
      - ***Adjust the PSW address using the instruction length***
    - **Locate the failing program**
  - **Find the entry point address of the failing program**
  - **Determine the offset into the program of the cancelling instruction**
    - **Offset = Adjusted PSW Address – Program Entry point**

ASRA Debugging Cookbook

- PART 2
  - Get program listing and locate the Procedure Division Map
    - Assembler Listing
    - Condensed Listing
  - Determine the failing instruction using the computed offset from Part 1
  - Determine the source instruction (verb) causing the problem
  - Review instruction and operands to determine cause of the program check
    - Identify affected fields

Locating a Field Cookbook

- Locate the TGT in the dump
  - General Purpose Register 09 → TGT
  - General Purpose Register 13 → DSA
    - DSA + X’5C’ → TGT
- Ensure that you are looking at a TGT by locating the eye-catcher ‘3TGT’ at +X’48’
- Locate the COBOL program listing
  - Find the TGT layout at the end of the listing
    - Locate the offset to the BLW Cells (Working Storage)
    - Locate the offset to the BLL Cells (Linkage Section)

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    - Locate the offset to the BLW Cells (Working Storage)
    - Locate the offset to the BLL Cells (Linkage Section)
  - Find the affected fields in the listing
    - Identify the BLW/BLL assigned, the displacement and the length of each field

Locating a Field Cookbook

- Locate the appropriate BLW/BLL cell in the dump
  - Using this content of the BLW/BLL cell add the field displacement
  - The result is the address of where the field is located in the dump
  - Locate the field in the dump for the length obtained in the COBOL listing
- If the cancelling instruction is a two operand field, find the other field in the dump

Closing

- When debugging a COBOL program that resulted in an ASRA cancellation, get the needed information from the dump
- The two most important control blocks needed to debug a COBOL program are:
  - TGT – GPR 09 → contains the entry point address of the program, the beginning Working-Storage address and the BLW/BLL cells required to locate fields in a dump
  - DSA – GPR 13 → contains the task's registers and a pointer to the TGT
- The techniques reviewed can be used to resolve any ASRA cancellation in addition to a S0C7