Session E59

IMS Debugging in a 64-Bit World

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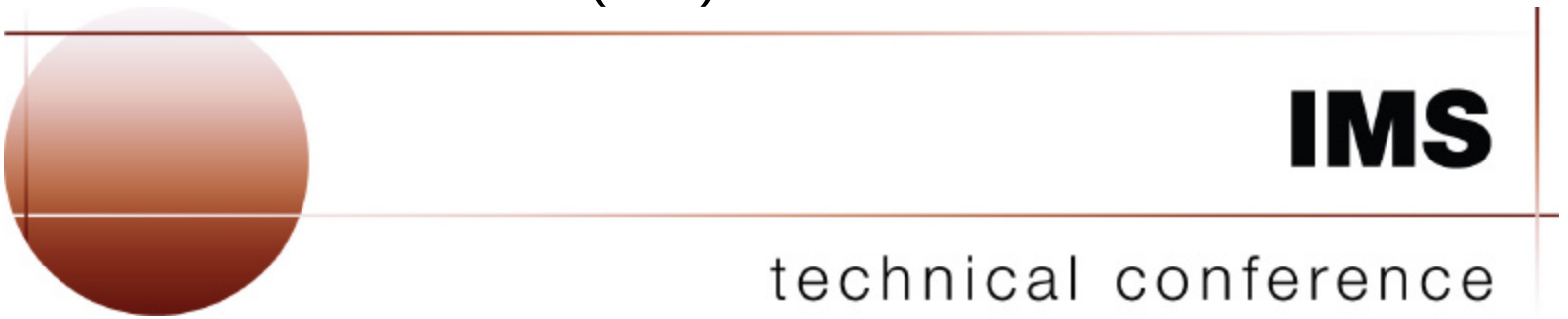

Las Vegas, NV **September 15 - September 18, 2003**

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IMS Debugging in a 64-Bit World - Regarding this Presentation

This procedure is intended to help systems programmers diagnose IMS This presentation documents information that is Diagnosis Information provided by IMS.

Attention: Do not use this Diagnosis Information as a programming interface.

IMS Debugging in a 64-Bit World Agenda

Agenda

- Section 1: 64-Bit Terminology
- Section 2: Recognizing z/Architecture in Dumps
- Section 3: z/Architecture Related Changes
- Section 4: MVS Formatting Changes
- Section 5: Verify Buffers Backed Above the Bar
- Section 6: ABEND0C4 RC38 Example
- Section 7: Appendix - IMS z/Architecture Related APARs

Section 1: 64-Bit Terminology

Section 1:

64-Bit Terminology

Hardware Terminology

- New hardware terminology
  - Unofficial prerelease term "Freeway"
  - z/Architecture servers
    - z900 series of processors
      - Constraint relief for workloads limited by 2GB real storage
      - Supports both ESA/390 and 64-bit z/Architecture
  - Device Type
    - D/T2064
      - Actual keyword used in RETAIN database APARs to describe this hardware

Software Terminology

- New software terminology
  - z/Architecture
    - The next step in the evolution from IBM's ESA/390 Architecture including 64-Bit general/control registers and a 64-bit addressing mode
  - z/Architecture Mode
    - IPL with ARCHLVL 2 in LOADxx SYS1.PARMLIB member
    - Default for z/OS systems if running on zSeries processor
  - Extended Addressing Mode or 64-Bit Addressing Mode
    - Addressing mode may be entered via:
      - SAM64, LPSWE, stacking PC/PR, BASSM/BSM, Interruptions
      - See z/Architecture Principles of Operation
        - Document Number SA22-7832-02

Software Terminology, Cont.

- **Software Terminology, Cont.**
  - **"Above the Bar"**
    - **Reference to storage above 2GB**
  - **ESAME**
    - **Enterprise Systems Architecture Modal Extensions**
    - **This term is obsolete and replaced by z/Architecture but you may spot it used in system control blocks and in some messages**

64-Bit Operating Systems

- **64-Bit Capable Operating Systems**
  - **OS/390 V2R10 - Planned to remain in service through Sept 2004**
    - **Minimum release to run in 64-Bit z/Architecture mode**
    - **IPL with ARCHLVL 2 in LOADxx SYS1.PARMLIB member**
  - **z/OS V1R1 GA March 2001**
  - **z/OS V1R4 GA September 2002, New functions to follow**
  - **z/OS V1R5 Planned availability 1Q04**
  - **Next, 9/04**
  - **Next, 9/05**

64-Bit Operating Systems, Continued

- **Note: z/OS V1R2/3/4 Bimodal Migration Accommodation for z/Architecture Servers. Available September 27, 2002**
  - **Allows for a 6 month "fallback" option to 31-bit mode when first migrating to z/OS on a z/Architecture server**
  - **Previously, z/OS had to run in 64-bit z/Architecture mode (ARCHLVL 2) on a z/Architecture server**
  - **See the following for details: http://www.ibm.com/servers/eserver/zseries/zos/downloads/**

Section 2: Recognizing z/Architecture in Dumps

Section 2:

Recognizing z/Architecture in Dumps

IPCS with OS/390 R10 and Above

- OS/390 R10 and above dump datasets may not be used with IPCS for OS/390 R9 and below
  - Dump prefix for OS/390 R10 dumps and above will contain DR2 if browsed

```
 BROWSE    IMSDUMP.X010718.Y093138.SJFEVMX.MADDIX                Browse subst
 Command ===> _____________________________________________________ Scroll ===
******************************** Top of Data ***************************
DR2 H .......................37..........0.....................IEAVTSDT¶
DR2 CV......................37..........0.....................................÷.
DR2 CV......................37..........0.....................................
DR2 CV....................ù^..37..........0.....................................ù^ .
DR2 CV....................ù{..37..........0.....................................ùA..
```

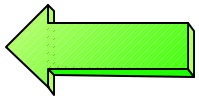
  - Dump prefix for OS/390 R9 dumps and below will contain DR1 if browsed

```
 BROWSE    IMSDUMP.X010621.Y095758.SJFEVMX.MADDIX                Browse subs
 Command ===> _____________________________________________________ Scroll ==
******************************** Top of Data ***************************
DR1 H ....................ì!.............0.....................IEAVTSDT
DR1 CV....................ì!.............0.....................................aåK8
DR1 CV................æ-...ì!........ø.....0.....................................
DR1 CV................æø...ì!.............0..................... TQE....
DR1 CV................æ°...ì!.............0.....................................
```

IPCS with OS/390 R10 and Above Continued...

- If an OS/390 R10 dump is initialized under OS/390 R9 or below, it will fail initialization

```
 IKJ56650I TIME-12:44:45 PM. CPU-00:00:05 SERVICE-627819 SESSION-00:12:17 SEPTE
BER 13,2001
 BLS18122I Initialization in progress for DSNAME('IMSDUMP.X010718.Y093138.SJFEV
X.MADDIX')
 BLS18123I 65,142 blocks, 270,990,720 bytes, in DSNAME('IMSDUMP.X010718.Y093138
SJFEVMX.MADDIX')
 IKJ56650I TIME-12:46:21 PM. CPU-00:00:05 SERVICE-987319 SESSION-00:13:52 SEPTE
BER 13,2001
 BLS18104I Symbol CVT not found
 ***
```



IPCS with OS/390 R10 and Above Continued...

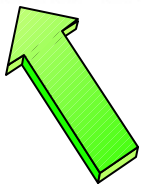
- If a pre-OS/390 R10 dump is initialized under OS/390 V2R10 and above, it will initialize, but IPCS commands will encounter errors.
  - IPCS ANALYSIS STATUS error example:

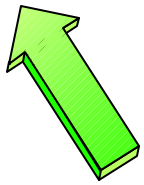
```
IPCS OUTPUT STREAM ------------------------------------- Line 0 Cols
Command ===> _                                           SCROLL ===>
 ******************************** TOP OF DATA ********************************
 BLS01000I Contention data initialization is in progress
 IAR80302I Primary RSM data area failed validity checks. RSM processing
           terminated.  Run RSMDATA EXCEPTION report.
 IEF1[illegible]1I No device group contention

 IOS10107I IOQ at 00F67B00 does not point to UCB at 00F33278
 Control block IOSB     at 00FC412C failed acronym check
```

Use Same release of IPCS when possible

- Dump initialization message BLS18223I tells you the z/OS level starting in z/OS 1.2
- Message BLS21001I tells you the level of IPCS being used

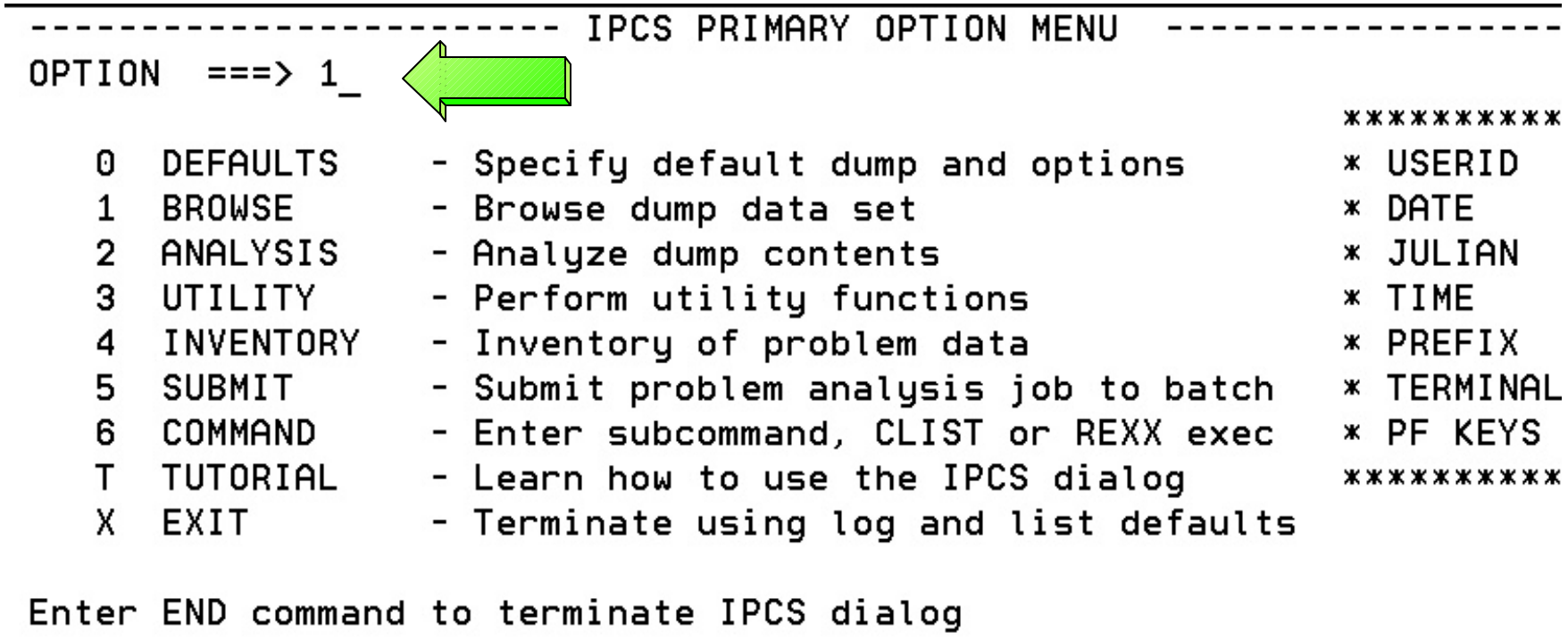
```
BLS18122I Initialization in progress for DSNAME('IMSDUMP.X020805.Y120942.PM7196

BLS18124I TITLE=IMS6 FOR IBM
BLS18223I Dump written by z/OS 01.02.00 SVC dump - level differs from IPCS level

BLS21001I IPCS for z/OS 01.04.00
BLS18222I ESA mode system
```





Recognizing the MVS Level

- Select Option 1 (BROWSE) from the IPCS Primary Option Menu



Recognizing the MVS Level Continued...

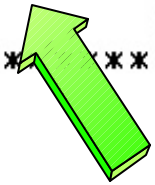
- Hit <Enter> to advance to IPCS Pointers Panel

```
------------------------- IPCS - ENTRY PANEL  ---------------------------------
Command ==>

 CURRENT DEFAULTS:
  Source ==> DSNAME('IMSDUMP.X020805.Y120942.PM71967.M030776')
  Address space ==> ASID(X'0001')

 OVERRIDE DEFAULTS:                                (defaults used for blank fields)
  Source ==> DSNAME('IMSDUMP.X020805.Y120942.PM71967.M030776')
  Address space ==>
  Password      ==>

 POINTER:
  Address       ==>                          (blank to display pointer stack)
  Remark        ==>                                          (optional text)
```

Recognizing the MVS Level Continued...

- Enter line command: S

```
DSNAME('IMSDUMP.X020805.Y120942.PM71967.M030776') POINTERS  ------------------
Command ===>                                                 SCROLL ===> CSR
ASID(X'0001') is the default address space
PTR   Address  Address space                                 Data type
s0001 00000000  ASID(X'0038')                                AREA
      Remarks:
********************************** END OF POINTER STACK ********************************
```



Recognizing the MVS Level Continued...

- Enter Command: L CVT

```
ASID(X'0038') STORAGE ----------------------------------------
Command ===> L CVT                                                 SCROLL ===> CSR
00000000   040C0000   814000E0   00000000   00000000   | ....a .\......... |
00000010   00FC97C0   00000000   070E0000   00000000   | ..p{............ |
00000020   070C0000   85652522   070C4000   8566CE3A   | ....e.....  .e... |
00000030   00000000   00000000   070E0000   00000000   | ................ |
00000040   00000000   00000000   00000000   00FC97C0   | ..............p{ |
00000050   00000000   00000000   040C0000   8134A8C0   | .............a.y{ |
00000060   040C0000   80FFE280   00080000   808A61E0   | ......S......./\ |
00000070   00080000   BD27D788   040C0000   813E2E80   | ......Ph....a... |
00000080   00000000   00001005   00020038   00060011   | ................ |
00000090   00002001   00010000   00000000   00000000   | ................ |
000000A0   0C000000   013F2808   00000000   00000000   | ................ |
000000B0   00000000   00000000   00010965   02F5B638   | ..............5.. |
000000C0   18000000   00000000   00000000   00000000   | ................ |
000000D0   00000000   15B05000   00000000   00000000   | .......&......... |
000000E0.:019F.--All bytes contain X'00'
```

Recognizing the MVS Level Continued...

- Enter Command: L CVT

```
ASID(X'0001') STORAGE  ----------------------------------------------------
Command ===> _                                              SCROLL ===> CSR
00FC9798                                E2D7F74B  F04BF240  |        SP7.0.2
00FC97A0  C8C2C2F7  F7F0F540  40404040  40404040  40404040  | HBB7705
00FC97B0  40404040  40404040  00009672  F0F3F840            |          o.038
00FC97C0  00000218  00FE393C  00FC973C  00FC9DA8  ..... ...y|
00FC97D0  00000000  00FD80A4  00FEBA4E  00FE0338  .......u. ..|
00FC97E0  00FE016C  01797BA8  81283B20  00FE1D98  ...%.`#ya..|
00FC97F0  02F70540  00FDF570  0102217F  00FC9DD0  .7. ..5....".|
00FC9800  00F3F000  00FEF5E8  00FE3960  00000000  .30...5Y...-....
00FC9810  0A0307FE  00FC9744  00FC9590  00000000  ......p...n.....
00FC9820  40C3E5E3  00FCACC0  00FD9FB2  00FD9FD2  | CVT...{.......K
00FC9830  00F3FE30  9BFCCF58  00000000  00FD4C10  .3.........<.
00FC9840  00000000  81449CC0  00FE3810  017AA1E8  ....a..{.....:~Y
00FC9850  85314000  00FC9DD0  00FE7E60  00D53140  e. ....}..=-.N.
00FC9860  00000000  7FFFFFFF  00000000  00000000  ....".........
00FC9870  00FC9EA8  0000A320  00FDE880  00FC9778  ...y..t...Y...p.
00FC9880  00FC9EE0  80F941E8  00FC8DB0  D3000000  ...\.9.Y....L...
00FC9890  00000000  0A0D0A06  00000000  00FC8CD8  ..............Q
00FC98A0  013BDBF8  03140F44  00FDF7C0  00FC7498  ...8.....7{...q
00FC98B0  00000000  00000000  00F41B78  00FC9D10  .........4.....
```

MVS FMID

Recognizing the MVS Level Continued...

- **MVS Release to FMID relationship**

OS/390 V2R8	HBB6608
OS/390 V2R9	JBB6609
OS/390 V2R10	HBB7703
z/OS 1.1	JBB7713
z/OS 1.2	HBB7705
z/OS 1.3	HBB7706
z/OS 1.4	HBB7707

Note: Currently, starting with z/OS 1.1, the last 3 digits add up to the release

HBB7705 ==> 7+0+5 = 12 ==> z/OS 1.2

Recognizing the Device Type D/T 2064

- **Select Option 1 (BROWSE) from the IPCS Primary Option Menu**

```
------------------------ IPCS PRIMARY OPTION MENU ------------------
OPTION  ===> 1_
                                                          **********
   0  DEFAULTS    - Specify default dump and options      * USERID
   1  BROWSE      - Browse dump data set                  * DATE
   2  ANALYSIS    - Analyze dump contents                 * JULIAN
   3  UTILITY     - Perform utility functions             * TIME
   4  INVENTORY   - Inventory of problem data             * PREFIX
   5  SUBMIT      - Submit problem analysis job to batch  * TERMINAL
   6  COMMAND     - Enter subcommand, CLIST or REXX exec  * PF KEYS
   T  TUTORIAL    - Learn how to use the IPCS dialog      **********
   X  EXIT        - Terminate using log and list defaults

Enter END command to terminate IPCS dialog
```

Recognizing the Device Type D/T 2064

- Enter line command: S

```
DSNAME('IMSDUMP.X010712.Y133100.SJFEVMX.MADDIX') POINTERS  ------------------
Command ===>                                                 SCROLL ===> CSR
ASID(X'0001') is the default address space
PTR   Address  Address space                                 Data type
S0001 00000000  ASID(X'00B8')                                 AREA
      Remarks:
********************************** END OF POINTER STACK ********************************
```

Recognizing the Device Type D/T 2064

- Enter Command: L CVT+42C?

```
ASID(X'00B8') STORAGE  ----------------------------------------------------
Command ===> L_CVT+42C?                                    SCROLL ===> CSR
00000000   000A0000   000130E1   00000000   00000000  | ................ |
00000010   00FD1B18   00000000   00000000   00000000  | ................ |
00000020.:2F.--All bytes contain X'00'
00000030   00000000   00000000   470C0000   A1E7E9EE  | ............~XZ. |
00000040   00000000   00000000   00000000   00FD1B18  | ................ |
00000050   00000000   00000000   000A0000   000140E1  | ..............  . |
00000060   000A0000   000150E1   000A0000   000160E1  | ......&.......-. |
00000070   000A0000   000170E1   000A0000   000180E1  | ................ |
00000080   00000000   00001005   00020001   00040016  | ................ |
00000090   00000002   00000000   00000000   00000000  | ................ |
000000A0   00000001   0133D108   00000000   0078B000  | ......J......... |
000000B0   00000000   00000000   0001369E   01F589E0  | ............5i\  |
000000C0   28000000   00000000   E0000000   00000000  | ........\....... |
000000D0.:012F.--All bytes contain X'00'
00000130   47041000   80000000   00000000   0A4282E2  | ..............bS |
00000140   47851400   80000000   00000000   21CF0A66  | .e............. |
00000150   44040000   80000000   00000000   0134AE14  | ................ |
00000160.:016F.--All bytes contain X'00'
00000170   07060000   00000000   00000000   00000000  | ................ |
```

CMD

Recognizing the Device Type D/T 2064

- You will see the machine information here at the CVTHID area
  - The device type can be found at offset x'1C'

```
ASID(X'0001') STORAGE  ----------------------------------------------
Command ===> _                                        SCROLL ===> CSR
016F2728                          00000396   012064B6  |          ...o....  |
016F2730   0478E100   00000000   00000000   00001800  |  ................  |
016F2740   0003F0F0   F2F0F6F4   F1C3F5C9   C2D4F0F2  |  ..0020641C5IBM02  |
016F2750   F0F0F0F0   F2F0F0F4   F0F0F0F0   FFF00000  |  00002040000.0..   |
016F2760   C9D6E2E5   E2E8E3D2   F0F261F2   F661F0F1  |  IOSVSTOR02/26/01  |
016F2770   E4E6F7F7   F9F1F440   00000000   00000000  |  UW77914 .......   |
016F2780.:016F27AF.--All bytes contain X'00'
016F27B0   00000000   00000000   C9D6E2E5   C9E2C4E3  |  ........IOSVISDT  |
016F27C0   F0F261F2   F661F0F1   E4E6F7F7   F9F1F440  |  02/26/01UW77914   |
016F27D0   00081018   20283038   C9D6E2E5   C3C8D9C2  |  ........IOSVCHRB  |
016F27E0   F0F261F2   F661F0F1   E4E6F7F7   F9F1F440  |  02/26/01UW77914   |
016F27F0   C3C8D9C2   00000000   00000000   00000000  |  CHRB............  |
016F2800   00000000   016F2820   00000000   81100BE8  |  .....?......a..Y  |
016F2810   00000000   00000080   00000000   00000000  |  ................  |
016F2820   E2D9C240   016F284C   00000000   00000000  |  SRB .?.<........  |
016F2830.:016F283F.--All bytes contain X'00'
016F2840   00000000   00000000   00000000   E2D9C240  |  ............SRB   |
016F2850   016F2878   00000000   00000000   00000000  |  .?..............  |
016F2860.:016F286F.--All bytes contain X'00'
```

Recognizing z/Architecture Mode IPL - Globally with CVT

- **Enter Command: CBF CVT**

```
------------------------ IPCS PRIMARY OPTION MENU -----------------------
OPTION  ===> IP CBF CVT_
                                                         ********************
   0  DEFAULTS    - Specify default dump and options     * USERID  - M030776
   1  BROWSE      - Browse dump data set                 * DATE    - 01/07/15
   2  ANALYSIS    - Analyze dump contents                * JULIAN  - 01.196
   3  UTILITY     - Perform utility functions            * TIME    - 12:54
   4  INVENTORY   - Inventory of problem data            * PREFIX  - M030776
   5  SUBMIT      - Submit problem analysis job to batch * TERMINAL- 3278
   6  COMMAND     - Enter subcommand, CLIST or REXX exec * PF KEYS - 24
   T  TUTORIAL    - Learn how to use the IPCS dialog     ********************
   X  EXIT        - Terminate using log and list defaults

Enter END command to terminate IPCS dialog
```

Recognizing z/Architecture Mode IPL - Globally with CVT

- Enter Command: F FLAG3

```
IPCS OUTPUT STREAM ------------------------------------- Line 0 Cols 1 78
Command ===> F FLAG3_                                    SCROLL ===> CSR
 ********************************* TOP OF DATA ***********************************

  CVT: 00FD1B18
     -0028  PRODN.... SP6.1.0   PRODI.... HBB7703   VERID....
     -0006  MDL..... 2064       RELNO.... 038
     +0000  TCBP.....  00000218  0EF00.... 00FF1064  LINK.....  00FD4C7C
     +000C  AUSCB....  00FD2100  BUF......  00000000  XAPG.....  00FE40A0
     +0018  0VL00....  00FF534E  PCNVT....  00FDD030  PRLTV....  00FDCE64
     +0024  LLCB.....  0170C3F0  LLTRM....  8118D620  XTLER....  00FDB1B8
     +0030  SYSAD....  01FDE418  BTERM....  00FDEAE8  DATE.....  0101172F
     +003C  MSLT.....  00FCF0A8  ZDTAB....  00F38000  XITP.....  00FF76B8
     +0048  0EF01....  00FF1088  VSS......  0000      VPSM.....  0000
     +0050  EXIT.....  0A03      BRET.....  07FE      SVDCB....  00FD4C84
     +0058  TPC......  00FD2128  ICPID....  0000      CVT......  40C3E5E3
     +0064  CUCB.....  00FCCC70  QTE00....  00FEF182  QTD00....  00FEF1A2
     +0070  STB......  00F496E0  DCB......  9B        DCBA.....  FD7438
     +0078  SV76M....  00000000  IXAVL....  00FDD2D8  NUCB.....  00000000
     +0084  FBOSV....  8136FEE0  0DS......  00FF0F38  ECVT.....  016E9B58
     +0090  DAIRX....  8A124000  MSER.....  00FCF0A8  0PT01....  00FEA5B0
```

CMD

Recognizing z/Architecture Mode IPL - Globally with CVT

- FLAG3, CVT+x'17A' = x'80' bit is set if IPLed in z/Architecture Mode

```
IPCS OUTPUT STREAM ---------------------------------- FOUND: LINE 39 C
Command ===>                                                SCROLL ===>
     +0174  SYLK..... 00        SLID..... 000000    FLAG1.... 7E
     +0179  FLAG2.... F8        FLAG3.... 80
     +017C  RT03..... 00FDED38  VLDWT.... 00000000  EXSNR.... 0118F6B8
     +018C  EXSNL.... 00        SPVLK.... 00        CTLFG.... 10
     +018F  APG...... 00        TRACE.... 07FB      TRAC2.... 07FB
     +0194  RSCN..... 00FF0EB4  TAS...... 00000000  TRCRM.... 8B7B3BF8
     +01A0  SHRVM.... 00800000  0VL01.... 00FF5348  PPGMX.... 811915A8
     +01AC  GRSST.... 00        GVT...... 00FD35F0  ASCRF.... 021E4E00
     +01B8  ASCRL.... 082F0200  PUTL..... 80DB8A3C  SRBRT.... 00FF0EF0
     +01C4  OLT0A.... 00FD25B0  SMFEX.... 00FD2610  CSPIE.... 88A85A10
     +01D0  PTGT..... 80DB8A42  SIGPT.... 1E        SPDMC.... 00
     +01D6  DSSAC.... 00        STCK..... 80DB8A36  MAXMP.... 0007
     +01DE  BSM2..... 0B02      SCAN..... 80DC4000  AUTHL.... 7FFFF001
     +01E8  BLDCP.... 00FDF220  GETCL.... 00FDF4E0  FRECL.... 00FDF670
     +01F4  DELCP.... 00FDF828  CRMN..... 00FF7A6C  CRAS..... 81191A50
     +0200  QSAS..... 812A2D3E  FRAS..... 81191A72  S1EE..... 00FF0D44
     +020C  PARS..... 80DB8A24  QUIS..... 01192D30  STXU..... 8A01BFF0
     +0218  OPTE..... 00FD85E6  SDRM..... 8A04C000  CSRT..... 016F4EB8
     +0224  AQTOP.... 016F6EB8  VVMDI.... 00000833  ASVT..... 00F9F0D0
```

IPLed in z/Arch Mode

Recognizing z/Architecture Mode IPL - Using PSA

- Select Option 1 (BROWSE) from the IPCS Primary Option Menu

```
------------------------ IPCS PRIMARY OPTION MENU  ------------------
OPTION  ===> 1_
                                                                ***********
   0  DEFAULTS     - Specify default dump and options          * USERID
   1  BROWSE       - Browse dump data set                      * DATE
   2  ANALYSIS     - Analyze dump contents                     * JULIAN
   3  UTILITY      - Perform utility functions                 * TIME
   4  INVENTORY    - Inventory of problem data                 * PREFIX
   5  SUBMIT       - Submit problem analysis job to batch      * TERMINAL
   6  COMMAND      - Enter subcommand, CLIST or REXX exec      * PF KEYS
   T  TUTORIAL     - Learn how to use the IPCS dialog          ***********
   X  EXIT         - Terminate using log and list defaults

Enter END command to terminate IPCS dialog
```

Recognizing z/Architecture Mode IPL - Using PSA

- Enter Line Command: S

```
DSNAME('IMSDUMP.X010712.Y133100.SJFEVMX.MADDIX') POINTERS  ------------------
Command ===>                                                SCROLL ===> CSR
ASID(X'00B8') is the default address space
PTR   Address  Address space                                Data type
s0001 00000000  ASID(X'00B8')                               AREA
      Remarks:
********************************** END OF POINTER STACK ********************************
```

Recognizing z/Architecture Mode IPL - Using PSA

- PSA+x'A3' = x'01' bit is set if IPLed in z/Architecture Mode

```
ASID(X'0001') STORAGE  ----------------------------------------------------
Command ===> _                                              SCROLL ===> CSR
00000000   000A0000   000130E1   00000000   00000000  | ................ |
00000010   00FD1B18   00000000   00000000   00000000  | ................ |
00000020.:2F.--All bytes contain X'00'
00000030   00000000   00000000   470C0000   A1E7E9EE  | ............~XZ. |
00000040   00000000   00000000   00000000   00FD1B18  | ................ |
00000050   00000000   00000000   000A0000   000140E1  | ............... . |
00000060   000A0000   000150E1   000A0000   000160E1  | ......&.......-. |
00000070   000A0000   000170E1   000A0000   000180E1  | ................ |
00000080   00000000   00001005   00020001   00040016  | ................ |
00000090   00000002   00000000   00000000   00000000  | ................ |
000000A0   00000001   00000000   00000000   0078B000  | ......J......... |
000000B0   00000000   00000000   0001369E   01F589E0  | ..............5i\ |
000000C0   28000000   00000000   E0000000   00000000  | ........\........ |
000000D0.:012F.--All bytes contain X'00'
00000130   47041000   80000000   00000000   0A4282E2  | ..............bS |
00000140   47851400   80000000   00000000   21CF0A66  | .e.............. |
00000150   44040000   80000000   00000000   0134AE14  | ................ |
00000160.:016F.--All bytes contain X'00'
00000170   07060000   00000000   00000000   00000000  | ................ |
```

IPLed in z/Arch Mode

Recognizing z/Architecture Mode IPL - Using Formatted PSA

- PSA formatted using Command: IP CBF PSAn
  - PSA AMDID at offset x'A3', x'01' bit is set if IPLed in z/Architecture Mode

```
IPCS OUTPUT STREAM ------------------------------------- Line 0 Cols 1 78
Command ===> IP CBF PSA0_                                SCROLL ===> CSR
 ******************************** TOP OF DATA ***********************************

  PSA: 00000000
     +0010  CVT..... 00FCF098  CVT2.... 00FCF098  EPARM... 00000000
     +0084  CPUAD... 0003      EICODE.. 1202      SDATA... 00020030
     +008C  PDATA... 00060011  PINFO... 00000000  MCNUM... 0000
     +0096  PERCODE. 0000      PER..... 00000000  00000000
     +00A0  AID..... 0C        PERAID.. 00        OPACID.. 00
     +00A3  AMDID... 01                           2E588
     +00A8  TEID.... 00000000  00002001
     +00B0  MONCODE. 00000000  00000000           SSID.... 000101AF
     +00BC  IOINTP.. 00EF5A28  IOINTID. 28000000  PCFETO.. 00000000
     +00C8  FACLIST. E0000000  MCIC.... 00000000  00000000
     +00F0  MCICE... 00000000  EDCODE.. 00000000
     +00F8  FSA..... 00000000  00000000
     +0120  ROPSW... 00000000  00000000  00000000  00000000
     +0130  EOPSW... 07040000  80000000  00000000  04222D68
     +0140  SOPSW... 07040000  80000000  00000000  0421C182
     +0150  POPSW... 07044000  80000000  00000000  04223E62
```

PSA Format Command

IPLed in z/Arch Mode

Recognizing z/Architecture Mode IPL - Dump Initialization

- z/OS 1.1 and below MSG BLS18222I will state "ESAME mode system" If z/Architecture Mode IPL
- z/OS 1.2 and higher MSG BLS18222I will state "z/Architecture mode system" If z/Architecture Mode IPL
- MSG BLS18222I will state "ESA mode system" if ARCHLVL 1, ESA mode IPL

```
 IKJ56650I TIME-07:18:51 PM. CPU-00:00:04 SERVICE-489060 SESSION-49:35:09 JULY 1
4,2001
 BLS18122I Initialization in progress for DSNAME('IMSDUMP.X010712.Y133100.SJFEVM
X.MADDIX')
 BLS18124I TITLE=JOBNAME SERVICEA STEPNAME SERVICEASERVICEA SYSTEM 0C4
 BLS18222I ESAME mode system
 BLS18123I 21,800 blocks, 90,688,000 bytes, in DSNAME('IMSDUMP.X010712.Y133100.S
JFEVMX.MADDIX')
 IKJ56650I TIME-07:19:08 PM. CPU-00:00:04 SERVICE-615601 SESSION-49:35:26 JULY 1
4,2001
 BLS18058I Warnings regarding STRUCTURE(PVT) at ASID(X'0001') FFA2A0:
 BLS18059I Located via STRUCTURE(CVT) at ASID(X'0001') FD1B18
 BLS18300I    Storage not in dump
 ***
```

IPLed in z/Arch Mode

Section 3: z/Architecture Related Changes

Section 3:

z/Architecture Related Changes

z/Architecture Related Changes

- z/Architecture Related Changes
  - 64-bit virtual storage management support starting z/OS V1R2
  - 128-bit PSW
  - New Program Interrupt Codes
  - 163 new assembler instructions
  - 64-bit General Purpose Registers
  - 64-bit Control Registers
  - 8K PSA
  - Central storage to 128 GB, x'20_00000000'
    - _ (underscore) is used to separate 64-bit addresses when displayed

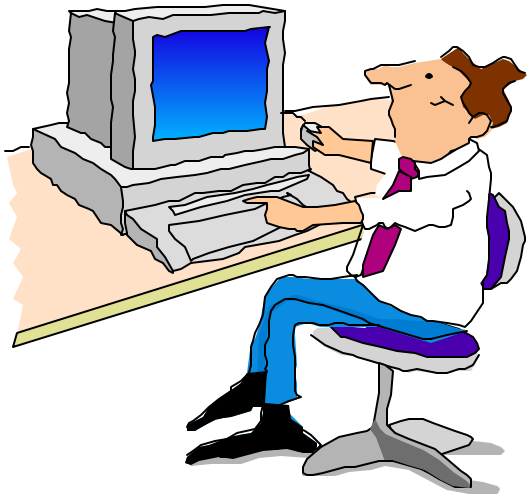
Note: Programs continue to be loaded and run below the 2GB Bar. RMODE support remains unchanged

z/Architecture Related Changes - 64-Bit Virtual Storage Management

- 64-bit virtual storage management support starting z/OS V1R2
  - 64-bit data addressability within a single address space
    - Former limit of 2GB = 2^{31} = 2,147,483,648 Bytes
    - New limit of 2^{64} = 18,446,744,073,709,551,616 bytes
      - 18 and a half quintillion bytes
      - 16 exabytes = 16,777,216 terabytes = 17,179,869,184 GB
      - 8,589,934,592 times greater than the 31-Bit address space
        - An MVS/XA 31-Bit address space was only 128 times greater than the System 370 24-BIT address space

z/Architecture Related Changes - 64-Bit Virtual Storage Management, Continued

To download a 2 gigabyte stand alone dump at 1789 Kbytes/sec...



...it took 19.5 minutes

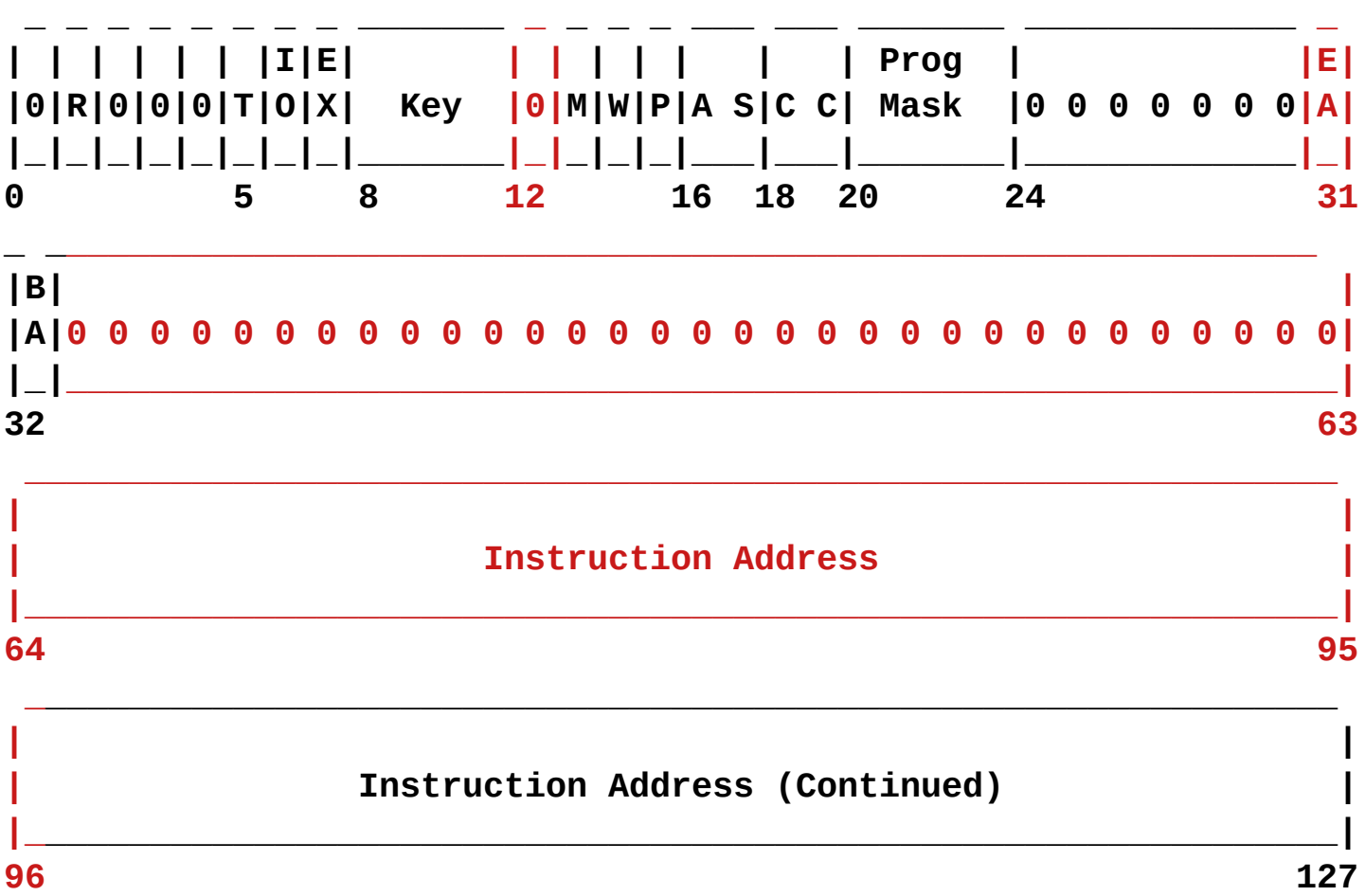
If the dump were 16 exabytes...

...it would have taken 319,302 years, 316 days, 12 hours and 45 minutes

z/Architecture Related Changes - 64-Bit Virtual Storage Management, Continued

- Storage above the bar is obtained via the IARV64 macro
  - Smallest memory object size is 1 megabyte, largest to limit set by MEMLIMIT in IEFUSI. MEMLIMIT is also available at job or SMF level.
  - SVCDUMPRGN=YES/NO parm in IARV64 macro is used to specify whether or not the virtual storage in the memory object is to be included when an SVC dump is requested using SDATA=(RGN)
    - The following options can be used to dump above the bar storage:
      - MVS DUMP command parm, STOR(beg,end)
      - SDUMPX macro SUMLIST64 or LIST64
      - MVS SLIP command parm, LIST
  - Storage is freed explicitly via IARV64 macro or at task term
  - GETMAIN/FREEMAIN, STORAGE, CPOOL, or callable cell pool services do not work on virtual storage above the bar

z/Architecture Related Changes - z/Architecture 128-Bit PSW Format



Bit-12 = 0 if z/Architecture Mode
Bit-31 = 1 if Extended Addressing Mode
Bit-32 = 1 if Basic Addressing Mode

z/Architecture Related Changes - z/Architecture PSW Format, Continued

- PSA at address x'00000000' in address space showing 128-bit PSWs

```
ASID(X'0001') STORAGE  ----------------------------------------------------
Command ===> _                                              SCROLL ===> CSR
00000000   000A0000   000130E1   00000000   00000000  | ................ |
00000010   00FD1B18   00000000   00000000   00000000  | ................ |
00000020.:2F.--All bytes contain X'00'
00000030   00000000   00000000   470C0000   A1E7E9EE  | ............~XZ. |
00000040   00000000   00000000   00000000   00FD1B18  | ................ |
00000050   00000000   00000000   000A0000   000140E1  | ............... . |
00000060   000A0000   000150E1   000A0000   000160E1  | ......&.......-. |
00000070   000A0000   000170E1   000A0000   000180E1  | ................ |
00000080   00000000   00001005   00020001   00040016  | ................ |
00000090   00000002   00000000   00000000   00000000  | ................ |
000000A0   00000001   0133D108   00000000   0078B000  | ......J......... |
00000      00000000   00000000   0001369E   01F589E0  | ............5i\  |
000000C    28000000   00000000   E0000000   00000000  | ........\........ |
000000D0.:012F.--All bytes contain X'00'
00000130   47041000   80000000   00000000   0A4282E2  | ..............bS |
00000140   47851400   80000000   00000000   21CF0A66  | .e............. |
00000150   44040000   80000000   00000000   0134AE14  | ................ |
00000160.:016F.--All bytes contain X'00'
00000170   07060000   00000000   00000000   00000000  | ................ |
```

z/Architecture Related Changes - z/Architecture PSW Format, Continued

- z/Architecture PSWs from PSA:
  - PSA+x'130', EOPSW: 47041000 80000000 00000000 0A4282E2
    - ESA PSW = 470C1000 8A4282E2
  - PSA+x'140', SOPSW: 47851400 80000000 00000000 21CF0A66
    - ESA PSW = 478D1400 A1CF0A66
  - PSA+x'150', POPSW: 44040000 80000000 00000000 0134AE14
    - ESA PSW = 440C0000 8134AE14
- The 128-bit z/Architecture PSW is converted to a z/OS apparent 64-bit (ESA/390-like) PSW in most control blocks

z/Architecture Related Changes - z/Architecture Mode PSW Example

- **64-bit mode PSW example:**
  - **PSA+x'130', EOPSW: 04045001 80000000 00000000 2A4282E2**
    - **ESA/390 PSW = 040C5001 AA4282E2**
- **PSW Bit 31 and 32 trimodal addressing chart:**

Bit-31	Bit-32	Addressing Mode
0	0	24-bit
0	1	31-bit
1	1	64-bit
1	0	Specification Exception (PIC 6)

z/Architecture Related Changes - Program Interrupt Codes

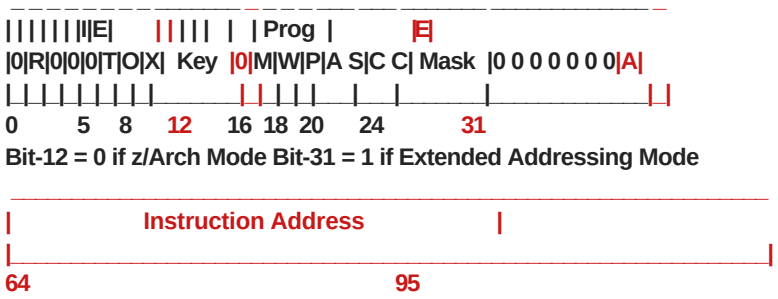
- Program Interrupt Codes

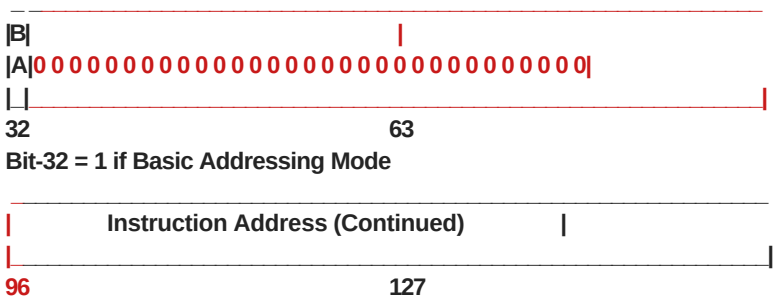
Program-Interruption Conditions	Hex PIC	Address mode	ABEND Code	Error PSW Points
Protection Exception	04	ALL	0C4	At Next Seq Instruction
Specification Exception	06	ALL	0C6	At Next Seq Instruction
Segment Translation	10	ALL	0C4	At Instruction
Page Translation	11	ALL	0C4	At Instruction
Special-Operation Except	13	ALL	0D3	At Next Seq Instruction
ASTE (AS Second Table Entry) Validity Exception	2B	ALL	0C4 : z/OS 1.2 and above 0E0 RC2B: 1.1 and below	At Instruction
ASCE (Address Space Control Element) -Type *	38	64Bit	0C4 : z/OS 1.2 and above 0E0 RC38: 1.1 and below	At Instruction
Region 1st Translation *	39	64Bit	0C4	At Instruction
Region 2nd Translation *	3A	64Bit	0C4	At instruction
Region 3rd Translation *	3B	64Bit	0C4	At instruction

* Unique to z/Architecture mode

z/Architecture Related Changes - PIC z/Architecture Summary

PICs	Hex PIC	Address mode	ABEND	Possible Reasons
Early Spec Except (occurs after operation is complete) Spec Exception	06	ALL	0C6	--- LPSW, LPSWE, PR, Interrupt - ILC = 0 --- Bit 31 of PSW =1, Bit 32 0 Bits 31/32=0 (24Bit Mode) 64-103 ¬= 0 Bit 31=0, Bit 32=1 (31Bit Mode) 64-96¬= 0 --- SAM24, SAM31 ILC=1 or 2 if EX target --- Bits 64-103 or 64-96 ¬= 0
Special-Operation	13	ALL	0D3	LRA w/Bits 0-32 of resulting real addr ¬= 0
ASCE -Type	38	64Bit	0C4 1.2^ 0E0 RC38	Branch to virtual address above the bar Access unallocated storage above the bar
Reg 1st Tran	39	64Bit	0C4	Access unallocated storage above the bar
Reg 2nd Tran	3A	64Bit	0C4	Access unallocated storage above the bar
Reg 3rd Tran	3B	64Bit	0C4	Access unallocated storage above the bar





z/Architecture Related Changes - Program Interrupt Codes - TEID

- The TEID (Translation Exception Identification), formerly known as TEA (Translation Exception Address), identifies the storage address that caused the PIC 10, 11, 38, 39, 3A, or 3B
  - Stored at PSA+x'A8', Label TEID, 2 words (64Bit value)
  - Also available in Logrec entries in SDWARC4 + x'148'
  - Full value not currently available in RTM2WA, SDWA, or IPCS STATUS

```
IPCS OUTPUT STREAM ------------------------------------- Line 0 Cols 1 78
Command ===> IP CBF PSA0_                                SCROLL ===> CSR
 ********************************* TOP OF DATA ***********************************

  PSA: 00000000
     +0010  CVT..... 00FCF098  CVT2.... 00FCF098  EPARM... 00000000
     +0084  CPUAD... 0003      EICODE.. 1202      SDATA... 00020030
     +008C  PDATA... 00060011  PINFO... 00000000  MCNUM... 0000
     +0096  PERCODE. 0000      PER..... 00000000  00000000
     +00A0  AID..... 0C        PERAID.. 00        OPACID.. 00
     +00A3  AMDID... 01        MPL..... 0132E588
     +00A8  TEID.... 00000D30  00000000
     +00B0  MONCODE. 00000000  00000000                    SSID.... 000101AF
```

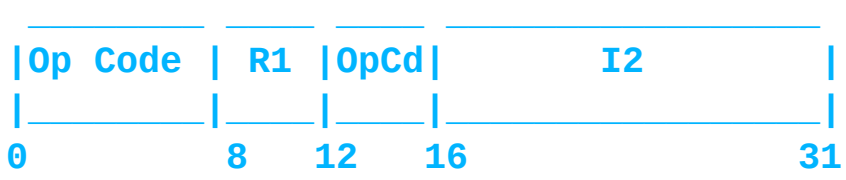
PSA Format Command

TEID Value

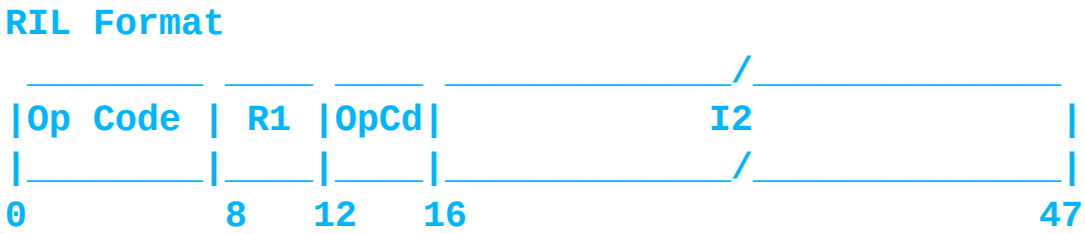
z/Architecture Related Changes - 163 New Assembler Instructions

- 163 new assembler instructions -
  - 141 for z/Architecture only, 22 for both ESA/390 and z/Architecture
  - IMS uses some of the new ESA/390 instruction set in V8
    - OS/390 V2R10 and necessary hardware already were a prereq
    - z/Architecture only instructions not used by IMS to avoid necessary checks for instruction availability
  - Three new instruction formats: RI, RIL, RIE

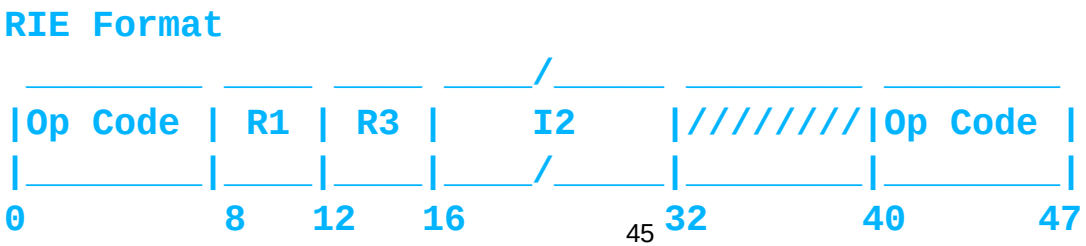
RI Format



RIL Format



RIE Format



z/Architecture Related Changes - 163 New Assembler Instructions

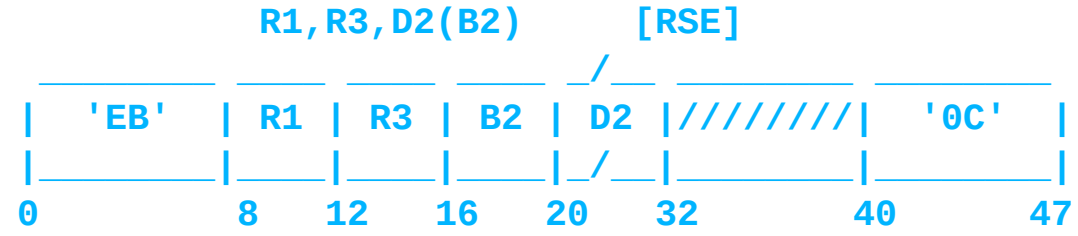
- 163 new assembler instructions -
  - Use IPCS OPCODE command to decipher opcodes.
    - Suggested to always provide 6 bytes of data to avoid possible confusion of OPCODE value

```
IPCS OUTPUT STREAM -----------------------------------------------
Command ===> ip opcode EB345800C80C_                          SCROLL
 ********************************* TOP OF DATA ***********************

 Mnemonic for X'EB345800C80C' is SRLG
 ******************************** END OF DATA ***********************
```

IPCS OPCODE COMMAND

IPCS OPCODE RESULTS

- (SRLG) SHIFT RIGHT SINGLE LOGICAL
  - Mnemonics for 64Bit instructions contain a "G" (GRANDE)



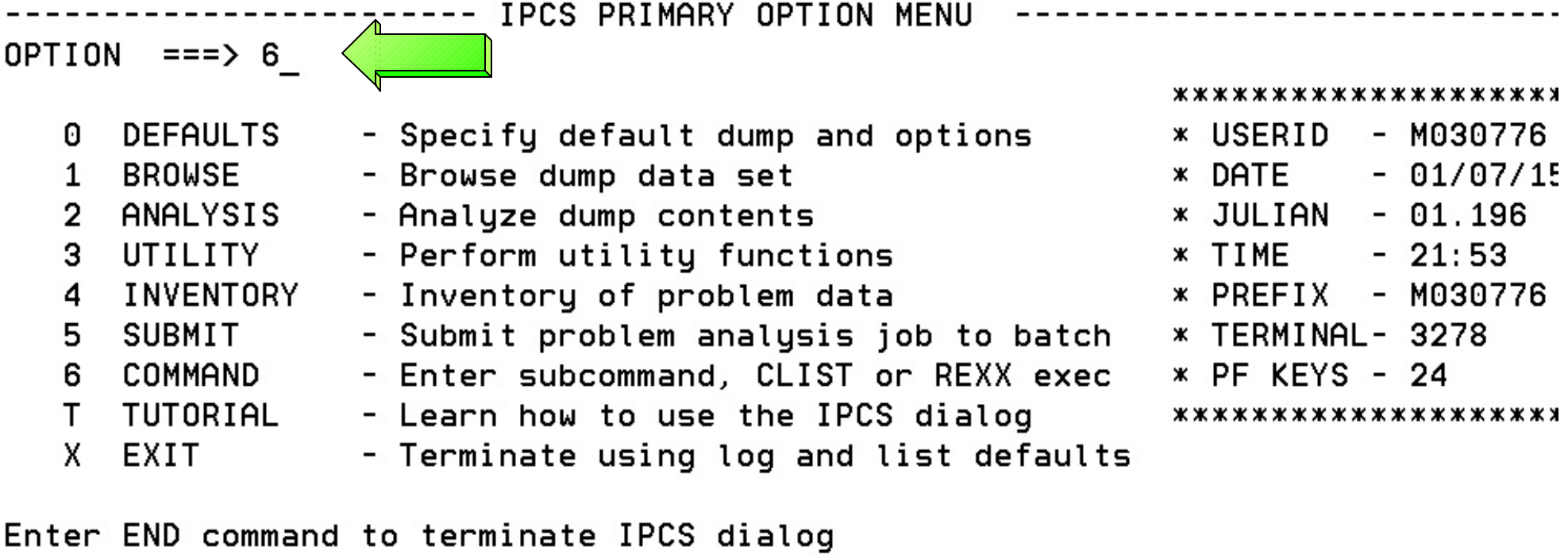
Section 4: MVS Diagnostic Changes

Section 4:

MVS Diagnostic Changes

TCB/RB Formatting Changes

- Select option 6 (COMMAND) from the IPCS Primary Option Menu



TCB/RB Formatting Changes

Issue Command: SUMMARY FORMAT

```
------------------------- IPCS Subcommand Entry ----------------------------
Enter a free-form IPCS subcommand or a CLIST or REXX exec invocation below:

===> SUMMARY FORMAT_
```

CMD

```
----------------------- IPCS Subcommands and Abbreviations -----------------
ADDDUMP              | DROPDUMP, DROPD   | LISTMAP,  LMAP    | RUNCHAIN, RUNC
ANALYZE              | DROPMAP,  DROPM   | LISTSYM,  LSYM    | SCAN
ARCHECK              | DROPSYM,  DROPS   | LISTUCB,  LISTU   | SELECT
ASCBEXIT, ASCBX      | EQUATE,   EQU, EQ | LITERAL           | SETDEF,   SETD
ASMCHECK, ASMK       | FIND,     F       | LPAMAP            | STACK
CBFORMAT, CBF        | FINDMOD,  FMOD    | MERGE             | STATUS,   ST
CBSTAT               | FINDUCB,  FINDU   | NAME              | SUMMARY,  SUMM
CLOSE                | GTFTRACE, GTF     | NAMETOKN          | SYSTRACE
COPYDDIR             | INTEGER           | NOTE,     N       | TCBEXIT,  TCBX
COPYDUMP             | IPCS HELP, H      | OPEN              | VERBEXIT, VERBX
COPYTRC              | LIST,     L       | PROFILE,  PROF    | WHERE,    W
CTRACE               | LISTDUMP, LDMP    | RENUM,    REN     |
```

TCB/RB Formatting Changes

- Issue Command: F ' TCB: '
  - Repeat the find until the failing TCB is found vis TCB CMP field

```
IPCS OUTPUT STREAM ------------------------------------- Line 0 Cols 1 78
Command ===> F  ' TCB:'_                                 SCROLL ===> CSR
 ******************************** TOP OF DATA ***********************************
 COULD NOT ACCESS PSA      AT 00F8A000
 COULD NOT ACCESS PSA      AT 00FBD000
 COULD NOT ACCESS PSA      AT 00FB6000
 COULD NOT ACCESS PSA      AT 00FAE000


     * * * *  F O R M A T  * * * *



     GLOBAL SERVICE MANAGER QUEUE
      QUEUE IS EMPTY

     LOCAL SERVICE MANAGER QUEUE
      QUEUE IS EMPTY
```

CMD

TCB/RB Formatting Changes

```
IPCS OUTPUT STREAM ------------------------------------ Line 3394 Cols 1 78
Command ===> _                                            SCROLL ===> CSR
  TCB: 007C92E8
     +0000  RBP..... 007FD6C0  PIE..... 00000000  DEB..... 007970CC
     +000C  TIO..... 007B4000  CMP..... 840C4000  ..... 00000000
     +0018  MSS..... 7F73F250  PKF..... 80        FLGS.... 01000000  00
     +0022  LMP..... FF        DSP..... FF        LLS..... 007933D0
     +0028  JLB..... 007C9558  JPQ..... 007933F0

     Register values
       0-3  0A460E1C  0078EF58  085A1018  7F696580
       4-7  007C8000  00000000  00000001  7F696EB0
       8-11 7F696990  00FBFA30  0078E000  0226F206
      12-15 0A460E1C  0078EF78  50DB5F28  00EB18C0

            64-Bit GPRs from TCB/STCB
      0-1  00000000_0A460E1C  00000000_0078EF58
      2-3  00000000_085A1018  00000000_7F696580
      4-5  00000000_007C8000  00000000_00000000
      6-7  00000000_00000001  00000000_7F696EB0
      8-9  00000000_7F696990  00000000_00FBFA30
     10-11 00000000_0078E000  00000000_0226F206
     12-13 00000000_0A460E1C  00000000_0078EF78
     14-15 00000000_50DB5F28  FFFFFFFF_00EB18C0
```

64-Bit GPRs are included with TCB Formatting

TCB/RB Formatting Changes

- Enter Command: F RB:
  - This will take you to the first RB. Note the RBP field so you know when to stop

```
IPCS OUTPUT STREAM ------------------------------------ Line 3393 Cols 1 78
Command ===> F RB:_                                        SCROLL ===> CSR

  TCB: 007C92E8
     +0000  RBP..... 007FD6C0  ...... 00000000  DEB..... 007970CC
     +000C  TIO..... 007B4000  CMP..... 840C4000  TRN..... 00000000
     +0018  MSS..... 7F73F250  PKF..... 80        FLGS.... 01000000  00
     +0022  LMP..... FF        DSP..... FF        LLS..... 007933D0
     +0028  JLB..... 007C9558  JPQ..... 007933F0

     Register values
       0-3  0A460E1C  0078EF58  085A1018  7F696580
       4-7  007C8000  00000000  00000001  7F696EB0
      8-11 7F696990  00FBFA30  0078E000  0226F206
     12-15 0A460E1C  0078EF78  50DB5F28  00EB18C0

           64-Bit GPRs from TCB/STCB
      0-1  00000000_0A460E1C  00000000_0078EF58
      2-3  00000000_085A1018  00000000_7F696580
      4-5  00000000_007C8000  00000000_00000000
      6-7  00000000_00000001  00000000_7F696EB0
      8-9  00000000_7F696990  00000000_00FBFA30
```

TCB/RB Formatting Changes - Error RB


```
IPCS OUTPUT STREAM ---------------------------------- FOUND: LINE 4092 COL 3
Command ===> F RB:_                                          SCROLL ===> CSR

  PRB: 007FE020
     -0020  XSB..... 7FFFEE10  FLAGS2... 80        RTPSW1... 478D0000
     -0014           800EA39A  RTPSW2... 00040004  00000000
     -0008  FLAGS1... 02000004 WLIC..... 00040004
     +0000  RSV..... 00000000  00000000            SZSTAB... 00110082
     +000C  CDE..... 007FAF08  OPSW..... 478D0000  800EA39A
     +0018  SQE..... 00000000  LINK..... 007C92E8
     +0020  GPR0-3... FD000056  00006FA8  00000040  007D2CD4
     +0030  GPR4-7... 007D2CB0  007FAD90  007B3FF8  FD000000
     +0040  GPR8-11.. 007FAF88  007F6108  00000000  007FAD90
     +0050  GPR12-15. 00E8F85A  00006F58  80E8FE2E  007FAFB8

            64-Bit GPRs from the RB/XSB
      0-1  00000001_FD000056  00000000_00006FA8
      2-3  00000000_00000040  00000000_007D2CD4
      4-5  00000000_007D2CB0  00000000_007FAD90
      6-7  00000000_007B3FF8  00000000_FD000000
      8-9  00000000_007FAF88  00000000_007F6108
    10-11  00000000_00000000  00000000_007FAD90
    12-13  00000000_00E8F85A  00000000_00006F58
    14-15  00000000_80E8FE2E  00000000_007FAFB8
```

Used to find next RB

Length/Interrupt Code

Converted ESA-Like PSW

64-Bit GPRs are included with the RB Formatting here. These registers are from the time the RB was first given control. Registers at the time of the interrupt are in the next RB. Enter "F RB:" to find those registers

TCB/RB Formatting Changes - Registers for Error RB


```
IPCS OUTPUT STREAM ------------------------------------ Line 4148 Cols 1 78
Command ===> F RB:_                                          SCROLL ===> CSR
  SVRB: 007FD5C8
     -0020  XSB.....  7FFFC2B0  FLG.....  00        RTPSW1...  00000000
     -0014            00000000  RTPSW2...  00000000  00000000
     -0008  FLAGS1...  220.....  WLIC.....  00020033
     +0000  RSV.....  00000000  00000000            SZSTAB...  001ED022
     +000C  CDE.....  00000000  OPSW.....  470C1000  8A583446
     +00..  Q.......  00000000  LINK.....  007FE020
     +0020  GPR0-3...  00000000  00121AD5  00121088  00000000
     +0030  GPR4-7...  000E87B0  00121088  21E95498  40404040
     +0040  GPR8-11..  FFFFF0F0  000ADC38  000E77B0  000E95BE
     +0050  GPR12-15.  000E773C  0002CB30  800EA02C  00000000

            64-Bit GPRs from the RB/XSB
     Left halves of all registers contain zeros
      0-3  00000000  00121AD5  00121088  00000000
      4-7  000E87B0  00121088  21E95498  40404040
      8-11 FFFFF0F0  000ADC38  000E77B0  000E95BE
     12-15 000E773C  0002CB30  800EA02C  00000000
```

CMD

Note that the 64-Bit GPRs are the same as the 32-bit GPRs and the left halves are not presented if they contain zeros. These are the registers from the time of the interrupt in the prior RB - in this case, the prior interrupt was an ABEND0C4 program check

TCB/RB Formatting Changes - Last RB in the TCB/RB Flow

- This is the last RB in the TCB/RB flow
  - TCBRBP from the TCB+x'00" contained 007FD6C0

```
IPCS OUTPUT STREAM ------------------------------------ Line 4198 Cols 1 78
Command ===> _                                            SCROLL ===> CSR
  SVRB: 007FD6C0   <-- Last RB for this TCB
     -0020  XSB..... 7FFFC3A8  FLAGS2... 00        RTPSW1... 478C0000
     -0014           8A42C45A  RTPSW2... 00020004  00000000
     -0008  FLAGS1... 02000000 WLIC..... 0002000C
     +0000  RSV...... 00000000 00000000            SZSTAB... 001ED022
     +000C  CDE...... 00000000 OPSW..... 470C1000  8A45FAE2
     +0018  Q........ 00000000 LINK..... 007FD5C8
     +0020  GPR0-3... 81323EE8 7FF871B0  7F6B2518  7F73ACEC
     +0030  GPR4-7... 00F68540 0A58371F  8A582720  00F68580
     +0040  GPR8-11.. 7F696EB0 000007B0  085A1018  0078CFC0
     +0050  GPR12-15. 7F73AB80 7F73AB80  085A1018  00000000

            64-Bit GPRs from the RB/XSB
     Left halves of all registers contain zeros
      0-3  81323EE8  7FF871B0  7F6B2518  7F73ACEC
      4-7  00F68540  0A58371F  8A582720  00F68580
      8-11 7F696EB0  000007B0  085A1018  0078CFC0
     12-15 7F73AB80  7F73AB80  085A1018  00000000
```

IPCS STATUS Output

- Select Option 2 (ANALYSIS) from the IPCS Primary Option Menu

```
------------------------ IPCS PRIMARY OPTION MENU  ---------------------------
OPTION  ===> 2_
                                                             ********************
   0  DEFAULTS     - Specify default dump and options        * USERID   - M030776
   1  BROWSE       - Browse dump data set                   * DATE     - 01/07/16
   2  ANALYSIS     - Analyze dump contents                  * JULIAN   - 01.197
   3  UTILITY      - Perform utility functions              * TIME     - 10:17
   4  INVENTORY    - Inventory of problem data              * PREFIX   - M030776
   5  SUBMIT       - Submit problem analysis job to batch   * TERMINAL- 3278
   6  COMMAND      - Enter subcommand, CLIST or REXX exec   * PF KEYS - 24
   T  TUTORIAL     - Learn how to use the IPCS dialog       ********************
   X  EXIT         - Terminate using log and list defaults

Enter END command to terminate IPCS dialog
```

IPCS STATUS Output

- Select Option 2 (STATUS) from the IPCS Analysis Menu

```
------------------- IPCS MVS ANALYSIS OF DUMP CONTENTS ----------------------
OPTION  ===> 2_

To display information, specify the corresponding option number.

   1  SYMPTOMS    - Symptoms                                  **********************
   2  STATUS      - System environment summary                * USERID  - M030776
   3  WORKSHEET   - System environment worksheet              * DATE    - 01/07/16
   4  SUMMARY     - Address spaces and tasks                  * JULIAN  - 01.197
   5  CONTENTION  - Resource contention                       * TIME    - 10:22
   6  COMPONENT   - MVS component data                        * PREFIX  - M030776
   7  TRACES      - Trace formatting                          * TERMINAL- 3278
                                                              * PF KEYS - 24
                                                              **********************

Enter END command to terminate MVS dump analysis.
```

IPCS STATUS Output

- You will now see the output from the STATUS formatter

```
IPCS OUTPUT STREAM ------------------------------------- Line 0 Cols 1 78
Command ===> _                                           SCROLL ===> CSR
 ********************************* TOP OF DATA ***********************************


 SYSTEM STATUS:
   Nucleus member name: IEANUC01
    I/O configuration data: Not Available
   Sysplex name: RETEST
   TIME OF DAY CLOCK: B6044DE4 00A5EE64  06/21/2001 00:54:06.598750 local
   TIME OF DAY CLOCK: B6048388 E9A5EE64  06/21/2001 04:54:06.598750 GMT
   Program Producing Dump: SYSMDUMP
   Program Requesting Dump: #UNKNOWN



                    *  *  *  DIAGNOSTIC DATA REPORT  *  *  *


 SEARCH ARGUMENT ABSTRACT
```

IPCS STATUS Output

- The Diagnostic Data Report summarizes the error information

```
IPCS OUTPUT STREAM ------------------------------------- Line 15 Cols 1 78
Command ===> _                                           SCROLL ===> CSR
                  *  *  *  DIAGNOSTIC DATA REPORT  *  *  *


 SEARCH ARGUMENT ABSTRACT

   RIDS/#UNKNOWN#L RIDS/#UNKNOWN AB/S00C4 PRCS/00000004 REGS/0E36E REGS/0BDDC

   Symptom             Description
   -------             -----------
   RIDS/#UNKNOWN#L     Load module name: #UNKNOWN
   RIDS/#UNKNOWN       Csect name: #UNKNOWN
   AB/S00C4            System abend code: 00C4
   PRCS/00000004       Abend reason code: 00000004
   REGS/0E36E          Register/PSW difference for R0E: 36E
   REGS/0BDDC          Register/PSW difference for R0B: DDC

 SERVICEABILITY INFORMATION NOT PROVIDED BY THE RECOVERY ROUTINE
```

IPCS STATUS Output

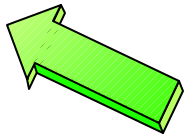
- The Time of Error Information is also provided in the output

```
IPCS OUTPUT STREAM ---------------------------------------- Line 40 Cols 1 78
Command ===> _                                             SCROLL ===> CSR
 Time of Error Information

   PSW: 478D0000 800EA39A   Instruction length: 04   Interrupt code: 0004
   Failing instruction text: 926C92E8 30005850 92204140

   Registers 0-7
   GR: 00000000 00121AD5 00121088 00000000  000E87B0 00121088 21E95498 40404040
   AR: 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
   Registers 8-15
   GR: FFFFF0F0 000ADC38 000E77B0 000E95BE  000E773C 0002CB30 800EA02C 00000000
   AR: 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000

   Home ASID: 00B8    Primary ASID: 00B8    Secondary ASID: 00B8
   PKM: 00C0          AX: 0016              EAX: 0000

   RTM was entered because of a program check interrupt.
   The error occurred while an enabled RB was in control.
   No locks were held.
   No super bits were set.

   STATUS FROM THE RB WHICH ESTABLISHED THE ESTAE EXIT
```

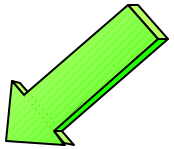
The registers would have been 64-Bit if PSW was in 64-Bit mode

IPCS STATUS Output

```
IPCS OUTPUT STREAM ------------------------------------- Line 92 Cols 1 78
Command ===> _                                            SCROLL ===> CSR
   General purpose register values
     Left halves of all registers contain zeros
      0-3  00000000  00121AD5  00121088  00000000
      4-7  000E87B0  00121088  21E95498  40404040
      8-11 FFFFF0F0  000ADC38  000E77B0  000E95BE
     12-15 000E773C  0002CB30  800EA02C  00000000

   Access register values
       0-3  00000000  00000000  00000000  00000000
       4-7  00000000  00000000  00000000  00000000
       8-11 00000000  00000000  00000000  00000000
      12-15 00000000  00000000  00000000  00000000

   Control register values
       0-1  00000000_5F29FE50  00000001_ADBDC003
       2-3  00000000_615F7D80  00000000_00C000B8
       4-5  00000000_001600B8  00000000_01E58E00
       6-7  00000000_FE000000  00000001_ADBDC003
       8-9  00000000_00000000  00000000_20000000
      10-11 00000000_20A0E158  00000000_20A0FFFE
      12-13 00000000_7C7B5F0F  00000001_ADBDC003
      14-15 00000000_DF881E53  00000000_617F6E9010
```



The registers can be found in their extended form at the end of the IPCS STATUS output



MVS System Trace Table

- Please note that the display of PSWs in the system trace table is not consistent. Some displayed PSWs are ESA/390-like while others display bit-12 off.

```
IPCS OUTPUT STREAM ----------------------------------------------------
Command ===> IP SYSTRACE ASID(x'116')_                      SCROLL ===> CSR
                                               005A9A68 00
 03-0116 005ACA68   DSP       070C0000 AB1C00B0 00000000 005ACA68 00598298
 03-0116 005ACA68   SVC    23 07741000 80111FD8 80111F...          ...E8
 03-0116 005ACA68   SVC    78 07040... 841C1064 0000E5...          ...00
 03-0116 005ACA68   SVCR   78 070C...0 841C1064 000000...          ...88
 03-0116 005ACA68   SVC    78 07042000 841C1190 0000E5...          ...00
 03-0116 005ACA68   SVCR   78 070C2000 841C1190 000000...          ...98
 03-0116 005ACA68   SVC    38 0704...0 841C3876 000000...          ...D0
 03-0116 005ACA68   PC    ...    0     ...291EEC
 03-0116 005ACA68   PT    ...    0     0129123C
 03-0116 005ACA68   SVCR   38 070C1000 841C3876 00000000 00000000 01400116
 03-0116 005ACA68   SVC     B 07042000 841C13EC 00000000 00000000 00000002
 03-0116 005ACA68   SVCR    B 070C2000 841C13EC 00000000 18185560 0101198F
 03-0116 005ACA68   PGM   011 070C2000 841C3D56 00040011 00585000

 03-0116 005ACA68   SVC    3C 07041000 841C3E10 841C3D10 00000100 00585B70
 03-0116 005ACA68   SVCR   3C 070C1000 841C3E10 00000000 00000000 00585B70
 03-0116 005ACA68   PGM   011 070C2000 83DE29D4 00040011 00586000
```

The hardware PSW bit-12 is actually off in z/Architecture mode

MVS System Trace Table

- The System Trace Table will show addressing mode changes.
  - MODE trace entry PSWs point after the instruction (SAMxx - Set Address Mode, BSM -Branch and Set Mode, PC - Program Call) that caused the mode switch.
  - MOBR trace entry PSWs contain the target branch address from the instruction (BASSM - Branch and Save and Set Mode or RP - Resume Program) that caused the mode switch

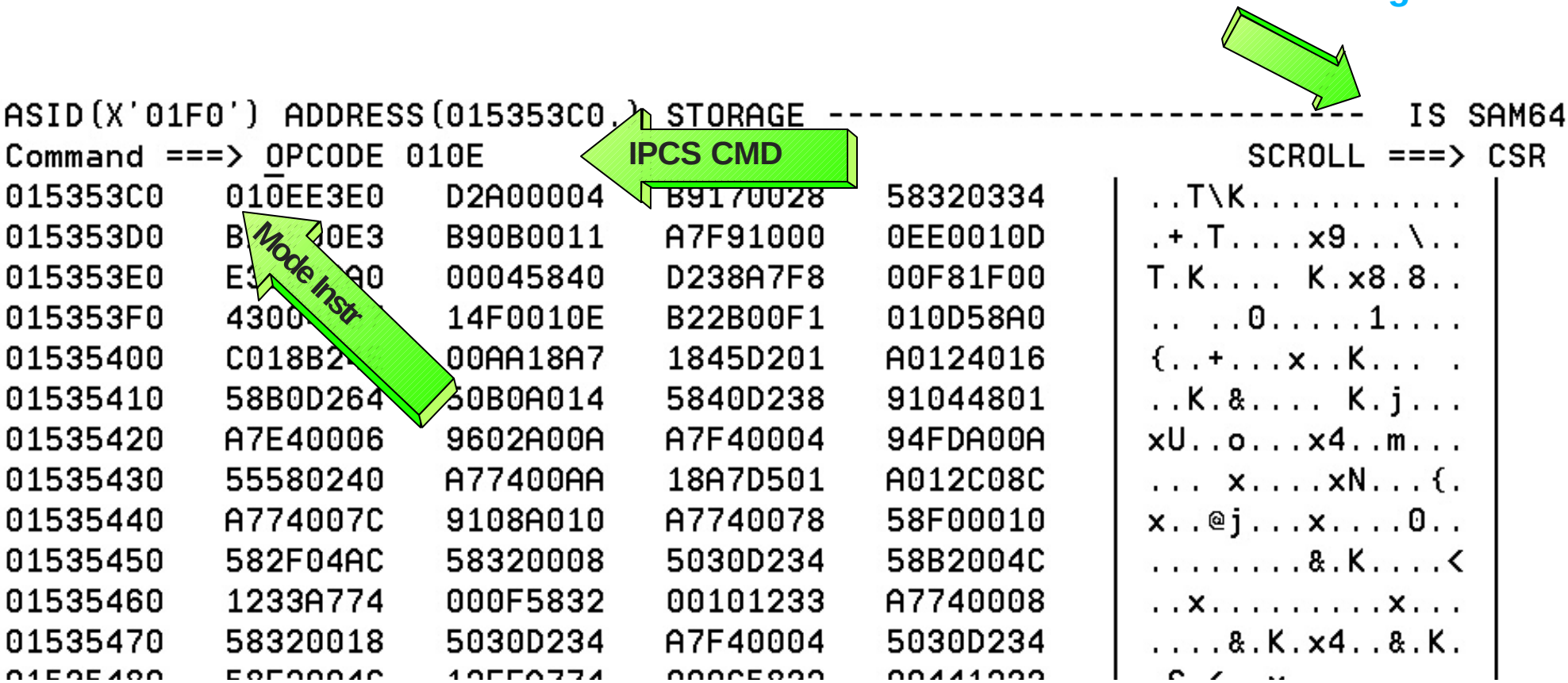
```
IPCS OUTPUT STREAM ----------                    ----------
Command ===> IP SYSTRACE ASID(x'1F0')                    SCROLL ===> C
 00 01F0 008BDCF0   SVC    78 47042[illegible]7FB190  0[illegible]2 00000068 00000000
 00 01F0 008BDCF0   BR        014C[illegible] 0139FDE4 01[illegible]60 00FE590C 014F7398
 00 01F0 008BDCF0   MODE  ... 64       015353C2
 00 01F0 008BDCF0   MODE  ... 24 OR 31      00_015353E0
 00 01F0 008BDCF0   MODE  ... 64       015353F8
 00 01F0 008BDCF0   MODE  ... 24 OR 31      00_015353FE
 00 01F0 008BDCF0   SVCR   78 470C2000 8B7FB190  00000000 00000068 7F80FF98
 00 01F0 008BDCF0   SVC    38 47041000 8B7FD876  00000000 00000068 008B2FC8
 00 01F0 008BDCF0   BR        011C5838 00FECF00 00FE5A0C 00FED000 011C4B50
 00 01F0 008BDCF0   PC    ...   0      011C4B8C           00101
 00 01F0 008BDCF0   BR        011C6178 00FE5A0C 011C6990 09E01640 011C6A1A
                    BR        011C707E 011C771E 00FE5F00 00FE26F8 011C5FC4
```

Target Mode

Instr+IL

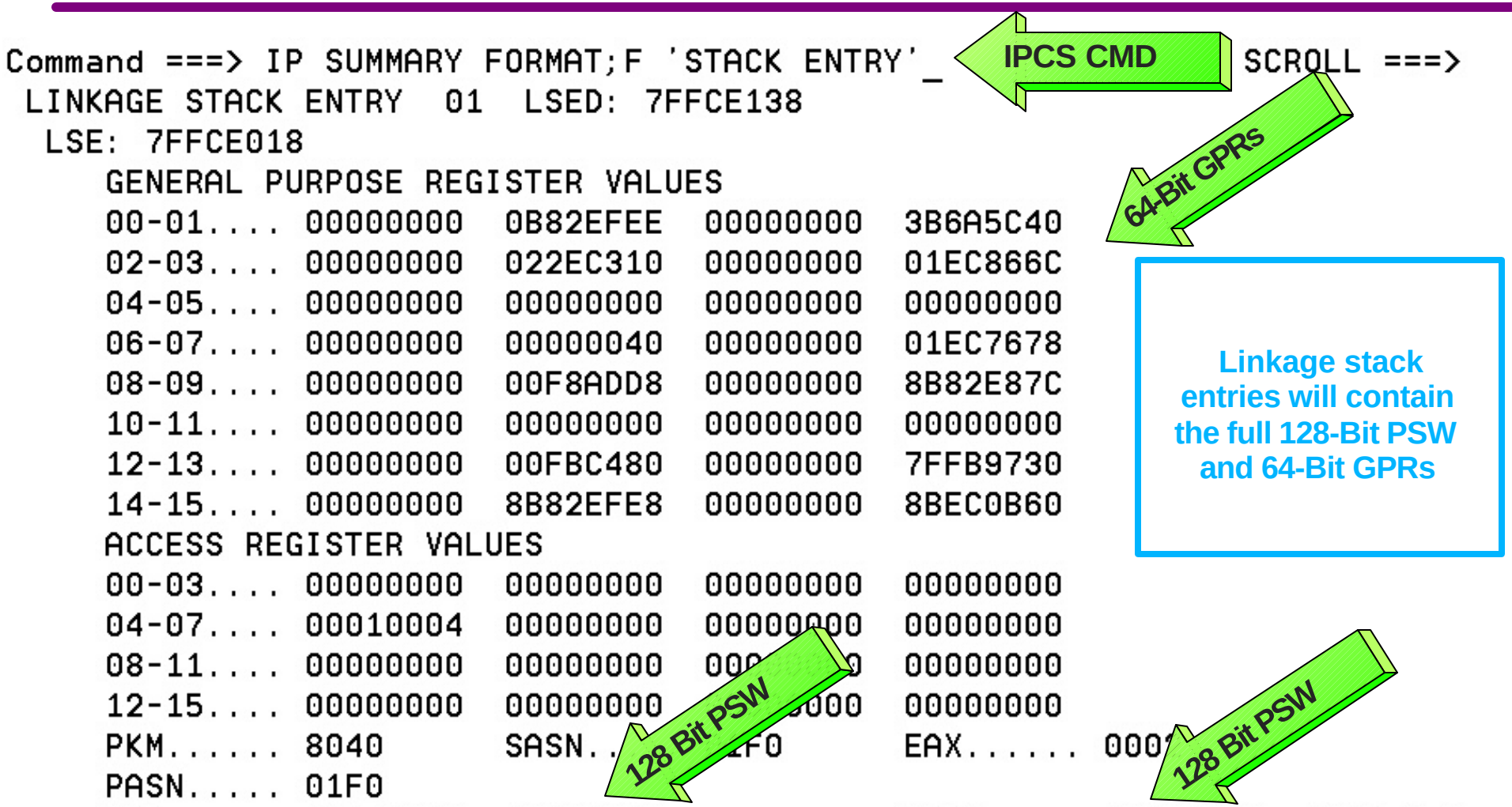
MVS System Trace Table

- Mode System Trace Table entry from prior page:
  - 00 01F0 008BDCF0 MODE ... 64 015353C2
  - Go to browse mode and select instruction address minus instruction length




```
ASID(X'01F0') ADDRESS(015353C0.) STORAGE ------------------------  IS SAM64
Command ===> OPCODE 010E                                  SCROLL ===> CSR
015353C0   010EE3E0   D2A00004   B9170028   58320334 | ..T\K.........  |
015353D0   B[illegible]0E3   B90B0011   A7F91000   0EE0010D | .+.T....x9...\..  |
015353E0   E[illegible]A0   00045840   D238A7F8   00F81F00 | T.K....  K.x8.8..  |
015353F0   4300[illegible]   14F0010E   B22B00F1   010D58A0 | ..  ..0.....1....  |
01535400   C018B2[illegible]   00AA18A7   1845D201   A0124016 | {..+...x..K...  .  |
01535410   58B0D264   50B0A014   5840D238   91044801 | ..K.&....  K.j...  |
01535420   A7E40006   9602A00A   A7F40004   94FDA00A | xU..o...x4..m...  |
01535430   55580240   A77400AA   18A7D501   A012C08C | ...  x....xN...{.  |
01535440   A774007C   9108A010   A7740078   58F00010 | x..@j...x....0..  |
01535450   582F04AC   58320008   5030D234   58B2004C | ........&.K....<  |
01535460   1233A774   000F5832   00101233   A7740008 | ..x.........x...  |
01535470   58320018   5030D234   A7F40004   5030D234 | ....&.K.x4..&.K.  |
```

MVS Linkage Stack Entry




```
Command ===> IP SUMMARY FORMAT;F 'STACK ENTRY'_          SCROLL ===>
 LINKAGE STACK ENTRY  01  LSED: 7FFCE138
  LSE: 7FFCE018
     GENERAL PURPOSE REGISTER VALUES
     00-01.... 00000000  0B82EFEE  00000000  3B6A5C40
     02-03.... 00000000  022EC310  00000000  01EC866C
     04-05.... 00000000  00000000  00000000  00000000
     06-07.... 00000000  00000040  00000000  01EC7678
     08-09.... 00000000  00F8ADD8  00000000  8B82E87C
     10-11.... 00000000  00000000  00000000  00000000
     12-13.... 00000000  00FBC480  00000000  7FFB9730
     14-15.... 00000000  8B82EFE8  00000000  8BEC0B60
     ACCESS REGISTER VALUES
     00-03.... 00000000  00000000  00000000  00000000
     04-07.... 00010004  00000000  00000000  00000000
     08-11.... 00000000  00000000  000[illegible]  00000000
     12-15.... 00000000  00000000  [illegible]000  00000000
     PKM..... 8040       SASN..  [illegible]1F0      EAX..... 000[illegible]
     PASN.... 01F0
     PSW..... 47042000  80000000          PSWE.... 00000000  0B82EFE8
     TARG.... 00000000  8BEC0B84          MSTA.... 00000000  00000000
     TYPE.... 8C
      BAKR STATE ENTRY
```

Linkage stack entries will contain the full 128-Bit PSW and 64-Bit GPRs

Section 5: Verify Buffers Backed Above the Bar

Section 5:

Verify Buffers Backed Above the Bar

Finding "Above the Bar" Log Buffers

- Select Option 2 (ANALYSIS) from the IPCS Primary Option Menu

```
------------------------ IPCS PRIMARY OPTION MENU ----------------------------
OPTION  ===> 2_
                                                            ********************
   0  DEFAULTS    - Specify default dump and options        * USERID  - M030776
   1  BROWSE      - Browse dump data set                    * DATE    - 01/07/18
   2  ANALYSIS    - Analyze dump contents                   * JULIAN  - 01.199
   3  UTILITY     - Perform utility functions               * TIME    - 12:59
   4  INVENTORY   - Inventory of problem data               * PREFIX  - M030776
   5  SUBMIT      - Submit problem analysis job to batch    * TERMINAL- 3278
   6  COMMAND     - Enter subcommand, CLIST or REXX exec    * PF KEYS - 24
   T  TUTORIAL    - Learn how to use the IPCS dialog        ********************
   X  EXIT        - Terminate using log and list defaults

Enter END command to terminate IPCS dialog
```

Finding "Above the Bar" Log Buffers

- Select Option 6 (COMPONENT) from the IPCS Analysis Menu

```
-------------------- IPCS MVS ANALYSIS OF DUMP CONTENTS ------------------------
OPTION  ===> 6_

To display information, specify the corresponding option number.

   1  SYMPTOMS    - Symptoms                                  **********************
   2  STATUS      - System environment summary                * USERID  - M030776
   3  WORKSHEET   - System environment worksheet              * DATE    - 01/07/18
   4  SUMMARY     - Address spaces and tasks                  * JULIAN  - 01.199
   5  CONTENTION  - Resource contention                       * TIME    - 13:06
   6  COMPONENT   - MVS component data                        * PREFIX  - M030776
   7  TRACES      - Trace formatting                          * TERMINAL- 3278
                                                              * PF KEYS - 24
                                                              **********************

Enter END command to terminate MVS dump analysis.
```

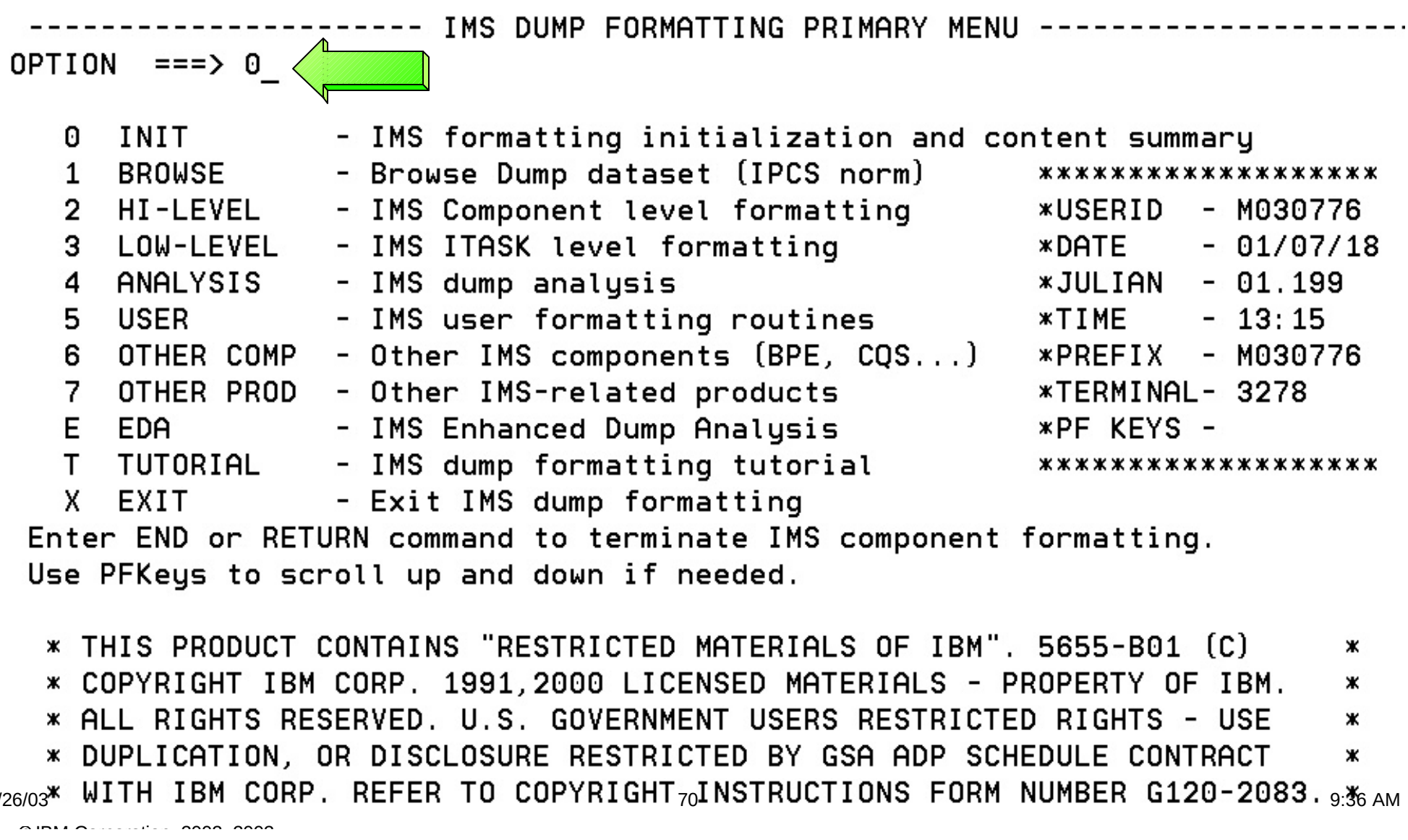
Finding "Above the Bar" Log Buffers

- Select DFSAAMPR from the IPCS Component Analysis Menu

```
------------------ IPCS MVS DUMP COMPONENT DATA ANALYSIS ---------------------
OPTION ===>                                              SCROLL ===> CSR

To display information, specify "S option name" or enter S to the left
of the option desired.  Enter ? to the left of an option to display
help regarding the component support.

S Name     Abstract
_ COUPLE   XCF Coupling analysis
_ CTRACE   Component trace summary
_ DAEH     DAE header data
_ DB2DATA  DB2 analysis
s DFSAAMPR IMS Interactive Dump Formatter
_ DIVDATA  Data in virtual storage
_ DLFDATA  Data Lookaside Facility data
_ DLFTRACE Data Lookaside Facility trace
_ ELXDATA  IMS Transport Manager Formatting
_ GRSDATA  ENQ/DEQ resources
_ IOSCHECK Active input/output requests
_ IPCSDATA IPCS control data
_ IRLM     IMS Resource Lock Manager analysis
```

Finding "Above the Bar" Log Buffers

- Select option 0 (INIT) from the IMS Dump Formatting Primary Menu



```
 ---------------------- IMS DUMP FORMATTING PRIMARY MENU --------------------
OPTION  ===> 0_

   0  INIT         - IMS formatting initialization and content summary
   1  BROWSE       - Browse Dump dataset (IPCS norm)      **********
   2  HI-LEVEL     - IMS Component level formatting       *USERID  - M030776
   3  LOW-LEVEL    - IMS ITASK level formatting           *DATE    - 01/07/18
   4  ANALYSIS     - IMS dump analysis                    *JULIAN  - 01.199
   5  USER         - IMS user formatting routines         *TIME    - 13:15
   6  OTHER COMP   - Other IMS components (BPE, CQS...)   *PREFIX  - M030776
   7  OTHER PROD   - Other IMS-related products           *TERMINAL- 3278
   E  EDA          - IMS Enhanced Dump Analysis           *PF KEYS -
   T  TUTORIAL     - IMS dump formatting tutorial         **********
   X  EXIT         - Exit IMS dump formatting
 Enter END or RETURN command to terminate IMS component formatting.
 Use PFKeys to scroll up and down if needed.

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```

Finding "Above the Bar" Log Buffers

- Initialize with the correct IMS JOBNAME in the CTL field

```
--------------------  IMS DUMP CONTENT STATUS AND CONTROL  ------------
COMMAND ===>

  Enter the IMS CTL/BATCH or DL/I jobname to cause the IMS symbols to
  be set for this dump. Request subsystem list for possible IMS names.

N <==== IMS SUBSYSTEM LIST DESIRED? (Y or N)
N <==== FORMATTER REFRESH?          (Y or N)

          JOBNAME          ID          ASID         DUMPED?
-------------------------------------------------------------------
  CTL     IMS71RP1         IMS1        0116           YES
  DL/I    DLIERES                      0118           YES
  DBRC    DBRCEORS                     0119           YES
  IRLM    IRLMC1           IRL1        0115           YES
  TMS                      _

  ABEND CODE =  SYS   0C3          USER    0
  MODULE     =   UNKNOWN

  IMS SDWA ADDRESS -   00584918    IMS RELEASE -   710
```

Finding "Above the Bar" Log Buffers

- Select option 2 (HIGH-LEVEL) from the IMS Dump Formatting Primary Menu

```
 ---------------------- IMS DUMP FORMATTING PRIMARY MENU --------------------
OPTION  ===> 2_

   0  INIT         - IMS formatting initialization and content summary
   1  BROWSE       - Browse Dump dataset (IPCS norm)      **********************
   2  HI-LEVEL     - IMS Component level formatting       *USERID   - M030776
   3  LOW-LEVEL    - IMS ITASK level formatting           *DATE     - 01/07/18
   4  ANALYSIS     - IMS dump analysis                    *JULIAN   - 01.199
   5  USER         - IMS user formatting routines         *TIME     - 13:20
   6  OTHER COMP   - Other IMS components (BPE, CQS...)   *PREFIX   - M030776
   7  OTHER PROD   - Other IMS-related products           *TERMINAL- 3278
   E  EDA          - IMS Enhanced Dump Analysis           *PF KEYS -
   T  TUTORIAL     - IMS dump formatting tutorial         **********************
   X  EXIT         - Exit IMS dump formatting
 Enter END or RETURN command to terminate IMS component formatting.
 Use PFKeys to scroll up and down if needed.

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  * WITH IBM CORP. REFER TO COPYRIGHT INSTRUCTIONS FORM NUMBER G120-2083.  *
```

Finding "Above the Bar" Log Buffers

- Select LOG formatting from the IMS High-Level Dump Formatting Menu

```
-------------------- IMS HIGH LEVEL DUMP FORMATTING OPTIONS  Row 1 to 14 of 30
Command ===>                                                 Scroll ===> PAGE

N <====SPOOL OUTPUT? (Y or N)        N <====REFRESH FORMATTER? (Y or N)
       S = select   M = select,min      select choice(s) and hit enter
                                        to process or UP/DOWN to scroll
Additional IMS format requests===>

Cmd  Option          Description
-------------------------------------------------------------------------------
_    AUTO        Internally determined options (by failing ITASK type)
_    ALL         All high level IMS dump formatting options
_    SUMMARY     PSW, regs, SAP, failing ITASK blocks at time of abend
_    SCD         SCD, SLX, FP ESCD, scheduler sequence queues
_    SAVEAREA    SAP, savearea, ECB prefix, UEHB  (sorted by DSPNO)
_    DISPATCH    Dispatcher work areas, Dispatcher and Latch traces
_    SPST        System PSTs and subordinate blocks
_    RESTART     CHKPT ID table, SIDX, LCRE, RPST, RRE, EQEL, IEEQE, FRB
s    LOG         LCD, log buffer prefixes, log buffers (OLDS and MON)
_    DB          DDIRs, PDIRs, intent list, DLI/LOCK traces, DPSTs, DBT
_    DEDB        ALDS, DMCB, DMAC, XCRB, SRB, ESRB, FPT blocks
```

Finding "Above the Bar" Log Buffers

- Enter Command: F 'OLDS BUFFER'

```
IPCS OUTPUT STREAM ---------------------------------------- Line 0 Cols 1 78
Command ===> f 'OLDS BUFFER'_                               SCROLL ===> CSR
 ********************************* TOP OF DATA ********************************
 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 **IMS                          I M S  CTL REGION  F O R M A T T I N G
 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

      DATE= 2001/199    TIME= 13.32.27

                              ***EYECATCHER AREA***

                          **LCD        LOG CONTROL DIR.
                          **LCDM       DC-MONITOR LCD
                          **LGT        DLOG TRACE
```

FYI...For those of you familiar with IMS formatting commands, we could have received this formatting through command: IP VERBX IMSDUMP 'IMS71RP1 FMTIMS LOG'

Finding "Above the Bar" Log Buffers

- Enter Command: F 'OLDS BUFFER' . Note Olds Buffer Address X'BABC00'

```
IPCS OUTPUT STREAM ------------------------------------ FOUND: LINE 285 COL 4
Command ===>                                                SCROLL ===> CSR

 ***OLDS BUFFER PREFIX (LBUFFER) AT  00BABC00

     *LBUFFER    - FCHAIN 00BABD00  FSCHN  00000000  FLAGS  80000000
                   LCD    00BBA000  BUFFA  2AD4B000  SAVEA  001DA5E0
                   BLKCNT 00000000  BLKOFF 00000000  DMYLOG 00000000
                   RESV   00000000  AWEQ   00000000  AWET   00000000

     *LBECBP1*
    00030  0FC4E2D7 00000000 00000000 00000000    *.DSP............*
    00040  00030909 2B01F150 001BE148 2AF58120    *.....1.....5a.*
    00050  00000000 00000000 00000000 00000000    *................*
     LINES  00060-0007F  SAME AS THE ABOVE

     *LBECBP2-LBRESVW*
    00080  0FC4E2D7 00000000 00000000 00000000    *.DSP............*
    00090  00030909 2B01F150 001BE148 2AF58120    *.....1.....5a.*
    000A0  00000000 00000000 00000000 00000000    *................*
     LINES  000B0-000EF  SAME AS THE ABOVE
```

Olds Buf Addr

Finding "Above the Bar" Log Buffers

- Enter Command: IP RSMDATA VIRTPAGE RA(00BABC00) ALL

```
IPCS OUTPUT STREAM ------------------------------------ FOUND: LINE 285 COL 4
Command ===> IP RSMDATA VIRTPAGE RA(00BABC00) ALL_      SCROLL ===> CSR

 ***OLDS BUFFER PREFIX (LBUFFER) AT  00BABC00

     *LBUFFER    - FCHAIN 00BABD00  FSCHN  00000000  FLAGS  80000000
                   LCD    00BBA000  BUFFA  2AD4B000  SAVEA  001DA5E0
                   BLKCNT 00000000  BLKOFF 00000000  DMYLOG 00000000
                   RESV   00000000  AWEQ   00000000  AWET   00000000

      *LBECBP1*
     00030  0FC4E2D7 00000000 00000000 00000000    *.DSP............*
     00040  00030909 2B01F150 001BE148 2AF58120    *.....1.....5a.*
     00050  00000000 00000000 00000000 00000000    *................*
      LINES  00060-0007F  SAME AS THE ABOVE

      *LBECBP2-LBRESVW*
     00080  0FC4E2D7 00000000 00000000 00000000    *.DSP............*
     00090  00030909 2B01F150 001BE148 2AF58120    *.....1.....5a.*
     000A0  00000000 00000000 00000000 00000000    *................*
      LINES  000B0-000EF  SAME AS THE ABOVE
```

CMD

Olds Buf Addr

Finding "Above the Bar" Log Buffers

- RSM Virtual Page Report shows "Above the Bar:" real address in "R LOC" field

```
IPCS OUTPUT STREAM ----------------------------------------- Line 12 Cols 1 78
Command ===> _                                                 SCROLL ===> CSR
                   R S M   V I R T U A L   P A G E   R E P O R T


 JOBNAME  DSP NAME PAGE     G K F R P D B L STAT T R LOC    LOC       LOC2
 -------- -------- -------- - - - - - - - - ---- - --------
 PAGECOMM -        00BAB000 Y 7 Y E N N N N REAL V 0014288C

 Totals (in decimal) for job PAGECOMMON:

             REAL              AUX               VIO
                1                0                 0

              DSN             FREF              HIDE
                0                0                 0

             SWAX
                0

             SOAI             SIAI
                0                0
```

Olds Buf Addr

The "R LOC" field presents the real page address. Three zeros must be added to the end of the field.

Real Page Location = x'1_4288C000'

Central storage to 128 GB = x'20_00000000'

Section 6: ABEND0C4 RC038 Example

Section 6
ABEND0C4 RC38 Example

ABEND0C4 RC038 Example

Program-Interruption Conditions	Hex PIC	Address mode	ABEND Code	Reason
ASCE (Address Space Control Element) -Type *	38	64Bit	0C4 : z/OS 1.2 and above	Branch to virtual address above the bar

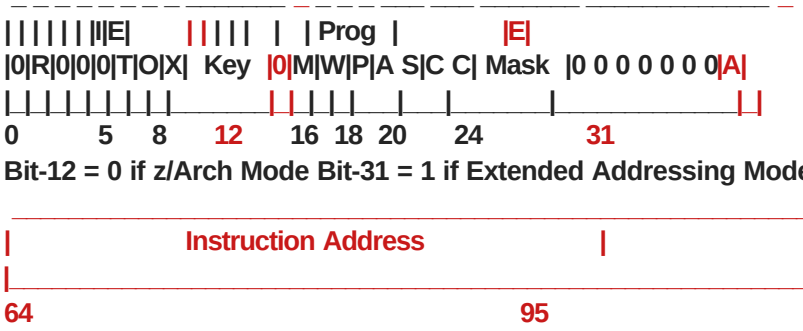
```
Problem: SYSTEM COMPLETION CODE=0C4  REASON CODE=00000038 ABEND0C4
  TIME=11.13.37 APRIL 30 SEQ=46373  CPU=0000  ASID=0152
  PSW AT TIME OF ERROR  070C1001   B45BC397  ILC 4  INTC 38
    ACTIVE LOAD MODULE           ADDRESS=345BC158  OFFSET=000002
    NAME=DFSAERE0
    DATA AT PSW  345BC391 - F0C23E0D  EF185F12  BB4780C2
    GR 0: 00000010   1: 345BC428
       2: 0000BAE8   3: 00000000
       4: 00000000   5: 00000000
       6: 345BC41C   7: 00B2FD80
       8: 0085F918   9: 00000000
       A: 0000000C   B: 0085FFB8
       C: B45BC158   D: 0000BAF8
       E: B45BC397   F: 00000000
```

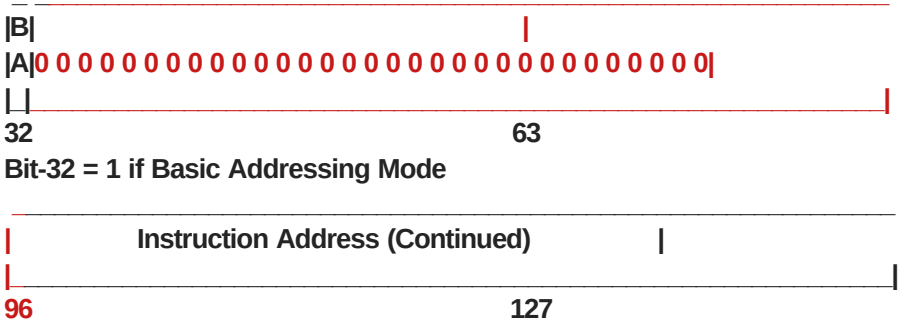
ABEND0C4 RC038 Example, Continued

- Error due to branch to address above the bar
  - PSW = 070C1001 B45BC397 PIC=038

Bit-31	Bit-32	Addressing Mode
0	0	24-bit
0	1	31-bit
1	1	64-bit
1	0	Specification Exception (PIC 6)

Because we are in EA Mode, the instruction address being translated is B34BC396, which is above the line, resulting in PIC 38





ABEND0C4 RC038 Example, Continued

- Error indicates branch to address above the bar
  - PSW = 070C1001 B45BC397
  - Register 14 = B45BC397

Code from module called just prior to 345BC396 follows:

Low order bit on indicates Extended Addressing (64Bit) Mode is to be entered for BSM instruction

```
LEAVE RC=(15),LINKAGE=DEP,CHAIN=NO,CAP=RET
DS    0H
LR    15,(15)              SET RETURN CODE.
L     14,12(13)            A(RETURN TO CALLER)
LM    0,12,20(13)          RESTORE REGS
OI    15(13),X'01'         SHOW RETURNED
BSM   0,14                 RETURN TO CALLER WITH MODE
```

Attempted to return to Module DFSAERE0 using a save area that has already been marked as residual (low order bit set on) by another task. Double use of save area - See APAR PQ76555. Would have been ABEND0C6 in ESA/390 mode.

Section 7: Appendix - IMS z/Architecture Related APARs

Section 7: Appendix

IMS z/Architecture Related APARs

z/Architecture Related IMS APARs

- **IMS will include keyword "64BITIMS" in APARs that involve z/Architecture software or hardware changes**

z/Architecture Related IMS APARs, Continued

- **Various IMS control region abends and waits when running in z/Architecture mode PEd APAR/PTF PQ60202/UQ67132**
  - **PQ63384/UQ67132 - R710 PDO 0242 ESO F210**
  - **PQ73981/UQ78487 - R710 PDO 0330 ESO F___**
  - **PQ65596/UQ70434 - R810 PDO 0241 ESO F210**
  - **PQ74282/UQ78488 - R810 PDO 0330 ESO F___**

- **ERROR DESCRIPTION: IMS Control region ABENDU0403 in DFSAOS70, wait for I/O completion DFSAOS80, ABEND0C4 IOSVIRBA DFSAOS70, ABENDS0D3 after application termination. Due to problems with construction of CCW chains and related control blocks because of size changes resulting in overlays.**

- **USERS AFFECTED: All IMS R710 Users with PEd APAR/PTF PQ60202/UQ67132 (64-Bit abends and waits OSAM and Logger - PDO 0227 ESO F207) installed and running in z/Architecture mode**

- **RECOMMENDATION: Install corrective PTF.**

z/Architecture Related IMS APARs, Continued

- **64-Bit exploitation for OSAM sequential buffers**
  - **PQ52333/UQ76745 - R710 PDO 0324 ESO F306**
  - **PQ66132/UQ76547 - R810 PDO 0321 ESO F305**
  - **IMS sequential buffering exploitation of 64-Bit real storage.**
  - **Virtual storage for these buffers remain below the 2GB bar and operate in 31-bit mode**

z/Architecture Related IMS APARs, Continued

- **Abend0C4 in DFSUT060 running an MFSGEN in 64-Bit Mode**
  - **PQ67953/UQ71988 - R710 PDO 0248 ESO F211**
  - **PQ68031/UQ72143 - R810 PDO 0249 ESO F211**

- **ERROR DESCRIPTION: Abend0C4 in DFSUT060 running an MFSGEN batch job in 64 bit ESAME mode. Picked up value from low core which is non-zero in z/Architecture mode.**
- **USERS AFFECTED: ALL MFS users compiling MFS formats defined without a DPAGE statement in a 64-bit machine.**
- **RECOMMENDATION: Install corrective PTF.**

z/Architecture Related IMS APARs, Continued

- **ABENDU0403 IN DFSAOS70 AT +X'4C2' WHEN RUNNING 64-BIT**
  - **PQ57234/UQ64497 - R710 PDO 0214 ESO F204**

- **ERROR DESCRIPTION: ABENDU0403 because global IOMA does not match local IOMA. Global IOMA pointer to local IOMA is overlaid with IDAL control blocks**

- **USERS AFFECTED: All IMS710 users of OSAM data bases in z/Architecture mode**

- **RECOMMENDATION: Install corrective PTF.**

z/Architecture Related IMS APARs, Continued

- **ABEND0D3 RC13 IN DFSVSPL0 +X'57E' WHEN OPENING VSO PRELOAD AREA.**
  - **PQ57983/UQ64591 - R610 PDO 0219 ESO F205**
  - **PQ58447/UQ64726 - R710 PDO 0216 ESO F204**

- **ERROR DESCRIPTION: The algorithm for page fixing the pages of the dataspace as the UOWs are processed fails. LRA instruction receives the ABEND0D3 RC13.**

- **USERS AFFECTED: IMSFP DEDB VSO running z/OS or S/390 R10 ARCHLVL=2 in z/Architecture mode**

- **RECOMMENDATION: Install corrective PTF.**

z/Architecture Related IMS APARs, Continued

- 64-Bit exploitation for fastpath buffer pool
  - PQ51419/UQ62396 - R710 PDO 0218 ESO F204 - PE
  - PQ62953/UQ68629 - R710 PDO 0233 ESO F208
  - IMS fastpath buffer pool exploitation of 64-Bit real storage
  - Virtual storage for these buffers remain below the 2GB bar and operate in 31-bit mode. LOC=(31,64) for IMODULE GETMAIN

z/Architecture Related IMS APARs, Continued

- Various IMS control region abends and waits when running in z/Architecture mode PEd APAR/PTF PQ42127/UQ52990
  - PQ60202/UQ67132 PE - R710 PDO 0227 ESO F207
  - PQ63384/UQ67132 - Various control region waits and abends

- ERROR DESCRIPTION: IMS Control region ABENDU0403 in DFSAOS70, wait for I/O completion DFSAOS80, ABEND0C4 IOSVIRBA DFSAOS70, ABENDS0D3 after application termination. Due to problems with construction of CCW chains because of size changes resulting in overlays.

- USERS AFFECTED: All IMS R710 Users with PEd APAR/PTF PQ42127/UQ52990 (64-Bit exploitation for OSAM and Logger - PDO 0121 ESO F105) installed and running in z/Architecture mode

- RECOMMENDATION: Install corrective PTF.

z/Architecture Related IMS APARs, Continued

- **Emergency Restart Ignores WADS Data when not Running in z/Architecture Mode with PEd APAR/PTF PQ42127/UQ52990**
  - **PQ52887/UQ59347 - R710 PDO 0144 ESO F111**

- **ERROR DESCRIPTION: Users may lose log data during emergency restart. Restart will ignore WADS data when closing the OLDS. It reads the WADS but decides that the data is residual. (Exclusion: If DFS0616I OLDS BUFFERS SUCCESSFULLY PURGED is received at previous execution of XRF capable system).**

- **USERS AFFECTED: All IMS R710 Users with PEd APAR/PTF PQ42127/UQ52990 (64-Bit exploitation for OSAM and Logger - PDO 0121 ESO F105) installed and not running in z/Architecture mode.**

- **RECOMMENDATION: Install corrective PTF.**

z/Architecture Related IMS APARs, Continued

- **64-Bit exploitation for OSAM and Logger**
  - **PQ42127/UQ52990 PE - R710 PDO 0121 ESO F105**
  - **PQ52887/UQ59347 - Log Data Loss During /ERE**
  - **PQ60202/UQ67132 - Various Control Region Abends and Waits**

- **Buffers for OSAM databases and for IMS logs are page fixed in real storage above the 2GB bar if IPLed in z/Architecture mode.**
- **Virtual storage for these buffers remain below the 2GB bar and operate in 31-bit mode.**

z/Architecture Related IMS APARs, Continued

- **Performance problems with Log Archive utility used on D/T2064 zSeries processor**
  - **PQ48811/UQ54912 - R510 PDO 0125 ESO F106**
  - **PQ46887/UQ54046 - R610 PDO 0120 ESO F105**
  - **PQ48050/UQ54047 - R710 PDO 0121 ESO F105**

- **The IMS Log Archive Utility contains numerous instances of variables defined in close proximity to instructions that modify them. If the distance between variable and instruction is less than the amount of cached storage for instruction prefetch, the modification invalidates the cache, causing it to be refreshed.**

- **Local subroutine variables have been moved to the general data area.**

z/Architecture Related IMS APARs, Continued

- **IMS V7 CQS loop calling IXLMG with ABEND0C4s in module IXLA1MG filling SYS1.LOGREC**
  - **PQ45860/UQ51962 - R710 PDO 0110 ESO F103**
    - **Users affected are those with more than two links defined between the machine on which CQS is running and any coupling facility containing a CQS list structure, or**
    - **Both the machine on which CQS is running and any coupling facility containing a CQS list structure or D/T2064 with any number of links.**

z/Architecture Related IMS APARs, Continued

- **BPE Dump formatting access problems**
  - **PQ44349/UQ50125 - R710 PDO 0103 ESO F101 - CQS**
  - **PQ44351/UQ50529 - R110 PDO 0105 ESO F102 - IMS Connect**
  - **PQ44351/UQ50244 - R110 PDO 0103 ESO F101 - ORS**
- **OS/390 V2R10 and above IPCS changes affected the EVALSYM function which now returns a 16 byte value instead of an 8 byte value. Formatting fails when a dump formatting option is attempted.**

z/Architecture Related IMS APARs, Continued

- **ABEND0C4 in DFSRCP30 due to accessing PSA data in z/Architecture mode. Also could result in overlay of CSA.**
  - **PQ42981/UQ48747 - R510 PDO 0048 ESO F011**
  - **PQ42917/UQ48701 - R610 PDO 0048 ESO F011**
  - **PQ42937/UQ48746 - R710 PDO 0048 ESO F011**
  - **This failure was recognized in z/Architecture mode because the layout of the PSA has changed. What was a high value in ESA/390 mode, is a low value in z/Architecture mode. In ESA/390 mode, an invalid length was used rather harmlessly. Not so in z/Architecture mode.**

z/Architecture Related IMS APARs, Continued

- **ABEND0D3 PIC x'13' on LRA (Load Real Address) instruction**
  - **PQ41295/UQ48302 - R510 PDO 0045 ESO F011**
  - **PQ42408/UQ48303 - R610 PDO 0045 ESO F011**
  - **PQ42409/UQ48304 - R710 PDO 0046 ESO F011**
- **In the z/Architecture environment, when pageable storage is getmained, it can be backed anywhere in real storage. The LRA instruction cannot handle translation of the 64-Bit real address if bits 0-32 of the real address are not all zeros, a special-operation exception (PIC 13) is recognized.**
- **TPROT instruction substituted to check if page is loaded into real**

IMS Debugging in a 64-Bit World - Summary

Summary

- 64-Bit Terminology
- Recognizing z/Architecture in Dumps
- z/Architecture Related Changes
- MVS Formatting Changes
- Verify Buffers Backed Above the Bar
- ABEND0C4 RC38 Example
- Appendix: IMS z/Architecture Related APARs

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