

Introduction to IPCS for Application Programmers

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Agenda

- IPCS Overview
- Capturing a Dump
- A Guided Tour
 - Initializing A Dump
 - Status
 - Browsing Storage
 - Address Spaces and Tasks
 - Other Interesting Commands
- Sources of Additional Information



IPCS Overview



IPCS Overview

- Interactive Problem Control System (IPCS)
 - Formatting and analysis support for
 - Unformatted dumps (SVC, Console, SYSMDUMP, transaction, stand-alone)
 - Traces (GTF, component, master console, system)
 - Several different interfaces
 - Line / Batch / Dialog mode
 - Most popular is full screen (dialog) mode run under ISPF



IPCS Overview...

- Advantages over Formatted Dump
 - Provides a more complete picture of the problem
 - Powerful commands and formatters available for dump analysis
- Disadvantages
 - Additional skills required for analysis
 - Application programmers may not have access to system dumps and/or IPCS



Capturing a Dump



Capturing a Dump

- System Mechanisms
 - SLIP, SVC, Console Dumps
 - Not usually available to Application Programmers
- Language Environment Mechanisms
 - TERMTHDACT Run-time Option is used to request a dump for an unhandled condition of severity 2 or greater
 - Suboption UADUMP/UATRACE/UAONLY
 - Application can use CEE3ABD callable service to request a dump while terminating
 - Type of dump controlled using TERMTHDACT setting



Capturing a Dump...

- TERMTHDACT Run-time Option not Sufficient
 - Application must also either:
 - Allocate a SYSMDUMP DD
 - SYSMDUMP DD DSN=<dump name>, SPACE=(CYL,(200,200),RLSE),DISP=(NEW,DELETE,CATLG),DCB=(RECFM=FBS,DSORG=PS,LRECL=4160,BLKSIZE=24960),UNIT=SYSDA
 - Not always convenient to add to JCL or to execution environment
 - Or, specify the DYNDUMP Run-time Option...



Capturing a Dump...

- DYNDUMP run-time option
 - DYNDUMP(hlq,U4039-ABEND,U40xx-ABEND)
 - hlq
 - *USERID or *USERID.hlq
 - *TSOPREFIX or *TSOPRE
 - (also *TSOPREFIX.hlq or *TSOPRE.hlq)
 - Up to 26 characters of an MVS data set name



Capturing a Dump...

- DYNDUMP run-time option
 - DYNDUMP(hlq,U4039-ABEND,U40xx-ABEND)
 - U4039-ABEND
 - NODYNAMIC (default)
 - DYNDUMP turned off for U4039 ABENDs
 - DYNAMIC
 - DYNDUMP active for U4039 ABENDs if no SYSMDUMP, SYSUDUMP or SYSABEND DD.
 - FORCE
 - DYNDUMP active for U4039 ABENDs even with above DDs allocated
 - BOTH
 - DYNDUMP plus SYSMDUMP/SYSUDUMP/SYSABEND



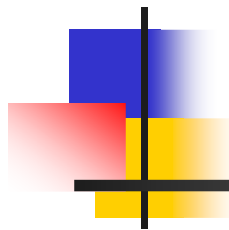
Capturing a Dump...

- DYNDUMP run-time option
 - DYNDUMP(hlq,U4039-ABEND,U40xx-ABEND)
 - U40xx-ABEND
 - TDUMP (Default)
 - DYNDUMP is active for all U40xx ABENDs (other than U4039) which request a dump.
 - NoTDUMP
 - DYNDUMP is not active for U40xx ABENDs



Capturing a Dump...

```
+CEE3798I ATTEMPTING TO TAKE A DUMP FOR ABEND U4039 TO
  DATA SET: PETRO.D018.T1525234.INTIPCS
IGD101I SMS ALLOCATED TO DDNAME (SYS00001) 084
  DSN (PETRO.D018.T1525234.INTIPCS )
  STORCLAS (STANDARD) MGMTCLAS (MIGONLY) DATACLAS ( )
  VOL SER NOS= SL7330
IGD104I PETRO.D018.T1525234.INTIPCS
  RETAINED, DDNAME=SYS00001
IEA822I COMPLETE TRANSACTION DUMP WRITTEN TO
  PETRO.D018.T1525234.INTIPCS
+CEE3797I LANGUAGE ENVIRONMENT HAS DYNAMICALLY CREATED A
  DUMP.
```



A Guided Tour



The Main IPCS Panel

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

Enter END command to terminate IPCS dialog



Initializing the Dump

- Use IPCS Option 0 to tell IPCS which dump to process

```
----- IPCS Default Values -----
```

```
Command ==>
```

```
You may change any of the defaults listed below. The defaults shown before  
any changes are LOCAL. Change scope to GLOBAL to display global defaults.
```

```
Scope ==> BOTH (LOCAL, GLOBAL, or BOTH)
```

```
If you change the Source default, IPCS will display the current default  
Address Space for the new source and will ignore any data entered in  
the Address Space field.
```

```
Source ==> DSNAME('PETRO.D018.T1525234.INTIPCS')
```

```
Address Space ==>
```

```
Message Routing ==> NOPRINT TERMINAL NOPDS
```

```
Message Control ==> CONFIRM VERIFY FLAG(TERMINATING)
```

```
Display Content ==> MACHINE REMARK REQUEST NOSTORAGE SYMBOL
```

```
Press ENTER to update defaults.
```




Initializing the Dump...

- Issue an IPCS command to cause IPCS to initialize the dump

```
----- IPCS PRIMARY OPTION MENU -----  
OPTION ==> ip status faildata  
  0  DEFAULTS      - Specify default dump and options  
  1  BROWSE        - Browse dump data set  
  2  ANALYSIS      - Analyze dump contents
```

```
IKJ56650I TIME-03:32:46 PM. CPU-00:00:00 SERVICE-45812 SESSION-00:13:06 JANUAR  
BLS18122I Initialization in progress for DSNAME('PETRO.D018.T1525234.INTIPCS')  
BLS18124I TITLE=JOBNAME INTIPCS  STEPNAME GO                USER  4039  
BLS18223I Dump written by z/OS 01.13.00 SYSMDUMP - level same as IPCS level  
BLS18222I z/Architecture mode system  
BLS18160D May summary dump data be used by dump access? Enter Y to use, N to  
bypass.  
Y  
BLS18123I 17,196 blocks, 71,535,360 bytes, in DSNAME('PETRO.D018.T1525234.INTI  
IKJ56650I TIME-03:34:06 PM. CPU-00:00:00 SERVICE-48680 SESSION-00:14:27 JANUAR  
BLS18224I Dump of z/OS 01.13.00 - level same as IPCS level  
***
```



IPCS Status Command

```
* * * DIAGNOSTIC DATA REPORT * * *
SEARCH ARGUMENT ABSTRACT
RIDS/CEEPLPKA#L RIDS/#UNKNOWN AB/U4039 PRCS/00000000 REGS/0B0DA REGS/05000

Symptom                Description
-----                -
RIDS/CEEPLPKA#L        Load module name: CEEPLPKA
RIDS/#UNKNOWN           Csect name: #UNKNOWN
AB/U4039                User Abend code: 4039
PRCS/00000000          Abend reason code: 00000000
REGS/0B0DA              Register/PSW difference for R0B: 0DA
REGS/05000              Register/PSW difference for R05: 000
...

```



IPCS Status Command...

...

Time of Error Information

PSW: 07851000 80000000 00000000 0D7B1682
Instruction length: 02 Interrupt code: 000D
Failing instruction text: 00181610 0A0D58D0 D00498EC

Breaking event address: 00000000_00000000

AR/GR 0-1	00000000/00000000_84000000	00000000/00000000_84000FC7
AR/GR 2-3	00000000/00000000_21096E08	00000000/00000000_00040004
AR/GR 4-5	00000000/00000000_0D7A5D70	00000000/00000000_0D7B1682
AR/GR 6-7	00000000/00000000_2100E348	00000000/00000000_2100B448
AR/GR 8-9	00000000/00000000_21096E08	00000000/00000000_2109699C
AR/GR 10-11	00000000/00000000_2109750F	00000000/00000000_8D7B15A8
AR/GR 12-13	00000000/00000000_2100FBEO	00000000/00000000_21099608
AR/GR 14-15	00000000/00000000_8D7A4E44	00000000/7F4A4D00_00000000

Home ASID: 0053 Primary ASID: 0053 Secondary ASID: 0053
PKM: 00C0 AX: 0000 EAX: 0000
This Task's ASID/TCB: 0053/008D89F0



IPCS Browse

- Option 1 on the IPCS Primary Options Panel
 - Allows user to browse raw storage in the dump
 - Maintains a handy list of user-defined pointers
 - To access, specify 1 on the Primary Options Panel, and then hit <enter> on the next panel



IPCS Browse...

```
DSNAME ('PETRO.D018.T1525234.INTIPCS') POINTERS -----  
Command ==> SCROLL ==> CSR  
ASID(X'0053') is the default address space  
PTR   Address           Address space           Data type  
00001 00.              ASID(X'0053')          AREA  
Remarks:  
***** END OF POINTER STACK *****
```



IPCS Browse...

- Pointer Stack Panel – Line Commands
 - Entered by typing over pointer number
 - S – Select a pointer entry for browsing
 - F – Format pointer entry storage
 - I – Insert a pointer entry
 - D – Delete a pointer entry
 - R – Repeat a pointer entry
 - E – Edit a pointer entry



IPCS Browse...

```
DSNAME ('PETRO.D018.T1525234.INTIPCS') POINTERS -----  
Command ==>                                     SCROLL ==> CSR  
ASID(X'0053') is the default address space  
PTR   Address          Address space          Data type  
s0001 00.              ASID(X'0053')          AREA  
Remarks:  
***** END OF POINTER STACK *****
```

IPCS Browse...

```

ASID (X'0053') ADDRESS(00.) STORAGE -----
Command ==>
                                SCROLL ==> CSR
00000000  000A0000  000130E1  00000000  00000000  | ..... |
00000010  00FD46B0  00000000  7FFFF000  7FFFF000  | .....".0.".0. |
00000020  7FFFF000  7FFFF000  7FFFF000  7FFFF000  | ".0.".0.".0.".0. |
00000030  00000000  00000000  7FFFF000  7FFFF000  | .....".0.".0. |
00000040  00000000  00000000  00000000  00FD46B0  | ..... |
00000050  00000000  00000000  000A0000  000140E1  | ..... |
00000060  000A0000  000150E1  000A0000  000160E1  | .....&.....-. |
00000070  000A0000  000170E1  000A0000  000180E1  | ..... |
00000080  00000000  00001005  00020033  00040016  | ..... |
00000090  00000001  00000000  00000000  00000000  | ..... |
000000A0  0A002401  0153BC08  00000048  027F1400  | .....". |
000000B0  00000000  00000000  000165F8  00E598E0  | .....8.Vq\ |
000000C0  28000000  00000000  FB77FFFB  FCFF0802  | .....7..... |
000000D0  781C0000  00000000  00000000  00000000  | ..... |
000000E0.:010F.--All bytes contain X'00'

```




IPCS Browse...

- Many ISPF-like Browse commands work
 - PF7|PF8 page up|down
 - PF3 return
 - UP|DOWN n scroll up|down n lines
 - FIND (more later)
 - PF5 Repeat Find

IPCS Browse...

- Locate command – Used to jump to another address

```

ASID (X'0053') ADDRESS(00.) STORAGE -----
Command ==> 1 2100FBEO                                SCROLL ==> CSR
00000000  000A0000  000130E1  00000000  00000000  | ..... |
00000010  00FD46B0  00000000  7FFFF000  7FFFF000  | .....".0.".0. |
00000020  7FFFF000  7FFFF000  7FFFF000  7FFFF000  | ".0.".0.".0.".0. |
00000030  00000000  00000000  7FFFF000  7FFFF000  | .....".0.".0. |
00000040  00000000  00000000  00000000  00FD46B0  | ..... |
00000050  00000000  00000000  000A0000  000140E1  | ..... |
00000060  000A0000  000150E1  000A0000  000160E1  | .....&.....-. |
00000070  000A0000  000170E1  000A0000  000180E1  | ..... |
00000080  00000000  00001005  00020033  00040016  | ..... |
00000090  00000001  00000000  00000000  00000000  | ..... |
000000A0  0A002401  0153BC08  00000048  027F1400  | .....". |
000000B0  00000000  00000000  000165F8  00E598E0  | .....8.Vq\ |
000000C0  28000000  00000000  FBF7FFFB  FCFF0802  | .....7..... |
000000D0  781C0000  00000000  00000000  00000000  | ..... |
000000E0.:010F.--All bytes contain X'00'

```

IPCS Browse...

- X – Symbol representing current location in dump

```
ASID(X'0053') ADDRESS(2100FBE0.) STORAGE -----
Command ==> 1 x-18                                SCROLL ==> CSR
2100FBE0 00000800 00000000 21096018 210B6018 | .....-...- |
2100FBF0.:2100FC4F.--All bytes contain X'00'
2100FC50 00000000 80B695E8 00000000 00000000 | .....nY..... |
2100FC60.:2100FCFF.--All bytes contain X'00'
2100FD00 21009F98 00000000 00000000 00000000 | ...q..... |
2100FD10.:2100FD6F.--All bytes contain X'00'
2100FD70 00000000 00000000 50C0D064 0DC058C0 | .....&{}..{.{|
2100FD80 C0060DCC 00B622A4 0700C3C8 0700C3C8 | {...u..CH..CH |
2100FD90 0700C3C8 0700C3C8 0700C3C8 0700C3C8 | ..CH..CH..CH..CH |
2100FDA0.:2100FDBF.--Same as above
2100FDC0 0700C3C8 0700C3C8 0700C3C8 00000000 | ..CH..CH..CH.... |
2100FDD0.:2100FE2F.--All bytes contain X'00'
2100FE30 00000000 00000000 00000000 21009760 | .....p- |
2100FE40 00000000 00000000 80B65E38 80B65D58 | .....;...). |
2100FE50.:2100FE7F.--All bytes contain X'00'
```



IPCS Browse...

```

ASID (X'0053') ADDRESS (2100FBC8.) STORAGE -----
Command ==>
                SCROLL ==> CSR
2100FBC8          C3C5C5C3   C1C14040   |          CEECAA   |
2100FBD0    00000000   00000000   000058C0   D0640CCC   | .....{}... |
2100FBE0    00000800   00000000   21096018   210B6018   | .....-...- |
2100FBF0.:2100FC4F.--All bytes contain X'00'
2100FC50    00000000   80B695E8   00000000   00000000   | .....nY..... |
2100FC60.:2100FCFF.--All bytes contain X'00'
2100FD00    21009F98   00000000   00000000   00000000   | ...q..... |
2100FD10.:2100FD6F.--All bytes contain X'00'
2100FD70    00000000   00000000   50C0D064   0DC058C0   | .....&{}..{.{|
2100FD80    C0060DCC   00B622A4   0700C3C8   0700C3C8   | {...u..CH..CH |
2100FD90    0700C3C8   0700C3C8   0700C3C8   0700C3C8   | ..CH..CH..CH..CH |
2100FDA0.:2100FDBF.--Same as above
2100FDC0    0700C3C8   0700C3C8   0700C3C8   00000000   | ..CH..CH..CH.... |
2100FDD0.:2100FE2F.--All bytes contain X'00'

```



IPCS Browse...

- Stack command – saves address on the pointer list

```
DSNAME ('PETRO.D018.T1525234.INTIPCS') POINTERS -----
Command ==> ip stack 2100FBEO                                SCROLL ==> CSR
ASID(X'0053') is the default address space
PTR   Address          Address space          Data type
00001 00.              ASID(X'0053')          AREA
Remarks:
***** END OF POINTER STACK *****
```

```
DSNAME ('PETRO.D018.T1525234.INTIPCS') POINTERS -----
Command ==>                                                    SCROLL ==> CSR
ASID(X'0053') is the default address space
PTR   Address          Address space          Data type
00001 00.              ASID(X'0053')          AREA
Remarks:
00002 2100FBEO.        ASID(X'0053')          AREA
Remarks: CAA Pointer
***** END OF POINTER STACK *****
```



IPCS Browse...

- Word Selection when browsing storage
 - Selection codes used with the storage panel allows a user to treat storage contents as addresses
 - L - Interpret the word as a 24-bit address and stack it
 - H - Interpret the word as a 31-bit address and stack it
 - % - Interpret the word as a 24-bit address, stack it, and display the addressed storage
 - ? - Interpret the word as a 31-bit address, stack it, and display the addressed storage
 - ! - Interpret the double word as a 64-bit address, stack it, and display the addressed storage



IPCS Browse...

```
ASID (X'0053') ADDRESS (2100FBE0.) STORAGE -----
Command ==>                                     SCROLL ==> CSR
2100FBE0  00000800  00000000 ? 21096018  210B6018  | .....-...- |
2100FBF0.:2100FC4F.--All bytes contain X'00'
```

```
ASID (X'0053') ADDRESS (21096018.) STORAGE -----
Command ==>                                     SCROLL ==> CSR
21096018                                     E2E3D2E4  21010454  |      STKU.... |
21096020  21010454  00020000  00000000  00000000  | ..... |
21096030  00104001  21010688  210964B0  A1000320  | .. ...h...~... |
```

```
DSNAME ('PETRO.D018.T1525234.INTIPCS') POINTERS -----
Command ==>                                     SCROLL ==> CSR
ASID (X'0053') is the default address space
...
00002 2100FBE0.          ASID (X'0053')          AREA
      Remarks: CAA Address
00003 21096018.          ASID (X'0053')          AREA
      Remarks:
```



IPCS Browse...

- Finding specific values in storage
 - Use the FIND command
 - Entered on the command line of any storage browse panel
 - find ccc – locates an EBCDIC string
ex: find ceecaa
 - find x'xxxx' – locates a hexadecimal value
ex: find x' 47f0f014'
 - find * - uses the same find value as the previous find command
 - find first / last / next / prev
 - find nobreak (or nobr) – tells IPCS to continue processing if it cannot retrieve storage from the dump
 - Can also specify storage boundary, column boundary, mask value, data length, ASCII data...



IPCS Browse...

- EQUATE command - Allows a user to create a symbol with an associated address and attributes
 - Syntax: EQUATE/EQU/EQ name <addr>
ex: ip equ caa 2100FBE0
 - Symbol can be used in places where an address may be specified
ex: l caa



IPCS Browse...

- EQUATE command...
 - Use "equate *name*" without providing an address to assign the value of "X" (current location) to the specified symbol name
 - Use LISTSYM command to show all defined equates
 - The list will be long, since IPCS defines many equates on its own
 - Use "dropsym *name* purge" to delete a symbol

IPCS Browse...

```
IPCS OUTPUT STREAM ----- Line 0 Cols 1 7
Command ==>                               SCROLL ==> CSR
***** TOP OF DATA *****
SYMBOL      ADDRESS  ATTRIBUTES
ABENDCODE   00. LITERAL LENGTH(X'04') STRUCTURE(Sdwaabcc) NODROP
ASCB83      FA2780. ASID(X'0001') LENGTH(X'0180') STRUCTURE(Asc b) NODROP
ASVT        FABDA8. ASID(X'0001') POSITION(X'+01E0') LENGTH(X'2074')
           STRUCTURE(Asvt) NODROP
ASXB83      8FDB60. ASID(X'0053') LENGTH(X'0300') STRUCTURE(Asxb) NODROP
CAA         2100FBE0. ASID(X'0053') LENGTH(X'04') AREA DROP
COMMON      900000. ASID(X'0001') LENGTH(X'700000') AREA(Common) NODROP
COMPONENTID 00. LITERAL LENGTH(X'09') CHARACTER NODROP
CVT         FD46B0. ASID(X'0001') POSITION(X'-28') LENGTH(X'0528')
           STRUCTURE(Cvt) NODROP
DAESYMPTOMS 00. LITERAL LENGTH(X'54') CHARACTER NODROP
DSA001     21099608. ASID(X'0053') LENGTH(X'50') AREA DROP
DSA002     21096510. ASID(X'0053') LENGTH(X'50') AREA DROP
DSA003     21096370. ASID(X'0053') LENGTH(X'50') AREA DROP
DSA004     210961D0. ASID(X'0053') LENGTH(X'50') AREA DROP
DSA005     21096030. ASID(X'0053') LENGTH(X'50') AREA DROP
```

IPCS Browse...

- List command - Displays storage in the dump
 - Boring by itself, but by adding INST attribute, IPCS will disassemble instructions at the given address
 - ip list 0D7B166E len(24) inst :

```
IPCS OUTPUT STREAM ----- Line 0 Col
Command ==>                               SCROLL ==
***** TOP OF DATA *****
LIST 0D7B166E. ASID(X'0053') LENGTH(X'18') INSTRUCTION
ASID(X'0053') ADDRESS(0D7B166E.) KEY(00)
0D7B166E | 4110 0FC7      | LA      R1,X'FC7'
0D7B1672 | 41F0 0000      | LA      R15,X'0'
0D7B1676 | 4100 0084      | LA      R0,X'84'
0D7B167A | 8900 0018      | SLL     R0,X'18'
0D7B167E | 1610           | OR      R1,R0
0D7B1680 | 0A0D           | SVC     X'0D' ABEND, type 4, calls IEAVTRT2
0D7B1682 | 58D0 D004      | L       R13,X'4' (,R13)
***** END OF DATA *****
```



IPCS Summary Command

- Produces information associated with an address space
 - Defaults to current ASID, but user can identify other(s) to work with using ASIDLIST, JOBLIST, JOBNAME keywords
- summary format (or summ format)
 - produces detailed report of major control blocks in the address space
 - ASCB / ASSB
 - TCBs / STCBs / RBs
 - RTM2WA
 - Load Lists / Job Pack Queue
 - Linkage stacks / Save Areas
 - TCB Summary

IPCS Summary Command...

- TCB Summary
 - Found at the end of the Summary output

```
* * * * T C B S U M M A R Y * * * *  
  
JOB INTIPCS ASID 0053 ASCB 00FA2780 FWDP 00F6A880 BWD P 00F72B80 PAGE  
00000005  
TCB AT CMP NTC OTC LTC TCB BACK PAGE  
008FE040 00000000 00000000 00000000 008FF890 008FD0C0 00000000 00000045  
008FD0C0 00000000 00000000 008FE040 00000000 008FF890 008FE040 00000051  
008FF890 00000000 008FD0C0 008FE040 008FF260 008FF260 008FD0C0 00000055  
008FF260 00000000 00000000 008FF890 008D89F0 008D89F0 008FF890 00000061  
008D89F0 8400FC7 00000000 008FF260 00000000 00000000 008FF260 00000068
```

IPCS Summary Command...

■ TCB/STCB/RB Information

TCB: 008D89F0

+0000	RBP.....	008FD928	PIE.....	000060C8	DEB.....	008CA048	
+000C	TIO.....	008CFFD0	CMP.....	84000FC7	TRN.....	00000000	
+0018	MSS.....	7F4251C0	PKF.....	80	FLGS.....	00000000	00
+0022	LMP.....	FF	DSP.....	FF	LLS.....	008FF450	
+0028	JLB.....	008D98B8	JPQ.....	008FF470			

General purpose register values

0-3	7F459B80	00000480	08556600	7F42EE70
4-7	7F43B640	00003E92	00001040	7F430E60
8-11	7F42FC50	000B0003	7F439DE8	00003E91
12-15	0B411150	00000008	03F8C000	00000480

64-Bit GPRs from TCB/STCB

0-1	00000004_7F459B80	00000000_00000480
2-3	00000048_08556600	00000000_7F42EE70
4-5	00000048_7F43B640	00000000_00003E92
6-7	00000000_00001040	00000000_7F430E60
8-9	00000000_7F42FC50	00000048_000B0003

IPCS Summary Command...

■ RTM2WA Information

RTM2WA SUMMARY

```
+001C  Completion code                84000FC7
+008C  Abending program name/SVRB address INTRIPCS
+0094  Abending program addr          21000000
```

GPRs at time of error

```
0-3   84000000  84000FC7  21096E08  00040004
4-7   0D7A5D70  0D7B1682  2100E348  2100B448
8-11  21096E08  2109699C  2109750F  8D7B15A8
12-15 2100FBEO  21099608  8D7A4E44  00000000
```

```
+06D8  PSW at time of error: 07851000 80000000 00000000 0D7B1682
+0084  Instruction Length Code: 0002  Interruption Code: 000D
+06C8  Translation Exception Identification: 00000000 00000000
+00DC  SDWACOMP                00000000
+00E8  Return code from recovery routine-00
       Continue with termination-implies percolation
+00E0  Retry Address returned from recovery exit 00000000
```


IPCS Summary Command...

■ Load List

```
EP..... CEEMENU3
ENTPT.... A1115000  RRB..... 00000000  USE..... 0001      SP..... FC
Reenterable. Reusable.
APF library.
LOADCNT.. 0001      SYSCT.... 0000
NRFAC.... 00000001  MSBAD.... 21115000  LNTH..... 0000C810
NAMEL.... 0008      ASID..... 0053      PROVIDI.. 00000002
PROVIDD.. 00010000  00E11639  60D3D5D2  D3E2E360
EPTOKEN.. 000001E2  0053001F

EP..... IGZINSH
ENTPT.... A10BF000  RRB..... 00000000  USE..... 0001      SP..... FC
Reenterable. Reusable.
APF library.
LOADCNT.. 0001      SYSCT.... 0000
NRFAC.... 00000001  MSBAD.... 210BF000  LNTH..... 00050088
NAMEL.... 0008      ASID..... 0053      PROVIDI.. 00000002
PROVIDD.. 00010000  10AD1339  60D3D5D2  D3E2E360
```

IPCS Summary Command...

■ Linkage Stack Entry

```
LINKAGE STACK ENTRY 00 FROM TCB. LSED: 7F45A010
```

```
LSEH: 7F45A000
```

```
FNXT..... 00000000 BSEA..... 00000000 TYPE..... 89
```

```
HEADER ENTRY
```

```
RFS..... 0FD0 NES..... 0128
```

```
LINKAGE STACK ENTRY 01 FROM TCB. LSED: 7F45A138
```

```
LSE: 7F45A018
```

```
GENERAL PURPOSE REGISTER VALUES
```

```
00-01.... 00000000 0B3C1068 00000000 A100B200
```

```
02-03.... 00000000 A100B200 00000000 0000E670
```

```
...
```

```
PKM..... 00C0 SASN..... 0053 SINS..... 00000605
```

```
EAX..... 0000 PASN..... 0053 PINS..... 00000605
```

```
PSW..... 07043000 80000000 PSWE..... 00000000 0B3BE1C4
```

```
TARG..... 00000000 8B3F9C8A MSTA..... 00000000 00000000
```

```
TYPE..... 8C
```



Where Command

- Identifies an area at a given address
 - where 21000F68

```
ASID(X'0053') 21000F68. AREA(Subpool1251Key08)+0F68 IN EXTENDED PRIVATE
ASID(X'0053') 21000F68. INTRIPCS+0F68 IN EXTENDED PRIVATE
```

- where 0D7B1682

```
ASID(X'0053') 0D7B1682. CEEPLPKA+0D1682 IN EXTENDED PLPA
```



Master Trace

- Option 2.7.3

- Formats the master trace table, containing the most recently issued console messages

```
21:07:26.84 TSU00010 00000090 $HASP100 WELLIE0 ON TSOINRDR
21:07:27.09 TSU00010 00000090 $HASP373 WELLIE0 STARTED
21:07:35.21 POSIXCON 00000090 slip
      set, a=svcd, c=0c4, enable, sdata=(csa, sum, trt, psa, nuc, sqa, grsq, rgn, lpa), end
21:07:35.22 POSIXCON 00000090 IEE727I SLIP TRAP ID=0001 SET
21:09:35.53 JOB00011 00000090 $HASP100 INTIPCS ON INTRDR PETRO FROM WELLIE0
21:09:35.56 JOB00011 00000290 IRR010I USERID WELLIE0 IS ASSIGNED TO THIS JOB.
21:09:35.80 JOB00011 00000090 ICH70001I WELLIE0 LAST ACCESS AT 21:07:26 ON
      WEDNESDAY, JULY 18, 2012
21:09:35.80 JOB00011 00000090 $HASP373 INTIPCS STARTED - INIT 1 - CLASS 2
21:09:36.82          00000090 IEA045I AN SVC DUMP HAS STARTED AT
      TIME=21.09.36 DATE=07/18/2012 523
          523 00000090 FOR ASID (0019)
          523 00000090 QUIESCE = YES
```



System Trace

- Option 2.7.4 or SYSTRACE command
 - Formats the system trace table, containing information on significant system events
 - Sample trace entries:

```
00-014B 008D89F0 SVC 6D 00000000_20FB1B62 0000001C 00000004 2111D5A8 Espie
                                07850000 80000000
00-014B 008D89F0 SSRV 78 8AEF2CA0 0000FA12 00000160 000060A0 Getmain
                                014B0000
00-014B 008D89F0 SVC 3C 00000000_20FB19EA A0FB1720 00000100 A111D5A8 Estae
                                07851000 80000000
00-014B 008D89F0 PGM 004 00000000_20F00080 00040004 00000000 00000000
                                07850000 80000000 00000000 00000000
00-014B 008D89F0*SVC D 00000000_20FEF8B2 00000000 84000000 84000FC7
                                07851000 80000000
```



VERBEXIT Command

- Calls an IBM or user-supplied verb exit
 - Optionally can provide parameters to tailor how the verb exit runs
 - Verb Exits useful for application debugging
 - LEDATA – Formats Language Environment diagnostic information as well as application information
 - OMVSDATA – Formats z/OS UNIX diagnostic information
 - DFHPDxxx – Formats CICS diagnostic information (and Language Environment info, too!)



VERBEXIT Command...

■ LEDATA Parameters

Report type parameters:

SUMMARY | ALL

HEAP | STACK | SM

HPT(value)

CM

MH

CEEDUMP

COMP(value)

PTBL(value)

Control block selection parameters:

CAA(caa-address)

DSA(dsa-address)

TCB(tcb-address)

ASID(address-space-ID)

NTHREADS(value)



Additional Component Support

Option 2.6 – over 50 components!

```
----- 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
ALCWAIT    Allocation wait summary
AOMDATA    AOM analysis
APPCDATA   APPC/MVS Data Analysis
ASCHDATA   APPC/MVS Scheduler Data Analysis
ASMCHECK   Auxiliary storage paging activity
ASMDATA    ASM control block analysis
AVMDATA    AVM control block analysis
CICS410    CICS Version 4 Release 1 analysis
COMCHECK   Operator communications data
COUPLE     XCF Coupling analysis
CSFDATA    ICSF control block analysis
CTRACE     Component trace summary
DAEDATA    DAE header data
DB2DATA    DB2 analysis
DIVDATA    Data in virtual storage
```




CBFORMAT Command

- Formats a control block
 - Syntax: CBF(ORMAT) <cbaddr> STR(<cbname>)
 - <cbaddr> can be address or symbol
 - STR(UCTURE) support provided by various components
 - IPCS Commands, Appendix D for MVS control blocks
 - Language Environment Debugging Guide for LE control blocks
 - CEExxx for AMODE 24/31 (CEECAA, CEECIBH, CEEDSA, CEEEDB, CEEHANC, CEESTKH, etc.)
 - CELxxxx for AMODE 64 (CELCIBH, CELDSA, CELEDB, CELLAA, CELLCA, CELSANC, etc.)



CBFORMAT Command...

- ip cbf 21099608 str(ceedsa)
OR
ip cbf dsa1 str(ceedsa)

```
IPCS OUTPUT STREAM -----  
Command ==>  
***** TOP OF DATA *****  
      DSA: 21099608  
+000000  FLAGS:0000  MEMD:1001  BKC:21096510  FWC:210996E0  
+00000C  R14:A1011460  R15:A1061FF8  R0:210997E0  
+000018  R1:2100B488  R2:21096E08  R3:00000001  
+000024  R4:2100B488  R5:2100E5D0  R6:000077FC  
+000030  R7:21011FFF  R8:00007A80  R9:00000004  
+00003C  R10:2109750F  R11:A1011000  R12:2100FBE0  
+000048  LWS:00000000  NAB:210996A8  PNAB:00000000  
+000064  RENT:00000000  CILC:00000000  MODE:00000000  
+000078  RMR:00000000  
***** END OF DATA *****
```



CBFORMAT Command...

- Can be used from Browse's Pointer Stack

```
DSNAME ('PETRO.D018.T1525234.INTIPCS') POINTERS -----  
Command ===>                                SCROLL ===> CSR  
ASID(X'0053') is the default address space  
PTR   Address          Address space          Data type  
00001 00.              ASID(X'0053')          AREA  
Remarks:  
f0002 2100FBE0.        ASID(X'0053')          STRUCTURE (Ceecaa)  
Remarks: CAA Pointer  
***** END OF POINTER STACK *****
```



RUNCHAIN Command

- Allows the user to process a chain of control blocks
- User provides:
 - Starting address
 - Link offset
 - Additional parameters to tell RUNCHAIN what to do with each control block / address

RUNCHAIN Command...

```
ip runc address(21099608) link(4) display length(x'50') name(dsa)
```

```
DSA001
```

```
LIST 21099608. ASID(X'0053') LENGTH(X'50') AREA
```

```
ASID(X'0053') ADDRESS(21099608.) KEY(88)
```

```
21099608.          00001001 21096510 |          .....|
21099610. 210996E0 A1011460 A1061FF8 210997E0 |..o\~..-~..8..p\|
21099620. 2100B488 21096E08 00000001 2100B488 |...h..>.....h|
21099630. 2100E5D0 000077FC 21011FFF 00007A80 |..V}.....:..|
21099640. 00000004 2109750F A1011000 2100FBEO |.....~.....\|
21099650. 00000000 210996A8          |.....oy          |
```

```
DSA002
```

```
LIST 21096510. ASID(X'0053') LENGTH(X'50') AREA
```

```
ASID(X'0053') ADDRESS(21096510.) KEY(88)
```

```
21096510. 0808CEE1 21096370 21099608 8D7A4E44 |.....o...+..|
21096520. 8D7B15A8 2109699C 2109696C 2100E7F8 |.#.y.....%..X8|
21096530. 00000794 0D7A5D70 21009F50 00000000 |...m.:)....&...|
21096540. 2100B448 8D7A4C62 2109850E 2109750F |.....:<...e.....|
21096550. 0D7A0F50 2100FBEO 00000000 21099608 |.:.&...\......o.|
```



RUNCHAIN Command...

```
ip runc address(21099608) link(4) name(dsa) exec((cbf x str(ceedsa)))
```

```
LIST 21099608. ASID(X'0053') LENGTH(X'04') AREA
```

```
ASID(X'0053') ADDRESS(21099608.) KEY(88)
```

```
DSA: 21099608
```

```
+000000  FLAGS:0000  MEMD:1001  BKC:21096510  FWC:210996E0
```

```
+00000C  R14:A1011460  R15:A1061FF8  R0:210997E0
```

```
+000018  R1:2100B488  R2:21096E08  R3:00000001
```

```
+000024  R4:2100B488  R5:2100E5D0  R6:000077FC
```

```
+000030  R7:21011FFF  R8:00007A80  R9:00000004
```

```
+00003C  R10:2109750F  R11:A1011000  R12:2100FBEO
```

```
+000048  LWS:00000000  NAB:210996A8  PNAB:00000000
```

```
+000064  RENT:00000000  CILC:00000000  MODE:00000000
```

```
+000078  RMR:00000000
```

```
LIST 21096510. ASID(X'0053') LENGTH(X'04') AREA
```

```
ASID(X'0053') ADDRESS(21096510.) KEY(88)
```

```
DSA: 21096510
```

```
+000000  FLAGS:0808  MEMD:CEE1  BKC:21096370  FWC:21099608
```

```
+00000C  R14:8D7A4E44  R15:8D7B15A8  R0:2109699C
```

Sources of Additional Information





Sources of Additional Info

- All Language Environment documentation is available on the z/OS DVD collection and on the Language Environment website
 - [Language Environment Debug Guide](#)
 - Language Environment Runtime Messages
 - Language Environment Programming Reference
 - Language Environment Programming Guide
 - Language Environment Customization
 - Language Environment Migration Guide
 - Language Environment Writing ILC Applications
- Language Environment Web site
 - http://www-03.ibm.com/systems/z/os/zos/features/lang_environment/



Sources of Additional Info...

- IPCS documentation is available on the z/OS DVD collection
 - MVS IPCS Commands
 - MVS IPCS User's Guide

