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 ==> DNAME('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 JANUARY
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 JANUARY
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

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIDS/CEEPLPKA#L</td>
<td>Load module name: CEEPLPKA</td>
</tr>
<tr>
<td>RIDS/#UNKNOWN</td>
<td>Csect name: #UNKNOWN</td>
</tr>
<tr>
<td>AB/U4039</td>
<td>User Abend code: 4039</td>
</tr>
<tr>
<td>PRCS/00000000</td>
<td>Abend reason code: 00000000</td>
</tr>
<tr>
<td>REGS/0B0DA</td>
<td>Register/PSW difference for R0B: 0DA</td>
</tr>
<tr>
<td>REGS/05000</td>
<td>Register/PSW difference for R05: 000</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>
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_2100FBE0 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
IPPCS Browse...

<table>
<thead>
<tr>
<th>PTR</th>
<th>Address</th>
<th>Address space</th>
<th>Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>00001</td>
<td>00.</td>
<td>ASID(X'0053')</td>
<td>AREA</td>
</tr>
</tbody>
</table>

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...

<table>
<thead>
<tr>
<th>PTR</th>
<th>Address</th>
<th>Address space</th>
<th>Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>s0001</td>
<td>00.</td>
<td>ASID(X'0053')</td>
<td>AREA</td>
</tr>
</tbody>
</table>

Remarks:

******************************* END OF POINTER STACK *******************************
### IPCS Browse...

ASID (X'0053') ADDRESS (00.) STORAGE

<table>
<thead>
<tr>
<th>Command</th>
<th>SCROLL</th>
<th>CSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000000 00A0000 00130E1 00000000 00000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00000010 0FD46B0 00000000 7FFFF000 7FFFF000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00000020 7FFFF000 7FFFF000 7FFFF000 7FFFF000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00000030 00000000 00000000 7FFFF000 7FFFF000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00000040 00000000 00000000 00000000 0FD46B0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00000050 00000000 00000000 000A0000 000140E1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00000060 00A0000 00150E1 00A0000 000160E1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00000070 00A0000 00170E1 00A0000 000180E1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00000080 0000000 00001005 0020033 0040016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00000090 00000001 00000000 00000000 00000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>000000A0 0A002401 0153BC08 00000048 027F1400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>000000B0 00000000 00000000 00165F8 00E598E0</td>
<td></td>
<td>8.Vq\</td>
</tr>
<tr>
<td>000000C0 28000000 00000000 FBF7FFF8 FCFF0802</td>
<td></td>
<td>7 ....</td>
</tr>
<tr>
<td>000000D0 781C0000 00000000 FBF7FFFB FCFF0802</td>
<td></td>
<td>7 ....</td>
</tr>
<tr>
<td>000000E0:010F.--All bytes contain X'00'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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
### Locate command – Used to jump to another address

<table>
<thead>
<tr>
<th>Address</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000000</td>
<td>00A0000 00130E1 00000000 00000000</td>
</tr>
<tr>
<td>00000010</td>
<td>0FD46B0 00000000 FFFF0000 FFFF0000</td>
</tr>
<tr>
<td>00000020</td>
<td>FFFF0000 FFFF0000 FFFF0000 FFFF0000</td>
</tr>
<tr>
<td>00000030</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>00000040</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>00000050</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>00000060</td>
<td>00A0000 00150E1 000A0000 00160E1</td>
</tr>
<tr>
<td>00000070</td>
<td>00A0000 00170E1 00A0000 00180E1</td>
</tr>
<tr>
<td>00000080</td>
<td>00000000 0001005 0020033 0040016</td>
</tr>
<tr>
<td>00000090</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>000000A0</td>
<td>A002401 015BC08 0000048 027F1400</td>
</tr>
<tr>
<td>000000B0</td>
<td>00000000 000165F8 00E598E0 8.Vq\</td>
</tr>
<tr>
<td>000000C0</td>
<td>28000000 00000000 FBF7FFF8 FCFF0802</td>
</tr>
<tr>
<td>000000D0</td>
<td>781C0000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>000000E0</td>
<td>.01F.--All bytes contain X'00'</td>
</tr>
</tbody>
</table>
### IPCS Browse...

**X – Symbol representing current location in dump**

<table>
<thead>
<tr>
<th>Command</th>
<th>SCROLL</th>
<th>ASID (X'0053')</th>
<th>ADDRESS (2100FBE0.)</th>
<th>STORAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>l x-18</code></td>
<td>CSR</td>
<td>2100FBE0</td>
<td>00000800</td>
<td>00000000</td>
</tr>
<tr>
<td>2100FC50</td>
<td>00000000</td>
<td>80B695E8</td>
<td>00000000</td>
<td>00000000</td>
</tr>
<tr>
<td>2100FD00</td>
<td>21009F98</td>
<td>00000000</td>
<td>00000000</td>
<td>00000000</td>
</tr>
<tr>
<td>2100FD70</td>
<td>00000000</td>
<td>00000000</td>
<td>50C0D064</td>
<td>0DC058C0</td>
</tr>
<tr>
<td>2100FDA0</td>
<td>.:2100FDBF</td>
<td>--Same as above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2100FDC0</td>
<td>0700C3C8</td>
<td>0700C3C8</td>
<td>0700C3C8</td>
<td>00000000</td>
</tr>
<tr>
<td>2100FE30</td>
<td>00000000</td>
<td>00000000</td>
<td>00000000</td>
<td>21009760</td>
</tr>
</tbody>
</table>
### IPCS Browse...

<table>
<thead>
<tr>
<th>Address</th>
<th>Storage</th>
<th>Command</th>
<th>SCROLL</th>
<th>CSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2100FBC8</td>
<td>C3C5C5C3 C1C14040</td>
<td>C3C5C5C3 C1C14040</td>
<td>CEECAA</td>
<td></td>
</tr>
<tr>
<td>2100FBD0</td>
<td>00000000 00000000 000058C0 D0640CCC</td>
<td>00000000 000058C0 D0640CCC</td>
<td>..........{}...</td>
<td></td>
</tr>
<tr>
<td>2100FBE0</td>
<td>00000800 00000000 21096018 210B6018</td>
<td>..........---...-.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2100FBBF0:2100FC4F</td>
<td>--All bytes contain X'00'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2100FC50</td>
<td>00000000 80B695E8 00000000 00000000</td>
<td>00000000 80B695E8 00000000 00000000</td>
<td>..........nY......</td>
<td></td>
</tr>
<tr>
<td>2100FC60:2100FCFF</td>
<td>--All bytes contain X'00'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2100FD00</td>
<td>21009F98 00000000 00000000 00000000</td>
<td>21096018 210B6018 21096018 210B6018</td>
<td>..........---...-.</td>
<td></td>
</tr>
<tr>
<td>2100FD10:2100FD6F</td>
<td>--All bytes contain X'00'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2100FD70</td>
<td>00000000 00000000 50C0D964 0DC058C0</td>
<td>00000000 00000000 50C0D964 0DC058C0</td>
<td>..........&amp;{}..{}..</td>
<td></td>
</tr>
<tr>
<td>2100FD80</td>
<td>C0060DCC 00B622A4 0700C3C8 0700C3C8</td>
<td>C0060DCC 00B622A4 0700C3C8 0700C3C8</td>
<td>..........u.CH.CH</td>
<td></td>
</tr>
<tr>
<td>2100FDBD0:2100FE2F</td>
<td>--All bytes contain X'00'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2100FDC0</td>
<td>0700C3C8 0700C3C8 0700C3C8 0700C3C8</td>
<td>0700C3C8 0700C3C8 0700C3C8 0700C3C8</td>
<td>..........---...-.</td>
<td></td>
</tr>
<tr>
<td>2100FDD0</td>
<td>00000000 00000000 00000000 00000000</td>
<td>00000000 00000000 00000000 00000000</td>
<td>..........---...-.</td>
<td></td>
</tr>
</tbody>
</table>
IPCS Browse...

Stack command – saves address on the pointer list

```
DSNAME('PETRO.D018.T1525234.INTIPCS') POINTERS ---------------------
Command ==> ip stack 2100FBE0
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 2100FBE0.        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

<table>
<thead>
<tr>
<th>Command ====&gt;</th>
<th>SCROLL ====&gt; CSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2100FBE0</td>
<td>00000800</td>
</tr>
<tr>
<td></td>
<td>00000000</td>
</tr>
<tr>
<td>210B6018</td>
<td>21096018</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 2100FBF0..:2100FC4F.--All bytes contain X'00'

#### ASID(X'0053') ADDRESS(21096018.) STORAGE

<table>
<thead>
<tr>
<th>Command ====&gt;</th>
<th>SCROLL ====&gt; CSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>21096018</td>
<td>E2E3D2E4</td>
</tr>
<tr>
<td></td>
<td>21010454</td>
</tr>
<tr>
<td>21096020</td>
<td>21010454</td>
</tr>
<tr>
<td>00020000</td>
<td>00000000</td>
</tr>
<tr>
<td>00000000</td>
<td>00000000</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>21096030</td>
<td>00104001</td>
</tr>
<tr>
<td>21010688</td>
<td>210964B0</td>
</tr>
<tr>
<td>A1000320</td>
<td></td>
</tr>
</tbody>
</table>

#### DSNAME('PETRO.D018.T1525234.INTIPCS') POINTERS

<table>
<thead>
<tr>
<th>Command ====&gt;</th>
<th>SCROLL ====&gt; CSR</th>
</tr>
</thead>
</table>
| ASID(X'0053') is the default address space
| 00002 2100FBE0. | ASID(X'0053')   |
| Remarks: CAA Address
| 00003 21096018. | ASID(X'0053')   |
| 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 cceca`
    - `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 Output Stream

**Command ==>**

**SCROLL ==>** CSR

**Top of Data**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>ADDRESS</th>
<th>ATTRIBUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABENDCODE</td>
<td>00.</td>
<td>LITERAL LENGTH(X'04') STRUCTURE(Sdwaabcc) NODROP</td>
</tr>
<tr>
<td>ASCB83</td>
<td>FA2780.</td>
<td>ASID(X'0001') LENGTH(X'0180') STRUCTURE(Ascb) NODROP</td>
</tr>
<tr>
<td>ASVT</td>
<td>FABDA8.</td>
<td>ASID(X'0001') POSITION(X'+01E0') LENGTH(X'2074') STRUCTURE(Asvt) NODROP</td>
</tr>
<tr>
<td>ASXB83</td>
<td>8FDB60.</td>
<td>ASID(X'0053') LENGTH(X'0300') STRUCTURE(Asxb) NODROP</td>
</tr>
<tr>
<td>CAA</td>
<td>2100FBE0.</td>
<td>ASID(X'0053') LENGTH(X'04') AREA DROP</td>
</tr>
<tr>
<td>COMMON</td>
<td>900000.</td>
<td>ASID(X'0001') LENGTH(X'700000') AREA(Common) NODROP</td>
</tr>
<tr>
<td>COMPONENTID</td>
<td>00.</td>
<td>LITERAL LENGTH(X'09') CHARACTER NODROP</td>
</tr>
<tr>
<td>CVT</td>
<td>FD46B0.</td>
<td>ASID(X'0001') POSITION(X'-28') LENGTH(X'0528') STRUCTURE(Cvt) NODROP</td>
</tr>
<tr>
<td>DAESYMPTOMS</td>
<td>00.</td>
<td>LITERAL LENGTH(X'54') CHARACTER NODROP</td>
</tr>
<tr>
<td>DSA001</td>
<td>21099608.</td>
<td>ASID(X'0053') LENGTH(X'50') AREA DROP</td>
</tr>
<tr>
<td>DSA002</td>
<td>21096510.</td>
<td>ASID(X'0053') LENGTH(X'50') AREA DROP</td>
</tr>
<tr>
<td>DSA003</td>
<td>21096370.</td>
<td>ASID(X'0053') LENGTH(X'50') AREA DROP</td>
</tr>
<tr>
<td>DSA004</td>
<td>210961D0.</td>
<td>ASID(X'0053') LENGTH(X'50') AREA DROP</td>
</tr>
<tr>
<td>DSA005</td>
<td>21096030.</td>
<td>ASID(X'0053') LENGTH(X'50') AREA DROP</td>
</tr>
</tbody>
</table>
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 :`

---

```plaintext
IPCS OUTPUT STREAM

Command ===>

****************************** 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  BWDP 00F72B80  PAGE 00000005
TCB AT CMP NTC OTC LTC TCB BACK PAGE
008FE040 00000000 00000000 00000000 00FF890 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 008D89F0 008FF890 00000061
008D89F0 84000FC7 00000000 008FF260 00000000 00000000 008FF260 00000068
```
### TCB/STCB/RB Information

**TCB: 008D89F0**

<table>
<thead>
<tr>
<th>Offset</th>
<th>Register</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0000</td>
<td>RBP</td>
<td>008FD928</td>
</tr>
<tr>
<td>+000C</td>
<td>TIO</td>
<td>008CFFD0</td>
</tr>
<tr>
<td>+0018</td>
<td>MSS</td>
<td>7F4251C0</td>
</tr>
<tr>
<td>+0022</td>
<td>LMP</td>
<td>FF</td>
</tr>
<tr>
<td>+0028</td>
<td>JLB</td>
<td>008D98B8</td>
</tr>
</tbody>
</table>

**General purpose register values**

<table>
<thead>
<tr>
<th>Offset</th>
<th>Register</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td></td>
<td>7F459B80</td>
</tr>
<tr>
<td>4-7</td>
<td></td>
<td>7F43B640</td>
</tr>
<tr>
<td>8-11</td>
<td></td>
<td>7F42FC50</td>
</tr>
<tr>
<td>12-15</td>
<td></td>
<td>0B411150</td>
</tr>
</tbody>
</table>

**64-Bit GPRs from TCB/STCB**

<table>
<thead>
<tr>
<th>Offset</th>
<th>Value</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>0000000048_7F459B80</td>
<td>00080000_00000480</td>
</tr>
<tr>
<td>2-3</td>
<td>000000048_08556600</td>
<td>00000000_7F42EE70</td>
</tr>
<tr>
<td>4-5</td>
<td>000000048_7F43B640</td>
<td>00000000_0003E92</td>
</tr>
<tr>
<td>6-7</td>
<td>00000000_00001040</td>
<td>00000000_7F430E60</td>
</tr>
<tr>
<td>8-9</td>
<td>00000000_7F42FC50</td>
<td>00000048_000B0003</td>
</tr>
</tbody>
</table>
## RTM2WA Information

### RTM2WA SUMMARY

<table>
<thead>
<tr>
<th>Offset</th>
<th>Description</th>
<th>Value(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+001C</td>
<td>Completion code</td>
<td>84000FC7</td>
</tr>
<tr>
<td>+008C</td>
<td>Abending program name/SVRB address</td>
<td>INTRIPCS</td>
</tr>
<tr>
<td>+0094</td>
<td>Abending program addr</td>
<td>21000000</td>
</tr>
</tbody>
</table>

**GPRs at time of error**

<table>
<thead>
<tr>
<th>Offset</th>
<th>Value(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>84000000 84000FC7 21096E08 00040004</td>
</tr>
<tr>
<td>4-7</td>
<td>0D7A5D70 0D7B1682 2100E348 2100B448</td>
</tr>
<tr>
<td>8-11</td>
<td>21096E08 2109699C 2109750F 8D7B15A8</td>
</tr>
<tr>
<td>12-15</td>
<td>2100FBE0 21099608 8D7A4E44 00000000</td>
</tr>
</tbody>
</table>

**PSW at time of error:**

07851000 80000000 00000000 0D7B1682

**Instruction Length Code:**

0002

**Interruption Code:**

000D

**Translation Exception Identification:**

00000000 00000000

**SDWACOMP:**

00000000

**Return code from recovery routine:**

00

**Continue with termination—implies percolation**

**Retry Address returned from recovery exit:**

00000000
**IPCS Summary Command...**

**Load List**

<table>
<thead>
<tr>
<th>EP</th>
<th>CEEMENU3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTP</td>
<td>A1115000</td>
</tr>
<tr>
<td>RRBP</td>
<td>00000000</td>
</tr>
<tr>
<td>USE</td>
<td>0001</td>
</tr>
<tr>
<td>SP</td>
<td>FC</td>
</tr>
</tbody>
</table>

Reenterable. Reusable.

APF library.

<table>
<thead>
<tr>
<th>LOADCNT</th>
<th>0001</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSCT</td>
<td>0000</td>
</tr>
</tbody>
</table>

NRFAC... 00000001 MSBAD... 21115000 LNTH.... 0000C810

NAMEL.... 0008 ASID..... 0053 PROVIDI.. 00000002

PROVIDD.. 00010000 00E11639 60D3D5D2 D3E2E360

EPTOKEN.. 000001E2 0053001F

EP.... IGZINSH

<table>
<thead>
<tr>
<th>ENTP</th>
<th>A10BF000</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRBP</td>
<td>00000000</td>
</tr>
<tr>
<td>USE</td>
<td>0001</td>
</tr>
<tr>
<td>SP</td>
<td>FC</td>
</tr>
</tbody>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>SYSCT</td>
<td>0000</td>
</tr>
</tbody>
</table>

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
  - 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 000000290 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
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
  - OMVSADATA – 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, CEEEODB, 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(Ceeca)
  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...**

```plaintext
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~...~...p\|
21099620. 2100B488 21096E08 00000001 2100B488 |...h...>
21099630. 2100E5D0 000077FC 21011FFF 00007A80 |...V}............|
21099640. 00000004 2109750F A1011000 2100FBE0 |..........~\|
21099650. 00000000 210996A8 |

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 210909F50 00000000 |...m:)...&....|
21096540. 2100B448 8D7A4C62 2109850E 2109750F |.......<...e.....|
21096550. 0D7A0F50 2100FBE0 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  R12:2100FBE0
  +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
Sources of Additional Info…

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