9805: Recent z/OS Debugging Enhancements
The Dark Arts

A Presentation by Nicole M. Fagen
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Agenda

SLIPs
IPCS Active
COPYDDIR
Dump Health Scan
GRS
Summary Format
System Trace
DOCPU
Dark Art

Art that is broadly defined as disturbing or horrific in nature

Roots are in horror

Synonyms: gothic, horror, nightmarish and disturbing

It is actually a culmination of techniques and styles

After the horror of a defect was encountered and the long torturous path to resolution suffered by many highly passionate skill technical professionals IPCS and SLIP were created. Both SLIP and IPCS have been built upon ever sense.
Dynamic System Name with REMOTE

**Horror:** The names of the REMOTE systems to be included in a dump must be “hardcoded” and declared when the slip was set

**New Technique:** Direct or indirect addresses can be used to look up system names when the trap matches

–System names assumed to be 8 characters

z/OS 1.9
Dynamic System Name Example

**Problem Situation:** A system in the sysplex is going in and out of the state of being status update missing, IXC426D is issued on the system detecting the temporary hang. The stall is temporary and the impacted system varies. A timely dump on the stalled system is desired.

- IXC426D SYSTEM system IS SENDING XCF SIGNALS BUT NOT UPDATING STATUS. REPLY SYSNAME= system TO REMOVE THE SYSTEM OR R TO RETRY

SLIP SET,MSGID=IXC426D,A=SVCD,
JOBLIST=(XCFAS),DSPNAME=('XCFAS'.*),
SDATA=(XESDATA,Couple,ALLNUC,CSA,PSA,LPA,LSQA,NUC,RGN,SQA,SUM,SWA,TRT),
REMOTE=(UNCOND,SYSLIST=((3R?+F)),DSPNAME,JOBLIST,SDATA),END

This example works if and only if the system name is 8 characters!
Gotch-ya

If only a dynamic system name is requested then the display of the slip does not indicate there is a SYSLIST.

```
RESPONSE=SDO
  IEE735I 16.38.48 SLIP DISPLAY 615
  ID=0011,NONEPER,ENABLED
  ACTION=SVCD,SET BY CONS NFAGEN,RBLEVEL=ERROR,MATCHLIM=1,0
  MSGID=IXC426D,DSPNAME='XCFAS'.'*
  SDATA=PSA,NUC,SQA,LSQA,RGN,LPA,TRT,CSA,SWA,SUMDUMP,ALLNUC,COUPLE,
  XESDATA
  REMOTE=(
    UNCOND
    JOBLIST,SDATA,DSPNAME
  )
  JOBLIST=XCFAS
  No SYSLIST
```

If a hardcoded system name is coded along with a dynamic system name then both appear in the display.

```
RESPONSE=SDO
  IEE735I 16.39.40 SLIP DISPLAY 890
  ID=0012,NONEPER,ENABLED
  ACTION=SVCD,SET BY CONS NFAGEN,RBLEVEL=ERROR,MATCHLIM=1,0
  MSGID=IXC426D,DSPNAME='XCFAS'.'*
  SDATA=PSA,NUC,SQA,LSQA,RGN,LPA,TRT,CSA,SWA,SUMDUMP,ALLNUC,COUPLE,
  XESDATA
  REMOTE=(
    UNCOND
    SYSLIST=SB0, CURRENT.3R?+F
    JOBLIST,SDATA,DSPNAME
  )
  JOBLIST=XCFAS
  z/OS 1.9
```
SDUMP Started Message

**Horror:** Dump is taking a long time but message log does not indicate when the dump started

**New Technique:** IEA045I issued to indicate SDUMP started

IEA045I AN SVC DUMP HAS STARTED AT TIME=hh:mm:ss
DATE=mm/dd/yyyy FOR ASIDS(xx[,xx,...,xx])
ERRORID=SEQyyyyyy CPUzz ASIDasid TIMEhh:mm:ss.t
QUIESCE=YES|NO

z/OS 1.11
IPCS ACTIVE

**Horror:** IPCS Active only lets users browse and analyze storage visible to key 8 applications.

**New Technique:** Access to more data!!

– Dataspaces owned by the ASID and visible to key 8 applications are now supported for IPCS users with no special authority

– Users authorized to BLSACTV ADDRSPAC can browse and analyze all storage in the ASID and its data spaces

– Users authorized to facility class BLSACTV SYSTEM can browse and analyze all systems ASIDs and data spaces, as well as, absolute storage

– Keep in mind the view is UNSERIALIZED. The system will not be stopped to execute an IPCS command.
COPYDDIR EXPORT / IMPORT

**Horror:** Having to engage additional assistance to pursue root cause on a huge standalone dump which requires the new person to initialize the huge standalone dump

**New Technique:** COPYDDIR EXPORT / IMPORT

EXPORT the directory information to a common dataset
IMPORT the directory to the new dump directory

z/OS 1.10
### IPCS INVENTORY - NFAGEN.ZOS185.DIRECTRY

Command ===>

<table>
<thead>
<tr>
<th>AC</th>
<th>Dump Source</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DSNAMEx('ONTOP.GS000.P03548.C672.DUMP.PP1A.PB9AIRLM')</td>
<td>CLOSED</td>
</tr>
<tr>
<td></td>
<td>Title=ABEND=S026,REASON=08118001,CONNECTOR HANG: CONNAME=DXRJP0A$PJ9A009,JD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Psy=RID$IEANUC01#L RIDS/IXLM1TMR VALU/C$PJ9A009 VALU/H0003 PIDS/5752SCIXL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSNAMEx('ONTOP.GS075.P61541.C724.DUMP2')</td>
<td>CLOSED</td>
</tr>
<tr>
<td></td>
<td>Title=SLIP DUMP ID=CJP1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trap=SLIP SET,ENABLE,ID=CJP1,COMP=QC4,JOBNAME=USACHPZ2,ACTION=SYCD,JOBLIST=</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSNAMEx('ONTOP.GS100.P43129.C838.LOGGER.DUMP')</td>
<td>CLOSED</td>
</tr>
<tr>
<td></td>
<td>Title=CQE1MSGL STRUCTURE DUMP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No symptoms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSNAMEx('ONTOP.GS113.P43516.C848.D205225')</td>
<td>CLOSED</td>
</tr>
<tr>
<td></td>
<td>Title=ABEND=S026,REASON=08118001,CONNECTOR HANG: CONNAME=SGPATH_030014DF,JD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Psy=RID$IEANUC01#L RIDS/IXLM1TMR VALU/C030014DF VALU/H0008 PIDS/5752SCIXL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSNAMEx('ONTOP.GS113.P43516.C848.D205436')</td>
<td>CLOSED</td>
</tr>
<tr>
<td></td>
<td>Title=ABEND=S026,REASON=08118001,CONNECTOR HANG: CONNAME=CSQEQT0QT0202,JOBN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Psy=RID$IEANUC01#L RIDS/IXLM1TMR VALU/C00QT0202 VALU/H0011 PIDS/5752SCIXL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSNAMEx('ONTOP.GS113.P43516.C848.D205736')</td>
<td>CLOSED</td>
</tr>
<tr>
<td></td>
<td>Title=END OF MEMORY RESOURCE MANAGER HANG DETECTED: TCB = 007EC0A8, NAME =</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Psy=RID$IEAVTMMWHL RIDS/IEAVTMMW VALU/C###SCSDS PIDS/5752SCRTM AB/S030D R</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSNAMEx('ONTOP.GS113.P43516.C848.D210927')</td>
<td>CLOSED</td>
</tr>
<tr>
<td></td>
<td>Title=IXC102A NOT ANSWERED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No symptoms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DSNAMEx('ONTOP.GS113.P44137.C848.SADMP')</td>
<td>OPEN</td>
</tr>
<tr>
<td></td>
<td>F1=HELP F2=SPLIT F3=END F4=RETURN F5=RFIND F6=MORE F7=UP F8=DOWN</td>
<td></td>
</tr>
</tbody>
</table>

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--- EXPORT DUMP DIRECTORY RECORD ---

Command ==> 

The source dump directory is NFAGEN.ZOSIB5.DIRECTRY

Enter the dsnames for export data set.
EXPORT DATA SET NAME ==> 'NFAGEN.EXPORT.DIRECT'

Use ENTER to view the continue, END to terminate

Place data in a dataset the new user can access
IPCST OUTPUT STREAM
Command ===>

***************************************************************************
TOP OF DATA
***************************************************************************

Description of Dump
DSNAME('ONTOP.GS113.P44137.C848.SADMP') .......................... 11,689
1 dump description copied

***************************************************************************
END OF DATA
***************************************************************************
Copy Dump Directory Data

Command ===> 

Session dump directory is 'NFAGEN.ZOS1B4.DIRECTRY'

Enter or verify the dsname of a source data set. The following types of sets are supported:

- Another dump directory than the session dump directory
- A RECFM=VB data set produced by a COPYDDIR EXPORT operation

Source dsname ===> 'NFAGEN.EXPORT.DIRECT'

Use ENTER to view the continue, END to terminate

Copy into the current directory from the dataset exported into in previous step. Access from Utilities -> COPYDDIR selections of IPCS.
--- Confirm COPYDDIR IMPORT ---

Command ==> _

Ready to copy description of a source into the current session directory.
Source described is DSNME('ONTOP.GS113.P44137.C348.SADMP')
Import dsnname is 'NFAGEN.EXPORT.DIRECT'
Session dump directory is 'NFAGEN.ZOS1B4.DIRECTRY'

Use ENTER to view the continue, END to terminate
Go ahead and start using the dump
Dump Health Scan

**Horror:** Large SAD must be FTPd to IBM, delays in the customer’s network, IBM’s network, etc. results in delays in problem resolution

**New Technique:** Get started with initial problem diagnosis faster using the dump health scan. Key system level IPCS command outputs routed to a PDS.

z/OS 1.12
Dump Health Scan, How it Works

Physically allocate the PDS
ALLOC the PDS as IPCSPDS
   ALLOC DDNAME(IPCSPDS)
   DSNAME(‘PMRxxxxx.yyy.zzz’) SHR
Go into IPCS and issue
   IP SETDEF PDS
   IP PROFILE PAGESIZE(2147483647)
Issue IPCS commands one at a time
   PRINT NOTERM is highly recommended
### PDS Allocation

#### Allocate New Data Set

<table>
<thead>
<tr>
<th>Command ==&gt;</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Data Set Name</th>
<th>NFAGEN.PDS.TEST2</th>
</tr>
</thead>
</table>

| Management class | MIGONLY | (Blank for default management class) |
| Storage class    | STANDARD | (Blank for default storage class) |
| Volume serial    | SL629D   | (Blank for system default volume) |
| Device type      | ________ | (Generic unit or device address) |
| Data class       | ________ | (Blank for default data class) |
| Space units      | CYLINDER | (BLKS, TRKS, CYLS, KB, MB, BYTES or RECORDS) |
| Average record unit | _ | (M, K, or U) |
| Primary quantity | 1 | (In above units) |
| Secondary quantity | 20 | (In above units) |
| Directory blocks | 20 | (Zero for sequential data set) |
| Record format    | VBA     | |
| Record length    | 255     | |
| Block size       | 32760   | |
| Data set name type | PDS    | (LIBRARY, HFS, PDS, LARGE, BASIC, EXTREQ, EXTPREF or blank) |
# DUMP Health Scan PDS Contents

<table>
<thead>
<tr>
<th>IPCS subcommand</th>
<th>PDS member</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANALYZE RESOURCE</td>
<td>ANALYZE</td>
</tr>
<tr>
<td>ASMK</td>
<td>ASMK</td>
</tr>
<tr>
<td>COMK</td>
<td>COMK</td>
</tr>
<tr>
<td>COPYCAPD</td>
<td>COPYCAPD</td>
</tr>
<tr>
<td>IOSK ALL VALIDATE</td>
<td>IOSK</td>
</tr>
<tr>
<td>STATUS CPU WORKSHEET</td>
<td>STATUS</td>
</tr>
<tr>
<td>SYSTRACE ALL TIME(LOCAL)</td>
<td>SYSTRACE</td>
</tr>
<tr>
<td>SYSTRACE TTCH(LIST)</td>
<td>SYSTRACE</td>
</tr>
<tr>
<td>VERBX MTRACE</td>
<td>VERBX</td>
</tr>
<tr>
<td>VERBX SADMPMSG</td>
<td>VERBX</td>
</tr>
</tbody>
</table>

```
z/OS 1.12 © 2011 IBM Corporation
```
GRS

**Horror:** Large dump, lots of resources, takes forever and a day to do finds in GRS report outputs

**New Techniques**

– Code restructured to yield performance improvements
– New filtering options to reduce data presented to user
– Panel driven interface
– More attributes relayed about resources of interest
  • Event TOD and ENQ history (request, contention, ownership)
  • Altered by RNLs, Exits, 3rd party managed
  • Directed ENQ details, requesting TCB / Target TCB

*z/OS 1.10*
To display information, specify "\$ option name" or enter \$ to the left of the option desired. Enter ? to the left of an option to display help regarding the component support.

<table>
<thead>
<tr>
<th>Name</th>
<th>Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLFTRACE</td>
<td>Data Lookaside Facility trace</td>
</tr>
<tr>
<td>GRSDATA</td>
<td>GRS managed resources</td>
</tr>
<tr>
<td>IMSDUMP</td>
<td>IMS analysis</td>
</tr>
<tr>
<td>IOSCHECK</td>
<td>Active input/output requests</td>
</tr>
<tr>
<td>IPCSDATA</td>
<td>IPCS control data</td>
</tr>
<tr>
<td>IRLM</td>
<td>IMS Resource Lock Manager analysis</td>
</tr>
<tr>
<td>JESXCF</td>
<td>JESXCF Address Space Analysis</td>
</tr>
<tr>
<td>JES2</td>
<td>JES2 analysis for HJE7780, service level 0</td>
</tr>
<tr>
<td>JES3D</td>
<td>JES3 analysis</td>
</tr>
<tr>
<td>LEDATA</td>
<td>Language Environment formatter</td>
</tr>
<tr>
<td>LISTEDT</td>
<td>Format eligible device table</td>
</tr>
<tr>
<td>LLATRACE</td>
<td>Library Lookaside trace</td>
</tr>
<tr>
<td>LOGDATA</td>
<td>LOGREC formatter</td>
</tr>
<tr>
<td>LOGGER</td>
<td>System logger formatter</td>
</tr>
</tbody>
</table>

OPTION ===> SCROLL ===> CSR
F1=HELP    F2=SPLIT    F3=END      F4=RETURN    F5=RFIND    F6=MORE
F7=UP      F8=DOWN     F9=SWAP     F10=LEFT     F11=RIGHT   F12=retrieve
GRSDATA contains all global resources if GRSQ Setting is CONTENTION
GRSTRACE has details for all the resources this system is interested in both LOCAL and GLOBAL
Select QNAME / RNAME to focus on

VERB GRSTRACE ' SUMMARY QNAME('SYSZMCS') RNAME('SYMCSS#MCS') SYSTEM'
S = START selected report.
R = Reset all panel variables.
END = Exit GRSDATA panel.
GRSTRACE SUMMARY

Major control blocks

z/OS 1.10
Mode, CNS system, ENQMAXA and ENQMAXU
System level resource
SELECT OPTION ==> _s_

Select a report type. The default is the GRSDATA report type.
  _ GRSDATA     * GRSTRACE

Select a level of detail. The default is SUMMARY.
  _ SUMMARY     * DETAIL (GRSTRACE only)

Select the time format to use for the GRSTRACE report. The default is LOCAL.
  _ LOCAL       _ GMT       _ UTC

Select zero or more filtering options. The default is NO filtering. Filters that do not apply to a given report will be ignored.
  _ SYSNAME      _ JOBNAME      _ ASID x'___' _ TCB x'___'
  _ QNAME        _ SYSZMCS
  _ RNAME        _ SYSMCS#MCS

SCOPE: _ STEP     _ SYSTEM     _ SYSTEMS
   _ CONTENTION   _ RESERVE


VERBX GRSTRACE ' DETAIL QNAME(''SYSZMCS'') RNAME(''SYSMCS#MCS'') SYSTEM ' 

S = START  selected report.
R = Reset all panel variables.
END = Exit GRSDATA panel.

z/OS 1.10
SELECT OPTION ==> s
Select a report type. The default is the GRSDATA report type.
   * GRSDATA   _ GRSTRACE
Select a level of detail. The default is SUMMARY reporting.
   * SUMMARY   _ DETAIL (GRSTRACE only)
Select the time format to use for the GRSTRACE report. The default is LOCAL.
   _ LOCAL    _ GMT    _ UTC
Select zero or more filtering options. The default is NO filtering.
Filters that do not apply to a given report will be ignored.
  SYSNAME   _ JOBNAME   _ ASID x' ___ ' TCB x' ___ ' QNAME   SYSZJES2
  RNAME
  SCOPE:   _ STEP   _ SYSTEM   _ SYSTEMS
   _ CONTENTION    _ RESERVE

GRSDATA SUMMARY QNAME('SYSZJES2')

S = START selected report.
R = Reset all panel variables.
GRSDATA Output for SYSZJES2

Global systems resources

Major.. CL8'SYSZJES2'

Minor.. CL050'PP1JS1SYS1.JESCKPT1'

<table>
<thead>
<tr>
<th>SCOPE</th>
<th>SYSTEMS</th>
<th>SYSNAME</th>
<th>ASID</th>
<th>TCB.....</th>
<th>JOBNAME</th>
<th>RESERVE</th>
<th>STATUS</th>
<th>ECB.....</th>
<th>2A5BA170</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEMS</td>
<td>SYSPRINT</td>
<td>PP1D</td>
<td>0022</td>
<td>00FF370</td>
<td>JES2</td>
<td>RESERVE</td>
<td>WAITEXC</td>
<td>2A5BA170</td>
<td></td>
</tr>
<tr>
<td>SYSTEMS</td>
<td>SYSPRINT</td>
<td>PP1C</td>
<td>002C</td>
<td>00FF370</td>
<td>JES2</td>
<td>RESERVE</td>
<td>WAITEXC</td>
<td>2A5BA170</td>
<td></td>
</tr>
</tbody>
</table>

Latch Statistics

Not a lot of detail
SUMMARY Subcommand

**Horror:** Output of IP SUMM FO can be very very very long

**New Technique:** New options to enable IPCS users to focus on a sole TCB or EXCLUDE(GLOBAL,JPQ,LOADLIST). Panel driven or command driven.

- EXCLUDE(GLOBAL) causes global SRB formatting to be omitted.
- EXCLUDE(JPQ) causes job pack queue formatting to be omitted.
- EXCLUDE(LOADLIST) cause load list formatting to be omitted.

IP SUMM FO ASID(6) TCB(xxxxx)
IP SUMM FO ASID(6) EXCLUDE(GLOBAL,JPQ,LOADLIST)
IPCS MVS Analysis of Address Spaces

Enter/verify options for analysis of address spaces and tasks. Use ENTER to start analysis, END to terminate.

REPORT
   TYPE  ===> F (F - format, J - jobsummary, K - keyfield, R - keyfield with registers, T - tcbsummary)

ASID selection
   All ASIDs  ===>                 Error ASIDs  ===> _
   Current ASIDs ===> / (default) TCBERROR ASIDs ===> _
   ASID by name ===> _______     ASID by number ===> ___ (hexadecimal)

SUMMARY FORMAT qualification
   Exclude Loadlist ===> _  Global ===> /  JPQ ===> _
   Select TCB address ===> _____ (hexadecimal)

COMMAND ===> F1=HELP  F2=SPLIT  F3=END  F4=RETURN  F5=RFIND  F6=MORE
             F7=UP  F8=DOWN  F9=SWAP  F10=LEFT  F11=RIGHT  F12=retrieve
IP SUMM FO ASID(6) TCBADDR(x'7d1178')

SRBs
Work Unit Queues
ASCB
ASSB
ASXB
PC tables
Formatted TCB x'7D1178'

*Does not have all of the “other” TCBs
IP SUMM FO ASID(6) EXCLUDE(GLOBAL)

Work Unit Queues
ASCB
ASSB
ASXB
PC tables
All TCBs in ASID 6 formatted

SRBs not formatted

z/OS 1.10
System Trace

**Horror:** History is not long enough to see the problem in the system trace table. Faster processors make this even worse.

**New Technique:** System trace buffers can be made larger and new “M” for megabyte notation accepted.

TR ST, {nnnK, nnnM}

Horror Remains: Buffers are below the line and that’s a lot of storage!
System Trace

**Horror:** We have the ability to specify HUGE system trace buffers and they reside below the bar!

**New Technique:** System trace buffers moved above the bar,

- Ability to specify in “G” gigabytes
- New default per processor is 1M
- 1M is the minimum per processor.

z/OS 1.10
System Trace

**Horror:** Turning on branch tracing also turns on mode tracing

**New Technique:** Branch tracing and mode tracing are controlled individually

TRACE ST,BR={ON|OFF},MODE={ON|OFF}
System Trace

TRACE ST,{nnnK|nnnM|nG}

– Each CPU will be allotted the amount of storage declared
– If “K” is specified 1M is allotted

TRACE ST,BUFSIZE={nnnnnnK|nnnnnnM|nnnG}

– All CPUs will share the storage allotment declared
– Much wiser and easier for complete system planning

**Caution:** Always take into consideration the amount of real storage on the system. Larger trace buffers means less pages available for other system work. More storage for trace buffers may cause a system level performance problem.

z/OS 1.10
5 Words Captured on SPER

**Horror:** there is some key data that needs to be captured immediately when SPER is trigger

**New Technique:** Ability to capture 5 words of data in SPER system trace entry when a slip hits.
5 Words Captured on SPER

Data to be captured

– displaces Unique Data Fields
  • Instruction length code
  • translation error address
  • PSACLHS/E
  • trap ID
– Specify by direct or indirect addressing
– Declare a start and end range
– Processing will always rounded up to word boundary
– Data to be capture truncated at 5 words

SLIP SET,IF,...,A=STRACE,STDATA=((2R?,+8),(10000,+4)),END
SYSTRACE SORTCPU

**Horror:** System trace sorts entries in time order. Some problems occur on a single CPU and analysis takes a long time when the traces are fully merged.

**New Technique:** Enable users to sort system trace entries by CPU

IP SYSTRACE SORTCPU(mm/dd/yy, hh:mm:ss:dddddd,n)

– “n” is the number of entries before and after the specified time to show in the output
IP SYSTRACE SORTCPU(07/05/11, 13:29:59.200299, 5)

**SYSTEM TRACE TABLE**

<table>
<thead>
<tr>
<th>PR ASID</th>
<th>WU-ADDR</th>
<th>IDENT</th>
<th>CD/D</th>
<th>PSW-----</th>
<th>ADDRESS-</th>
<th>UNIQUE-1</th>
<th>UNIQUE-2</th>
<th>UNIQUE-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>TIMESTAMP-LOCAL</th>
<th>CP</th>
<th>DATE-07/05/2011</th>
</tr>
</thead>
</table>

******* TRACE DATA FOR CPU00 FOLLOWS. *******

<p>| | | | | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>0001</td>
<td>00000000</td>
<td>WAIT</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>00</td>
<td>0001</td>
<td>00000000</td>
<td>CALL</td>
<td>070E0000</td>
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<td>00000012</td>
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<td>0001</td>
<td>001</td>
<td>13:29:59.192973</td>
<td>36</td>
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</tr>
<tr>
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<tr>
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<td>03118300</td>
<td>SRB</td>
<td>070E0000</td>
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<td>4000E552</td>
<td>000000058</td>
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<td>SSRY</td>
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<td>009D4950</td>
<td>SSRY</td>
<td>78</td>
<td>811F42BE</td>
<td>0000F503</td>
<td>00000080</td>
<td>0300F3A0</td>
<td>Freemain</td>
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<td>005C0000</td>
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<tr>
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<td>005C</td>
<td>009D4950</td>
<td>SSRY</td>
<td>78</td>
<td>811F42BE</td>
<td>0000F503</td>
<td>00000080</td>
<td>0300F3A0</td>
<td>Freemain</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Focal Time**

************ CP TIME = 13:29:59.200299

<p>| | | | | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
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<td>00</td>
<td>005C</td>
<td>03118300</td>
<td>SSRY</td>
<td>78</td>
<td>811F3FC2</td>
<td>00000000</td>
<td>00000000</td>
<td>00000000</td>
<td>00000000</td>
<td>005C</td>
<td>005C</td>
<td>13:29:59.201407</td>
<td>24</td>
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<tr>
<td>13:29:59.201412</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data for each CPU follows in the same format.
System Trace Performance Analysis

**Horror:** Nightmare to do performance analysis by hand in a dump.

**New Technique:** Introduction of SYSTRACE PERFDATA

PERFDATA ([SHOWTRC] [DOWHERE] [SIGCPU(sss.dddddd)])

- SHOWTRC requests the system trace table be displayed in the output
- DOWHERE requests WHERE on the PSWs within CLKC and SRB analysis sections of PERFDATA
- SIGCPU requests CLKC analysis and WHERE analysis for SRB events be bypassed for usage less than the specified time

Always always always keep in mind this is a very tiny focused picture. It is relevant for the time covered but may not reflect they overall system view.

z/OS 1.12
Summary of Contents of PERFDATA Report

CPU usage summary
CPU breakdown by ASID
SRB breakdown by ASID
  –With WHERE info
TCB breakdown by ASID
CLKC events
  –With WHERE info
Lock information
SSCH to I/O times

z/OS 1.12
IP SYSTRACE PERFDATA

No address spaces with the CURRENT attribute were found

Note: Only SYSTRACE records available for ALL PROCESSORS are considered

System: MCEVS1 SP7.1.2 HBB7770

PERFDATA Analysis:

<table>
<thead>
<tr>
<th>CPU#</th>
<th>Went from</th>
<th>To</th>
<th>Seconds</th>
<th>SRB Time</th>
<th>TCB Time</th>
<th>Idle Time</th>
<th>CPU Overhead</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>17:29:58.257288</td>
<td>17:30:02.762979</td>
<td>4.525691</td>
<td>0.224277</td>
<td>0.327805</td>
<td>3.868902</td>
<td>0.126643</td>
</tr>
<tr>
<td>00</td>
<td>17:29:58.258513</td>
<td>17:30:02.785919</td>
<td>4.527406</td>
<td>0.396144</td>
<td>0.783116</td>
<td>3.141088</td>
<td>0.240969</td>
</tr>
<tr>
<td>02</td>
<td>17:29:58.280770</td>
<td>17:30:02.785971</td>
<td>4.505201</td>
<td>0.001450</td>
<td>0.001013</td>
<td>4.501923</td>
<td>0.001918</td>
</tr>
</tbody>
</table>

| SRB time | 0.621872 |
| TCB time  | 1.111934 |
| Idle time | 11.511933 |
| CPU Overhead | 0.371531 |

Total : 13.558299

Lots of Idle Time
Caution: zIIPs, zAAPs processed
The same as GP
Found 104 address spaces in SYSTRACE.
Found 230 SRB and SSRB PSWs in SYSTRACE.

CPU breakdown by ASID:

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>SRB Time</th>
<th>TCB Time</th>
<th>Total Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0067</td>
<td>RMF</td>
<td>0.006995</td>
<td>0.005196</td>
<td>0.012191</td>
</tr>
<tr>
<td>0079</td>
<td>ZESCM</td>
<td>0.000095</td>
<td>0.002359</td>
<td>0.002454</td>
</tr>
<tr>
<td>0024</td>
<td>JES2MON</td>
<td>0.003534</td>
<td>0.057579</td>
<td>0.061114</td>
</tr>
<tr>
<td>0001</td>
<td><em>MASTER</em></td>
<td>0.006579</td>
<td>0.002225</td>
<td>0.008805</td>
</tr>
<tr>
<td>0068</td>
<td>NET</td>
<td>0.135695</td>
<td>0.018589</td>
<td>0.154284</td>
</tr>
<tr>
<td>0006</td>
<td>XCFAS</td>
<td>0.131358</td>
<td>0.367775</td>
<td>0.499133</td>
</tr>
<tr>
<td>0071</td>
<td>RCS</td>
<td>0.003644</td>
<td>0.001970</td>
<td>0.005614</td>
</tr>
<tr>
<td>0083</td>
<td>EKM</td>
<td>0.007061</td>
<td>0.001013</td>
<td>0.008075</td>
</tr>
<tr>
<td>0061</td>
<td>TCPIP</td>
<td>0.079679</td>
<td>0.019590</td>
<td>0.099269</td>
</tr>
<tr>
<td>0075</td>
<td>TN3270</td>
<td>0.045144</td>
<td>0.027801</td>
<td>0.072946</td>
</tr>
<tr>
<td>0085</td>
<td>ZT17MSTR</td>
<td>0.012100</td>
<td>0.005796</td>
<td>0.017897</td>
</tr>
<tr>
<td>0027</td>
<td>NFSC</td>
<td>0.000470</td>
<td>0.000895</td>
<td>0.001366</td>
</tr>
<tr>
<td>0056</td>
<td>ZCICSZJ</td>
<td>0.001101</td>
<td>0.000760</td>
<td>0.001862</td>
</tr>
<tr>
<td>005C</td>
<td>SMSYSAM</td>
<td>0.022346</td>
<td>0.055299</td>
<td>0.077646</td>
</tr>
<tr>
<td>000B</td>
<td>WLM</td>
<td>0.004230</td>
<td>0.117218</td>
<td>0.121448</td>
</tr>
<tr>
<td>0029</td>
<td>JES2S001</td>
<td>0.004554</td>
<td>0.004564</td>
<td>0.009119</td>
</tr>
<tr>
<td>0026</td>
<td>JES2</td>
<td>0.002373</td>
<td>0.040293</td>
<td>0.042666</td>
</tr>
</tbody>
</table>

... lines omitted ...

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>SRB Time</th>
<th>TCB Time</th>
<th>Total Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>00A7</td>
<td>LDAPSRY</td>
<td>0.000194</td>
<td>0.000000</td>
<td>0.000194</td>
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<tr>
<td>0051</td>
<td>BPXDINIT</td>
<td>0.000933</td>
<td>0.003040</td>
<td>0.004033</td>
</tr>
</tbody>
</table>

**Totals**

- SRB Time: 0.621872
- TCB Time: 1.111934
- Total Time: 1.733807

(Note: 3 CPUs in Systrace: 3)

Total address spaces observed
Running in the intersect of trace buffers

Breakdown by asid / jobname
SRB Time, TCB Time, Total Time
Caution: Not sorted!

Caution: Includes work running
On zIIP and zAAPs
If the problem is on a GP
Data may not be applicable
### SRB details by ASID

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>SRB PSW</th>
<th># of SRBs</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0067</td>
<td>RMF</td>
<td>070C0000 811F3E14</td>
<td>14</td>
<td>0.005065</td>
</tr>
<tr>
<td>0067</td>
<td>RMF</td>
<td>070C0000 84610000</td>
<td>1</td>
<td>0.000417</td>
</tr>
<tr>
<td>0067</td>
<td>RMF</td>
<td>070C0000 8469B0C8</td>
<td>2</td>
<td>0.001512</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.006995</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>SRB PSW</th>
<th># of SRBs</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0079</td>
<td>ZESCM</td>
<td>070C0000 84610000</td>
<td>1</td>
<td>0.000095</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>SRB PSW</th>
<th># of SRBs</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0024</td>
<td>JES2MON</td>
<td>070C0000 811F3E14</td>
<td>88</td>
<td>0.003463</td>
</tr>
<tr>
<td>0024</td>
<td>JES2MON</td>
<td>070C0000 84610000</td>
<td>1</td>
<td>0.000071</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>0.003534</td>
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</tbody>
</table>
### TCB breakdown by ASID:

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>TCB Addr</th>
<th># of DSPs</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0067</td>
<td>RMF</td>
<td>009E47E8</td>
<td>28</td>
<td>0.005196</td>
</tr>
<tr>
<td>0079</td>
<td>ZESCM</td>
<td>009D532B</td>
<td>2</td>
<td>0.000781</td>
</tr>
<tr>
<td>0079</td>
<td>ZESCM</td>
<td>009D5E88</td>
<td>2</td>
<td>0.001577</td>
</tr>
</tbody>
</table>

Total Time: 0.002359

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>TCB Addr</th>
<th># of DSPs</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0024</td>
<td>JES2MON</td>
<td>009FF148</td>
<td>87</td>
<td>0.057533</td>
</tr>
<tr>
<td>0024</td>
<td>JES2MON</td>
<td>009D7BF8</td>
<td>2</td>
<td>0.000045</td>
</tr>
</tbody>
</table>

Total Time: 0.057579
I/O Timings observed in System trace table

<table>
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<tr>
<th>Device</th>
<th>SSCH Issued</th>
<th>I/O Occurred</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>E463</td>
<td>17:29:58.618556</td>
<td>17:29:58.619699</td>
<td>0.001143</td>
</tr>
<tr>
<td>E461</td>
<td>17:29:58.618580</td>
<td>17:29:58.619729</td>
<td>0.001149</td>
</tr>
<tr>
<td>E461</td>
<td>17:29:58.619808</td>
<td>17:29:58.622719</td>
<td>0.002910</td>
</tr>
<tr>
<td>E461</td>
<td>17:29:58.622779</td>
<td>17:29:58.626976</td>
<td>0.004197</td>
</tr>
</tbody>
</table>

Events for E461:
- Total: 3
- Quickest I/O: 0.001149
- Slowest I/O: 0.004197
- Average: 0.002752

**Total**:
- 0.008257
IP SYSTRACE PERFDATA(DOWHERE)

Summary sections at the top are the same

SRB breakdown by ASID: (WHERE command bypassed for CPU usage less than 0.100000):
WHERE success same ratio as WHERE success in dumps

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>SRB PSW</th>
<th># of SRBs</th>
<th>Time</th>
<th>Where Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>006B</td>
<td>NET</td>
<td>070C0000 811F3E14</td>
<td>61</td>
<td>0.022359</td>
<td></td>
</tr>
</tbody>
</table>

Errors detected in STRUCTURE(Xtlst) at NOCPU ASID(X'0001') FBCA2C:
Located via STRUCTURE(Cdemajor) at NOCPU ASID(X'0001') FBCA00
Not on doubleword boundary

Errors detected in STRUCTURE(Cdemajor) at NOCPU ASID(X'0001') FBCA00:
Locator CDXLMJP=00FBCA2C It may be damaged

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>SRB PSW</th>
<th># of SRBs</th>
<th>Time</th>
<th>Where Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>006B</td>
<td>NET</td>
<td>070C0000 B6A4C6D0</td>
<td>293</td>
<td>0.112009</td>
<td>RC= 4 for WHERE 36A4C6D0 ASID(07) command</td>
</tr>
<tr>
<td>006B</td>
<td>NET</td>
<td>070C0000 8105BDC8</td>
<td>4</td>
<td>0.000187</td>
<td></td>
</tr>
<tr>
<td>006B</td>
<td>NET</td>
<td>070C0000 816B8F00</td>
<td>1</td>
<td>0.000705</td>
<td></td>
</tr>
<tr>
<td>006B</td>
<td>NET</td>
<td>070C0000 84610000</td>
<td>1</td>
<td>0.000432</td>
<td></td>
</tr>
</tbody>
</table>

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0.135695
IP SYSTRACE PERFDATA(DOWHERE) cont.

**TCB breakdown by ASID:**

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>TCB Addr</th>
<th># of DSPs</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0006</td>
<td>XCFAS</td>
<td>009F8E88</td>
<td>206</td>
<td>0.336749</td>
</tr>
<tr>
<td>0006</td>
<td>XCFAS</td>
<td>009F9AA0</td>
<td>179</td>
<td>0.011334</td>
</tr>
<tr>
<td>0006</td>
<td>XCFAS</td>
<td>009FAA30</td>
<td>239</td>
<td>0.019591</td>
</tr>
<tr>
<td>0006</td>
<td>XCFAS</td>
<td>009F8CD8</td>
<td>4</td>
<td>0.000054</td>
</tr>
<tr>
<td>0006</td>
<td>XCFAS</td>
<td>009FAE88</td>
<td>3</td>
<td>0.000045</td>
</tr>
</tbody>
</table>

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0.367775
IP SYSTRACE PERFDATA(DOWHERE) cont.

Lock Events:

<table>
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<tr>
<th>Lock</th>
<th>ASID</th>
<th>TCB/SRB</th>
<th>Type</th>
<th>PSW Addr</th>
<th>Suspended at</th>
<th>Resumed at</th>
<th>Suspend Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEDQ</td>
<td>0009</td>
<td>009FF230</td>
<td>TCB</td>
<td>B840F2A0</td>
<td>17:30:00.988762</td>
<td>17:30:00.988777</td>
<td>0.000014</td>
</tr>
</tbody>
</table>

CLKC Events:

<table>
<thead>
<tr>
<th>ASID</th>
<th>Jobname</th>
<th>SRB/TCB</th>
<th>Clkc PSW</th>
<th>Where processing (CPU usage for this ASID is: 0.499133)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0006</td>
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<td>009FAA30</td>
<td>070C2000</td>
<td>80FE81CA ASID(X'0006') 00FE81CA. IECUC01.IEAYTSFR+03CA IN READ ONLY NUCLEUS</td>
</tr>
<tr>
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<td>070C0000</td>
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<tr>
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<td>070C0000</td>
<td>80FF24FA ASID(X'0006') 00FF24FA. IECUC01.IEAYELK+0902 IN READ ONLY NUCLEUS</td>
</tr>
<tr>
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<td>80FF24FA (Same as above)</td>
</tr>
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<td>80FF24FA (Same as above)</td>
</tr>
<tr>
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<td>80FF24FA (Same as above)</td>
</tr>
</tbody>
</table>

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System Trace – CPUMASK

**Horror:** More processors, more data to dig through in the system trace table and elongated problem identification times.

**New Technique:** CPUMASK and CPUTYPE

IP SYSTRACE CPUMASK(24F)

– X’24F’ is a bit mask where each bit represents a CPU
  • X’24F’ represents CPUs 3,5,8,9,10 and 11
– CPU numbers start with CPU 0 and go to maximum number of CPUs 128
– Really helpful for very large LPARs with a high number of CPUs.
System Trace – CPUTYPE

**Horror:** More types of processors, where the profiles for the processors differ greatly as the work eligible to run on the processors differs, more data to dig through in the system trace table and elongated problem identification times.

**New Technique:** CPUTYPE

IP SYSTRACE CPUTYPE(ZAAP, ZIIP, STANDARD)

- ZAAP is abbreviated as ZA
- ZIIP is abbreviated as ZI
- STANDARD represents the classic general purpose processors and is abbreviated as CP or S
- Blanks or commas can be used to separate the options
System Trace – CPUMASK and CPUTYPE

CPUMASK and CPUTYPE options can be combined the output is the union of the two
DOCPU

**Horror:** Obtaining diagnostic data from each processor in a standalone dump

**New Technique:** DOCPU

```
IP DOCPU
IP DOCPU CPU(list)
  – CPU(0) – only processor 0
  – CPU(3:5) – processors 3, 4 and 5
  – CPU(x’B’) – only processor 11
IP DOCPU CPUTYPE(ZA,ZI,S)
IP DOCPU CPUMASK(401)
```

z/OS 1.13
DOCPU EXEC((ipcs command))

DOCPU was built with the ability to execute an IPCS command against each processor.

IP DOCPU CPU(0,1) EXEC((L 1000 LEN(50)))

– For processors 0 and 1, display 50 bytes of data starting at address 1000.

Gotchya – If you accidentally enter DOCPU on a z/OS 1.13 SVC dump the command will take and no error message is returned. No data is returned either.
The End...

Questions??
IPCS GRSTRACE Summary Output

MAJOR NAME: xmajorname

MINOR NAME: xminorname

SCOPE: xscope  SYSNAME: xsysname  STATUS: xstatus
ASID: xasid  TCB: xtcb  JOBNAME: xjobname
MASID: xmasid  MTCB: xmtcb
Reserve Device: xdevice  Volser: xvolser

Critical ENQ Time(s):  
Request: xdate xtime
Contention: xdate xtime
Grant: xdate xtime
Delta Time Waiting: xdeltatime
Movewaiter: xdate xtime
Example of IP VERBEX GRSTRACE ‘QNAME(”TES?ENQ”)’ SUMMARY’
IPCS GRSTRACE Summary Example

MAJOR NAME: TESTENQ

* MINOR NAME: DUMMYENQ
  SCOPE: SYSTEMS  SYSNAME: S1  STATUS: *SHARED* /OWN
  ASID: 0000002C  TCB: 006FF020  JOBNAME: GRSTOOL
  Critical ENQ Time(s):
    Request:  06/04/2007 15:30:05.804018
    Grant:    06/04/2007 15:30:05.834250
  SCOPE: SYSTEMS  SYSNAME: S1  STATUS: *SHARED* /OWN
  ASID: 00000028  TCB: 006FF020  JOBNAME: GRSTOOL
  Critical ENQ Time(s):
    Request:  06/04/2007 15:32:18.460284
    Contention:  06/04/2007 15:32:18.484524
    Grant:    06/04/2007 15:32:34.846436
    Delta Time Waiting: 00:00:16.361911
  SCOPE: SYSTEMS  SYSNAME: S2  STATUS: *EXCLUSIVE* /WAIT
  ASID: 0000002F  TCB: 006FF020  JOBNAME: GRSTOOL
  Critical ENQ Time(s):
    Request:  06/04/2007 15:33:18.738913

Some ENQ information is unavailable for this remote request
IPCS GRSTRACE Detail Output

MAJOR NAME: xmajorname
MINOR NAME: xminorname
  Resource Creation Time: xdate xtime
  Last Movewaiter Time:  xdate xtime
SCOPE: xscope  SYSNAME: xsysname  STATUS: xstatus
  ASID: xasid  TCB: xtcb  JOBNAME: xjobname
  MASID: xmasid  MTCB: xmtcb
  Reserve Device: xdevice Volser: xvolser
  Critical ENQ Time(s):
    Request:  xdate xtime
    Contention:  xdate xtime
    Grant:  xdate xtime
    Delta Time Waiting: xdeltatime
    Movewaiter:  xdate xtime
Caller PSW: xpsw  Caller TCB: xcallertcb
Request Type: xrequesttype
RNL Processing Actions: xrnlactions
Affected by ISGNQXIT/FAST
Affected by ISGNQXITBATCH/CND
Managed by an Alternate Serialization Product
ISGENQ Userdata:
  xuserdata
QEL: xqeladdr  QXB: xqxbaddr
QCB: xqcbaddr  SVRB: xsrvbaddr

z/OS 1.10