Introduction to z/OS SLIP

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New York, NY
June 22nd 2009

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Overview of SLIP

- **S**erviceability

  Level

  Indication

  Processing
- z/OS system command which can be entered from console, TSO, IEASLPxx parmlib, etc…
- Diagnostic aid to trap system events and errors
- Many keywords allow tailoring to unique problems or specific conditions

The command

- **SLIP SET, Type_of_SLIP, Action, Environmental_Conditions, Collect_your_Documentation, END**

- First determine whether your SLIP will be a PER or a Non-PER SLIP. This is determined by the target (ie. the error or event) of the SLIP.
- Next determine what Action will be taken, and under what Conditions you want the SLIP to hit.
- Finally, collect the documentation you need (if any) for analysis of the problem.

Types of SLIP

- PER events

  IF - Instruction fetch

  SBT - Successful Branch

  SA - Storage Alteration

- Non-PER events

  ABEND (**COMP**)

  Program checks

  MSGID (message id)

  Machine checks …. Etc.

Types of SLIP

- PER events

  IF - Instruction fetch is used if you wish to capture documentation on a particular instruction or set of instructions during execution

  SA – Storage Alteration is used when you wish to monitor the alteration of some area of storage (eg. A control block)

  SBT - Successful Branch is used when you want to identify who is branching TO a particular instruction or set of instructions

- Non-PER events

  ABEND – Use the **COMP**= parameter to allow the SLIP to hit when an abend occurs (eg. COMP=0C4)

  MSGID – Used when you with to capture documentation upon the issuance of a WTO/R.

What is PER?

- PER = Program Event Recording hardware

  Bit 1 of the PSW is on when PER is active

  Eg. **4**70C5000 83AF43A8

  In the system trace table of a dump, if bit 1 is on, then a PER slip trap is active.

- Control Registers

  CR 10 - Starting addr of monitored range

  CR 11 - Ending addr of monitored range

Note: Only 1 PER SLIP can be enabled

Non-PER SLIPs

- COMP SLIPs are the most common type to use.

- Example:
  - SLIP SET,COMP=071,ACTION=SVCD,END
  - SLIP SET,C=071,A=SVCD,END
  - SLIP SET,C=071,END

- Most keywords have abbreviated forms
- Also be aware of default SLIP action

Non-PER SLIPs

- Example: Set a SLIP which will hit when an ABEND378 with Reason Code 14 occurs. Collect an SVC dump which includes all the virtual storage areas that are needed for analysis.

- SL SET,COMP=378,REASON=14,A=SVCD,
  SDATA=(ALLNUC,RGN,SQA,LPA,
  TRT,PSA,LSQA,CSA),END

Non-PER SLIPs

- BROWSE   **SYS1.PARMLIB(IEASLP00)** - 01.06   Line 0000
- Command ===>
- ************************** Top of Data ******************************
- SLIP SET,C=013,ID=X013,A=NOSVCD,J=JES2,END
- SLIP SET,C=028,ID=X028,A=NOSVCD,END
- SLIP SET,C=058,ID=X058,A=NODUMP,
  DATA=(15R,EQ,4,OR,15R,EQ,8,OR,
- 15R,EQ,C,OR,15R,EQ,10,OR,15R,EQ,2C,OR,15R,EQ,30,OR,
- 15R,EQ,3C),END
- SLIP SET,C=0E7,ID=X0E7,A=NOSVCD,END
- SLIP SET,C=0F3,ID=X0F3,A=NODUMP,END
- SLIP SET,C=13E,ID=X13E,A=NODUMP,END
- SLIP SET,C=1C5,RE=00090004,ID=X1C5,A=NODUMP,END
- SLIP SET,C=222,ID=X222,A=NODUMP,END
- SLIP SET,C=322,ID=X322,A=NODUMP,END

SLIP commands

- IEASLPxx parmlib
  - Activate with SET SLIP=xx
- SLIPs have 4-character ID
  - SL SET,COMP=378,RE=14,ID=SLP1, A=SVCD,END
- D SLIP=SLP1
- SLIP MOD,DISABLE,ID=SLP1
- SLIP MOD,ENABLE,ID=SLP1
- SLIP DEL,ID=SLP1

MSGID SLIP

- PER is NOT used, so multiple MSGID traps can be set
- MSGID ≤ 10 characters
- Use single quotes around the message identifier if lower case letters or blank spaces are part of the message
- SLIP is called after SSI and exits have modified the message text.

MSGID SLIP

-
  ```
  SLIP SET,MSGID=IEE136I,A=SVCD,
        SDATA=(ALLNUC,RGN,SQA,CSA,LPA,
        PSA,GRSQ),
        JOBLIST=(OMVS,CONSOLE),END
  ```

- This SLIP will hit when the message IEE136I is issued. The SLIP will collect an SVC dump containing the OMVS and Console asids and the virtual storage indiated by the SDATA keyword.

MSGID SLIP

- MSGID SLIP can also be used on multiline WTOs
- Using Regs 2,3,4,5 either the major or minor line WTO text can be examined as part of data comparison

SLIP Actions

- Syntax: ACTION={SVCD,TRACE,REFBEFOR,Other…..}
- Specify what SLIP should do
  - Take a dump
    - SVCD, SYNCSVCD, TRDUMP,STDUMP
  - Trace
    - TRACE, TRDUMP, STRACE,STDUMP
  - Change a field or register
    - REFBEFOR, REFAFTER
  - Enable another SLIP
    - TARGETID
  - Miscellaneous actions
    - RECOVERY, NODUMP, IGNORE, WAIT,RECORD,STOPGTF
- Some actions can be combined
  - Example: ACTION=(SVCD,REFBEFOR)

SLIP Actions

- Take a DUMP
  - SYNCSVCD vs. SVCD
    - SYNCSVCD stops unit of work when the match occurs
  - TRDUMP
    - GTF Trace and when SLIP disables, take an SVC dump
  - STDUMP
    - Write "SPER" entries to system trace, take SVCDUMP when SLIP disables

Note: The MATCHLIM (ML=) keyword specifies how many times SLIP should match before disabling

- Default for SYNCSVCD and SVCD is 1

SLIP Actions

- TRACE
  - TRACE will cause SLIP to write a GTF trace record
    - requires use of TRDATA= keyword to specify
      - TRDATA will be discussed with triplets
    - Requires GTF to be active to capture trace records.
      - Requires GTF option TRACE=SLIP
  - STRACE produces entries in the system trace table
    - NO GTF required
  - TRDUMP with ML may be used without GTF being active to count occurrences before dumping:
    - Example: SLIP SET,IF,A=TRDUMP,*condition*,ML=10
    - Match the condition 9 times and take a dump on the 10th occurrence.

SLIP Actions

- Change storage or registers
  - <u>REFBEFOR</u> or <u>REFAFTER</u>
  - Used to change storage or register before or after SLIP takes other actions
    - Storage to be changed must be paged-in
    - May enable the debugger to repair damage/overlays
  - Used in conjunction with REFBEFOR/REFAFTER keyword
    - Example:
      - SLIP SET,SA,A=(SVCD,REFBEFOR), RANGE=(7A6000,7A6003),ASIDSA=SA, REFBEFOR=(1R,EQ,00000000),END
        - » When the address 7A6000 is changed, set register 1 = 0 before taking an SVC dump
        - » ASIDSA=SA discussed later in presentation.

SLIP Actions

- Miscellaneous actions
  - WAIT
    - Put system in restartable WAIT01B
  - RECORD
    - Cause a logrec entry to be cut on SLIP match
  - RECOVERY
    - Initiates recovery. SLIP will ABEND06F the current unit of work
    - Can use in conjunction with other actions, eg. SVCD
  - IGNORE
    - SLIP matched, but ignore the match
    - More details/example on IGNORE slides next.
  - TARGETID
    - Activate another PER SLIP when first matches
    - More details/example on subsequent TARGETID slide.
  - NODUMP
    - Do not take any dumps, SVC, SYSM, SYSU, SYSABEND

Examples

- SL SET,COMP=0C4, JOBNAME=C1VAXBH, ACTION=NODUMP,END

- SL SET,MSGID=ISG343I, ACTION=SYNCSVCD, JOBLIST=(*MASTER*), SDATA=(ALLNUC,RGN,LPA,SQA,PSA), DSPNAME=(‘GRS’.*),END

- SL SET,COMP=1C5,RE=0009000B, A=TRACE,TRDATA=(STD,REGS,12R?,+30), MATCHLIM=15,END

- SL SET,COMP=B37, JOBNAME=C2VAR12, ACTION=RECORD,END

Collect the Documentation

- Numerous keywords allow the collection of documentation, including
  - Address spaces / jobs
  - Dataspaces
  - Virtual storage areas (sqa, nucleus, lpa, csa, etc..)
  - Specific information (System trace, ENQ contention, WLM information, etc…)
  - Range(s) of storage
  - GTF Traces
  - CF Structures
  - Dumps on other systems in the sysplex

Collect the Documentation

- JOBLIST / ASIDLIST - Address spaces / jobs
- DSPNAME - Dataspaces
- SDATA - Virtual storage areas (sqa, nucleus, lpa, csa, etc..)
- SDATA - Specific information (System trace, ENQ contention, WLM information, etc…)
- ADDRESS - Range(s) of storage
- TRDATA - GTF Traces
- STRLIST - CF Structures
- REMOTE - Dumps on other systems in the sysplex

Examples

```
• SL SET,COMP=1C5,
      ACTION=SVCD,
      ASIDLIST=(1,3,3F,2B),
      JOBLIST=(IXGLOGR,XCFAS),
      DSPNAME=(‘OMVS’.*,3F.*),
      SDATA=(ALLNUC,PSA,RGN,SQA,LPA,TRT,CSA,
            LSQA,GRSQ,WLM),
      STRLIST=(STRNAME=struc_name,
            LOCKENTRIES,ACC=NOLIM,
            (LISTNUM=ALL,ENTRYDATA=SERIALIZE,
            ADJUNCT=CAPTURE)),
      REMOTE= (SYSLIST=*('IXGLOGR','XCFAS','GRS'),
            DSPNAME,SDATA),END
```

PER SLIPs

- The Hardware identifies when a PER event such as an instruction execution or storage alteration occurs. The range of the instruction address or storage being monitored is identified by Control Regs 10/11.
- **IF** – specifies that an instruction(s) is to be monitored for execution
- **SA** – specifies that any storage modified within the specified range will cause the SLIP to hit

PER SLIPs

- SLIP SET,**IF**, …action,collect_doc,END
  - – Slipping on an instruction or set of instructions
- SLIP SET,**SA**, … action,collect_doc,END
  - – Slipping on modification of an area of storage
- SLIP SET,**SBT**, … action,collect_doc,END
  - – Slipping when a piece of code (range of instructions) is branched into

Specify Environmental Conditions

- SLIP can be tailored to hit only when specific environmental conditions are met, including
  - Register contents
  - Virtual storage contents
  - Which job is running
  - Which module is executing
  - Which virtual storage is being modified

Specify Environmental Conditions

- SLIP makes the comparisons specified and if all conditions match, then it triggers
  - Register contents
    - Use DATA ‘triplets’ to compare registers
  - Virtual storage contents
    - Use DATA ‘triplets’ to compare virtual storage or regs
  - Which job is running
    - Use JOBNAME or ASID
  - Which module is executing
    - Use PVTMOD, NUCMOD, LPAMOD
  - Which virtual storage is being modified
    - Use ASIDSA or DSSA (always use with **SA** SLIPs)

Specify Environmental Conditions

- Set a SLIP which will take an SVC dump when NUCMOD IAXPI executes with Register 1 equal to 00000FE5 on entry.

```
SL SET,IF,NUCMOD=IAXPI,
        DATA=(1R,EQ,00000FE5),
        ACTION=SVCD,END
```

- Set a SLIP which will suppress a dump if an ABEND0C4 occurs under Jobname C1VAXDM when Reg15 = 8

```
SL SET,COMP=0C4,JOBNAME=C1VAXDM,
        DATA=(15R,EQ,00000008),
        ACTION=NODUMP,END
```

Specify Environmental Conditions

- Set a SLIP which will dump all the OMVS dataspaces if storage located at 00FD3800 is modified (by any program)

```
SL SET,SA,ASIDSA=SA,RANGE=(00FD3800),
    A=SYNCSVCD,DSPNAME=(‘OMVS’.*),END
```

- Set a SLIP which will change the value of Reg3 to be 00000084 if the word at any dataspace address of 01234678 is modified when the CONSOLE address space is running.

```
SL SET,SA,DSSA=SA,RANGE=(01234678,0123467B),
    ACTION=REFBEFOR,
    REFBEFOR=(3R,EQ,00000084),
    JOBNAME=CONSOLE,END
```

Considerations

- When setting SLIPs, ensure that the filtering (specification of environmental conditions) is made as complete as possible
- This prevents invalid hits and prevents unnecessary recreates
- When specifying ranges of storage, try to keep range as short as possible in order to avoid performance overhead

Reference

- z/OS V1R8.0 MVS System Commands
  - Chapter 4.52 **SLIP Command**