IBM Education Assistance for z/OS V2R2

Item: GRS EQDQ Monitor Enhancements
Element/Component: Global Resource Serialization (GRS)

Agenda

- Trademarks

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- Overview

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- Migration & Coexistence Considerations

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Trademarks

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Presentation Objectives

- Provide you with insight into the function and purpose of GRS EQDQ Monitor Enhancements

Overview

- Problem Statement / Need Addressed:
    - Diagnosing ENQ-related errors is difficult without built-in tracing
    - Understanding RESERVEs or the impact of RNLs as well
    - The GRS EQDQ monitor (ISGAUDIT) provides tracing at the cost of ENQ performance, and its user interface is complex

- Solution / Approach:
    - Captures ENQ/DEQ diagnostics for problem determination while minimizing impact to system performance
    - Uses SMF 87 (introduced in APAR OA42221 to track Global Generic Queue Scans)
    - More cohesive, understandable filtering than EQDQ Monitor

- Benefit / Value:
    - Provides ability to establish ENQ/DEQ history, filter on certain requests, and aid in problem determination
    - Inherits the power of SMF (e.g. Logstream recording, exits, etc)

Usage & Invocation

- How do I activate GRS Monitoring
    - Enable the GRS Monitoring with existing filtering
        - **SETGRS MONITOR=YES**
    - Disable the GRS Monitoring
        - **SETGRS MONITOR=NO**
    - Change the active filters and activate
        - **SETGRS GRSMON=XX**
            - xx corresponds to GRSMON<u>xx</u>
    - Existing **MONITOR(YES|NO)** keyword in GRSCNFxx
        - No GRSMON(xx) analogue in GRSCNFxx

- How do I know GRS Monitor status?
    - **Display GRS[,SYSTEM]** shows MONITOR status and current GRSMONxx

Usage & Invocation

- You must ensure that SMFPRMxx includes Type 87

- How do I activate SMF Tracing of Type 87 in SMFPRMxx?
    - Specify **SYS(TYPE(87(1)))** for only subtype 1 – QSCAN
    - Specify **SYS(TYPE(87(2)))** for only subtype 2 – ENQ/DEQ
    - Specify **SYS(TYPE(87))** for all subtypes

- SMF 87 Recording in V2R2 drives SMF exit IEFU84 (switch from IEFU85 with OA42221)

- In V2R2, SMF 87 records are no longer cut under the caller's thread

Usage & Invocation

- SMF 87 Subtype 1 – QSCAN
    - Includes `SMF87RHS` (Header), `SMF87DEF` (self defining section), `SMF87REQ` (Requester section), `SMF87QSCAN` (Queue scan section)
    - Cut whenever global generic queue scan is issued
    - Introduced to help track queue scan "abusers"

Usage & Invocation

- SMF 87 Subtype 2 – ENQ/DEQ
    - Multiple ENQ/DEQ requests per record, cut within 1 SMF interval from time of request
    - Includes `SMF87RHS` (Header), `SMF87DEF` (self defining section), `SMF87REQ` (n Requester sections), `SMF87ENQ` (n ENQ/DEQ sections)
        - Requester section x **corresponds** to ENQ/DEQ section x...

Usage & Invocation

- Breakdown of an SMF 87 Subtype 2 record (Mapped by ISGYSMFR)
  - **SMF87RHS –** Header section
  - **SMF87DEF –** Self defining section
  - **SMF87REQ 1 thru n –** Requester section
    - contains items like the PSW, JOBNAME, ASID, TCB and time of request
    - *Some new fields added that are specific to ENQ/DEQ*
  - **SMF87ENQ 1 thru n –** Data Section
    - contains QNAME, RNAME, SCOPE, and other details about the request parameters

- See *Appendix A* for more details

Usage & Invocation

- GRSMONxx Syntax

```
FILTER  INCLUDE | EXCLUDE        QSCAN keywords
        QSCAN
        [ XSYS(YES | NO | ANY) ]
        [ GENERIC(YES | NO | ANY) ]

FILTER  INCLUDE | EXCLUDE        ENQ/DEQ keywords

        ENQ | DEQ | ENQDEQ
        QNAME( qnamePattern )
        RNAME( rnamePattern )
        [ JOBNAME( jobnamePattern ) ]
        [ SCOPE(STEP | SYSTEM | SYSTEMS | ANY) ]
        [ AUTHQLVL(2 | NONE) ]
        [ RESERVE(YES | NO | ANY) ]
        [ RNLMATCH(YES | NO | ANY) ]
        [ WAITER(YES | NO | ANY) ]
```

Usage & Invocation

- Two logical FILTER lists: Include list and Exclude list like RNLs
    - Exclude list trumps Include list

- Pattern strings support wildcard characters * and ?

- Both types of FILTER statements can coexist in same member

- Order does not matter

- Long Rname support to handle strings greater than one record length
    - `RNAME( 'on_your_marks...',`
      `'get_ready...',`
      `'get_set...',`
      `'go!' )`
    - Up to 255 characters excluding quotes and commas

- **Avoid** `FILTER INCLUDE ENQ QNAME(*) RNAME(*)` without other modifiers – too much data!

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Usage & Invocation

- Example:
    - Trace all ENQs and DEQs with a scope of SYSTEMS and Qname of SYSDSN except those from MYJOB
    - Also trace global generic queue scans

```
FILTER INCLUDE ENQDEQ QNAME(SYSDSN) RNAME(*)
        SCOPE(SYSTEMS)

FILTER EXCLUDE ENQDEQ QNAME(*) RNAME(*)
        JOBNAME(MYJOB)

FILTER INCLUDE QSCAN GENERIC(YES) XSYS(YES)
```

Usage & Invocation

- Example:
    - Trace all ENQs and DEQs resulting in a HW RESERVE

```
FILTER INCLUDE ENQDEQ QNAME(*) RNAME(*)
        RESERVE(YES)
```

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Usage & Invocation

- Example:
    - Trace all ENQ requests which **matched the RNLs** and may have been affected
    - But exclude SYSDSN ENQs

```
FILTER INCLUDE ENQ QNAME(*) RNAME(*)
        RNLMATCH(YES)

FILTER EXCLUDE ENQ QNAME(SYSDSN) RNAME(*)
```

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Usage & Invocation

- **`SYS1.SAMPLIB(ISGMON00)`** contains more hints and examples

Interactions & Dependencies

- Software Dependencies
  - SMF considerations
    - Think about planning SMF resources for new data stream
    - Unlike other SMF records, SMF 87 subtype 2's can be cut in **much greater frequency**
    - Use a separate logstream for type 87s to avoid running out of space for other types
  - You will likely need to create a program (REXX?) to aggregate the SMF 87 data or use an existing product

- Hardware Dependencies
  - None

- Exploiters
  - None

Migration & Coexistence Considerations

- None, as this is a single-system solution

- If you are already using APAR OA42221, the default behavior will be the same, except...
  - SMF 87 Recording in V2R2 drives SMF exit IEFU84 (switch from IEFU85 with OA42221)
  - The Requester section (SMF87REQ) grew in size but that is encapsulated by the self-defining section
  - In V2R2, the Requester Section is version 2
  - If no GRSMONxx is active, filtering reverts to OA42221 logic

Presentation Summary

- GRS EQDQ Monitor Enhancements
    - Tracing ENQs and DEQs via SMF 87
    - minimal impact to ENQ performance
    - Filtering options in PARMLIB

Appendix A – SMF 87 Subtype 1&2 fields

- Details: Header Section

```
SMFRCD87 DSECT
SMF87RHS DS     0CL24      Record Header Section
SMF87LEN DS     H          Record Length
SMF87SEG DS     H          Segment Descriptor
SMF87FLG DS     0CL1       Header Flag Byte
SMF87FST EQU    X'40'      bit 1 - SUBTYPES utilized
         ORG    SMF87FLG+1
SMF87RTY DS     CL1        Record Type - 87
SMF87TME DS     FL4        Record Written Time
SMF87DTE DS     CL4        Record Written Date
SMF87SID DS     CL4        System Identification
SMF87SSI DS     CL4        Subsystem ID
SMF87STP DS     H          Record Subtype
```

Appendix A – SMF 87 Subtype 1&2 fields

- Details: Self Defining Section

```
SMF87DEF DS     0CL20     Self Defining section
SMF87DEF_LEN DS F         Length of this section
SMF87DEF_REQ_OFF DS F     Requester section offset
SMF87DEF_REQ_LEN DS H     Requester section length
SMF87DEF_REQ_NUM DS H     Number of Requester sections
SMF87DEF_QSCAN_OFF DS 0F Qscan section offset
SMF87DEF_DATA_OFF DS F   Data section offset
SMF87DEF_QSCAN_LEN DS 0H Qscan section length
SMF87DEF_DATA_LEN DS H   Data section length
SMF87DEF_QSCAN_NUM DS 0H Number of Qscan sections
SMF87DEF_DATA_NUM DS H   # of Data sections
SMFRCD87_LEN EQU *-SMFRCD87
```

Appendix A – SMF 87 Subtype 1&2 fields

- Details: Requester Section (Page 1)

```
SMF87REQ DSECT
SMF87REQ_COMP DS CL8        Requester Component ID
SMF87REQ_VERSION DS F       Requester section version
SMF87REQ_SYS DS CL8         Requester System Name
SMF87REQ_STOK DS CL8        Requester SToken
SMF87REQ_ASID DS H          Requester Asid
             DS    CL2      reserved
SMF87REQ_TCB DS A           Requester TCB address
SMF87REQ_JOB DS CL8         Requester Jobname
SMF87REQ_STIME DS CL16      Requester start timestamp
SMF87REQ_CTIME DS CL16      Requester completion timestamp
SMF87REQ_RC DS F            Requester return code
SMF87REQ_RSN DS F           Requester reason code
SMF87REQ_PSW DS CL8         Requester PSW
```

Appendix A – SMF 87 Subtype 1&2 fields

- Details: Requester Section (Page 2)

```
SMF87REQ_FLAGS DS 0B        Flags
SMF87REQ_JOBINIT EQU X'80' Initiated Job. Only valid when SMF87STP is
                           SMF87STP_ENQ
SMF87REQ_STCTSU EQU X'40' Started Task. Only valid when SMF87STP is
                           SMF87STP_ENQ
        ORG    SMF87REQ_FLAGS+1
SMF87REQ_AUTH1 DS B        copy of CDATTR2. Only valid when SMF87STP is
                           SMF87STP_ENQ
        DS     CL2
SMF87REQ_SMFID DS CL4     System id. Only valid when SMF87STP is
                           SMF87STP_ENQ
SMF87REQ_PROGRAMNAME DS CL8 Program Name. Only valid when SMF87STP is
                           SMF87STP_ENQ
SMF87REQ_LEN EQU *-SMF87REQ
```

Appendix A – SMF 87 Subtype 2 fields

- Details: ENQ/DEQ Section (Page 1)

```
SMF87ENQ DSECT
SMF87ENQ_EYE DS CL8        service eye-catcher
SMF87ENQ_VERSION DS F     enq section version
SMF87ENQ_REQUESTFIELDS DS 0CL8
SMF87ENQ_FLAGS1 DS 0CL1
SMF87ENQ_REQWAITED EQU X'80' When on, this request was queued to wait
                            for the resource
SMF87ENQ_EXITCHANGED EQU X'40' When on, this request was changed by an
                            exit
SMF87ENQ_INCLUDED EQU X'20' When on, this request was included by RNLs
SMF87ENQ_EXCLUDED EQU X'10' When on, this request was excluded by RNLs
SMF87ENQ_CONVERTED EQU X'08' When on, this request was converted by
                            RNLs
SMF87ENQ_PCREQUEST EQU X'04' When on, this request was a result of a
                            PC-ENQ, PC-DEQ, or ISGENQ
SMF87ENQ_RNLNO EQU X'02' When on, this request was made requesting no
                            changes be allowed by RNLs
SMF87ENQ_LIST EQU X'01'  When on, this request was part of a list
                            request
```

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Appendix A – SMF 87 Subtype 2 fields

- Details: ENQ/DEQ Section (Page 2)

```
SMF87ENQ_FLAGS2 DS 0CL1
SMF87ENQ_DIRECTEDTCB EQU X'80' When on, this request was directed to
                                another TCB
SMF87ENQ_STEPMUSTCOMPLETE EQU X'40' When on, this request asked for
                                Step must complete
SMF87ENQ_SHARE EQU X'20' When on, this request was for shared access
SMF87ENQ_RESERVE EQU X'10' When on, this request was for a RESERVE
SMF87ENQ_OBTAIN EQU X'08' When on, this request was to obtain or
                                change an ENQ. when off, this request was to
                                release an ENQ
        ORG    SMF87ENQ_FLAGS2+1
SMF87ENQ_SCOPE DS X       Final scope of the request
SMF87ENQ_RNAMELEN DS X    Rname length
SMF87ENQ_REQUESTTYPE DS X Type of request
        DS     CL3
SMF87ENQ_DEVICEINFO DS 0CL8
SMF87ENQ_DEVN DS BL2      Device number
SMF87ENQ_UCBVOLI DS CL6   VolSer if UCB avail.
SMF87ENQ_QNAME DS CL8     QNAME
SMF87ENQ_RNAME DS CL256   Rname
```

Appendix A – SMF 87 Subtype 1 fields (OA42221)

- Details: QSCAN Section (Page 1)

```
SMF87QSCAN DSECT              Addressability derived from address of
                             SMF87RCD + SMF87DEF_QSCAN_OFF +
                             (SMF87DEF_QSCAN_LEN * (index-1))
SMF87QSCAN_EYE DS CL8        Service eye-catcher. Refer to constants
                             beginning with SMF87QSCAN_EYE.
SMF87QSCAN_VERSION DS F      Qscan section version
SMF87QSCAN_SCANACTION DS X   Requested scan action. Refer to constants
                             beginning with SMF87QSCAN_SCANACTION
SMF87QSCAN_FLAGS DS 0X
SMF87QSCAN_QNAME_SPECIFIC EQU X'80' Specific Qname?
SMF87QSCAN_RNAME_SPECIFIC EQU X'40' Specific Rname?
        ORG    SMF87QSCAN_FLAGS+1
SMF87QSCAN_QNAMELEN DS X Qname length
SMF87QSCAN_RNAMELEN DS X Rname length
SMF87QSCAN_MINWAITERS DS F Minimum waiters
SMF87QSCAN_QNAME DS CL8      Requested Qname. If not specified on request,
                             then zeroes
SMF87QSCAN_RNAME DS CL256 Requested Rname. If not specified on
                             request, then zeroes. For length, refer to
                             SMF87QSCAN_RNAMELEN
SMF87QSCAN_LEN EQU *-SMF87QSCAN
```

Appendix A – SMF 87 Subtype 1 fields (OA42221)

- Details: QSCAN Section (Page 2)
    - Subtype 1 records contain the same header, self-defining section, and requester section as subtype 2
    - They are single request records

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