Case Study 3

LPAR Was Not Responsive

Case Study Summary

Velocity Software solves performance problems.

- As a valued customer, we want to pass this knowledge on to you.
- The following is a case study of a solved real-life performance issue.
- This case study will show:
  - The problem as reported by users
  - The problem observations
  - What was found in the Velocity Software data
  - What was suggested to the customer
  - If provided, follow up from the customer

The Problem:

A particular LPAR became unresponsive.

Problem Observations:

- CPU utilization went to 100%
- The LPAR became unresponsive and was eventually IPL'd

ESAOPER – Operator/System Log showed:

- A large number of messages. These are not error messages, but the master processor is used to write them to the console
- The messages were due to the testing of an exec that does DASD manipulation and turned out not to be important to the issue

```
Report: ESAOPER      Operator/System Log
Monitor initialized: 06/10/22 at 10:00:05 on 3906 serial 31B1B8    First record analyzed: 06/10/22
-------------------------------------------------------------------------------------------------
11:18:43 Device Duplex Status Change: 8xxx Device is primary of a duplex pair with device 8xxx
11:18:43 Device Duplex Status Change: 8xxx Device is primary of a duplex pair with device 8xxx
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11:18:43 Device Duplex Status Change: 8xxx Device is primary of a duplex pair with device 8xxx
11:18:43 Device Duplex Status Change: 8xxx Device is primary of a duplex pair with device 8xxx
11:18:43 Device Duplex Status Change: 8xxx Device is primary of a duplex pair with device 8xxx

11:22:28 Configuration command executed: VARY ONLINE 8xxx
11:22:28 Configuration command executed: VARY ONLINE 8xxx
11:22:28 Configuration command executed: VARY ONLINE 8xxx
11:22:28 Configuration command executed: VARY ONLINE 8xxx
11:22:28 Configuration command executed: VARY ONLINE 8xxx
11:22:28 Configuration command executed: VARY ONLINE 8xxx
```

ESAXACT – Transaction Delay Analysis showed:

- Simulation wait went up by 30% at the time of the issue

```
Report: ESAXACT      Transaction Delay Analysis                    Velocity Software C
Monitor initialized: 06/10/22 at 11:00:00 on 3906 serial 31B1B8    First record analyz
-------------------------------------------------------------------------------------
                     <-----Percent non-dormant (Wait states)------------------->
UserID   <-Samples->                        E-  D-  T-     Tst <Asynch>        Lim  Pct
/Class   Total  In Q Run Sim CPU SIO Pag SVM SVM SVM  CF Idl I/O Pag Ldg Oth Lst Elig
-------- ----- ----- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ----
06/10/22
11:16:00   497
Hi-Freq: 37920 15578 1.1 2.3  14 0.0 0.1   0 5.1 1.7 0.0  78 1.4   0 1.4 0.0   0    0
*TheUsrs 16380   701 1.0 2.1 2.1 0.4   0   0 2.9  20   0  74   0   0 0.1   0   0    0
11:17:00   498
Hi-Freq: 37972 15568 1.1 2.7  16 0.1 0.1   0 5.3 1.5 0.1  77 1.3   0 1.1   0   0    0
*TheUsrs 16380   621 1.1 3.2 2.9 1.0   0   0 3.4  13 0.3  78   0   0 0.3   0   0    0
11:18:00   498
Hi-Freq: 36666 15096 1.4  12  37 0.1 0.3   0 5.0 1.4 0.4  46 1.2   0 0.8   0   0    0
*TheUsrs 15844   708 2.8  11  15 0.6 0.3   0 3.2  12 3.8  55 0.1   0 0.1   0   0    0
11:21:18   498
Hi-Freq:  115K 52174 1.2  40  31 2.3 1.0   0 4.2 1.0  17 5.3 1.2   0 0.0   0   0 0.01
*TheUsrs 50270  6797 3.1  53  16 1.1 0.2   0 3.4 4.8  15 6.0 1.0   0 0.0   0   0 0.05
```

Simulation wait represents the time waiting for the z/VM control program to execute (or simulate) instructions on its behalf. These instructions are only run on the Master processor. This turned out not to be an issue, but was a result of the EXEC testing.

ESACPUA – CPU Utilization Analysis (Part 2) showed:

- CPU Overhead rose significantly at the time of the issue

```
Report: ESACPUA      CPU Utilization Analysis                    Velocity Software Corporate   ZMAP 5.1
Monitor initialized: 06/10/22 at 11:00:00 on 3906 serial 31B1B8    First record analyzed: 06/10/22 11:00:

         <----Load---->     <CPU percents><--Internal (per second)--> SIGP <-Spin Locks--><UsrExits> User
         <-Usrs--> Tran      Totl Ovrhead Diag Inst    SIE Fast  Page Rate Proc  ms/  rate Rate ms/  Diag
Time     Actv In Q /sec CPU Util Usr Sys nose  Sim intrcp path fault /sec  Pct spin /sec  /sec Exit /sec
-------- ---- ---- ---- --- ---- --- --- ----- ---- ------ ---- ----- ---- ---- ---- ----- ---- ---- ----
06/10/22
11:16:00  252  270 13.3   0  54.2  14 3.5 7532  18K  29588    0 412.4 6251 4.46 0.03  1605    0    .    0
                        1  54.1  14 1.8 5441  18K  30720    0 393.5 7403 4.02 0.03  1541    0    .    0
                        2  53.8  14 1.6 4656  17K  29053    0 315.3 7485 4.25 0.04  1104    0    .    0
                        3  53.7  15 1.8 6226  19K  31224    0 358.5 7331 4.89 0.03  1630    0    .    0
                        4  53.8  14 1.8 5860  18K  30089    0 389.8 7386 4.78 0.03  1524    0    .    0
                        5  53.3  14 1.8 6481  18K  29172    0 300.0 7466 4.38 0.03  1456    0    .    0
                           ---- --- --- ----- ---- ------ ---- ----- ---- ---- ---- ----- ---- ---- ----
System:                     323  85  12  36K 106K 179847    0  2170  43K 26.8 0.03  8861    0    0    0
-------- ---- ---- ---- --- ---- --- --- ----- ---- ------ ---- ----- ---- ---- ---- ----- ---- ---- ----
11:17:00  257  270 13.9   0  65.2  22 4.8  16K  27K  39061    0 256.4 5629 11.5 0.04  2974    0    .    0
                        1  64.7  23 2.1  12K  26K  39234    0 499.8 6491 11.1 0.04  2789    0    .    0
                        2  65.2  23 2.1  11K  24K  36696    0 386.3 6473 11.3 0.05  2403    0    .    0
                        3  65.3  23 2.3  17K  29K  41729    0 305.3 6427 11.1 0.03  3311    0    .    0
                        4  64.8  23 2.3  16K  29K  41627    0 272.1 6460 10.5 0.03  3197    0    .    0
                        5  64.6  21 2.3  20K  32K  43681    0 337.1 6503  9.8 0.03  3253    0    .    0
                           ---- --- --- ----- ---- ------ ---- ----- ---- ---- ---- ----- ---- ---- ----
System:                     390 135  16  92K 166K 242029    0  2057  38K 65.4 0.04 17926    0    0    0
-------- ---- ---- ---- --- ---- --- --- ----- ---- ------ ---- ----- ---- ---- ---- ----- ---- ---- ----
11:18:00  262  255 13.9   0  73.9  37 9.4 5809  13K  21267    0 181.8 4544 32.7 0.49 665.8    0    .    0
                        1  74.1  37 7.6 2416  11K  20493    0 435.8 4805 30.5 0.44 695.3    0    .    0
                        2  73.8  42 2.7 2742  11K  19902    0 289.4 4778 28.7 0.51 567.6    0    .    0
                        3  73.5  41 3.0 5786  15K  24340    0 219.8 4745 30.0 0.40 754.8    0    .    0
                        4  73.8  43 1.8 2184  11K  20119    0 175.5 4765 30.1 0.42 724.5    0    .    0
                        5  73.2  41 1.4 2338  11K  19854    0 208.5 4755 26.4 0.40 664.7    0    .    0
                           ---- --- --- ----- ---- ------ ---- ----- ---- ---- ---- ----- ---- ---- ----
System:                     442 240  26  21K  73K 125976    0  1511  28K  179 0.44  4073    0    0    0
-------- ---- ---- ---- --- ---- --- --- ----- ---- ------ ---- ----- ---- ---- ---- ----- ---- ---- ----
11:21:18  264  246  5.8   0  97.4  67  27 3073 3381 3806.3    0  72.4    0 81.1 22.0 36.89    0    .    0
                        1  98.8  88 4.8 5606 6069 6766.0    0 172.3  0.0 76.5 16.6 46.14    0    .    0
                        2  98.8  89 4.1 4876 4538 5183.9    0 139.9  0.0 76.4 17.8 42.96    0    .    0
                        3  99.0  91 3.0 2233 2130 2691.5    0 158.4  0.0 79.6 26.6 29.89    0    .    0
                        4  98.9  91 2.7 2531 3257 3844.3    0 144.7  0.1 78.8 19.4 40.59    0    .    0
                        5  98.4  86 4.6 5648 6261 6969.9    0 148.1  0.0 68.9 13.8 50.03    0    .    0
                           ---- --- --- ----- ---- ------ ---- ----- ---- ---- ---- ----- ---- ---- ----
System:                     591 512  46  24K  26K  29262    0 835.8  0.2  461 18.7 246.5    0    0    0
```

ESAUSR2 – User Resource Utilization showed:

- The T:V ratio rose significantly at the time of the issue
- The T:V ratio indicates system overhead

```
Report: ESAUSR2      User Resource Utilization                    Velocity Software Corporate   ZMAP 5.1.3 07/18/22
Monitor initialized: 06/10/22 at 11:00:00 on 3906 serial 31B1B8    First record analyzed: 06/10/22 11:00:00
-------------------------------------------------------------------------------------------------------------------------
          <---CPU time--> <Main Storage (pages)> <-Paging (pages)> <Spooling(pages)> Q'd Total    <VMDBLK Rebalances>
UserID    <(seconds)> T:V <Resident> Lock        Paged <---I/O---->       <---I/O---> Pg+  Session <-nesting lvls> per
/Class    Total  Virt Rat Totl Activ  -ed Resrvd   Out  Read Write Alloc  Read Write Spl  CPU Sec NL1 NL2 NL3 NL4 sec
--------- ----- ----- --- ---- ----- ---- ------ ----- ----- ----- ----- ----- ----- --- -------- --- --- --- --- ---
06/10/22
11:09:00 161.6 134.6 1.2  17M   17M 908K   5000   70M 40461   341   39M     0   113   4  2603473   0   0   0   0   0
*TheUsrs  4.22  3.60 1.2  75K 61309 3530   5000  548K   791   341   34M     0    53   0   909156   0   0   0   0   0
11:10:00 264.8 219.9 1.2  17M   17M 907K   5000   70M 64254 29685   39M     3   278   0  2606576   0   0   0   0   0
*TheUsrs  4.67  3.98 1.2  77K 62167 3534   5000  543K  6767  2687   34M     0   112   0   908665   0   0   0   0   0
11:11:00 284.1 200.5 1.4  17M   17M 907K   5000   70M 37350 55204   39M     0   142   0  2621714   0   0   0   0   0
*TheUsrs  8.39  4.28 2.0  76K 61949 3530   5000  542K  1693   959   34M     0    74   0   924773   0   0   0   0   0
11:12:00 180.2 147.0 1.2  17M   17M 908K   5000   70M 33578 30702   39M   184   413   0  2659975   0   0   0   0   0
*TheUsrs  7.49  6.44 1.2  78K 71335 3531   5000  542K  2381   803   34M   180   324   0   961623   0   0   0   0   0
11:13:00 206.5 150.7 1.4  17M   17M 908K   5000   70M 40524 26332   39M   439  1096   0  2645884   0   0   0   0   0
*TheUsrs  8.62  5.38 1.6  81K 69887 3531   5000  542K  4951   646   34M   439   963   0   950652   0   0   0   0   0
11:14:00 252.5 136.6 1.8  17M   17M 907K   5000   70M 30733 17899   39M   468   145   1  2612872   0   0   0   0   0
*TheUsrs 14.02  4.88 2.9  81K 63957 3531   5000  543K  1052   674   34M   468    84   0   916170   0   0   0   0   0
11:15:00 183.3 146.9 1.2  17M   17M 907K   5000   70M 46173 35039   39M    10   214   3  2606381   0   0   0   0   0
*TheUsrs  4.98  4.26 1.2  80K 64149 3534   5000  542K   395   484   34M     6    81   0   908648   0   0   0   0   0
11:16:00 186.2 135.0 1.4  17M   17M 908K   5000   70M 33243 34112   39M     3   179   0  2615744   0   0   0   0   0
*TheUsrs  6.87  5.04 1.4  78K 63505 3531   5000  543K  1499  2209   34M     3   101   0   916598   0   0   0   0   0
11:17:00 224.3 143.5 1.6  17M   17M 908K   5000   70M 40366 35924   39M    10   209   0  2646957   0   0   0   0   0
*TheUsrs 12.39  5.43 2.3  77K 72427 3532   5000  542K   532   702   34M     1    86   0   947596   0   0   0   0   0
11:18:00 251.3 106.0 2.4  17M   17M 906K   5000   70M 25394 21806   39M  3155  3491   0  2679718   0   0   0   0   0
*TheUsrs 27.97  6.29 4.4  89K 77865 3533   5000  540K  2746  1466   34M  3155  3439   0   982227   0   0   0   0   0
11:21:18  1184 69.39  17  17M   16M 901K   5000   70M 53122 52400   39M     6  3417   2  2650405   0   0   0   0   0
*TheUsrs 368.2  8.87  41  85K 81147 3532   5000  539K  5046  2119   34M     2  3360   1   950471   0   0   0   0   0
```

ESADIAG – Diagnose Rate:

- Many DIAG x'204' instructions were being issued
- Unusual spikes can lead to problem determination

```
Report: ESADIAG       Diagnose Rate Report                          Velocity Software Corporate   ZMAP 5.1.3 07/18/2
Monitor initialized: 06/10/22 at 11:00:00 on 3906 serial 31B1B8     First record analyzed: 06/10/22 11:00:00
-------------------------------------------------------------------------------------------------------------------
Date      CPU <--Total-->   <-------------------------------Diagnose Counts per Second-------------------------------->
/Time          <Diags/Sec>  DIAG: Rate DIAG:Rate DIAG: Rate DIAG: Rate DIAG: Rate DIAG: RateDIAG: Rate DIAG: Rate
               User  IBM
-------- --- ----- -----   ----- ---- ----- ---- ----- ---- ----- ---- ----- ---- ----- ---- ----- ---- ----- ----
06/10/22
11:13:00
System:           0 47793   0000: 13.0 0008:   334 000C:  237 0010: 45.4 0014:   7.8 0024: 38.6 0044:   0.0
                            004C:  0.1 0058:   1.6 005C: 41.9 0060: 70.2 0064:   2.3 0068:  198 007C:   3.5 0088:   2.2
                            008C:  0.4 009C:   39K 00A0:  0.0 00A4:  933 00A8:  147 00B0:   0.0 00B4:   0.0 00BC:   0.0
                            00D0:  0.0 00D4:   0.0 00DC:  0.0 00F8:  0.1 0204: 85.6 0210:   3.5 0214: 6242 0218:   0.0
                            023C:  0.1 0254:   0.0 0260:  0.0 0264:  0.0 0270: 75.5 0274:   0.0 02A0: 78.5 02A4:   0.0
11:14:00
System:           0 44276   0000: 13.5 0008:   319 000C:  176 0010: 45.3 0014:   6.7 0024: 45.6 0044:   0.0
                            004C:  0.0 0058:   3.9 005C: 62.3 0060: 53.1 0064: 15.3 0068:  213 007C:   7.0 0088:   2.4
                            008C:  0.6 009C:   36K 00A4:  428 00A8: 28.1 00B0:  0.0 00B4:   0.0 00BC:   0.1 00DC:   0.0
                            00F8:  0.6 0204: 71.0 0210:  4.1 0214: 7055 0218:  0.0 023C:   0.1 0264:   0.0 0270:   127
                            0274:  0.0 02A0: 78.5
11:15:00
System:           0 83147   0000: 10.9 0008:   245 000C:  144 0010: 45.4 0014:   0.6 0024: 26.1 0044:   0.0
                            004C:  0.1 0058:   1.7 005C: 41.8 0060: 42.5 0064:   6.4 0068:  168 007C:   3.2 0088:   1.9
                            008C:  0.4 009C:   77K 00A4:  257 00A8: 23.9 00B0:   0.1 00BC:   0.1 00DC:   0.1 00F8:   0.1
                            0204: 90.2 0210:   2.4 0214: 5005 023C:  0.1 0264:   0.1 0270:  96.9 0274:   0.1 02A0: 78.6
11:16:00
System:           0 36180   0000: 10.6 0008:   418 000C:  127 0010: 45.4 0014:   0.5 0024: 33.3 004C:   0.0
                            0058:  2.5 005C: 54.3 0060: 63.0 0064:   4.8 0068:  200 007C:   4.9 0088:   2.3 008C:   0.4
                            009C:  28K 00A4:   443 00A8: 27.6 00B0:  0.0 00BC:   0.0 00DC:   0.0 00F8:   0.0 0204: 87.1
                            0210:  3.3 0214:  6296 023C:  0.3 0264:  0.0 0270: 87.7 0274:   0.0 02A0:  78.4
11:17:00
System:           0 92043   0000: 16.8 0008:   351 000C:  109 0010: 45.5 0014:   0.9 0024: 68.1 0058:   1.9
                            005C: 60.8 0060: 60.5 0064:   5.4 0068:  216 0070:   0.0 007C:   3.3 0088:   2.4 008C:   0.3
                            009C:  82K 00A0:   0.0 00A4:  467 00A8: 30.0 00B0:   0.0 00BC:   0.2 00D4:   0.0 00DC:   0.0
                            0204: 79.4 0210:   3.8 0214: 8013 0218:  0.0 023C:   0.1 0264:   0.0 0270:   184 0274:   0.0
                            02A0: 78.6 02A4:   0.0
11:18:00
System:           0 21288   0000: 17.5 0004:   0.0 0008:   393 000C:  101 0010: 39.5 0014: 52.4 0024: 73.1
                            0044:  0.0 004C:   0.0 0058:   2.2 005C: 54.8 0060: 81.3 0064:  5.2 0068:  178 0070:   0.0
                            007C:  3.9 0088:   2.0 008C:   0.4 009C: 7265 00A0:   0.0 00A4: 1543 00A8: 3228 00B0:   0.1
                            00BC:  0.2 00D4:   0.0 00DC:   0.1 00F8:  0.1 0204: 55.5 0210:  4.9 0214: 8018 023C:   0.2
                            0264:  0.1 0270:   102 0274:   0.1 02A0: 67.4 02A4:  0.0 02CC:  0.0
11:21:18
System:           0 29916   0000:  5.3 0008: 56.5 000C: 12.8 0010: 20.5 0014:  0.2 0024: 26.4 0044:   0.0
                            0058:  1.5 005C: 13.6 0060: 16.3 0064:  1.5 0068: 69.4 0070:  0.0 007C:   4.3 0088:   0.5
                            008C:  0.2 009C:   23K 00A0:  0.0 00A4:  163 00A8:  991 00B0:  0.0 00BC:   0.0 00D4:   0.0
                            00DC:  0.0 0204:   2.3 0210:  1.2 0214: 5313 023C:  0.1 0264:  0.0 0270:  96.8 0274:   0.0
                            02A0: 27.3 02A4:   0.0
```

ESAPAGE – Paging and Spooling Analysis showed:

- The Page Space Threshold setting was high (default is 90%)
- The Spooling Activity for files created/purged per minute was high

```
Report: ESAPAGE      Paging Analysis                                  Velocity Software Corporate   ZM
Monitor initialized: 06/10/22 at 11:00:00 on 3906 serial 31B1B8    First record analyzed: 06/10/22
-------------------------------------------------------------------------------------------------------

          <-----Paging----->  Page  Space <-Page Space--> <----------Spooling Activity---------->
          <-pages/sec-> Resp  <megabytes> <--Threshold--> <pages/sec> Serv <megabytes> <files/min>
Time        Read  Write Time  Avail InUse setting  passed  Read Write Time Avail InUse Creat Purge
--------  ------ ------ ----  ----- ----- -------  ------ ----- ----- ---- ----- ----- ----- -----

06/10/22
11:11:00   629.8  862.2  0.1 375674  277K    227%       0   0.0   2.4  0.1 19633 11973  18.0  15.0
11:12:00   567.8  517.4  0.1 375674  277K    227%       0   3.1   6.9  0.1 19633 11973  34.0  32.0
11:13:00   682.4  440.2  0.1 375674  277K    227%       0   7.3  18.3  0.1 19633 11976  16.0  10.0
11:14:00   517.3  317.4  0.1 375674  277K    227%       0   7.8   2.4  0.1 19633 11976   7.0   4.0
11:15:00   776.0  606.8  0.1 375674  278K    227%       0   0.2   3.7  0.1 19633 11977   9.0   8.0
11:16:00   561.6  558.4  0.1 375674  278K    227%       0   0.0   3.0  0.1 19633 11977  18.0  16.0
11:17:00   677.5  604.6  0.1 375674  278K    227%       0   0.2   3.5  0.1 19633 11978  16.0  10.0
11:18:00   426.3  349.3  0.3 375674  278K    227%       0  52.5  58.1  0.1 19633 11990  17.0   9.0
11:21:18   265.3  259.8  1.4 375674  278K    227%       0   0.0  16.1  3.6 19633 12002   2.4   0.9
*************************************************Summary*************************************************
Average:   859.7  556.5  0.2 375674  277K    227%       0   3.5  14.0  0.3 19633 11973  14.2  10.2
```

ESASXS – System Execution Space Report showed:

- System execution space available dropped/vacillated during the time of the issue

Report: ESASXS System Execution Space Report Velocity Software Corporate ZMAP 5.1.3 07/18/22
Monitor initialized: 06/10/22 at 11:00:00 on 3906 serial 31B1B8 First record analyzed: 06/10/22 11:00:00

	<----Load---->			<--System Execution Space pages--------->						<--Frames->		<-----System Execution Space Pages------>						
						<-Backed-->		<----In Use----->		<--Backed->		Steal	not		Un-	<Available>		Resrv
Time	Actv	In Q	/sec	Size	Avail	>2GB	<2GB	Total	CP	FIXED	<2GB	>2GB	OK	Owned	Lockd	backd	>2GB	<2GB	
06/10/22																			
11:09:00	250	269	13.3	524K	81541	326K	117K	443K	178K	3658	103K	65540	264K	0	2605	81490	20	31	48
11:10:00	249	281	13.4	524K	83172	324K	117K	441K	180K	3658	103K	66621	261K	0	2558	83138	32	2	48
11:11:00	252	268	13.9	524K	84122	323K	118K	440K	180K	3658	103K	66428	260K	0	2566	84068	32	22	48
11:12:00	253	269	14.3	524K	82532	324K	117K	442K	180K	3658	104K	66339	262K	0	2533	82495	32	5	48
11:13:00	256	269	13.5	524K	79100	326K	119K	445K	181K	3658	105K	66230	265K	0	2553	79066	32	2	48
11:14:00	248	268	14.0	524K	75550	329K	120K	449K	181K	3658	105K	66093	268K	0	2589	75514	32	4	48
11:15:00	248	275	12.8	524K	77459	327K	120K	447K	181K	3658	105K	65900	266K	0	2573	77426	31	2	48
11:16:00	252	270	13.3	524K	80896	322K	121K	443K	182K	3658	106K	65801	262K	0	2570	80832	32	32	48
11:17:00	257	270	13.9	524K	76796	326K	122K	447K	182K	3658	107K	65839	265K	0	2606	76762	32	2	48
11:18:00	262	255	13.9	524K	81022	321K	122K	443K	183K	3658	107K	65821	261K	0	2652	80997	8	17	48
11:21:18	264	246	5.8	524K	82658	319K	122K	442K	183K	3658	107K	66079	259K	0	2631	82635	1	22	48
**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********
Average:	256	268	12.8	524K	83101	323K	119K	441K	180K	3658	104K	65770	261K	0	2586	83054	28	19	48

Performance Enhancement Suggestions:

1 – Per IBM, Install PTF UM35877 for APAR VM66529

- The Velocity reports showed the number of DIAG x'204' instructions being issued
- The Velocity reports showed many of the system repercussions that indicated there was an issue

- Per the APAR, when guests are issuing DIAG x'204' instructions, it could cause the system to hang, which it did

What the customer reported:

- Once the APAR was applied, the problem did not return.