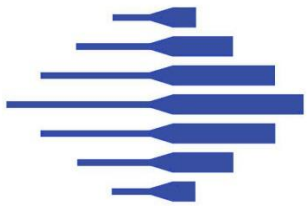
35 YEARS OF PERFORMANCE MANAGEMENT



VELOCITY SOFTWARE

Case Study 3

LPAR Was Not Responsive

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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 amount 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
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
11:18:43 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
```

What the Data Showed (Utilization data)

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
```

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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

UserID /Class	<---CPU time--> <(seconds)> Total	Virt	T:V Rat	<Main Storage (pages)> <Resident> Totl	Activ	Lock -ed	Resrvd	<-Paging (pages)> Paged Out	<---I/O---> Read	Write	<Spooling(pages)> Alloc	<---I/O---> Read	Write	Q'd Pg+ Spl	Total Session CPU Sec	<VMDBLK Rebalances> <-nesting lvls> NL1	NL2	NL3	NL4	per 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
```

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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
*************************************************Summary*************************************************************
Average:  256  268 12.8  524K 83101   323K  119K  441K  180K  3658  104K 65770  261K     0  2586 83054    28     19     48
```

VELOCITY SOFTWARE

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.