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August 7, 1999

Via Federal Express

Mr. Chris Hoidal
Director - Western Region
Office of Pipeline Safety
Research and Special Programs Administration
12600 West Colfax Avenue, Suite A-250
Lakewood, Colorado 80215-3736

RE: In the Matter of Equilon Pipeline Company, Respondent
CPF No. 59505-h

Dear Mr. Hoidal:

We have been authorized by Equilon Pipeline Company LLC, on behalf of Olympic Pipeline Company, to submit to you the enclosed "Olympic Computer System Upgrade Final Status Report." The July 26, 1999 response to the above-referenced Corrective Action Order indicated that such a report would be forthcoming. Please call if you have any questions about the enclosure.

Very truly yours,

Bill Beaver

William H. Beaver

cc: Paul Sanchez
Barbara Hickl

0250077.01

OLYMPIC COMPUTER SYSTEM UPGRADE
FINAL STATUS REPORT
August 6, 1999

I. System Condition since Preliminary Report

Since the time of the "Olympic Computer System Preliminary Report" dated July 1, 1999, the Computer System utilized by the Olympic Control Center has performed without any abnormal operation or problems. This computer system has been closely monitored throughout the diagnostic evaluations and upgrades and has remained in excellent working order.

II. Status of Recommended Changes

A number of recommendations were made as a result of the initial computer system review on June 26 and 27, 1999. The implementation phase of these recommendations began immediately after the system's hardware and system performance evaluation was completed. Performance enhancement items and load sharing adjustments were installed and were in service until all hardware upgrades were completed. Net result of this initial phase of the recommendations on the existing hardware platform was an increase of reserve capacity from 25% to 55%. A tape of the software utilized on the Olympic system was shipped to Houston to allow the Olympic system to be reproduced at the development site. An in-depth software process review and system performance stress testing was completed.

1. **Develop an updated version of the HISTORIC process**
   Commission the development of an updated version of the Historic Process to reduce the demands on CPU resources.

   Status:
   In the early stages of this review, it was determined that the source code for the Historic process in the software version utilized by the Olympic computer system was significantly different than anticipated. Since previous experience with the Historic process was not directly applicable, a complete investigation of the software module was commissioned and completed. Source code of the Historic module was obtained from Teledyne Control Applications, the software vendor. After extensive testing and a line-by-line review of the source code, no problems were found in the error handling routines or any other aspect of the Historic process. See attached document titled "Olympic Software Review."

   An image tape was utilized to reproduce the Olympic system on test hardware in Houston. Since computer hardware was not available that matched the performance of the existing Olympic system, the test was accomplished on a system that was slightly smaller and slower than the recommended hardware upgrade. Normal loading of the data acquisition could not be completely accomplished, so the load was tested with simulated traffic of 30% of the number of RTU's in service, with the scan times raised 600% to simulate a full load.

The test system was run through a wide variety of tests to stress the system in repeated attempts to reproduce the problems encountered at Olympic or to determine if other problems might exist. As part of the test, multiple errors were incorporated into many of the processes, especially the Historic process, but no problems were found that were not properly handled by the system. See attached document titled "Olympic Software Review."

Extensive system stress tests and software investigations verified that the software package utilized by the Olympic SCADA system is viable and should be a dependable platform to monitor the Olympic Pipe Line systems. System tuning recommendations were made as a result of the software review and system tests. These adjustments are minor in nature, but tuned the system to better handle unexpected process loads. All tuning recommendations were completed by July 27, 1999. See attached document "Olympic Process Priorities" and "Olympic Queue Data."

2. **Move the PLDS interface application to the backup computer**

A significant recovery of CPU resources would be gained if this data transfer application was moved to the backup SCADA system.

Status:
The data transfer application that serves the PLDS application was moved to the backup SCADA system Thursday, June 24, 1999. Extensive testing was accomplished and the resource savings were verified to be 25% - 30%. This resource recovery was important to assure there was sufficient processor power available to handle unexpected loads. However, since the PLDS application must be run at a reduced sensitivity on the backup SCADA system, this was considered to be only an interim measure. The PLDS interface was returned to the primary computer after the hardware updates were completed on July 26th.

3. **Upgrade the Computer System hardware**

It was recommended that an upgrade of the VAX hardware be purchased and installed to provide additional CPU resource to meet extraordinary demands.

Status:
The hardware to update the existing pair of Digital VAX 4000-300 computers to Digital VAX 4000-705 computers was purchased. This upgrade increases the CPU rating 750% and significantly increases the amount of reserve processing power available. The new computer hardware was delivered Monday, July 19, 1999 with the installation of the first upgrade accomplished on Tuesday July 20, 1999. After hardware and software evaluations verified that the new system was completely compatible and ready for service, it was installed as the prime computer system with one of the existing computers remaining in a hot backup mode. The final computer hardware upgrade was accomplished Monday July 26th. A wide variety of diagnostics and performance evaluations have been completed and this hardware platform has performed satisfactorily. The PLDS interface application was reinstalled onto the

primary computer system and additional performance evaluations were conducted. The results show that with a full load and the PLDS interface adjusted for optimum performance, the computer hardware is operating with the processor running at idle 87% of the time. See attached document titled "Olympic System Statistical Results."

4. **Update various VMS and Vector parameters**

There were some recommended additional updates to various parameters utilized by the Vector application and the VMS operating system. The system was found to be in excellent shape, and these recommendations were minor adjustments to tune the system to better utilize the available resources.

Status:

All recommendations were implemented Sunday, June 27, 1999. The result of these changes was the recovery of approximately 5% of the CPU resource. See attached document titled "Olympic SCADA System Observations and Recommendations."

III. Summary of the Olympic Computer System Condition

A great deal of analysis and evaluations have been completed on the SCADA system utilized by the Olympic Control Center. All of these tests appear to validate the fact that the system is operating with a very stable hardware platform and software package. It is apparent that the June 10, 1999 computer problem was not caused by a single hardware or software problem, but rather a combination of situations that required more processing power than was available.

A. Computer Hardware

The Olympic Control Center is now utilizing upgraded computer hardware that exceeds the requirements of the SCADA system. This hardware platform has undergone extensive testing and was found to be very stable with excess processing power. Hardware enhancements and the VMS operating system tuning adjustments have increased the average reserve processor resources to 87%. This upgrade will provide a large amount of reserve resources comparable with SCADA systems of much larger pipeline systems. These additional resource reserves should be more than sufficient to maintain consistent, stable operations.

B. Computer Software

Extensive tests have shown the software utilized by the Olympic Control Center to be very stable. Enhancements and tuning adjustments have been installed to assure continued proper performance during unexpected increases in computer resource demands. No major software problems were found and it is reasonable to expect the software to be capable of providing excellent service.

IV. Attachments

1. **Olympic SCADA System Observations and Recommendations**
   Results of the system evaluations by NeoNet Inc.
2. **Olympic Software Review**
   Results of the software evaluations by individuals employed by Equilon Pipeline Company LLC.
3. **Olympic Process Priorities**
   Recommended Priority Adjustments by individuals employed by Equilon Pipeline Company LLC.
4. **Olympic Queue Data**
   Recommended Queue size Adjustments by individuals employed by Equilon Pipeline Company LLC.
5. **Olympic System Statistical Results**
   Results of System Statistics from the OpenVMS Monitor Utility

Olympic SCADA System Observations and Recommendations

Made on June 26 & 27, 1999

Diagnostics and System Observations requested by B. L. Burns of Equilon Pipeline Company LLC and accomplished by P. K. Zimmerman, NeoNet Inc.

1. Pagefile space is overallocated. (Reservable shows 120000 blocks negative.) Recommend extending DIA2:[PAGEFILE]PAGEFILE2.SYS to 300,000 blocks from present 100,000.
   Reason: A negative "reservable" means that all processes which have been allocated pagefile space have received, in total, more than the total pagefile space available. If all processes, or a significant number of the total, were to take their allocation simultaneously, then available pagefile space would drop too low, and the entire operating system would slow down significantly.

2. Non-paged dynamic memory pool is too low. This pool is used dynamically to create various memory structures and the number of bytes spare changes constantly and rapidly. It is best to maintain at least 50% of the base allocation free. Currently, the base allocation shows 700,000 free out of 3,150,000. Recommend increasing Sysgen parameter NPAGEDYN to 8153920 (which will provide more than 50% free since this system has considerable free memory available.) Recommend increasing NPAGEVIR to 16615680 from its present 12615680 (this is the reserve quantity that can be allocated by VMS if the base allocation is exceeded, but at the cost of some cpu time.)

3. Cpu loading is high with the PLDS Server process running on the prime machine. This is the third party line/meter integrity product which runs external to Vector itself, but reads Vector databases at frequent intervals. Observing cpu loading, idle time percentage, kernal mode percentage, direct and buffered I/O, and command line response time, the system as a whole appears to be 75-80% loaded on average (over a long period of time) with the PLDS server running on the prime, and 40-50% loaded with the PLDS server running on the backup machine. At 75 to 80% loading, the system lacks reserve to handle sudden and unexpected loads (looping processes, impromptu heavy disk I/O, simultaneous change in a large number of scan data points, etc.) without a noticeable reduction in performance to the users. At 40-50% loading, most unexpected situations should be covered by the available cpu reserve. Recommend running the PLDS server on the backup machine with provision to generate alarms for the controller without direct output from the server to Vector.

4. Direct I/O rates appear nominal for the RF31 DSSI type disks in use. Peak usage averaged ~ 30 operations per second and this rate appeared only as occasional bursts. The only major user of direct disk I/O was the SY$DSKUPD process which writes copies of the databases in memory to disk at user-specified intervals. Since the disk I/O rate is within the capabilities of the disk hardware, there is no need to adjust those user-specified intervals.

5. Buffered I/O (largely network traffic) rates appear nominal, even with a three second screen refresh rate on all the mmi's. The only two heavier users of network I/O are the RD$XMT process which keeps the databases on the backup machine updated continuously, and the PLDS Server. Total network I/O does not appear to be excessive for the hardware in use, even with the PLDS Server running on the prime computer.

6. Several additional SYSGEN parameters should be adjusted, although none would immediately affect system performance:

a. The memory management set by which VMS recovers pages of memory when the free list has dropped too low is presently:

FREELIM 150
FREEGOAL 12000
BORROWLIM 150
GROWLIM 150

Recommend changing to:
FREELIM 20000
FREEGOAL 42400
BORROWLIM 35600
GROWLIM 30800

This allows VMS to take action long before the size of the free list is so low that a system lockup could occur. IT SHOULD BE NOTED HOWEVER, THAT THIS SYSTEM HAS A VERY LARGE QUANTITY OF FREE MEMORY AVAILABLE (350,000 PAGES +). It is very unlikely that the free list on this system would ever become small enough to require memory recovery action.

b. QUANTUM is presently set to 20. Recommend changing to 10. This allows better sharing of available cpu time by systems having large numbers of processes and few or no large batch type jobs.

c. MPW_THRESH is presently set to 200. Recommend changing to 22520. This is the minimum value in pages on the modified page list before the memory recovery routines will attempt to satisfy the freelist shortfall by taking those pages from the modified list. If MPW_THRESH is at least the difference between FREE LIM and FREEGOAL, plus the value of MPW_LOLIMIT, then memory recovery will not take place from the modified list until sufficient pages are available to resolve the freelist shortfall in one operation.

d. A global page summary command showed 21000 global pages free out of 76000 total. Recommend changing the SYSGEN parameter GBLPAGES from its present 76900 to 110000 to allow for 50% free pages. As a consequence of that increase, recommend changing the parameter GBLPAGFIL from its present 10240 to 50000. This will allow for significant additional numbers of records to be added to any of the Vector databases.

7. A review of the VMS hardware error log showed no hardware failures except for a few tape drive errors when writing backup tapes. This is normal for these tape drive models (TK70 and TU81) and is completely external to the VAX system as a whole. While it is normal to find error messages indicating automatic bad block replacement on DSSI disks, none were found on this system.

8. Free disk space was quite adequate on all three main disks. Version control of files having the same name, and purging of extraneous files in key directories appeared to be in good order.

9. Examination of the DecNet circuit and line counters showed normal network connectivity from the Vaxes. No framing errors, excess collisions, unrecognized destinations, or adjacency failures were evident.

All Vector processes were set to non-realtime priorities. The ET$XMTxxx processes were set to the top quantum based priority (15), the same as the RD$RCV and RD$XMT processes which maintain the dialog between primary and backup as well as updating the databases between the same. Recommend setting the ET$XMTxxx processes' base priority to 13, as a match to the other two processes which make up an mmi (the PC$KEYxxx process runs at a base priority of 12, and the PC$DYNxx process runs at 14.)

OLYMPIC SOFTWARE REVIEW
July 14, 1999

1 General

The software support group of Equilon Pipeline Company LLC performed a review of the pipeline control software of the Olympic Pipe Line Company. An image copy of a disk containing the pipeline control system was sent to Equilon and was installed on one of the Equilon development computers. This was possible since Equilon is running similar software, but a different version, provided by the same software vendor. The Olympic version was tested. Many attempts were made to duplicate the performance anomaly experienced by Olympic on June 10, 1999. No performance anomalies could be created on the Olympic system running on the Equilon computer.

2 General Test Information

There are two likely reasons why these tests were negative: 1) The Equilon computer is a VAX 6000 rated at 35 VUP's versus the Olympic VAX 4000 rated at 6 VUP's. 2) The Equilon computer was not loaded with normal scan loading. Limited data processing was simulated using a utility provided by the software vendor.

3 Test Details

One of the possible scenarios regarding the Olympic performance anomaly involved the Historic process, its database and its linkage to the Analog database which was queuing information to the Historic process. The prime concern was that some fields may have had unknown errors and that error processing could have contributed to the computer anomaly. At Equilon, scripts were prepared to simulate scan data inputs to the analog processor. Three groups of scripts placed 43 points in ramped data loops inputting data to the analog process once per second. Various database entry errors were made, individually and in combination. In all cases, appropriate error processing occurred without any significant performance anomaly.

4 Proposed System Adjustments

In analyzing the Olympic system and comparing it to Equilon's system, there were some areas where modifications/adjustments could be made to upgrade the system. These areas involve parameter adjustments and future configuration changes. No specific recommendations for software modifications were indicated by the tests at Equilon.

4.1 Parameter Adjustments

Parameter changes are suggested to be made via the SCADA software system generation program, VGEN. Areas of interest are: 1) process priority, 2) interprocess queue sizes, 3) future configuration changes listed to enhance performance and redundancy, and 4) other system management changes.

4.1.1 Suggested VGEN Priority Changes

Attachment 3 is a spreadsheet, **Olympic Process Priorities**, indicating current and suggested priority adjustments. These suggestions are made based upon the experience with the Equilon system, which, while different in version and scale, has significant similarities with Olympic's system since both have their roots with the same software vendor. The philosophy in setting these priorities is to have processes which empty queues have a higher priority than those processes which fill the queues.

4.1.2 Suggested Number of Queue Entries

Attachment 4 is a spreadsheet, **Olympic Queue Data**, indicating current and suggested values for the number of queue entries for the various queues. It is important in a queue driven system that enough queue entries are available when needed, especially in times of high computer activity. For example, when communication is intermittent, all records on the intermittent channels must be processed, even though their values may not have changed in the field. In addition, secondary processing will have data queued to them, as well. Also, if queues overflow, then additional error processing is required, further loading the computer. Again, these suggestions are based upon experience with the Equilon computers, running similar software.

4.1.3 Future Configuration Changes

Future configuration changes are suggested for a natural evolution from the current configuration to a possible future configuration. These changes are described in the following categories: 1) near term, 2) secondary changes, and 3) futures changes.

4.1.3.1 Near Term Configuration Changes

In the near term, faster computer hardware of the same type should be obtained so that minimal impact is made to the software. This change is already in progress, and will increase the performance rating from 6 VUPS to 45 VUPS. This will immediately provide for more analysis and corrective action to be possible in cases of anomalous operation. In addition, a terminal set to a high VMS priority (28-31) should be maintained, so that processes can be stopped and revived, taking advantage of the flexibility designed into the system.

4.1.3.2 Secondary Configuration Changes

A secondary change is suggested which would use a later version of backup redundancy provided by the software vendor and used by many control systems including Equilon. This redundancy system is call Distributed Network Option (DNO). In this system, the backup computer is processing live raw data provided by the prime system. A failover to the backup takes only a few seconds since all first pass processing has already been done. All scanning, MMI and logging functions are available immediately using the full power of the computer. This change is more complex and would require considerable planning to accomplish as a rolling upgrade, that is, an upgrade with no control center down time. This configuration offers sufficient benefits to justify its consideration.

4.1.3.3 Future Configuration Changes

The two previous suggested changes do not affect the core SCADA software and do not require a version change, only configuration changes. However, significantly faster hardware is now available which can run a slightly later version of the SCADA software. This would replace the existing VAXes with Alphas from the same computer vendor. This change also has been made by many pipeline companies as well as Equilon. With Alphas, a triple redundant configuration, as Equilon uses, might be considered. This approach also would pave the way for the utilization of future versions of the vendor's SCADA product as it evolves.

4.1.4 System Management Changes

Some system management changes are suggested. One change is to increase the number of versions saved for some files containing logs and histories of operation, which will enhance any after-the-fact analysis. These changes are listed below. These include error logs and event files. The version limits on these files must be checked/set periodically so that they remain in force.

4.1.4.1 VCS$SYSTEM: ERROR.DAT = 25
4.1.4.2 SYS$MANAGER:ACCOUNTNG.DAT = 10

5 Notes on PIC files

A quick check was made on 1282 PIC files in the system directory using the READPIC utility. The following is a list of PIC files with possible problems. All of these PIC files were called up on our test system with no performance anomalies noted. It is suggested that these files be reviewed and checked. Any PIC file not currently required should be moved to another directory.

5.1 PIC files with 9 or greater character length:

5.1.1 AASANAU2K.PIC
5.1.2 COMMHELPX.PIC
5.1.3 CRKAMLIN2.PIC
5.1.4 SYSMAPPC9.PIC
5.1.5 SYSRPT_15.PIC
5.1.6 USWWACLOUD.PIC

5.2 PIC files Referencing Non-Existent .GIF files

5.2.1 DAN.PIC
5.2.2 DAN1.PIC
5.2.3 DAN2.PIC
5.2.4 DAN3.PIC
5.2.5 DAN4.PIC
5.2.6 DAN5.PIC

5.2.7 DANMAP.PIC
5.2.8 RONMAP.PIC

5.3 PIC Files with Dynamic Packet Errors

5.3.1 CPFER1.PIC
5.3.2 FER1.PIC
5.3.3 RTMLOLD.PIC
5.3.4 RTU2U3.PIC
5.3.5 S03ADOWN.PIC
5.3.6 S03AUPLD.PIC
5.3.7 STAFE.PIC
5.3.8 STAFENEW.PIC
5.3.9 STARTML.PIC
5.3.10 STARTNEW.PIC
5.3.11 TEMPFE.PIC

5.4 PIC Files with Zero Length Records

5.4.1 SHD4TO56.PIC
5.4.2 SHD5TO46.PIC
5.4.3 SHD6TO45.PIC
5.4.4 SHDDEF.PIC
5.4.5 SYSSHAD.PIC

5.5 PIC Files with Known Errors

5.5.1 ACCUMULA.PIC
Packet with Offset = 109 should be single precision floating point, not double precision. Data entry will overwrite offset 113, the Current Accumulator Total.

5.5.2 ACCDEF.PIC
Packet with Offset = 109 should be single precision floating point, not double precision. No data entry defined but type is wrong.

5.5.3 ANADEF.PIC
The data entry word for the Historic Record Id is HIST which is the same as for the H bit in the status word. Change the data entry

word for the Historic Record Id to HREC. Then the field will be editable from the def page.

5.6 Gas Application PIC files.

5.6.1 DAC*.PIC Daily Accumulation Gas Applications.
5.6.2 HAC*.PIC Hourly Accumulation Gas Applications.

OLYMPIC PROCESS PRIORITIES

7/14/99

RECORD ID	CURRENT PRIORITY	PROPOSED CHANGE	
AE$DLTEVT	8		
AE$EVTARC	6		
AE$HRNTMR	13		
AE$MAIN	13	12	Reduce to allow DP to run effeciently
AE$SDMPIO	8		
BC$CHART	6		
CN$ANALOG	13		
CN$AUTTIM	13		
CN$CONDIS	13		
CN$DISCRE	13		
CN$DWNLOD	13		
CN$EXEC	13		
CN$MANUAL	13		
CN$REPORT	13		
CN$UPLOAD	13		
CS$STAPRC	11		
DA$EXEC	10		
DA$SCAN01	10		
DA$TIMER	9		
DP$ACC	11		
DP$ANA	11		
DP$APIAN	11	12	* Allow sub processes to unload queues
DP$BCDACC	11	12	*
DP$BLOCK	11		
DP$BTCDIS	11	12	*
DP$CAAC	11	12	*
DP$CAAN	11	12	*
DP$CADI	11	12	*
DP$CALC1	11		
DP$CALSWP	14		
DP$CATNK	11	12	*
DP$CONFIG	11		
DP$CTIMER	11		
DP$DIS	11		
DP$DISCTL	11	12	*
DP$FPAN	11	12	*
DP$IEEEAN	11	12	*
DP$NETBBL	11		
DP$PCALC	11	12	*
DP$PROD	10	12	*

DP$PVCL	10		
DP$TNK	11		
DP$UPLDIS	11	12	*
DS$AEECHO	13		
DS$CLOCK	12		
DS$DYNAMI	13		
DS$ECHO	13		
DS$KBDRVR	13		
DS$SYSTEM	13		
DS$TRNTMR	12		
ER$QUEPRC	5		
ET$XMITER	15		
ET$XMTXX	13	15	Give MMI ouput highest priority.
FASAMP	10		
FR$CALC	11		
HI$ARCHV	8		
HI$AVG	12		
HI$EQUAL	13		
HI$INS	12		
HI$MAX	8		
HI$MIN	8		
HI$ROC	8		
HI$SNP	8		
HI$STORIC	12		
HI$SUM	8		
HI$TMR	8		
LD$BATCH	6		
LG$LOG01	8		
LG$PRNTR	9		
LG$SYSTEM	8		
OP$ACK	13		
OP$CAROSL	13		
OP$CLR	13		
OP$DBMENU	13		
OP$DISP	13		
OP$DC	13		
OP$DOWN	13		
OP$DWNLOD	13		
OP$FEDIT	13		
OP$HELP	13		
OP$HRDCPY	13		
OP$KBPRCR	13		
OP$LOGOFF	13		
OP$LOGON	13		
OP$PASSWD	13		
OP$PBAK	13		
OP$PFCR	13		
OP$PRINT	13		
OP$PRCG	13		

OP$RECALC	13		
OP$RECALL	13		
OP$REFSH	13		
OP$REPORT	13		
OP$SEL	13		
OP$SHTDWN	13		
OP$SILN	13		
OP$SLTMR	13		
OP$SWITCH	13		
OP$TBAK	13		
OP$TFOR	13		
OP$TOUCH	13		
OP$TRD	13		
OP$TREND	13		
OP$TTAB	13		
OP$UP	13		
OP$VGMENU	13		
OP$WAKE	13		
PC$DYNXX	14	12	Lower packet processing below KB and IO functions.
PC$HCTMR	6		
PC$KEYXX	12	14	Accept KB when packet processing is busy.
RD$RCV	15		
RD$TIMRCV	8		
RD$TIMXFR	8		
RD$TRNMIT	8		
RD$XMT	15		
SP$SPCSUM	10		
SR$AEFOR	6		
SR$MDTR	6		
SR$MFOR	6		
SR$MLINE	6		
SR$OLLOG	6		
SR$REQST	6		
SR$REQUES	6		
SR$SCHED	6		
SR$SEATAC	6		
SY$DSKUPD	6		
SY$FILTIM	6		
SY$SYSINT	6		
U$UCLUPDAT	10		
VO$CALC	6		
XX$MAIN	4		

OLYMPIC QUEUE DATA

7/14/99

NOTE: Sized to offload error processing by reducing queue full errors.

VCSID	RECORD ID	NAME	NUMBER OF RECORDS	PROPOSED CHANGE	TYPE	RECORD SIZE	PROCESS ENABLE
803	AE$DLTEVT	LTVENT_Q	200		4	27	1
802	AE$EVTARC	AEARCH_Q	100		4	27	1
800	AE$MAIN	NWVENT_Q	450		4	20	1
800	AE$MAIN	ACKVNT_Q	96		4	20	1
402	CN$ANALOG	CACONTRO	10	40	4	11	1
405	CN$CONDIS	CDCONTRO	5	40	4	11	1
401	CN$DISCRE	DICONTRO	5	40	4	11	1
404	CN$DWNLOD	DNCONTRO	10	40	4	11	1
400	CN$EXEC	CONTROLQ	20	40	4	11	1
403	CN$MANUAL	MNCONTRO	10	40	4	11	1
406	CN$REPORT	RPCONTRO	10	40	4	11	1
407	CN$UPLOAD	UPCONTRO	10	40	4	7	1
600	CS$STAPRC	COMSTATQ	250		4	4	1
700	DA$EXEC	REQUESTQ	20		4	6	1
701	DA$SCANXX	SEQUENXX	20	40	4	5	1
701	DA$SCANXX	CONTROXX	30		4	14	1
701	DA$SCANXX	CRITICXX	10		4	5	1
2000	DP$ACC	ACCUMULA	100		4	8	1
2100	DP$ANA	ANALOG	450		4	8	1
2160	DP$APIAN	DPAPIANA	25	40	4	90	1
2020	DP$BCDACC	CABCDACC	50		4	117	1
2500	DP$BLOCK	BLOCK	20		4	70	1
2240	DP$BTCDIS	BTCDIS	10	40	4	64	1
2010	DP$CAAC	CAACCUMU	50		4	117	1
2110	DP$CAAN	CAANALOG	150		4	90	1
2210	DP$CADI	CADISCRE	750		4	64	1
2300	DP$CALC1	CALCULQ	50		4	17	1
2300	DP$CALC1	CRTCALCQ	50		4	17	1
2340	DP$CALSWP	CALSWAPQ	25		4	7	1
2410	DP$CATNK	CATANK	50		4	145	1
2200	DP$DIS	DISCRETE	3000		4	8	1
2230	DP$DISCTL	DISCTL	30	40	4	64	1
2120	DP$FPAN	FPANALOG	16	40	4	90	1
2121	DP$IEEEAN	IEEEANLG	16	40	4	90	1
5400	DP$NETBBL	NETBBL_Q	100		4	9	1
2211	DP$PCALC	PCDISCRE	50		4	9	1
2070	DP$PROD	PRODUC_Q	100		4	145	1

2213	DP$PVCL	POSTVCLQ	16	40	4	9	1
2400	DP$TNK	TANK	30	50	4	9	1
2220	DP$UPLDIS	UPLDIS	20	40	4	64	1
1060	DS$AEECHO	AEECHO_Q	400		4	26	1
1000	DS$SYSTEM	CRTRQ	64		4	12	1
0	ER$QUEPRC	ERROR_Q	100		4	8	1
1101	ET$XMTXX	XMITQXX	200		4	362	1
1101	ET$XMTXX	DSUQXX	1		4	81	1
3463	FASAMP	FASAMP_Q	5		4	1803	1
903	HI$AVG	HISTAVGQ	50		4	70	1
940	HI$EQUAL	HIEQUALQ	200		4	114	1
901	HI$INS	HISTINSQ	100		4	70	1
904	HI$MAX	HISTMAXQ	50		4	70	1
905	HI$MIN	HISTMINQ	50		4	75	1
907	HI$ROC	HISTROCQ	50		4	70	1
902	HI$SNP	HISTSNPQ	50		4	70	1
920	HI$STORIC	HISTORIC	450		4	10	1
906	HI$SUM	HISTSUMQ	50		4	70	1
960	HI$TMR	HISTEODQ	7		4	3	1
960	HI$TMR	HISTQ	2		4	31	1
1401	LG$LOG01	LGR_01	20		4	23	1
1402	LG$LOG02	LGR_02	200		4	23	1
1463	LG$PRNTR	LOG_QUE	40		4	23	1
1400	LG$SYSTEM	LOGRQ	50		4	4	1
1205	OP$ACK	ACK_Q	16		4	32	1
1242	OP$CAROSL	CAROSL_Q	20		4	32	1
1201	OP$CLR	CLR_Q	16		4	32	1
1239	OP$DBMENU	DBMENU_Q	64		4	32	1
1239	OP$DBMENU	DBMENUQ	64		4	55	1
1203	OP$DISP	DISP_Q	16		4	32	1
1226	OP$DO	DO_Q	16		4	32	1
1226	OP$DO	PRCDO_Q	16		4	3	1
1232	OP$DOWN	DOWN_Q	10		4	32	1
1222	OP$DWNLOD	DWNLOD_Q	16		4	32	1
2863	OP$FEDIT	FEDIT_Q	16		4	32	1
1223	OP$HELP	HELP_Q	16		4	32	1
1216	OP$HRDCPY	HRDCPY_Q	10		4	32	1
1200	OP$KBPRCR	KBPQUE	16		4	32	1
1209	OP$LOGOFF	LOGOFF_Q	5		4	32	1
1206	OP$LOGON	LOGON_Q	5		4	32	1
1208	OP$PASSWD	PASSWD_Q	1		4	32	1
1211	OP$PBAK	PBAK_Q	16		4	32	1
1210	OP$PFOR	PFOR_Q	16		4	32	1
1213	OP$PRINT	PRINT_Q	10		4	32	1
1207	OP$PROG	PROG_Q	16		4	32	1
1225	OP$RECALC	RECALC_Q	16		4	32	1
1219	OP$RECALL	RECALL_Q	10		4	32	1
1218	OP$REFSH	REFSH_Q	16		4	32	1
1204	OP$REPORT	REPORT_Q	16		4	32	1

1202	OP$SEL	SEL_Q	16		4	32	1
1220	OP$SHTDWN	SHTDWN_Q	2		4	32	1
1217	OP$SILN	SILN_Q	16		4	32	1
1221	OP$SWITCH	SWITCH_Q	16		4	32	1
1234	OP$TBAK	TBAK_Q	16		4	32	1
1233	OP$TFOR	TFOR_Q	16		4	32	1
1236	OP$TOUCH	TOUCH_Q	16		4	32	1
1237	OP$TRD	TRD_Q	12		4	32	1
1237	OP$TRD	TRDH_Q	12		4	32	1
1237	OP$TRD	TRDPNT_Q	12		4	32	1
1215	OP$TREND	TREND_Q	16		4	32	1
1235	OP$TTAB	TTAB_Q	10		4	17	1
1231	OP$UP	UP_Q	10		4	32	1
1245	OP$VGMENU	VGMENU_Q	10		4	32	1
1227	OP$WAKE	WAKE_Q	0	10	4	17	1
1002	PC$DYNXX	DYNXX_Q	25		4	12	1
1002	PC$DYNXX	REFXX_Q	75		4	12	1
1009	PC$KEYXX	PCKYBXX	200		4	2	1
1301	RD$TRNMIT	REDCRITQ	150		4	6	1
1301	RD$TRNMIT	REDUPDQ	100		4	2	1
1301	RD$TRNMIT	REDCRTQ	5		4	3	1
1300	RD$XMT	REDQUEQ	200		4	320	1
1300	RD$XMT	REDCRITQ	50		4	7	1
1300	RD$XMT	REDUPDQ	40		4	3	1
1300	RD$XMT	REDCRTQ	10		4	4	1
1500	SP$SPCSUM	SPSUM_Q	200		4	11	1
2707	SR$AEFOR	ALMEVNTQ	16		4	48	1
2704	SR$MDTR	METHQD	32		4	46	1
2703	SR$MFOR	METHQF	16		4	46	1
2703	SR$MFOR	SRFOR_Q	16		4	46	1
2710	SR$MLINE	MAINLDQ	16		4	48	1
2712	SR$OLLOG	OLLOGFTQ	16		4	48	1
2713	SR$REQST	REQSTDQ	16		4	48	1
2701	SR$REQUES	SRKYBD	16		4	148	1
2701	SR$REQUES	SRVDBCS	16		4	4	1
2700	SR$SCHED	SRSCHEDQ	4		4	4	1
2711	SR$SEATAC	SEATACFQ	16		4	27	1
0	SY$DSKUPD	DISKUPDQ	100	200	4	2	1
0	SY$DSKUPD	CRITUPDQ	100	200	4	3	1

OLYMPIC SYSTEM STATISTICAL RESULTS

OpenVMS Monitor Utility
SYSTEM STATISTICS
on node OLY01
SUMMARY

From: 26-JUL-1999 12:04:58
To: 26-JUL-1999 13:06:49

	CUR	AVE	MIN	MAX
Interrupt Stack	1.50	3.19	0.00	14.50
MP Synchronization	0.00	0.00	0.00	0.00
Kernel Mode	3.00	2.99	0.00	15.50
Executive Mode	1.00	0.09	0.00	14.50
Supervisor Mode	0.00	0.00	0.00	2.50
User Mode	5.00	6.46	0.00	19.50
Compatibility Mode	0.00	0.00	0.00	0.00
Idle Time	89.50	87.25	41.50	100.00
Process Count	189.00	188.04	188.00	189.00
Page Fault Rate	0.00	54.09	0.00	1788.50
Page Read I/O Rate	0.00	0.07	0.00	43.00
Free List Size	340653.00	357748.81	349374.00	358814.00
Modified List Size	50044.00	49967.53	48952.00	50263.00
Direct I/O Rate	58.50	2.26	0.00	53.50
Buffered I/O Rate	40.50	175.48	2.50	76[illegible].00

SUMMARIZING

Attachment 5
(Olympic System Statistical Results)