Peeking into Windows to Improve your SAS Performance

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Overview

Getting the most from SAS on the Windows platform requires understanding SAS and how it behaves in a Microsoft Windows environment.

If performance problems arise with your SAS jobs, what information sources are available to determine the cause?

From the SAS application perspective, this presentation will cover accessing the following:

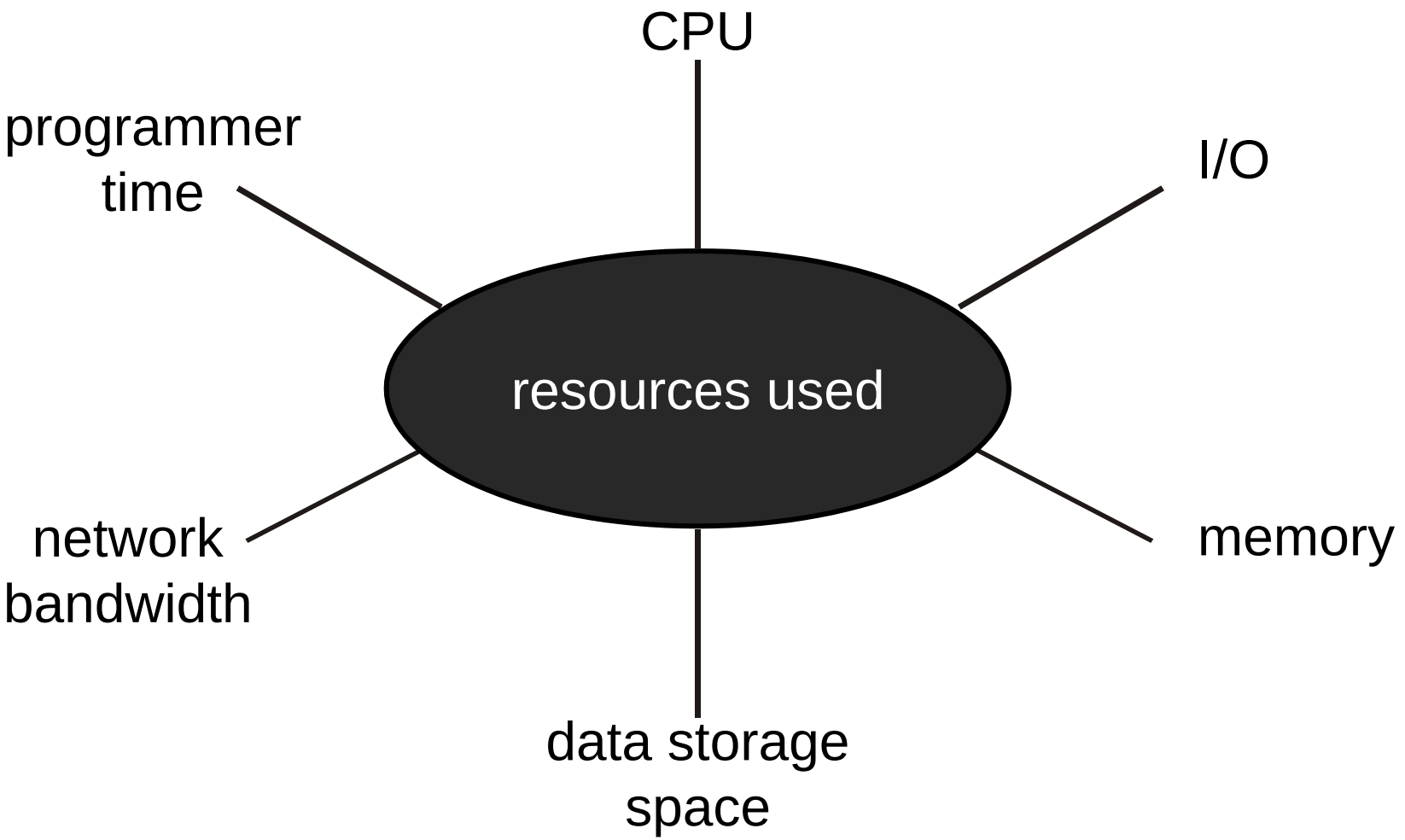
- SAS Logging information
- SAS Options
- Windows System Configuration Information
- Microsoft Windows Performance Metrics

SAS is also useful for gathering and analyzing this information.

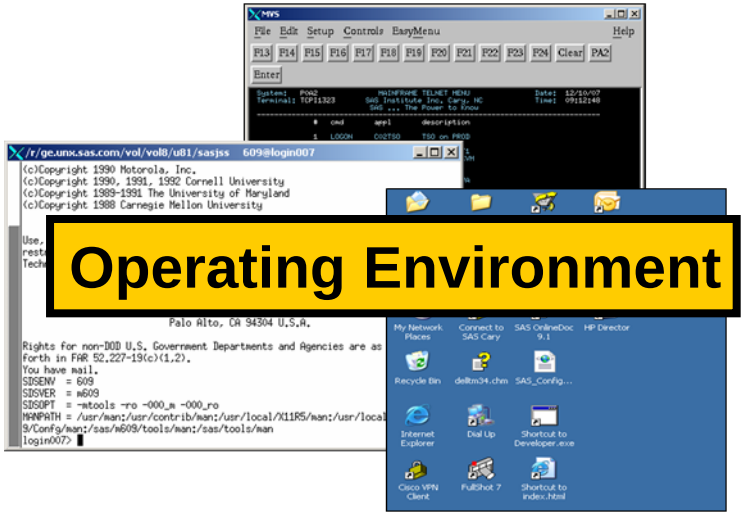
The use of newer Windows performance monitoring tools like RESMON will also be discussed.

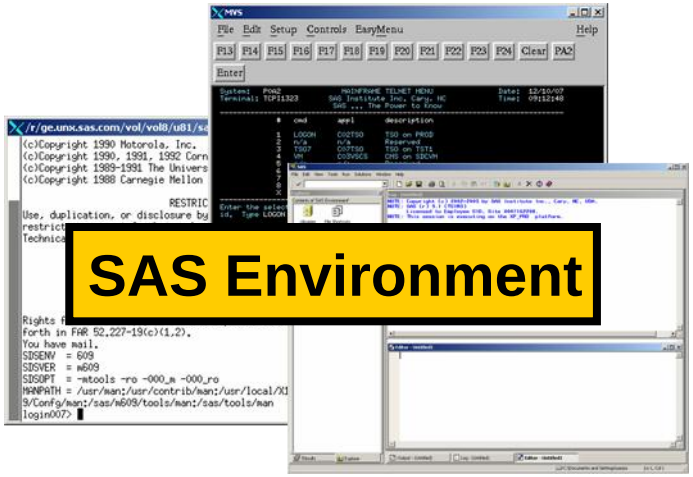
This introductory tutorial will provide you with the tips and techniques needed to begin your journey toward a better understanding of information related to SAS performance on Windows.

Resource Overview



Understanding Efficiency at Your Site





Sources of Information Accessible by SAS

- Logging
- Options
- Configuration Information
- PerfMon
- Miscellaneous

SAS Logging

"C:\Program Files\SASH93\SASFoundation\9.3\sas.exe"

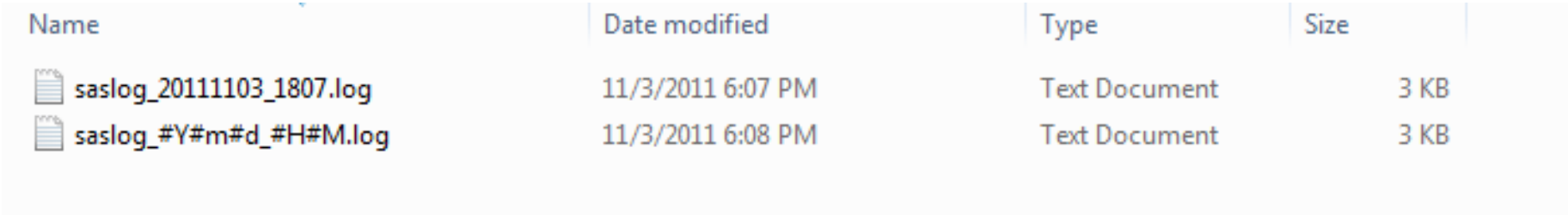
-CONFIG "C:\Program Files\SASH93\SASFoundation\9.3\nls\en\sasv9.cfg"

-log "c:\mpw\logdata\SASLOG_#Y#m#d_#H#M.log"

-logparm "rollover=session"

-altlog "c:\logs\sasprg1.log"

-FULLSTIMER



Name	Date modified	Type	Size
saslog_20111103_1807.log	11/3/2011 6:07 PM	Text Document	3 KB
saslog_#Y#m#d_#H#M.log	11/3/2011 6:08 PM	Text Document	3 KB

```
NOTE: Log file opened at Wed, 26 Oct 2011 13:55:32.345
NOTE: SAS initialization used:
      real time               3.30 seconds
      user cpu time           0.56 seconds
      system cpu time         0.68 seconds
      memory                  5320.28k
      OS Memory               6072.00k
      Timestamp               10/26/2011 01:55:34 PM
```

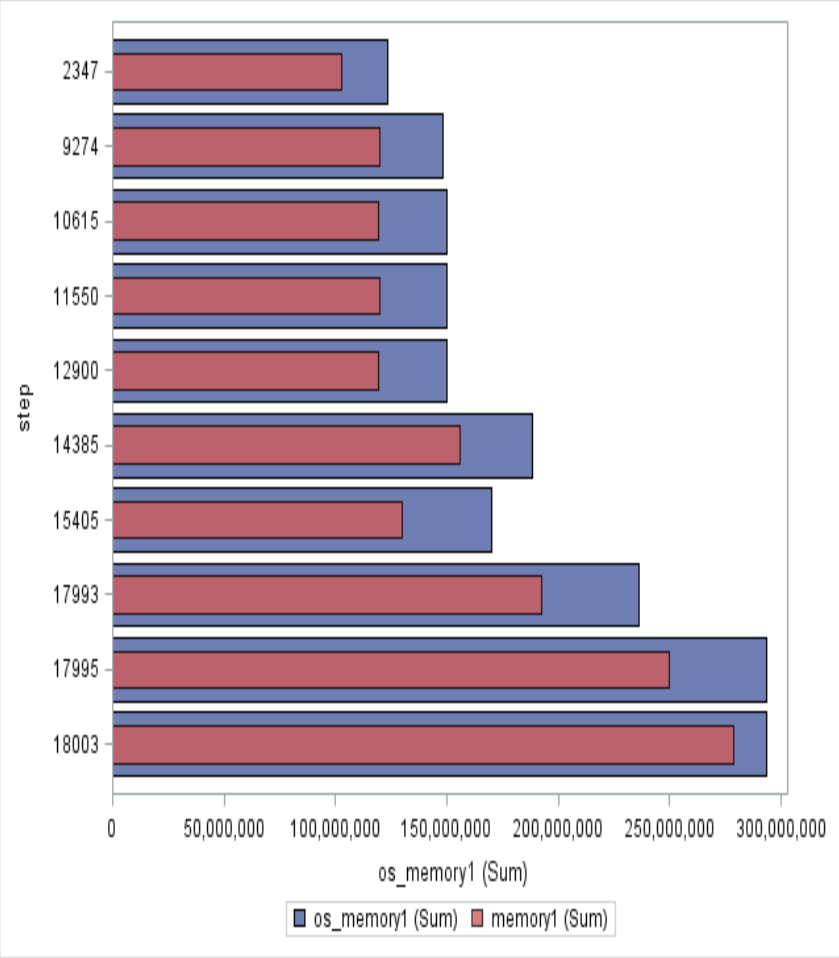
If the Real time and total CPU time are usually within 15% of each other, this is a general indication that the system is moving data well…

More about the FULLSTIMER SAS Option

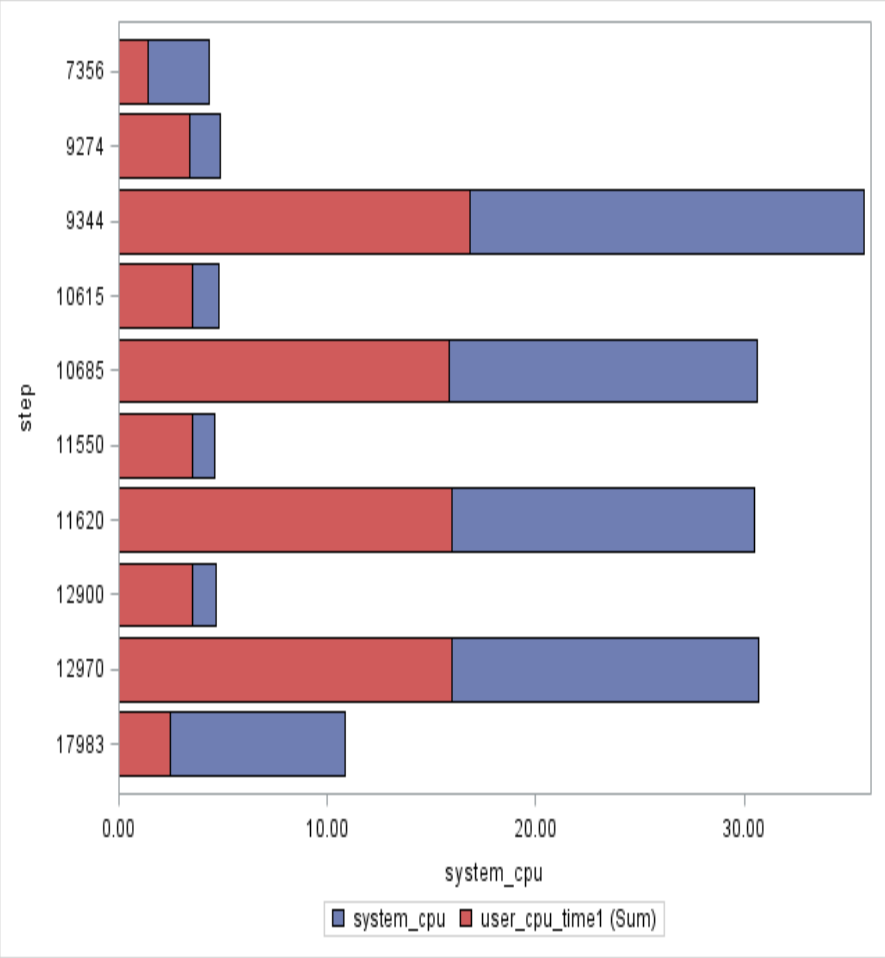
http://support.sas.com/rnd/scalability/tools/fullstim/index.html

Parsing Windows SAS Log

Memory Utilization

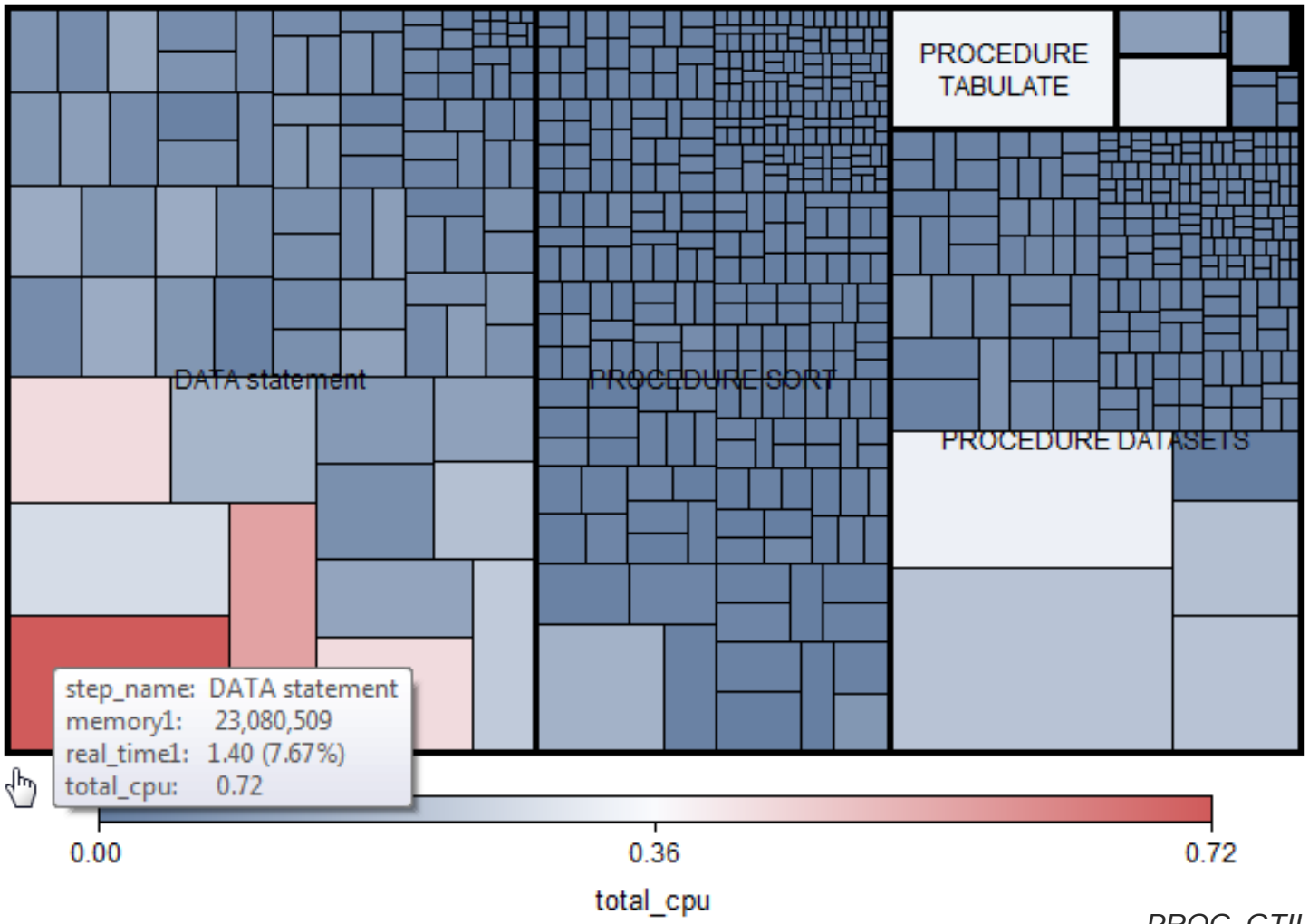


CPU Utilization



PROC SGPLOT;

Parsing Windows SAS Log



PROC GTILE;

SAS Options

PROC OPTIONS GROUP=PERFORMANCE;

```
BUFNO=1             Number of buffers for each SAS data set
BUFSIZE=0           Size of buffer for page of SAS data set
COMPRESS=YES        Specifies whether to compress observations
CPUCOUNT=8          Number of processors available.
NODBIDIRECTEXEC     Do not use SQL optimization with SAS/ACCESS engines
SORTSIZE=419430400  Size parameter for sort
THREADS             Threads are available for use
MEMSIZE=2147483648  Specifies the limit on the total amount of memory
```

. . . Also PROC OPTIONS GROUP=MEMORY;

PROC OPTIONS OPTION=COMPRESS VALUE DEFINE;

```
Option Value Information For SAS Option COMPRESS
    Value: YES
    Scope: DMS Process
    How option value set: Options Statement

Option Definition Information for SAS Option COMPRESS
    Group= SASFILES
    Group Description: Library and member file information
    Group= PERFORMANCE
    Group Description: Performance settings
    Description: Specifies whether to compress
    observations in output SAS data sets
```

```
data _null_;
 memsize_value  = getoption('memsize');
 memsize_howset = getoption('memsize','howset');
 memsize_howscope = getoption('memsize','howscope');
 memsize_defaultvalue = getoption('memsize','defaultvalue');
 memsize_startupvalue = getoption('memsize','startupvalue');
 put memsize_value=;
 put memsize_howset=;
 put memsize_howscope=;
 put memsize_startupvalue=;
 run;
```

memsize_value=2147483648
memsize_howset=Config Files
memsize_howscope=SAS Session
memsize_startupvalue=2147483648

Also SORT and UTILLOC and more

Options Information in SAS Report Format

optname	default	startup	current	howset
bufno	1	1	1	Shipped Default
bufsize	0	0	0	Shipped Default
compress	NO	NO	YES	Options Statement
cpucount	1	8	4	Options Statement
sortsize	MAX	268435456	419430400	Options Statement
threads	THREADS	THREADS	THREADS	Options Statement
memsize	0	2147483648	2147483648	Config Files
memblksz	16777216	16777216	16777216	Shipped Default
memmaxsz	2147483648	2147483648	2147483648	Shipped Default

Microsoft .nfo Information File

msinfo32 /nfo syssum.nfo /categories +systemsummary

```
<?xml version="1.0"?>
<MsInfo>
<Metadata>
<Version>8.0</Version>
<CreationUTC>11/08/10 03:56:54</CreationUTC>
</Metadata>
<Category name="System Summary">
<Data>
<Item><![CDATA[OS Name]]></Item>
<Value><![CDATA[Microsoft Windows 7 Ultimate]]></Value>
</Data>
<Data>
<Item><![CDATA[Version]]></Item>
<Value><![CDATA[6.1.7600 Build 7600]]></Value>
</Data>
<Data>
<Item><![CDATA[Other OS Description ]]></Item>
<Value><![CDATA[Not Available]]></Value>
</Data>

...
```

Also see: MSCONFIG command

What is Powershell?

On 22nd October 2009 Microsoft released Windows Server 2008 R2 and Windows 7; PowerShell, version 2.0

"**Windows PowerShell** is one of my favorite tools to use for gathering information from my PC and network, and also for automating processes."

"I have used Windows PowerShell to automate some of my SAS-related processes, such as batch processing with SAS Enterprise Guide. **I've also used it within my development work to gather metrics about files, computers on the network, and running processes** -- all of which are interesting activities for a system administrator. Because Windows PowerShell allows you to gather different types of information and easily save it in CSV files, it's a convenient way to generate data sources for further analysis using SAS."

Running Windows PowerShell Scripts
Chris Hemedinger September 12, 2011
The SAS Dummy
A SAS® blog for the rest of us

Accessing Windows Objects with SAS

```
filename GetChip pipe "powershell -Command ""get-wmiobject win32_processor -
ComputerName . | Select-Object -Property [a-z]* """";

data _null_; infile GetChip; input; put _infile_; run;
```

```
Name                      : Intel(R) Core(TM) i5-2540M CPU @ 2.60GHz
Description               : Intel64 Family 6 Model 42 Stepping 7
CurrentClockSpeed         : 2601
DataWidth                 : 64
DeviceID                  : CPU0
ExtClock                  : 100
Family                    : 205
L2CacheSize               : 256
L3CacheSize               : 3072
Level                     : 6
LoadPercentage            : 36
MaxClockSpeed             : 2601
NumberOfCores             : 2
NumberOfLogicalProcessors : 4
Manufacturer              : GenuineIntel
...
```

```
filename GetProc pipe
  "powershell -Command ""get-wmiobject win32_process
     -filter name='"SAS.EXE"' | Select-Object -Property [a-z]* """";
```

```
Name                       : sas.exe
OtherOperationCount        : 10574
OtherTransferCount         : 158450
PageFaults                 : 47560
PageFileUsage              : 88032
ParentProcessId            : 1760
PeakPageFileUsage          : 89644
PeakVirtualSize            : 757379072
PeakWorkingSetSize         : 98384
...
```

Interesting System Objects

win32_operatingsystem

win32_processor

win32_logicaldisk

win32_process

win32_service

win32_product

cim_Physicalmemory

win32_quickfixengineering

System Information in SAS Report Format

OBJECT=CIM_Physicalmemory

OBJECT	token1	token2
CIM_Physicalmemory	BankLabel :	BANK 0
CIM_Physicalmemory	Capacity :	4294967296
CIM_Physicalmemory	Speed :	1333
CIM_Physicalmemory	BankLabel :	BANK 1
CIM_Physicalmemory	Capacity :	4294967296
CIM_Physicalmemory	Speed :	1333
CIM_Physicalmemory	BankLabel :	BANK 2
CIM_Physicalmemory	Capacity :	2147483648
CIM_Physicalmemory	Speed :	1333
CIM_Physicalmemory	BankLabel :	BANK 3
CIM_Physicalmemory	Capacity :	2147483648
CIM_Physicalmemory	Speed :	1333

OBJECT=win32_processor

OBJECT	token1	token2
win32_processor	L2CacheSize :	256
win32_processor	L3CacheSize :	6144
win32_processor	Name :	Intel(R) Core(TM) i7 CPU Q 740 @ 1.73G
win32_processor	NumberOfCores :	4
win32_processor	NumberOfLogicalProcessors :	8

OBJECT=Win32_quickfixenginee

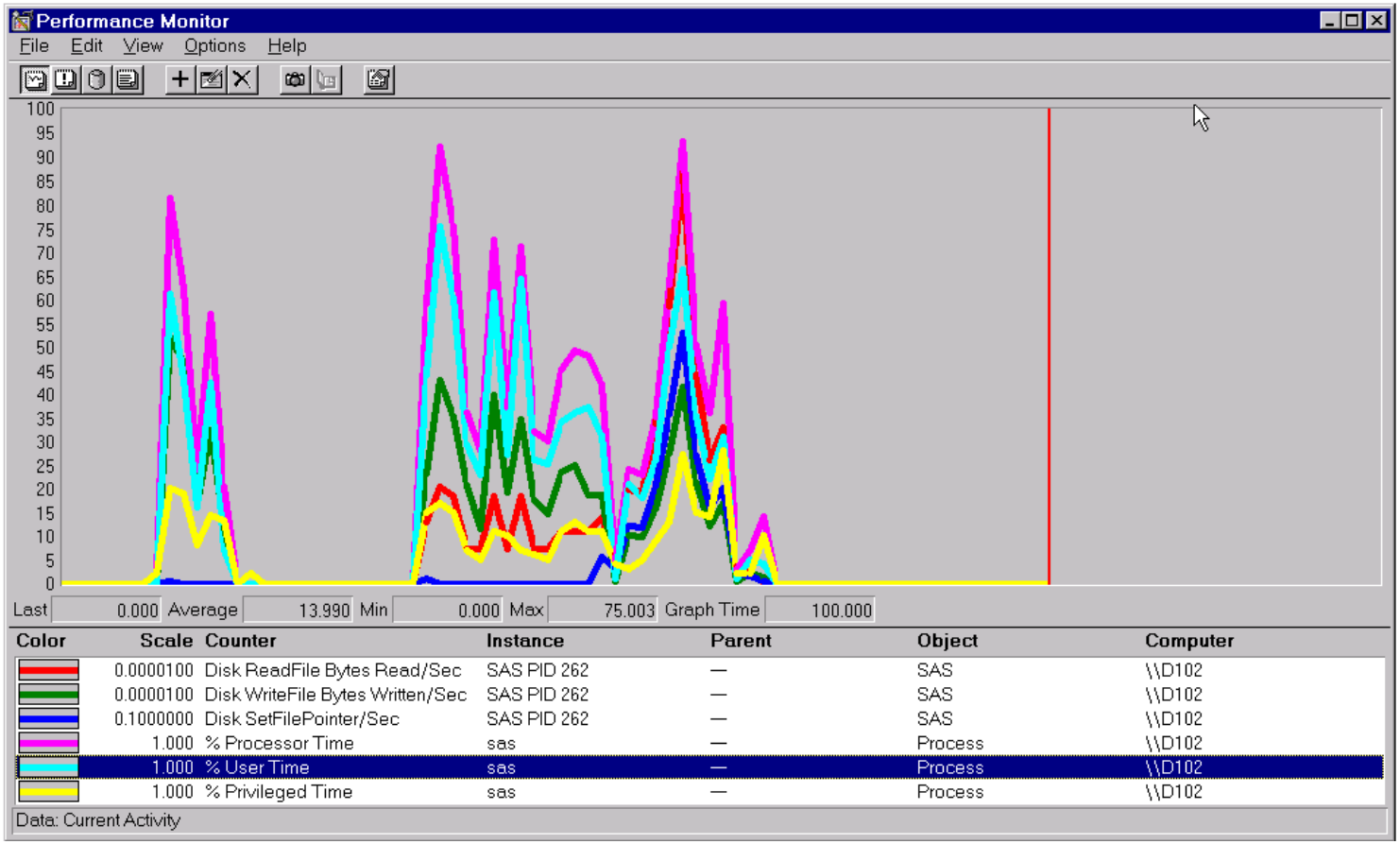
OBJECT	token1	token2
Win32_quickfixenginee	HOTFIX KB2564238	NOT APPLIED

OBJECT=Win32_logicaldisk

OBJECT	token1	token2
Win32_logicaldisk	DeviceID :	C:
Win32_logicaldisk	Description :	Local Fixed Disk
Win32_logicaldisk	FileSystem :	NTFS
Win32_logicaldisk	FreeSpace :	13322514432
Win32_logicaldisk	Size :	125026955264
Win32_logicaldisk	DeviceID :	D:
Win32_logicaldisk	Description :	Local Fixed Disk
Win32_logicaldisk	FileSystem :	NTFS
Win32_logicaldisk	FreeSpace :	41162440704
Win32_logicaldisk	Size :	120031539200
Win32_logicaldisk	DeviceID :	E:
Win32_logicaldisk	Description :	Local Fixed Disk
Win32_logicaldisk	FileSystem :	NTFS
Win32_logicaldisk	FreeSpace :	127517732864
Win32_logicaldisk	Size :	500104687616
Win32_logicaldisk	DeviceID :	F:
Win32_logicaldisk	Description :	Local Fixed Disk
Win32_logicaldisk	FileSystem :	NTFS
Win32_logicaldisk	FreeSpace :	207459184640
Win32_logicaldisk	Size :	354104111104

What is PerfMon?

Performance Counters and Objects



SAS Counters in the Performance and System Monitors

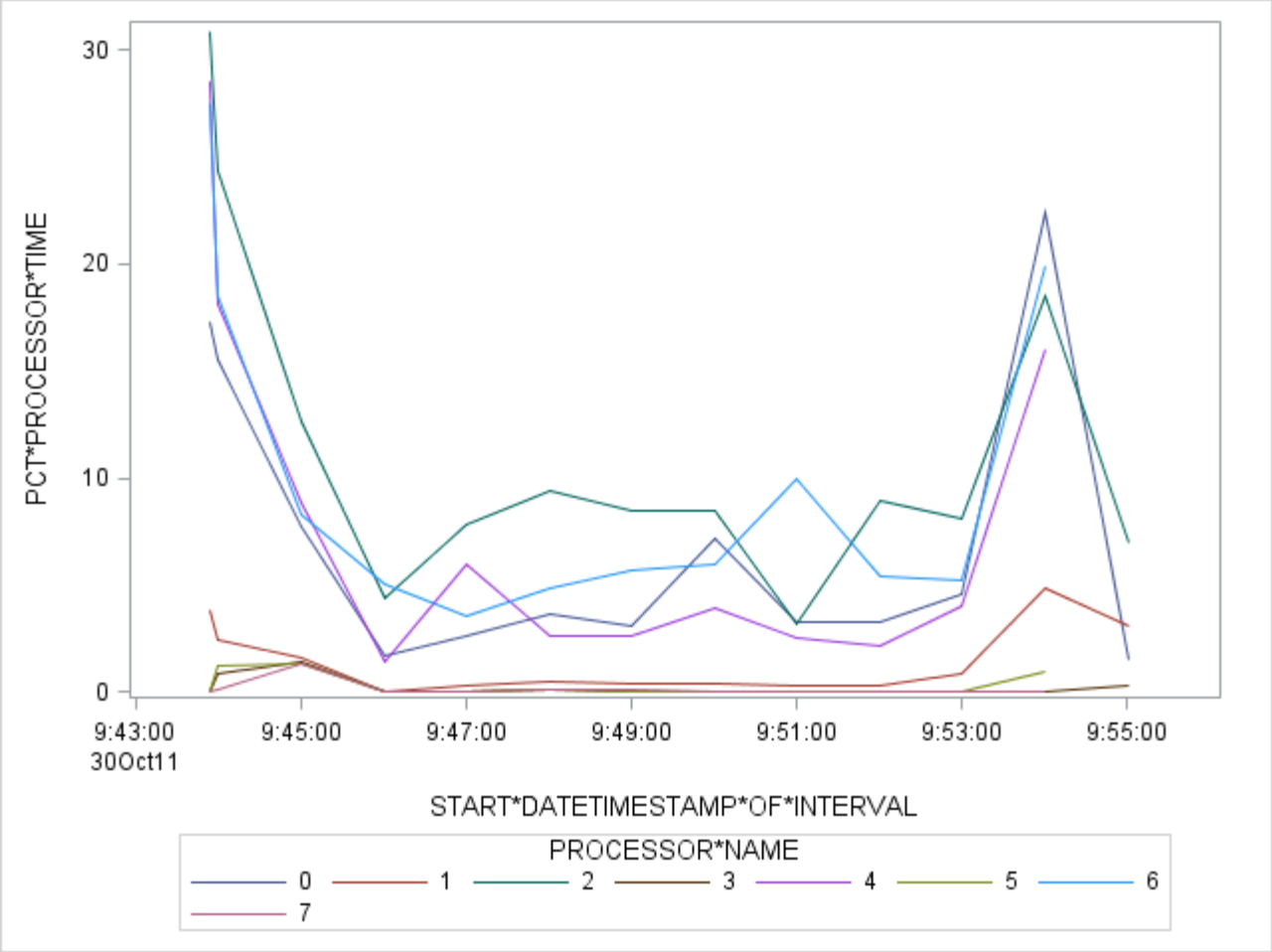
Recommended Performance Counters for Windows Performance Monitor
http://support.sas.com/rnd/scalability/papers/practicalperf.pdf

Accessing Perfmon Data with SAS

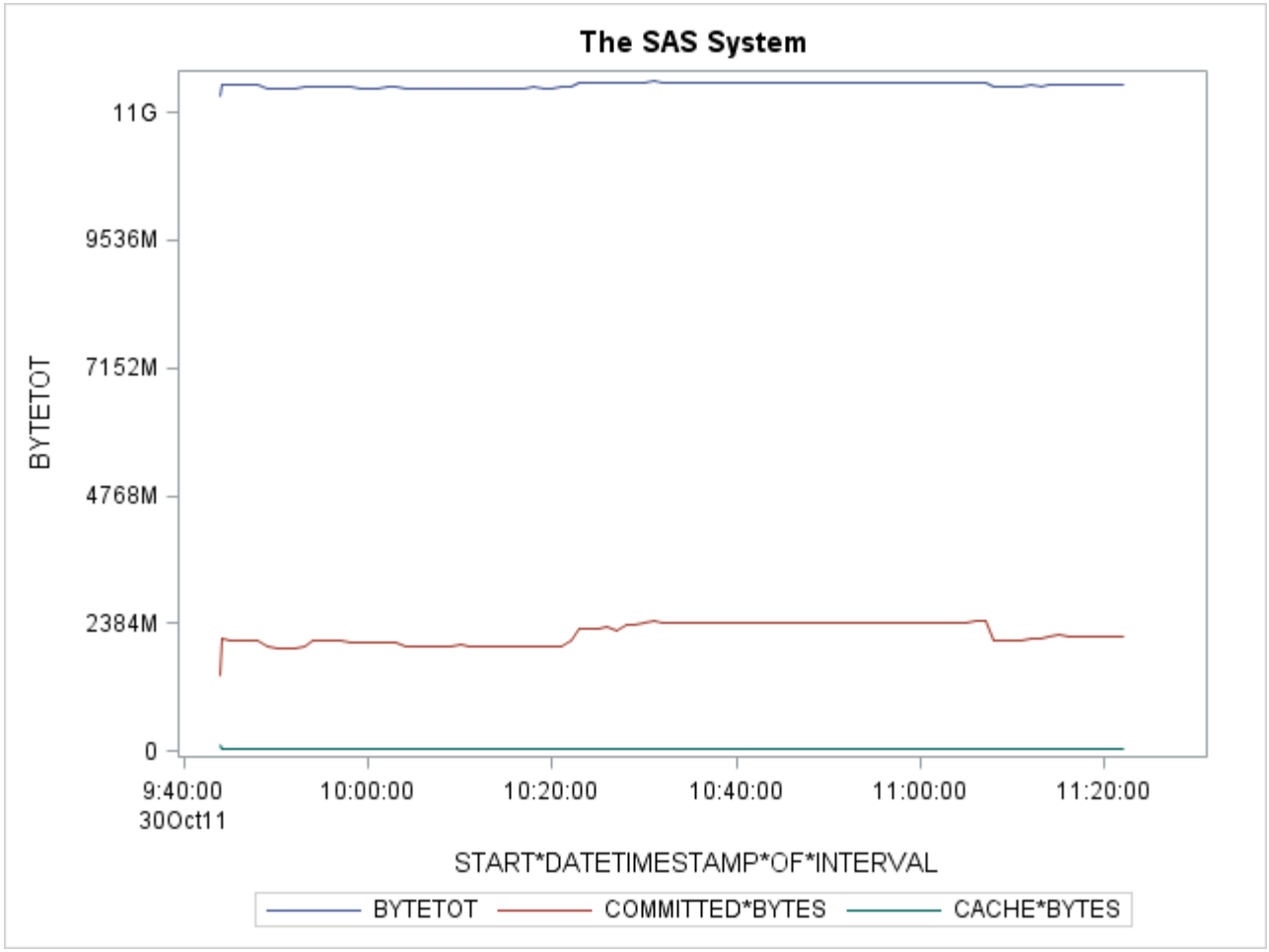
```
2.2.2,232,Thread,2011,10,27,19,36,0,339,26,60008,1,19,12,2,System,0,,00,,,,100,,,500,800,4
2.2.2,232,Thread,2011,10,27,19,36,0,339,26,60008,1,19,12,2,System,26,,00,,,,1800,,,500,180
2.2.2,232,Thread,2011,10,27,19,36,0,339,26,60008,1,19,12,2,System,27,,00,,,,1700,,,500,800
2.2.2,232,Thread,2011,10,27,19,36,0,339,26,60008,1,19,12,2,System,28,,00,,,,1700,,,500,800
2.2.2,232,Thread,2011,10,27,19,36,0,339,26,60008,1,19,12,2,System,31,,00,,,,800,,,500,800,
2.2.2,234,PhysicalDisk,2011,10,27,19,36,0,494,26,60005,1,18,34,1,0 C: F:,00,00,12964217908
2.2.2,234,PhysicalDisk,2011,10,27,19,36,0,494,26,60005,1,18,34,1,1 D:,00,0.0075,1296421790
2.2.2,234,PhysicalDisk,2011,10,27,19,36,0,494,26,60005,1,18,34,1,2 E:,00,00,12964217908048
2.2.2,236,LogicalDisk,2011,10,27,19,36,0,494,26,60004,1,18,37,1,C:,1070,11923400,1275800,0
2.2.2,236,LogicalDisk,2011,10,27,19,36,0,49
2.2.2,236,LogicalDisk,2011,10,27,19,36,0,49
2.2.2,236,LogicalDisk,2011,10,27,19,36,0,49
2.2.2,238,Processor,2011,10,27,19,36,0,502,
2.2.2,238,Processor,2011,10,27,19,36,0,502,
2.2.2,238,Processor,2011,10,27,19,36,0,502,
2.2.2,238,Processor,2011,10,27,19,36,0,502,
2.2.2,238,Processor,2011,10,27,19,36,0,502,
2.2.2,238,Processor,2011,10,27,19,36,0,502,
2.2.2,238,Processor,2011,10,27,19,36,0,502,
2.2.2,238,Processor,2011,10,27,19,36,0,502,
2.2.2,238,Processor,2011,10,27,19,36,0,502,
2.2.2,262,Redirector,2011,10,27,19,36,0,494
2.2.2,330,Server,2011,10,27,19,36,0,494,26,
2.2.2,510,Network Interface,2011,10,27,19,3
2.2.2,510,Network Interface,2011,10,27,19,3
2.2.2,510,Network Interface,2011,10,27,19,3
2.2.2,510,Network Interface,2011,10,27,19,36,0,502,26,60005,1,18,20,1,Teredo Tunneling Pse
```

PCT*PROCESSOR*TIME	PCT*DPC*TIME	PCT IDLE TIME	PCT*INTERRUPT*TIME	PCT*PRIVILEGED*TIME	PCT*USER*TIME	TRA
3	0.19	.	0.0473	0.28	0	
4.08	0.14	.	0.24	0.95	0.43	
4.1299999999	0	.	0.0473	0.8	0.61	
2.76	0	.	0	0	0	
3.75	0	.	0	0.8	0.24	
2.76	0	.	0	0	0	
4.3199999999	0	.	0	0.76	0.85	
2.76	0	.	0	0	0	
0.11	0.1	.	0.026	0.13	0	
1.38	0.21	.	0.36	0.91	0.49	
0.78	0	.	0.026	0.52	0.29	
0	0	.	0	0	0	
0.68	0	.	0	0.42	0.29	
0	0.026	.	0	0.026	0	
0.42	0	.	0.026	0.29	0.16	
0	0	.	0	0	0	
0.6	0.42	.	0.16	0.57	0	
3.9	0.052	.	0.34	1.48	2.39	
7.8799999999	0.18	.	0	3.38	4.47	
0.0294	0	.	0	0	0	
6.35	0	.	0	1.53	4.78	
0.11	0.078	.	0	0.078	0	
7.18	0		0	1.4	5.75	

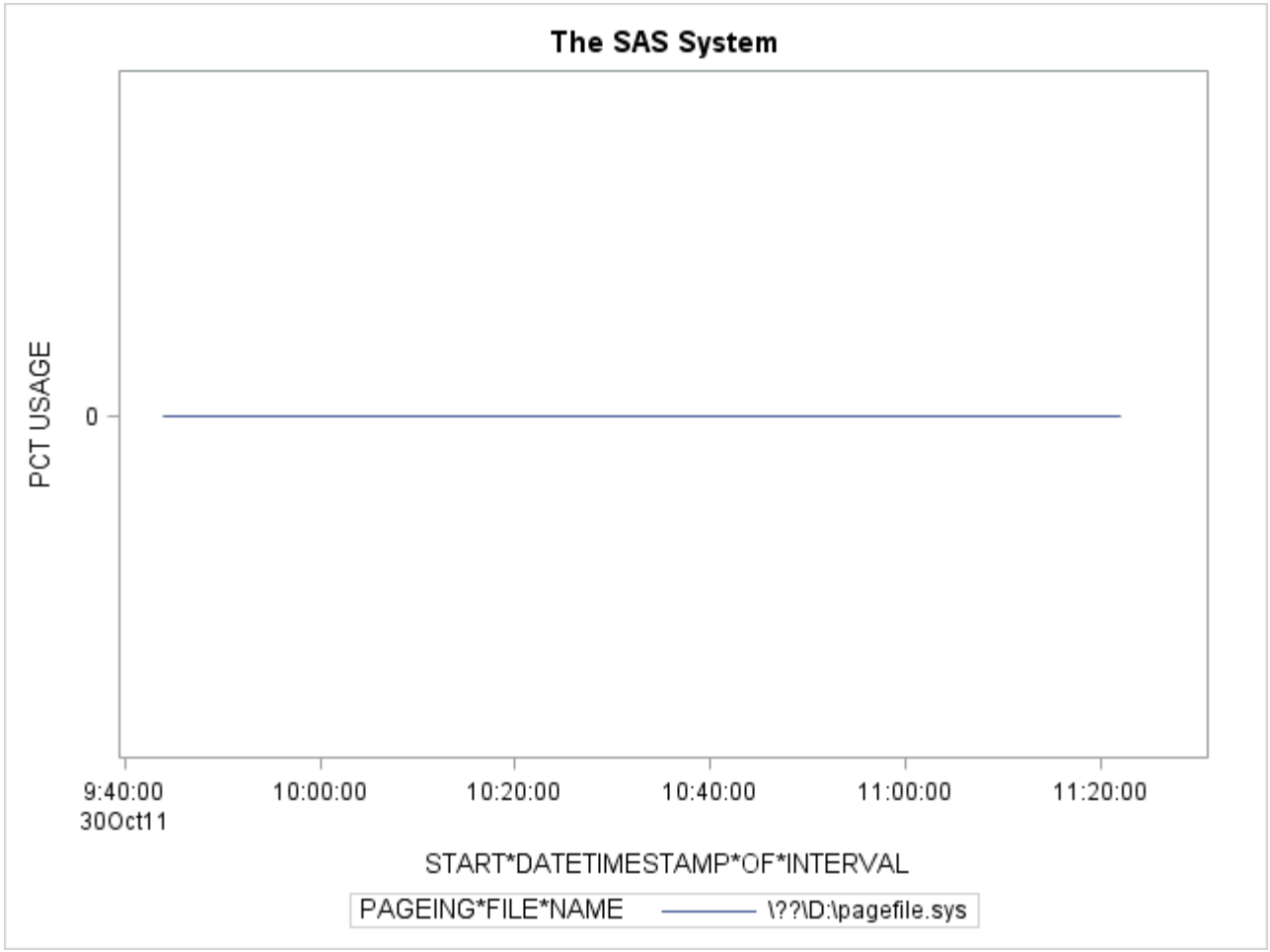
Processor(s) Utilization Data



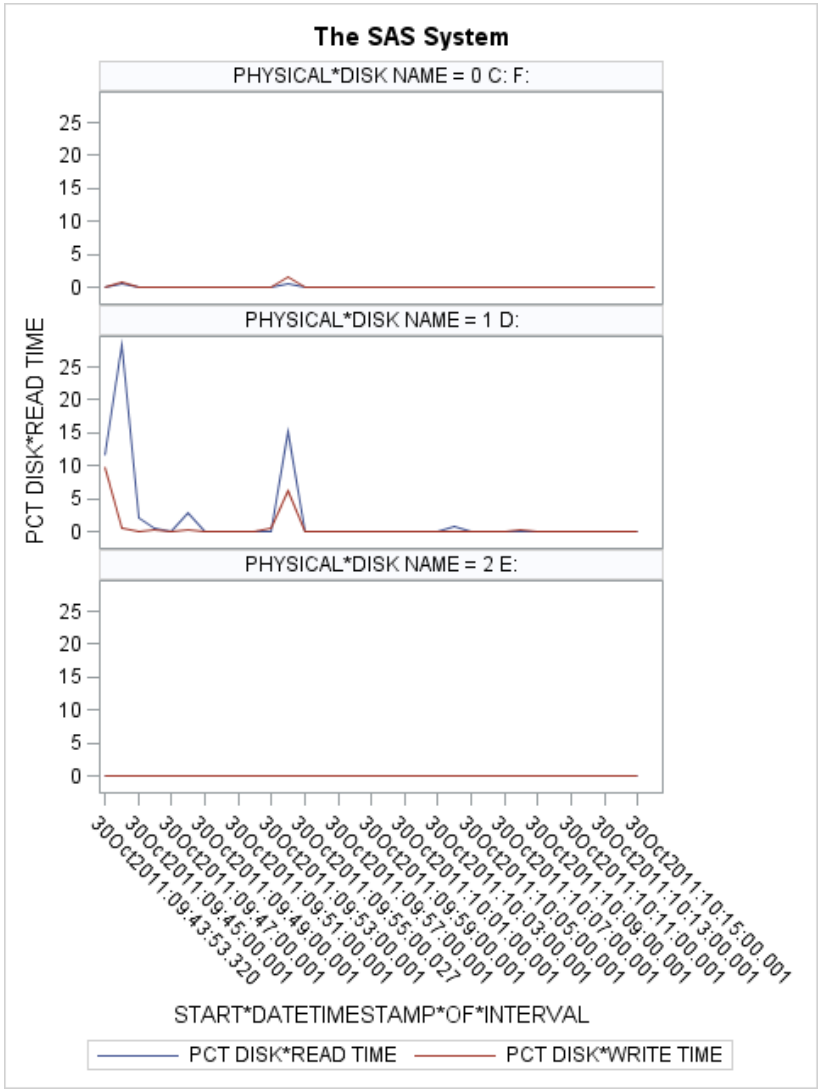
Memory Allocation

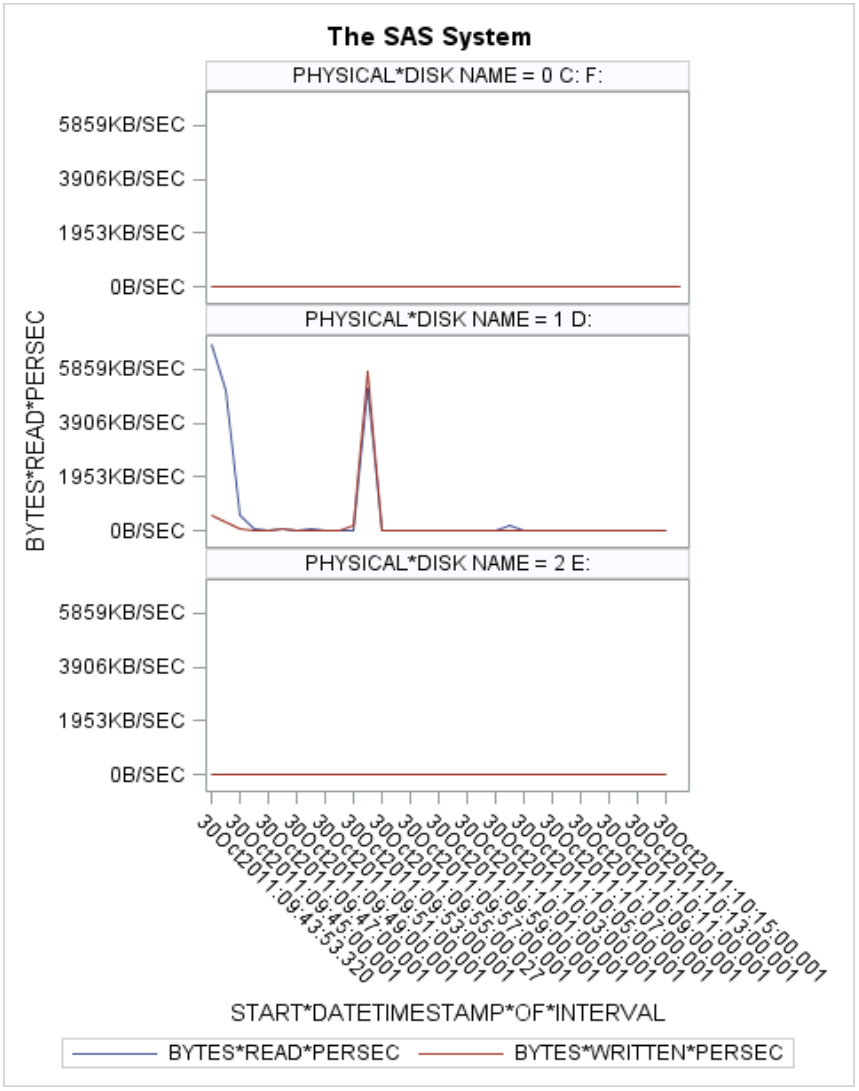


Page File Utilization



Disk Drive Utilization Information





PROC SGPANEL;

Miscellaneous Topics

Problem Note *39615:* Input/output performance in SAS® is degraded due to excessive memory usage on Windows
http://support.sas.com/kb/39/615.html

Apply Microsoft Hot Fix 2564236
All SAS customers who are running Windows 7 and Windows 2008 R2 should apply the Microsoft hot fix http://support.microsoft.com/kb/2564236 "I/O throughput is low when large files are read sequentially in Windows 7 or in Windows Server 2008 R2."
This Microsoft hot fix is not required for the SAS hot fix to work.
This Microsoft hot fix improves SAS I/O by improving the behavior of the Windows cache manager.

It is recommended that you apply Service Pack 1 (SP1) to Windows 7 and Windows 2008 R2. The Microsoft SP1 contains Microsoft hot fix 979149, which helps prevent Microsoft from becoming unresponsive.

Note: Support for Windows Server 2008 R2 starts with the third maintenance release for SAS 9.2 (TS2M3). If you are using an earlier release of SAS or Windows, consider upgrading so that you can apply these hot fixes.
For more details about how SAS uses Windows I/O and Windows file cache, see Configuration and Tuning Guidelines for SAS®9 in the Microsoft Windows Server 2008.

Miscellaneous Topics

- Do not run your antivirus software in real-time mode. If you **must** run it in real-time mode, then be sure to exclude the following file types from your virus scan list:
  - o SAS*
  - o LCK*
  - o UTL*
- Run a disk defragmentation tool often on the file systems that are used by SAS, particularly the file system that is associated with the SAS WORK library (where SAS creates the temporary files).

Configuration and Tuning Guidelines for SAS®9 in Microsoft Windows Server 2008
Margaret Crevar, SAS Institute Inc., Cary, NC

- Virtualization (via VMware) is supported by SAS. However, you should ensure that your guest systems on your VMware computer are properly set up with the amount of RAM, the number of cores, and I/O throughput that is required to support your peak SAS load.

Moving SAS Applications from a Physical to a Virtual VMware Environment Best Practices and Performance Expectations March 2011
http://support.sas.com/resources/papers/MovingVirtuaVMware.pdf

Key SAS Performance Papers

A Practical Approach To Solving Performance Problems with SAS® (2007)
Tony Brown SAS Performance Lab
Host Systems R&D SAS Institute Inc.
Updated December 12, 2007
http://support.sas.com/rnd/scalability/papers/solve_perf.pdf

Crevar, Margaret. 2009. "How to Maintain Happy SAS®9 Users." ***Proceedings of the SAS Global Forum 2009 Conference*****.**
http://support.sas.com/resources/papers/proceedings09/310-2009.pdf

Solving SAS®Performance Problems: Employing Host-Based Tools (2006)
Tony Brown, SAS Institute Inc., Dallas, TX
http://support.sas.com/rnd/scalability/papers/practicalperf.pdf

Brown, Tony. 2008. "SAS® Performance Monitoring – A Deeper Discussion®. ***Proceedings of the SAS Global Forum 2008 Conference*****.** http://www2.sas.com/proceedings/forum2008/387-2008.pdf

TS-684 *(historical but good basic information)*
PC Performance and the SAS System
Casey Thompson PC Systems
SAS Technical Support
http://support.sas.com/techsup/technote/ts684/ts684.html

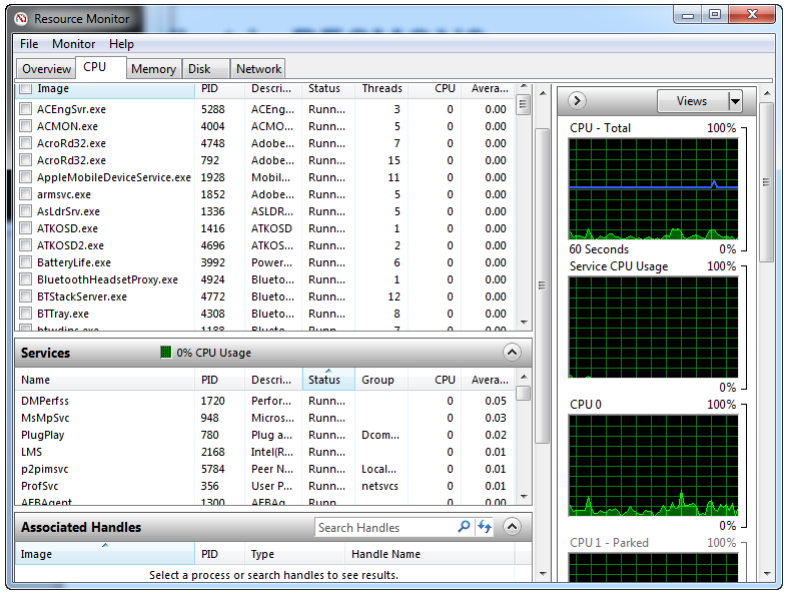
Key SAS Performance Papers

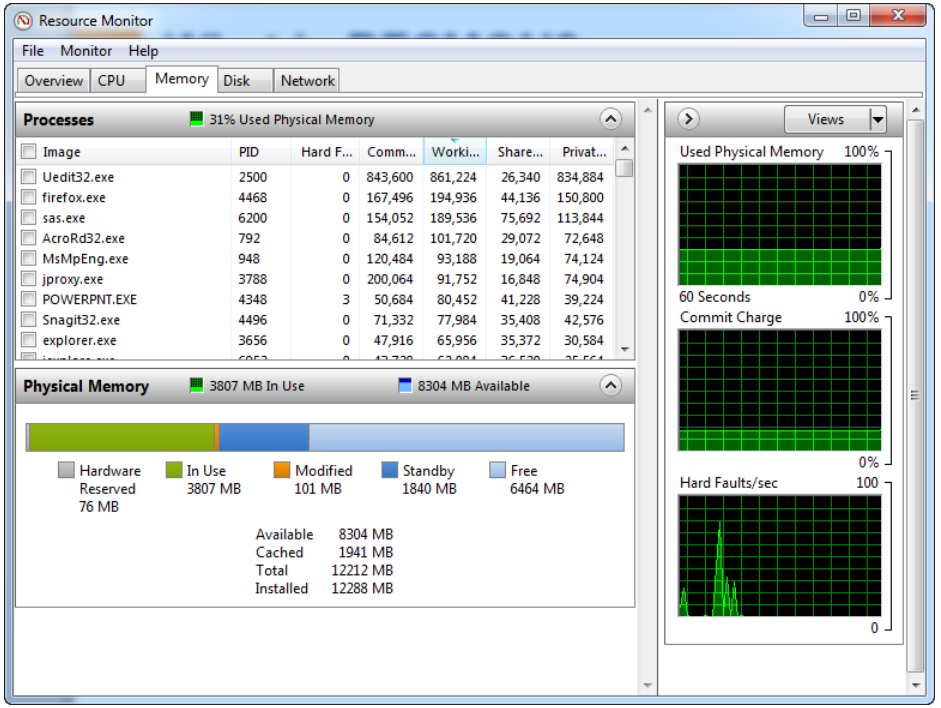
Configuration and Tuning Guidelines for SAS®9 in Microsoft Windows Server 2008
Margaret Crevar, SAS Institute
Updated: August 2011
http://support.sas.com/resources/papers/WindowsServer2008ConfigurationandTuning.pdf

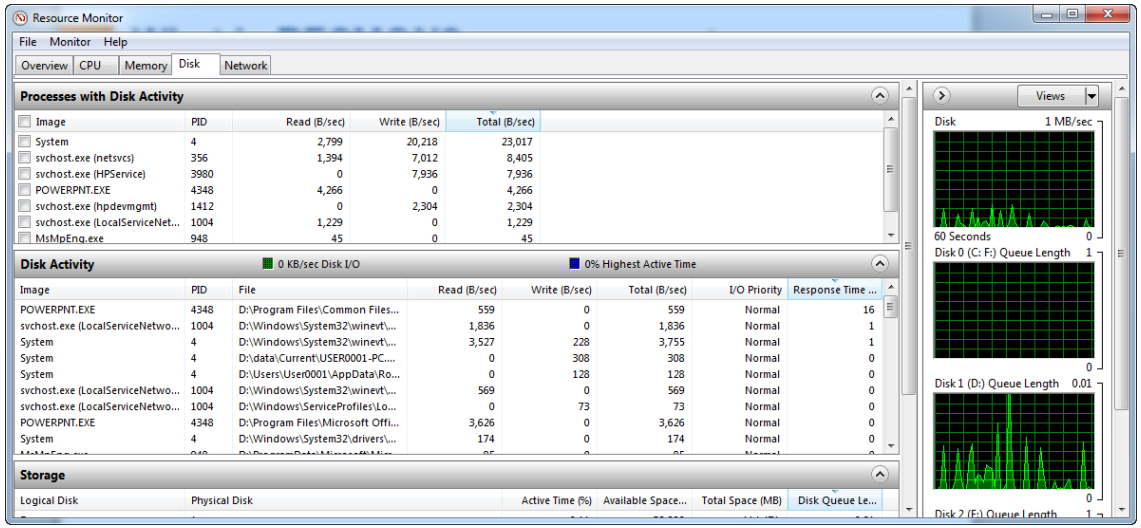
Best Practices for Configuring your IO Subsystem for SAS®9 Applications
Margaret A. Crevar, SAS Institute Inc.
Tony Brown, SAS Institute Inc.
Updated: August 2011
http://*support.sas.com/rnd/papers/sgf07/sgf2007-iosubsystem.pdf*

Frequently Asked Questions Regarding Storage Configurations
Margaret Crevar and Tony Brown, SAS Institute Inc. Last Updated: July 2011
http://support.sas.com/resources/papers/proceedings10/FAQforStorageConfiguration.pdf

What is RESMON?







System Monitoring

Both SAS and Microsoft strongly advise that you proactively and closely monitor the computer resources that are used in your Windows environment to avoid running out of resources, thereby causing poor performance. You should regularly collect and analyze the performance measures for the following areas:

Overall Server (aggregate server-level measures)

CPU (total and individual CPUs)

I/O throughput (total throughput and by file system)

Memory and system file cache

Network

ITRM - SAS IT Resource Management New Features, Super Demo, Tuesday 8am Find out what all of the excitement is about with the latest version of SAS/ITRM Solution designed to provide the power to know everything about all of your company's IT systems. This newest version was built from the ground up with all of the best features of the SAS 9.3 Platform and then added on Flash/Flex technology too. Come and see it live!

Questions?

Contact info

On the Web at http://www.sas.com/solutions/itresource/index.html

By Phone 1-800-727-0025