Performance Monitoring - Automated Process Workflow

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Course Outline

- Performance Monitoring (PerfMon) workflow overview

- Present the workflow steps

- Notes

- Results Interpretation – if time.

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PerfMon Workflow Overview

The main steps necessary to create a PerfMon report:

1. Initiate the PerfMon session

2. Collect PerfMon results

3. Analyse the data

4. Create Report

5. Estimate system growth (EIM and Sales) – not for customers!

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Initiate the PerfMon session

Currently there are two options of running our custom Performance Monitor

1. Runs once for a 48 hours period

- it creates one Baseline file (one .csv file)

- it stops automatically after 48 hours

OR,

2. Runs continuously

- It creates a new report every 24 hours at 12:00 AM

- It never stops

- Baseline files older than 30 days are automatically deleted *

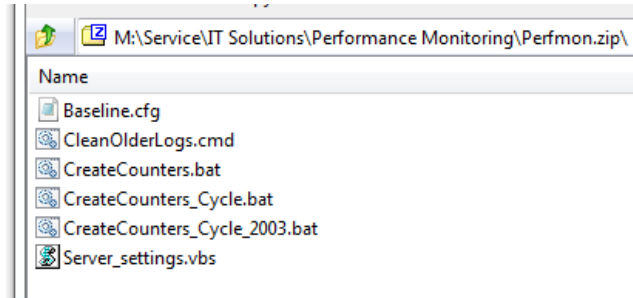- For Win2003 requires some editing before the start (Win2003 limitation)

Initiate the PerfMon session (1)

Currently this process is only designed for DB server, although it can be used for the rest of servers (not tested)

1. Upload the script files onto the server (using FTP, RDP, DropBox etc.) – it is a zip file that contains six files. Place those files into a separate folder
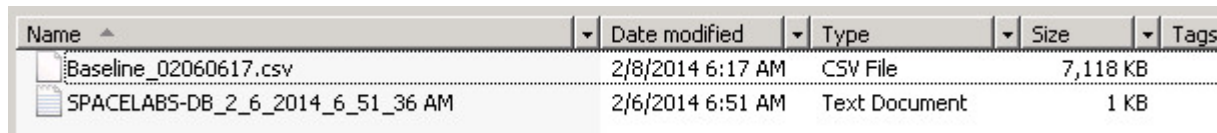

2. For 48 hours, run (double click) CreateCounters.bat file ONLY!!!

3. For continuous run, use CreateCounters_Cycle.bat file ONLY!!!

4. For continuous run Win2003, use CreateCounters_Cycle_2003.bat file ONLY!!! Edit the file first.

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Initiate the PerfMon session (2)

Recommended – verify that PerfMon is running

1. Browse to C:\PerfLogs\Spacelabs

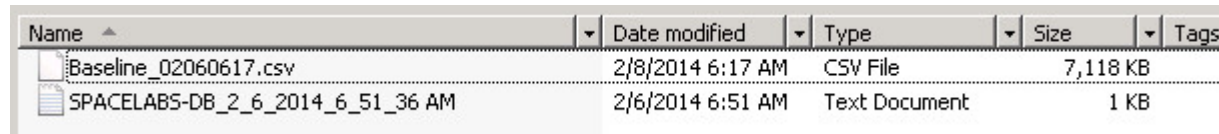2. You should see two files. More files will be created for continuous run version. Check the date if not sure.

Name ▲		Date modified		Type		Size		Tags
Baseline_02060617.csv		2/8/2014 6:17 AM		CSV File		7,118 KB		
SPACELABS-DB_2_6_2014_6_51_36 AM		2/6/2014 6:51 AM		Text Document		1 KB		

3. Baseline_XXX.csv – most important

4. HOSTNAME_XXX.txt – contains useful information – can be read immediately

5. Logout and come back after 48 hours or whenever there is an issue (continuous version)

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Collect the PerfMon results (1)

After running it for 48 hours:

1. On the remote database server, browse to C:\PerfLogs\Spacelabs

2. Download the .csv files and the .txt file onto your computer (most recent Baseline_XXX.csv's if using the continuous)

Name ▲	Date modified	Type	Size	Tags
Baseline_02060617.csv	2/8/2014 6:17 AM	CSV File	7,118 KB	
SPACELABS-DB_2_6_2014_6_51_36 AM	2/6/2014 6:51 AM	Text Document	1 KB	

3. <u>On your computer</u> it is preferable to have a subfolder for each customer account. Place these files in that subfolder.

4. Copy ProcessResults.xlsm into same subfolder on your computer

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Collect the PerfMon results (2)

<u>IMPORTANT!!</u> Before logging out the DB server make sure you know:

1. Total Number of Monitors and Telemetry Channels connected to ICS

2. The drive letter for the OS disk (usually is C:)

3. The drive letter for the database disk (usually is D:)

4. The drive letter for the Transaction log disk – if any

5. The drive letter for the TempDB disk - if any

6. Total system Memory (RAM)

7. Total number of cores (sockets X cores/processor)

6 and 7 can be found in HOSTNAME_XXX.txt file

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Analyze PerfMon results (1)

On your computer browse into the customer subfolder:

1. Open ProcessResults.xlsm

2. Open Baseline_XXX.csv file – you can add multiple Baseline files.

3. Move the .csv data into the xlsm file:
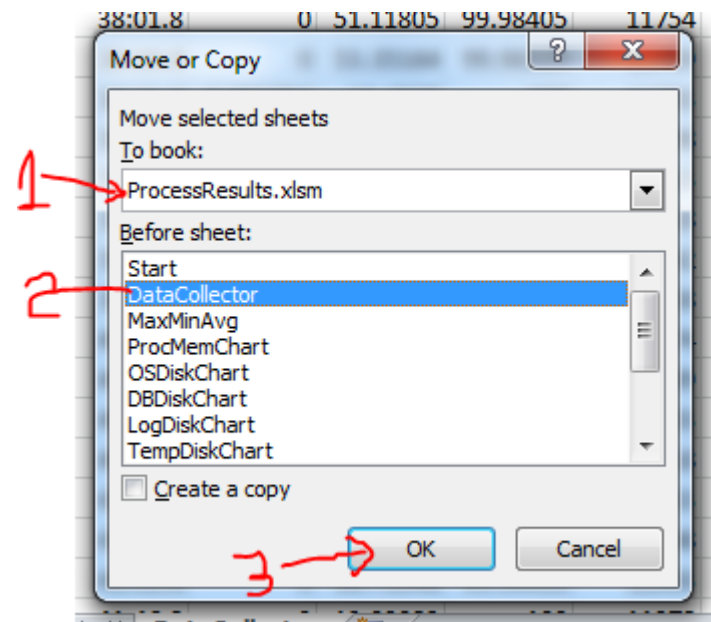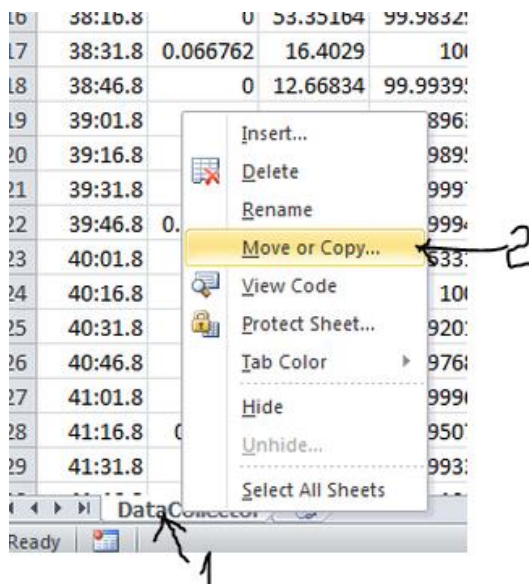
Analyze PerfMon results (2)

In the ProcessResult.xslm click on "Merge Baseline Sheets" button on Start sheet – this moves data from all Baseline sheets into DataCollector sheet.

Analyze PerfMon results (3)

In the ProcessResult.xslm go to Start sheet and fill out the fields:

	A	B	C	D	E	F	G	H	I	J
1										
2	CUSTOMER NAME	Mount Sinai							Version 1.02.01	
3										
4	THE SHEET CONTAINING THE .csv DATA MUST BE NAMED "DataCollector"									
5	The following information must be entered for the macro to work correctly.									
6	Number of monitors and telly nodes connected to the ICS	100								
7										
8	Operating system Drive (no colon (:))	c								
9	Database drive (portal.mdf) (no colon (:))	d	Leave blank if none							
10	Transaction log (portal.ldf) (no colon (:))		Leave blank if none							
11	Temp DB drive (no colon (:))		Leave blank if none							
12										
13	Total Memory in GB	8								
14	Number of processor cores (from all sockets)	4								
15										
16		1 Merge Baseline Sheets		this will merge and sort all off the sheets called Baseline						
17										
18										
19		2 Start Processing		This processes the data in DataCollector worksheet						
20										
21										
22		3 Report for Customer		This creates a report to be delivered to customer						
23										
24										
25		4 Estimate Growth		Estimates the growth of the system - do not use for customers -						
26										
27										
28										

Analyze PerfMon results (4)

1. Hit Start Processing button and wait for the message that it ended

PerfMon results (1)

In the ProcessResult.xslm – Report sheet :

1. Anything red in there is a potential issue and needs to be investigated.
2. Red = limit is exceeded more than 10% of the time
3. Blue = limit is exceeded less than 10% of the time
4. Green = Limit is never exceeded

	A	B	C	D	E	F	G	H
1	Sever Name	SDC4SDB1						
2	PROCESSOR	% Processor Time	is running fine			Average usage is	10	percent
3	MEMORY	Available MBytes	is running fine			Average usage is	81	percent
4	MEMORY	Pages/sec	has spikes up to	611	times the threshold limit	Average usage is	1927	percent
5	OS DISK	% Idle Time	has spikes up to	27	times the threshold limit	Average usage is	51	percent
6	OS DISK	Avg. Disk Read Queue Length	has spikes up to	3	times the threshold limit	Average usage is	1	percent
7	OS DISK	Avg. Disk Write Queue Length	has spikes up to	1	times the threshold limit	Average usage is	6	percent
8	OS DISK	Avg. Disk sec/Read	has spikes up to	3	times the threshold limit	Average usage is	10	percent
9	OS DISK	Avg. Disk sec/Write	has spikes up to	2	times the threshold limit	Average usage is	79	percent
10	OS DISK	Disk Reads/sec	has spikes up to	1	times the threshold limit	Average usage is	3	percent
11	OS DISK	Disk Writes/sec	is running fine			Average usage is	2	percent
12	DATABASE DISK	% Idle Time	is exceeding the limit about	15	percent of the time	Average usage is	61	percent
13	DATABASE DISK	Avg. Disk Read Queue Length	is exceeding the limit about	10	percent of the time	Average usage is	147	percent
14	DATABASE DISK	Avg. Disk Write Queue Length	is exceeding the limit about	19	percent of the time	Average usage is	984	percent
15	DATABASE DISK	Avg. Disk sec/Read	is exceeding the limit about	26	percent of the time	Average usage is	161	percent
16	DATABASE DISK	Avg. Disk sec/Write	is exceeding the limit about	19	percent of the time	Average usage is	188	percent
17	DATABASE DISK	Disk Reads/sec	has spikes up to	3	times the threshold limit	Average usage is	20	percent
18	DATABASE DISK	Disk Writes/sec	is exceeding the limit about	18	percent of the time	Average usage is	69	percent
19	T-LOG DISK	% Idle Time	has spikes up to	35000	times the threshold limit	Average usage is	53	percent
20	T-LOG DISK	Avg. Disk Read Queue Length	is running fine			Average usage is	0	percent
21	T-LOG DISK	Avg. Disk Write Queue Length	has spikes up to	1	times the threshold limit	Average usage is	6	percent
22	T-LOG DISK	Avg. Disk sec/Read	has spikes up to	1	times the threshold limit	Average usage is	0	percent
23	T-LOG DISK	Avg. Disk sec/Write	has spikes up to	3	times the threshold limit	Average usage is	11	percent
24	T-LOG DISK	Disk Reads/sec	is running fine			Average usage is	0	percent
25	T-LOG DISK	Disk Writes/sec	has spikes up to	2	times the threshold limit	Average usage is	34	percent
26	TEMP-DB DISK	% Idle Time	has spikes up to	35000	times the threshold limit	Average usage is	53	percent
27	TEMP-DB DISK	Avg. Disk Read Queue Length	is running fine			Average usage is	0	percent
28	TEMP-DB DISK	Avg. Disk Write Queue Length	has spikes up to	1	times the threshold limit	Average usage is	6	percent
29	TEMP-DB DISK	Avg. Disk sec/Read	has spikes up to	1	times the threshold limit	Average usage is	0	percent
30	TEMP-DB DISK	Avg. Disk sec/Write	has spikes up to	3	times the threshold limit	Average usage is	11	percent
31	TEMP-DB DISK	Disk Reads/sec	is running fine			Average usage is	0	percent
32	TEMP-DB DISK	Disk Writes/sec	has spikes up to	2	times the threshold limit	Average usage is	34	percent
33	SQL	Buffer cache hit ratio	has spikes up to	1	times the threshold limit	Average usage is	99	percent
34	SQL	Buffer cache hit ratio	has spikes up to	1	times the threshold limit	Average usage is	99	percent
35	SQL	Free list stalls/sec	is running fine			Average usage is	0	percent
36	SQL	Free pages	has spikes up to	3	times the threshold limit	Average usage is	20	percent
37	SQL	Lazy writes/sec	has spikes up to	1	times the threshold limit	Average usage is	0	percent
38	SQL	Page life expectancy	is running fine			Average usage is	74	percent
39	SQL	Page reads/sec	is exceeding the limit about	24	percent of the time	Average usage is	111	percent

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PerfMon results (2)

In the ProcessResult.xslm – MinMaxAvg sheet:

1. Anything red in there is a potential issue and needs to be investigated.

2. Red = limit is exceeded more than 10% of the time

3. Blue = limit is exceeded less than 10% of the time

4. Green = Limit is never exceeded

5. Each Counter is compared against the limits defined in the Threshold sheet

	A	B	C	D	E	F	G
16		MINIMUM	1.296000013	35	EXCEEDED AS SPIKES		
17	OS DRIVE c:	PhysicalDisk(0 C:)\Avg. Disk Read Queue Length	THRESHOLD	RESULT		
18		AVERAGE	0.022122268	2	OK		
19		MAXIMUM	10.73401011	3	EXCEEDED AS SPIKES		
20		MINIMUM	0	2	OK		
21	OS DRIVE c:	PhysicalDisk(0 C:)\Avg. Disk Write Queue Length	THRESHOLD	RESULT		
22		AVERAGE	0.132453089	2	OK		
23		MAXIMUM	3.688790037	3	EXCEEDED AS SPIKES		
24		MINIMUM	0.00094	2	OK		
25	OS DRIVE c:	PhysicalDisk(0 C:)\Avg. Disk sec/Read	THRESHOLD	RESULT		
26		AVERAGE	0.001032612	0.01	OK		
27		MAXIMUM	0.076366666	0.02	EXCEEDED AS SPIKES		
28		MINIMUM	0	0.01	OK		
29	OS DRIVE c:	PhysicalDisk(0 C:)\Avg. Disk sec/Write	THRESHOLD	RESULT		
30		AVERAGE	0.007917712	0.01	OK		
31		MAXIMUM	0.041184033	0.02	EXCEEDED AS SPIKES		
32		MINIMUM	0.004131828	0.01	OK		
33	OS DRIVE c:	PhysicalDisk(0 C:)\Disk Reads/sec	THRESHOLD	RESULT		
34		AVERAGE	9.823810005	274.5	OK		
35		MAXIMUM	943.2415472	658.8	EXCEEDED AS SPIKES		
36		MINIMUM	0	274.5	OK		
37	OS DRIVE c:	PhysicalDisk(0 C:)\Disk Writes/sec	THRESHOLD	RESULT		
38		AVERAGE	9.204691875	366	OK		
39		MAXIMUM	238.8109463	732	OK		
40		MINIMUM	0.199804376	366	OK		
41	DATABASE DRIVE	PhysicalDisk(1 D:)\% Idle Time	THRESHOLD	RESULT		
42		AVERAGE	80.892226	50	OK		
43		MAXIMUM	100.6351262	50	OK		
44		MINIMUM	0	35	EXCEEDED CONSTANTLY		
45	DATABASE DRIVE	PhysicalDisk(1 D:)\Avg. Disk Read Queue Length	THRESHOLD	RESULT		
46		AVERAGE	2.959156781	2	EXCEEDED		
47		MAXIMUM	1414.708984	3	EXCEEDED CONSTANTLY		
48		MINIMUM	0	2	OK		
49	DATABASE DRIVE	PhysicalDisk(1 D:)\Avg. Disk Write Queue Length	THRESHOLD	RESULT		
50		AVERAGE	19.69393891	2	EXCEEDED		
51		MAXIMUM	1040.58515	3	EXCEEDED CONSTANTLY		
52		MINIMUM	0	2	OK		
53	DATABASE DRIVE	PhysicalDisk(1 D:)\Avg. Disk sec/Read	THRESHOLD	RESULT		
54		AVERAGE	0.016101385	0.01	EXCEEDED		
55		MAXIMUM	1.513900021	0.02	EXCEEDED CONSTANTLY		
56		MINIMUM	0	0.01	OK		
57	DATABASE DRIVE	PhysicalDisk(1 D:)\Avg. Disk sec/Write	THRESHOLD	RESULT		
58		AVERAGE	0.018875217	0.01	EXCEEDED		
59		MAXIMUM	1.998000107	0.02	EXCEEDED CONSTANTLY		
60		MINIMUM	0	0.01	OK		
61	DATABASE DRIVE	PhysicalDisk(1 D:)\Disk Reads/sec	THRESHOLD	RESULT		
62		AVERAGE	56.38698859	274.5	OK		
63		MAXIMUM	2279.663338	658.8	EXCEEDED AS SPIKES		
64		MINIMUM	0	274.5	OK		
65	DATABASE DRIVE	PhysicalDisk(1 D:)\Disk Writes/sec	THRESHOLD	RESULT		
66		AVERAGE	253.2983705	366	OK		
67		MAXIMUM	3688.951982	732	EXCEEDED CONSTANTLY		
68		MINIMUM	0	366	OK		
69	T-LOG DRIVE e:	PhysicalDisk(2 E:)\% Idle Time	THRESHOLD	RESULT		
70		AVERAGE	94.2763725	50	OK		
71		MAXIMUM	100.3310926	50	OK		

PerfMon results (3)

In the ProcessResult.xslm – XXXChart sheet:

1. Investigate the distribution of the values.
2. Check for any patterns
3. Look for "eye averages"
4. Check the approximate time when odd events happened
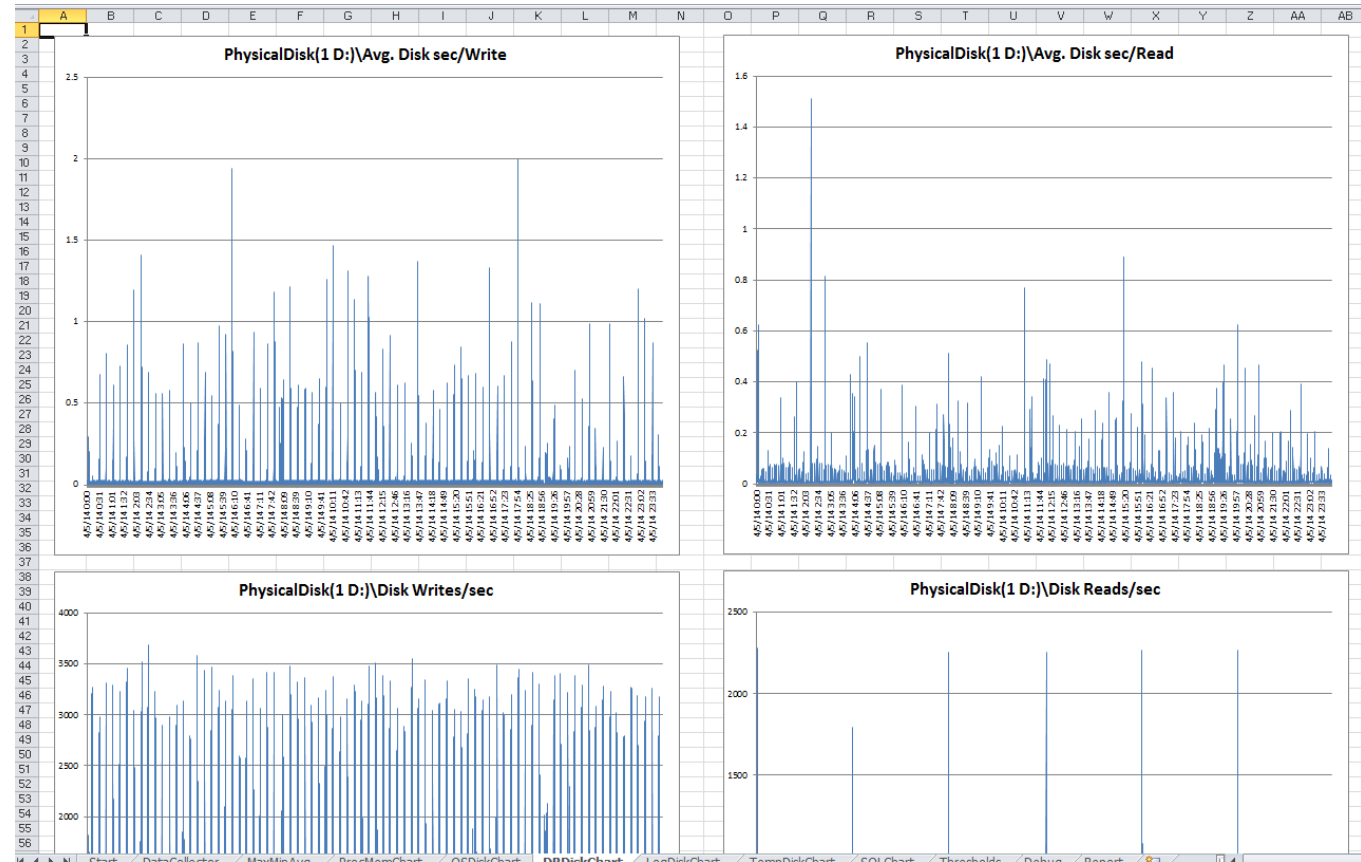
Create Report for Customer (1)

1. Hit Report for Customer button and wait for the confirmation message.

2. The Report strips down all the "inside information (code, limits, debug etc.)

	A	B	C	D	E	F	G	H	I	J
1										
2	CUSTOMER NAME	Mount Sinai							Version 1.02.01	
3										
4	THE SHEET CONTAINING THE .csv DATA MUST BE NAMED "DataCollector"									
5	The following information must be entered for the macro to work correctly.									
6	Number of monitors and telly nodes connected to the ICS	100								
7										
8	Operating system Drive (no colon (:))	c								
9	Database drive (portal.mdf) (no colon (:))	d	Leave blank if none							
10	Transaction log (portal.ldf) (no colon (:))		Leave blank if none							
11	Temp DB drive (no colon (:))		Leave blank if none							
12										
13	Total Memory in GB	8								
14	Number of processor cores (from all sockets)	4								
15										

1 Merge Baseline Sheets

2 Start Processing — This processes the data in DataCollector worksheet

3 Report for Customer — This creates a report to be delivered to customer

4 Estimate Growth — Estimates the growth of the system - do not use for customers -

Report

Report Generated
R:\Spacelabs\Trainings\Automate Perfmon\Report 2014-4-8.xlsx

OK

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Estimate Growth

1. Hit Estimate Growth button and wait for the message that it ended.

2. The two possible lines (orange) added in Report sheet

3. The routine is intended for EIMs and sales people

4. It is not a perfect tool – use it with a lot of "salt"

5. If there is any red cell in column G (Usage) of the Report sheet do not add any more monitors before consulting with a TM or EIM.

6. The yellow estimate is just an estimate. Never add more than 100 monitors at once regardless of how much that number says
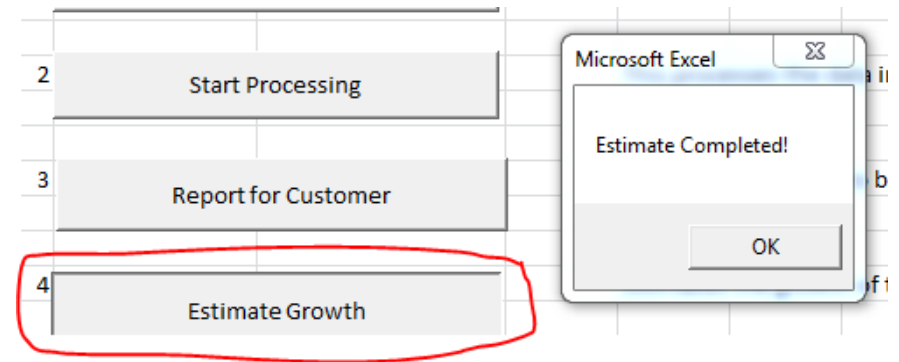
Notes on Report

When reading the report:

1. Any red line requires further investigations (charts, Min/Max/Avg. sheets)

2. For VMware, Performance Monitor from within Windows may not be enough. Use also *VMware console* or *esxtop* for complete data

3. All necessary files are located at "M:\Service\IT Solutions\Performance Monitoring" (\\isqdfs02.osient.com)

4. Q&A

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Interpreting the Results

Server Resources Overview

- Any server uses four main physical resources:

  ➢Processor

  ➢Memory

  ➢Storage

  ➢Network

These resources need to be available and sufficient before any further investigation

takes place (software issues, user training etc.).

- We can consider SQL as another resource for ICS

  ➢SQL

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Performance Monitor – Interesting Counters

- ## PROCESSOR

Counter Object	Counter Property	Counter Instance
Processor	%Processor Time	_Total

- Most familiar (from Task Manager).

- Anything more than 50-60 % for a longer time may indicate an issue
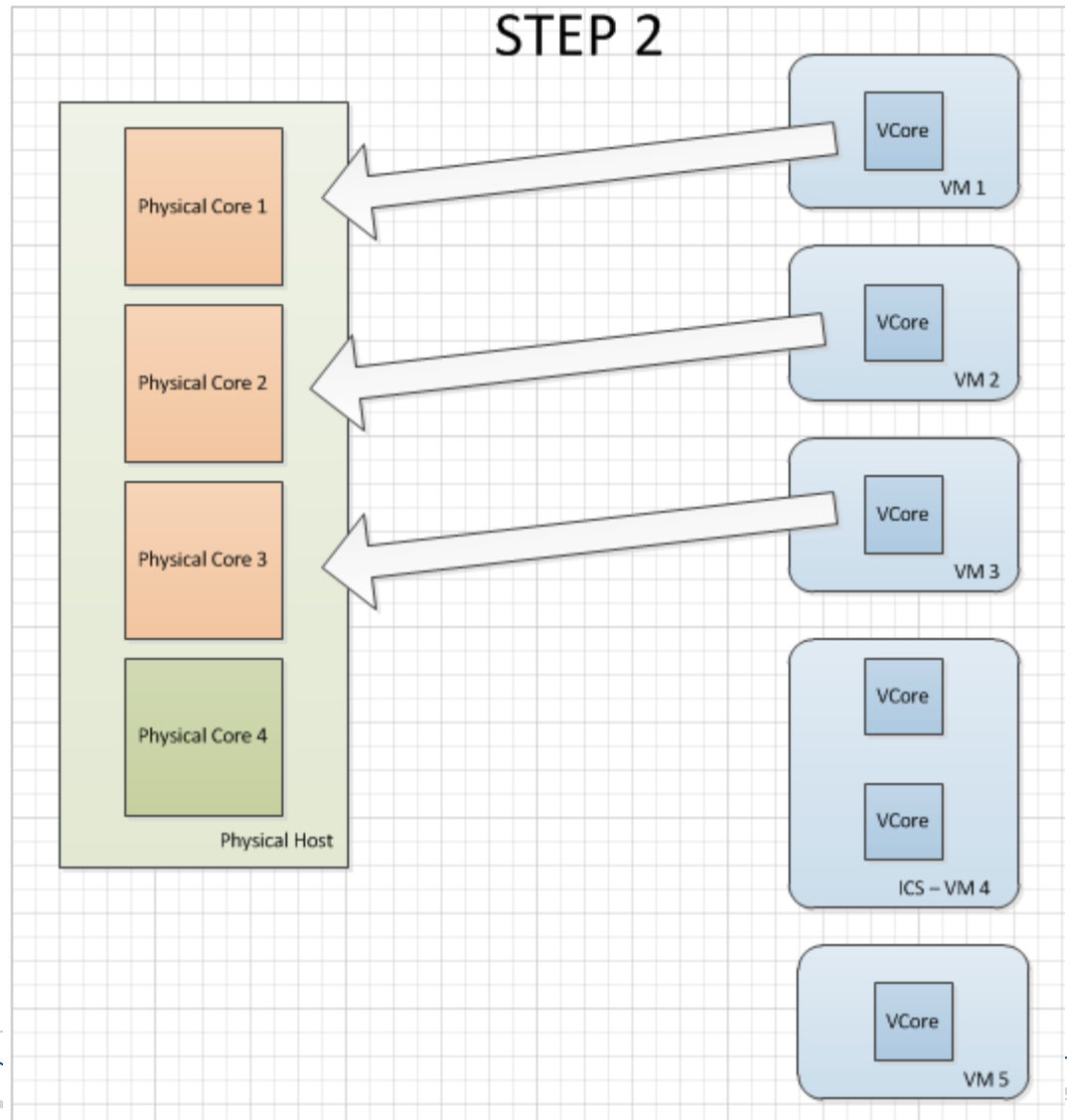
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Performance Monitor – Interesting Counters

- PROCESSOR – VMware Issue

- 1 host with 4 Physical Cores
- 4 VMs with 1 Vcore
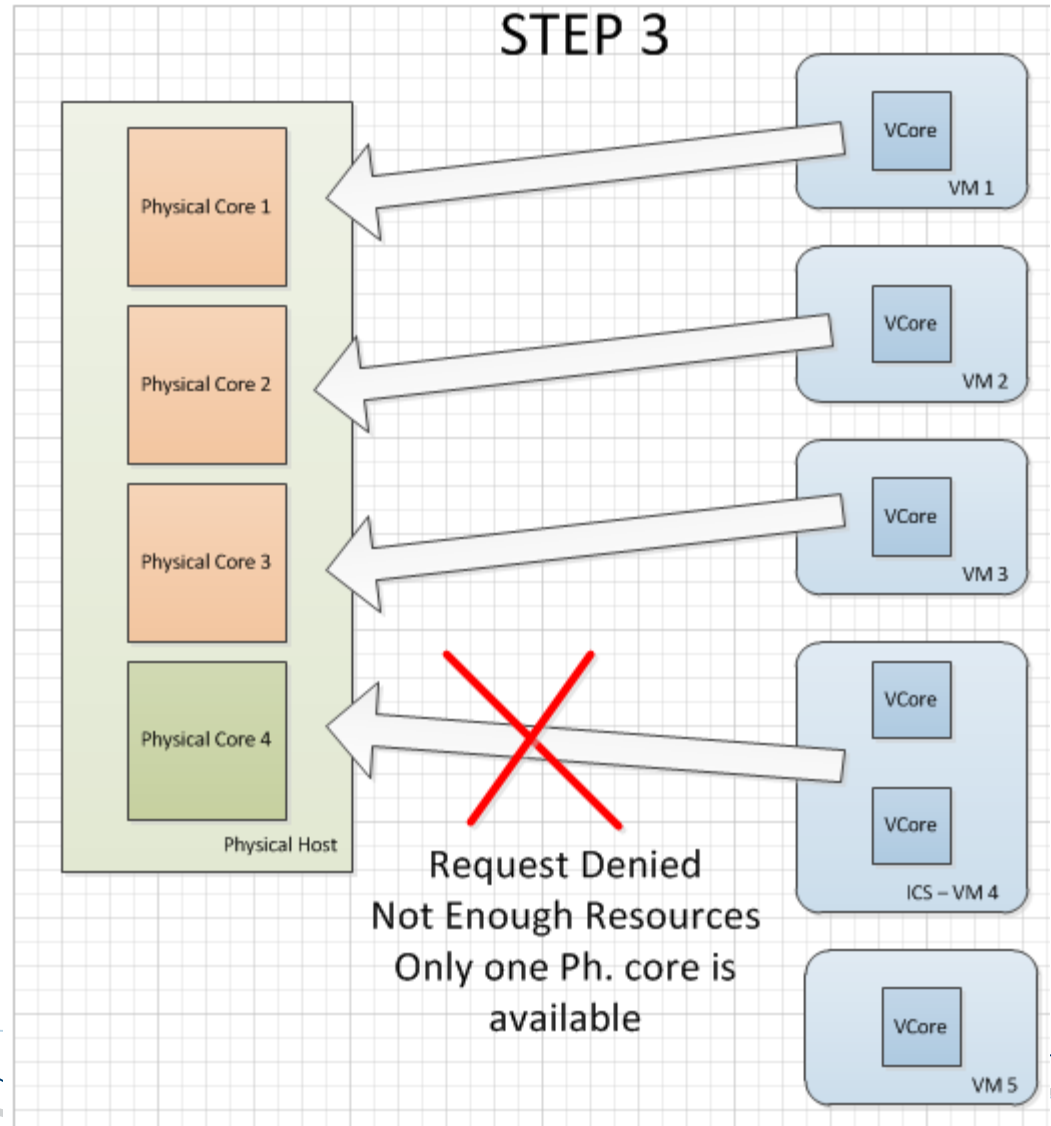- ICS VM has 2 VCores
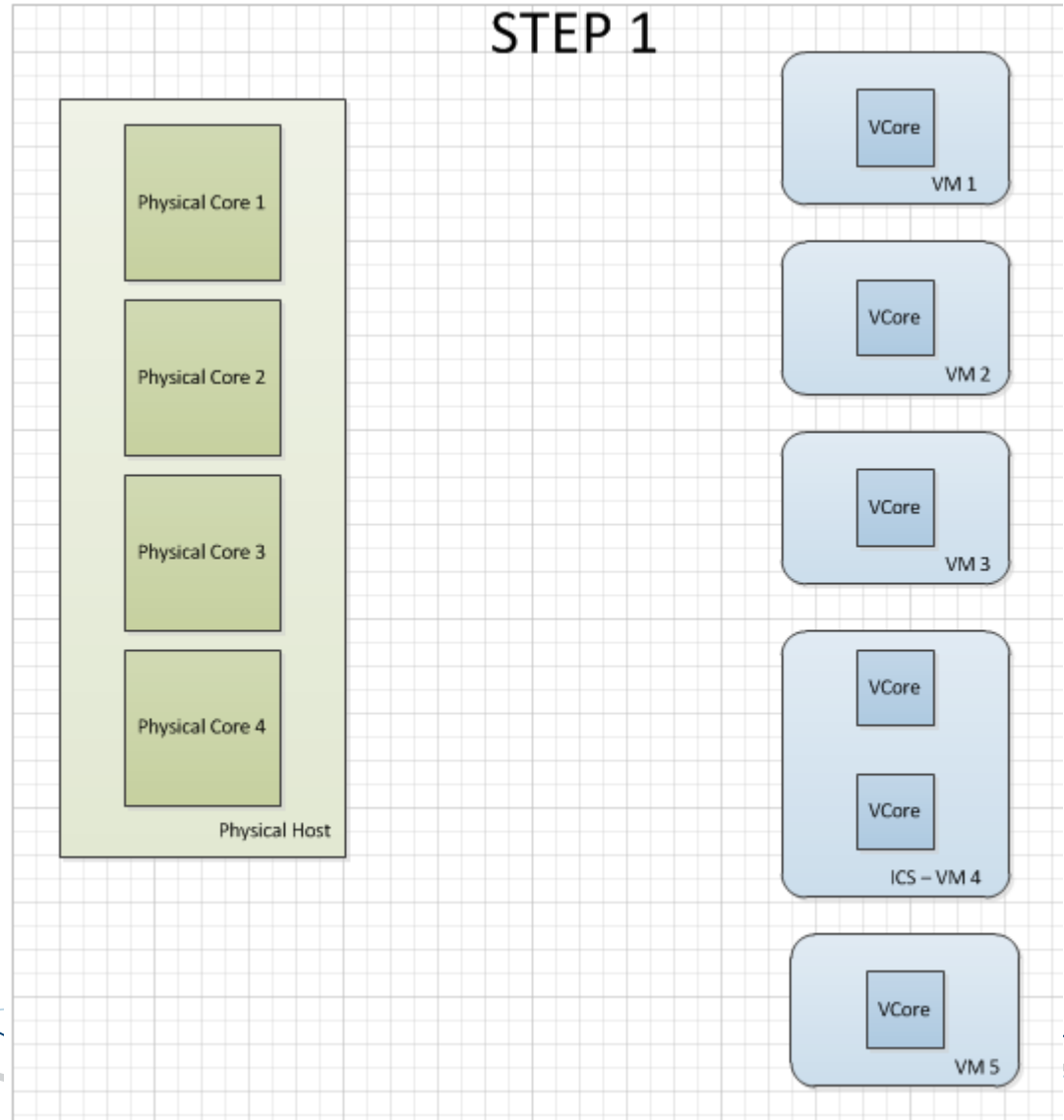
Performance Monitor – Interesting Counters

- PROCESSOR – VMware Issue

  - VM1 – VM3 have to process and occupy the first three VCores

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Performance Monitor – Interesting Counters

- PROCESSOR – VMware Issue

  - ICS VM has to process but it has to wait because there is only one Vcore left

STEP 3

Physical Core 1

Physical Core 2

Physical Core 3

Physical Core 4

Physical Host

VCore — VM 1

VCore — VM 2

VCore — VM 3

VCore / VCore — ICS – VM 4

VCore — VM 5

Request Denied
Not Enough Resources
Only one Ph. core is
available

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Performance Monitor – Interesting Counters
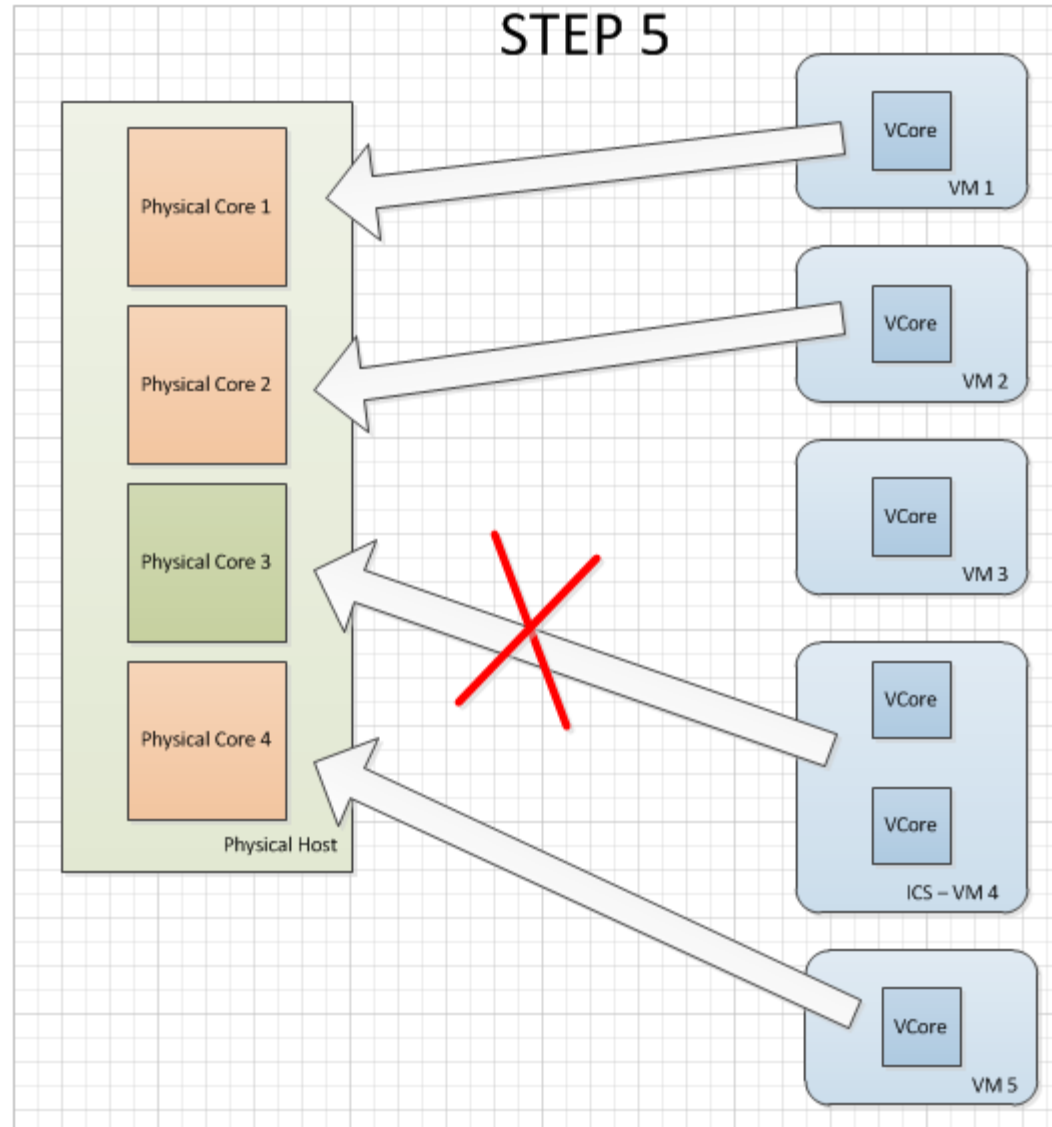
- PROCESSOR – VMware Issue

  - While ICS VM is waiting for free resources, VM5 has to process and occupies the last free VCore
  - Now ICS VM has no resources at all
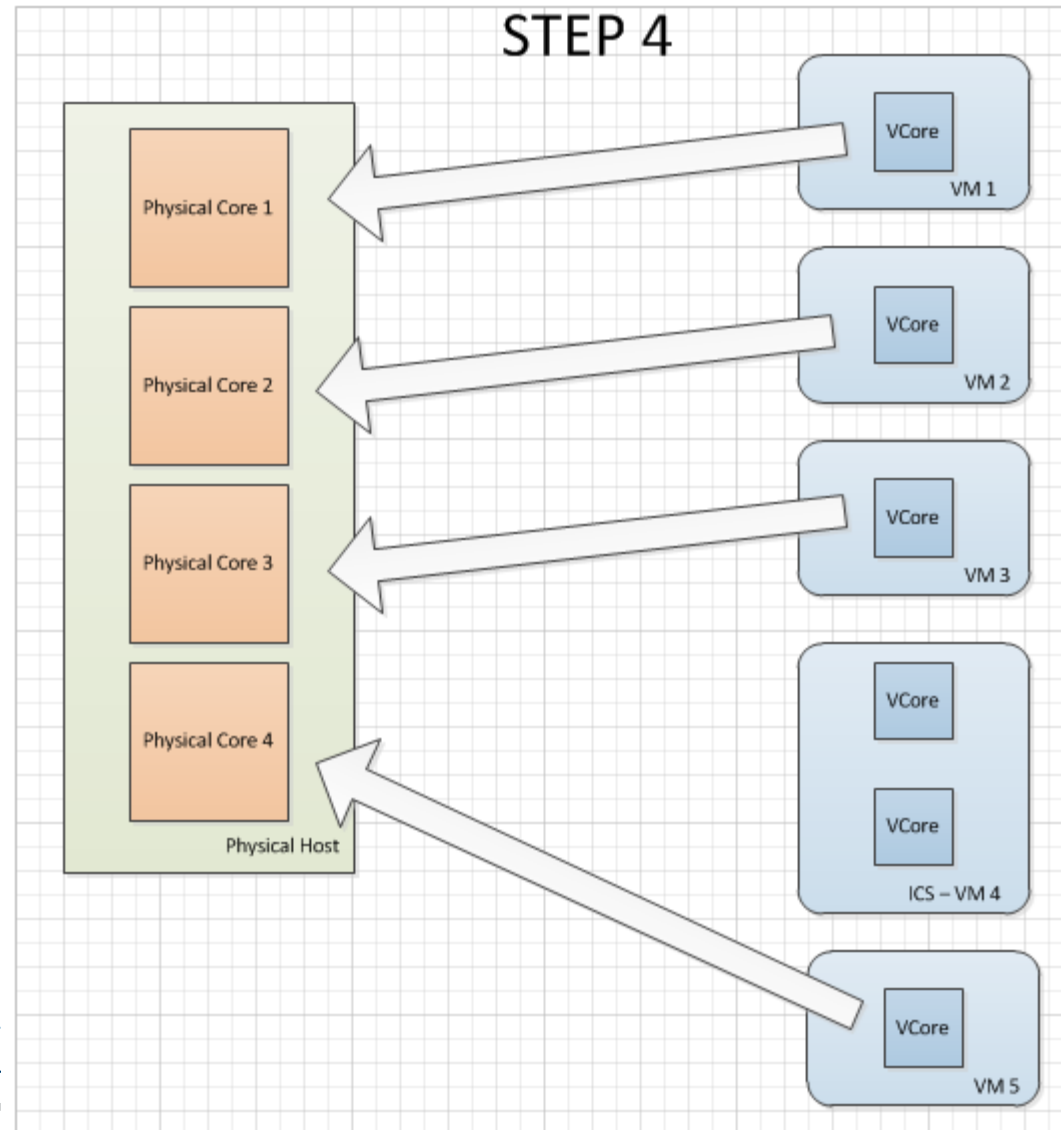
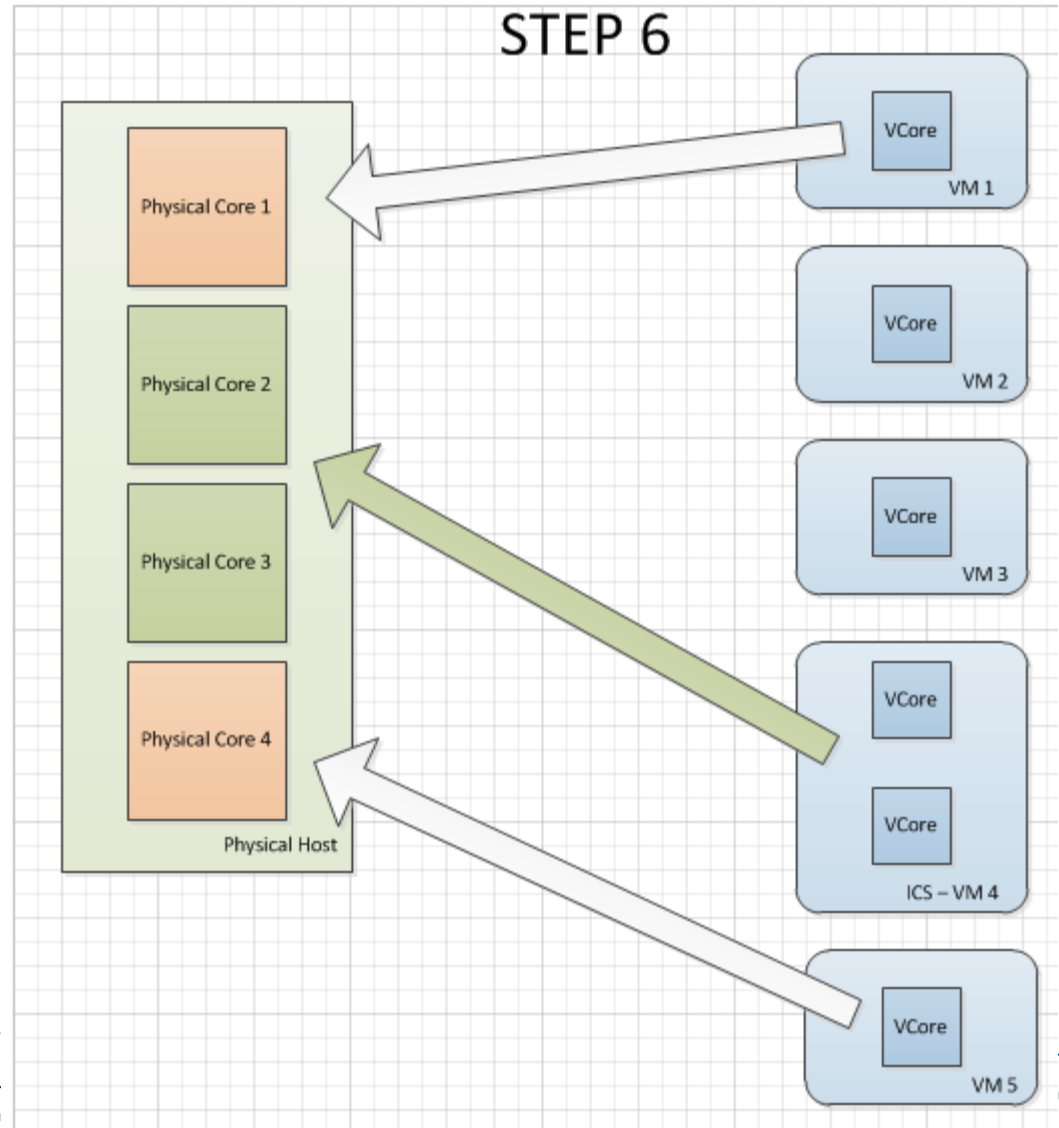# Performance Monitor – Interesting Counters

- PROCESSOR – VMware Issue

  - VM3 is done processing and frees up one Vcore
  - ICS VM is still unable to process – not enough free VCores

STEP 5

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Performance Monitor – Interesting Counters

- PROCESSOR – VMware Issue

  - VM2 is done processing and frees up another Vcore
  - ICS finally has the resources to process

STEP 6

Performance Monitor – Interesting Counters

- PROCESSOR – VMware Issue - Conclusion

- Multiple cores for a VM can result in poor performance – not seen from inside Windows (see VMware presentation)

- ICS DB Server needs more than one core in order to take advantage of SQL's multithreading capability

- ANSWER:
- **Set the Virtual Processor Shares to High** for the ICS VM in VMware console (customer has to do this). This will increase the priority for this VM against the rest.
- Keep the number of ICS's VCores to half of available Physical Cores.
- Create 4 VProcessors with 1Vcore rather than 1 VProcessor with 4 VCores

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Performance Monitor – Interesting Counters

- MEMORY

Counter Object	Counter Property	Counter Instance
Memory	Pages/sec	N/A

- Measures how often the system uses the hard-disk instead of memory. More than 5 it may indicate an issue (spike >20)

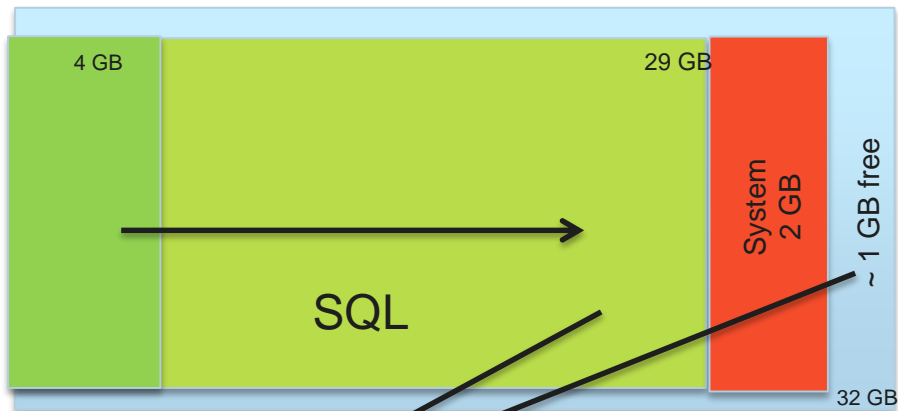| Counter Object	Counter Property	Counter Instance
Memory	Available Mbytes	N/A

- Very familiar – indicates if system is lacking in RAM (if gets close to zero) – > 0.5 GB

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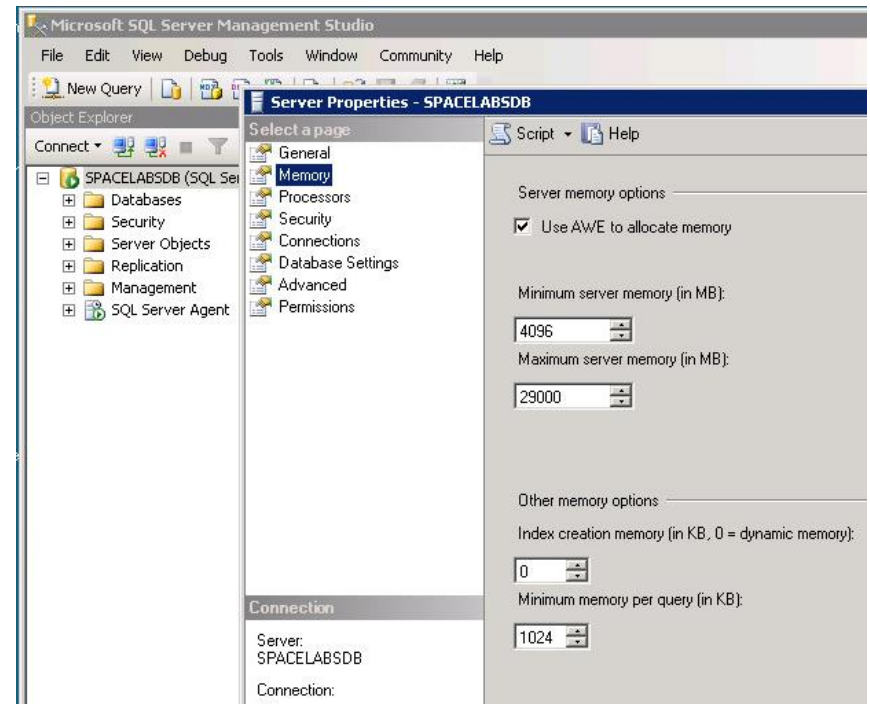
Performance Monitor – Interesting Counters

- ## MEMORY "Gotcha" for over 4GB

Counter Object	**Counter Property**	**Counter Instance**
Memory	Available Mbytes	N/A

Available Mbytes – still 1GB free while SQL is struggling

Performance Monitor – Interesting Counters

- STORAGE

- Space - generally not an issue as DB is constant in size

- Delay/Latency

Counter Object	Counter Property	Counter Instance
Physical Disk	Avg. Disk Sec/Read	The disk where the DB is located (D:, E:)
Physical Disk	Avg. Disk Sec/Write	The disk where the DB is located (D:, E:)

- Measures how many seconds (milliseconds) it takes the system to complete ONE Read (Write) operation

- <10 ms (spike <20ms)

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Performance Monitor – Interesting Counters

- STORAGE

- Delay/Latency (continued)

Counter Object	Counter Property	Counter Instance
Physical Disk	Avg. Disk Read Queue Length	The disk where the DB is located (D:, E:)
Physical Disk	Avg. Disk Write Queue Length	The disk where the DB is located (D:, E:)

- Measures the number of read/write requests that had to be delayed (buffer for the physical disks)
- More than 2 (spike 3) indicates a slow hard-disk

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Performance Monitor – Interesting Counters

- STORAGE

- IOPS

Counter Object	Counter Property	Counter Instance
Physical Disk	Disk Reads/sec	The disk where the DB is located (D:, E:)
Physical Disk	Disk Writes/sec	The disk where the DB is located (D:, E:)

- Measures the disk utilization
- Threshold greatly varies with number of monitors, installed ICS applications (HL7), number of CA users (Analyze)

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Performance Monitor – Interesting Counters

- SQL

- Transactions

Counter Object	Counter Property	Counter Instance
SQLServer: SQL Statistics	Batch	Requests/sec

- ~~Replaces~~ the *Transactions/sec* in prior SQL versions

- Measures the activity of the SQL Engine

- A value above 1000/sec/core (spike 2500) may indicate a SQL engine issue

Performance Monitor – Interesting Counters

- SQL

- Buffer Activity

Counter Object	Counter Property	Counter Instance
SQLServer:	Buffer Manager	Page life expectancy

- Similar to Pages/sec for Memory

- Measures for how long the system expects a page to reside in memory before is discarded and a new one is read from the disk

- A value UNDER 2500 (spike 400) may indicate RAM shortage or a SQL engine issue

Performance Monitor – Interesting Counters

- SQL

- Buffer Activity (continued)

Counter Object	Counter Property	Counter Instance
SQLServer:	Buffer Manager	Page reads/sec
SQLServer:	Buffer Manager	Page writes/sec

- It is the IOPS for SQL (similar to IOPS for Disk)
- Measures the number of physical DB page reads/writes issued
- A value above 90 may indicate a SQL engine issue

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Performance Monitor – Interesting Counters

- SQL

- Available Memory "Gotcha" – more counters

Counter Object	Counter Property	Counter Instance
SQLServer:	Buffer Manager	(1)Lazy Writes/sec
SQLServer:	Buffer Manager	(2)Free Pages
SQLServer:	Buffer Manager	(3)Free List Stall/sec

- (1) This counter tracks how many times a second that the Lazy Writer process is moving dirty pages from the buffer to disk in order to free up buffer spaceMeasures the number of physical DB page reads/writes issued. It should be under 20/sec (25/sec spike)
- (2) Total number of pages on all free lists. Always above 0 (>640 – OK, >800 excellent)
- (3) Free list stalls/sec is the frequency with which requests for available database pages are suspended because no buffers are available. Should always be 0 (<2/sec – OK; spike <3/sec)

Interpreting the Results

- TIPS:

- A high maximum or low minimum may be isolated and not a sign of issues (that's why charts are useful)

- Average values can be your first clue of system performance issues

- When you see spikes in charts, look for a pattern – that can indicate a scheduled job (backup) that is consuming resources

- Compare related counters for consistency (i.e if Avg. Disk Sec/Write is high, compare with Write Queue Length and Disk Writes/sec) or Memory Pages/sec vs. SQL Page Life Expectancy.

- Better interpretation skills come with practice ☺

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Performance Monitor – Quiz 1

- How is the load on the Processor on this system?

- Can you see the pattern?

Processor(_Total)\\% Processor Time
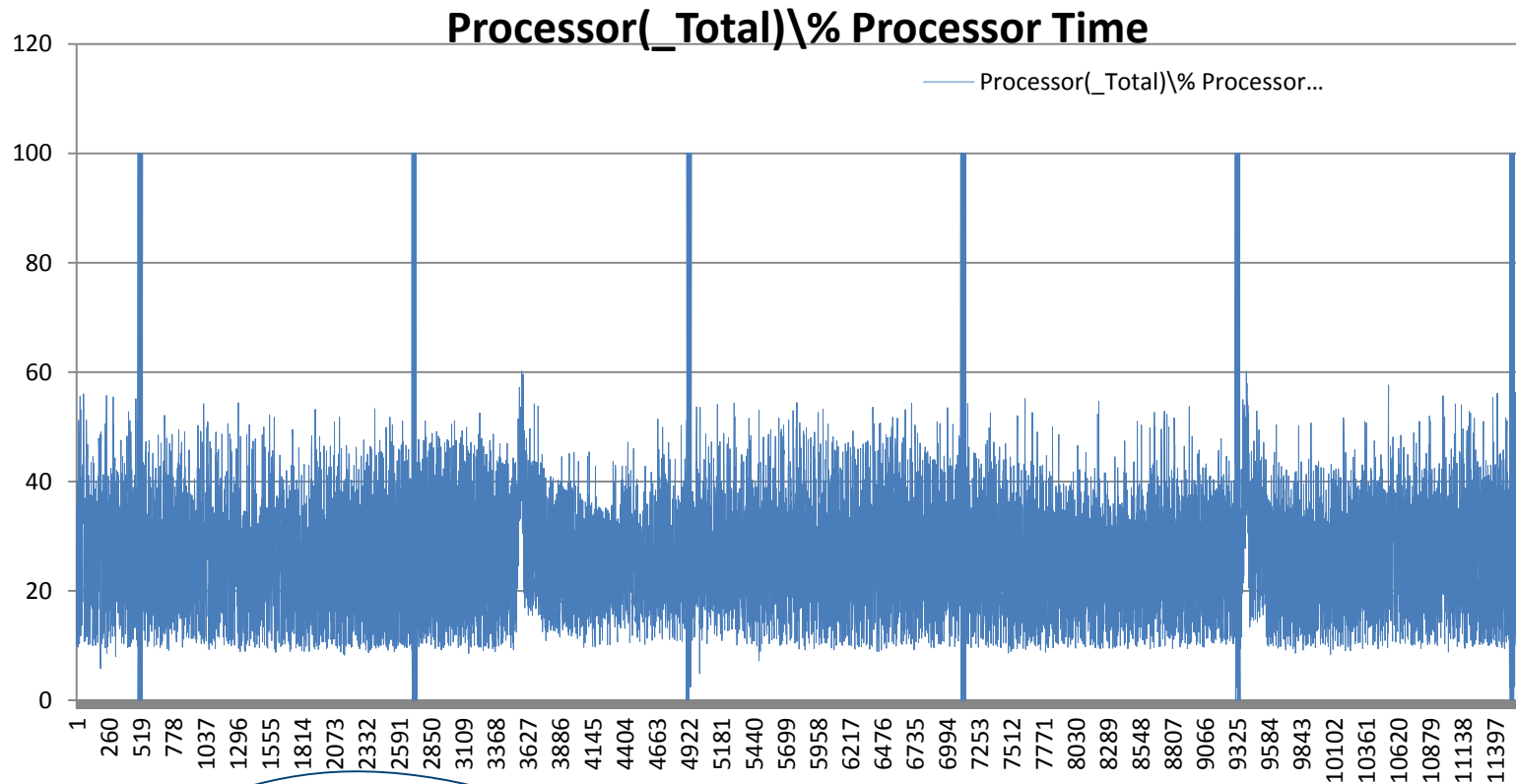
Performance Monitor – Quiz 2

- The threshold for Avg. Disk sec/Write is 10 ms (spike 20 ms)

- Is this disk performing properly?

PhysicalDisk(2 F:)\Avg. Disk sec/Write