Capturing Virtual Bytes To A PerfMon Log File

A White Paper From



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The Pervasive database engine, when running as a 32-bit process on a 32-bit server, has a limited addressing space of 2GB. If it is running on a 64-bit server, the available memory space is a bit better (4GB), but it is still something that should be monitored.

In this paper, we are going to investigate a few different ways of monitoring the Virtual Bytes for the database engine process. Prior to reading this, you may wish to also review the two white papers from http://www.goldstarsoftware.com/press.asp on **Understanding Server Memory Counters** and **Interpreting Server Memory Counters**.

Spot-Checking Your Virtual Bytes Manually

The easiest way to monitor the Virtual Bytes is to simply check on it periodically with PerfMon, as described in the papers above. We will repeat the details here for completeness.

First, start up Performance Monitor by selecting Start/Run and entering PerfMon.



Then, click on the plus sign (+) on the tool bar and add the setting that you want. In this case, we want to add the **Virtual Bytes** value, so select the **Process** object, the **Virtual Bytes** counter, and the **ntdbsmgr** instance.

Add Counters	<u>? ×</u>
Use local computer counters Select counters from computer:	
INDEATHSTAR	
Performance <u>o</u> bject:	
Process	
C All cou <u>n</u> ters	○ <u>A</u> ll instances
Select counters from list:	 Select instances from list:
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A <u>d</u> d <u>E</u> xplain	

Click **Add**, then **Close**, and you'll have added the counter to the PerfMon screen. Then, just click on it and read the **Last** value to find out where you are right now.

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Generating a Log File With Virtual Bytes Counter Values

If you are trying to find out WHEN the virtual bytes are being used up, then watching it manually won't be very helpful, since it will change slowly over time, and it may take weeks for the engine to leak enough memory to reach the maximum addressing space.

A better solution is to write the counter values to a log file, which can be done using these steps.

First, start up PerfMon and click on the **Counter Logs** entry in the tree on the left.

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Console Root	Name	Comment	Log File Type	Log File Name
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Then, right click in the space and select **New Log Settings...**, where you will get a dialog box asking for a name. Give it a useful name and click **OK**.

New Log Settings		? ×
<u>N</u> ame:		
PSQLVirtualBytes		
	ОК	Cancel

From the next dialog box, click **Add counters...** and add the counter exactly as indicated above.

PSQLVirtualBytes	? ×
General Log Files Schedule	
Current log file name:	
C:\PerfLogs\PSQLVirtualBytes_000001.blg	
This log begins immediately after you apply changes.	
<u>C</u> ounters:	
\\DEATHSTAR\Process(ntdbsmgr)\Virtual Bytes	
Add <u>O</u> bjects Add <u>Counters</u> <u>R</u> emove	
Sample data every:	-
Interval: 15 📩 Units: seconds	┓│
	-
	_
Run As: <default> Set Password</default>	
OK Cancel App	ly

Note that the default sample rate interval is every 15 seconds. This is probably overkill for this setting (unless you are leaking memory very rapidly). You may wish to change this to every 1 minute or perhaps even higher.

PSQLVirtualBytes	? ×
General Log Files Schedule	
Log file type and name Log file type: Text File (Comma delimited) ▼ Configure) ✓ End file names with: nnnnnn ▼ Start numbering at: 1 Example: C:\PerfLogs\PSQLVirtualBytes_000001.csv	
Comment:	
☐ O⊻erwrite existing log file	
OK Cancel A	pply

Click on the Log Files tab to get to the next dialog.

As we are going to graph this data in Excel, we want to change the **Log file type...** setting from the default of a **Binary File** to **Text File (Comma Delimited)**. The rest of the settings can remain the same. The Comment is optional, but you can add it if you want. If the default directory is unacceptable for your log files (remember that you don't want to run the C: drive out of disk space), then click on the **Configure...** button and you can change the path and file names.

Click **OK** to go back to the main PerfMon screen, and the counter will be started. This is evidenced by the green database icon in the **Counter Logs** listing.

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Console Root	Name	Comment	Log File Type	Log File Name
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Performance Logs and Alerts	PSQLVirtualBytes		Text File (C:\PerfLogs\PSQLVi.
Counter Logs Trace Logs Alerts	٩			

Now, let this run for a while to collect useful data. When you have enough data in the log file, right click on the Counter Log that you just created and select **Stop**. You can later restart the log by right-clicking and selecting **Start**.

Reviewing the Log File Data

When you are done collecting data, you can directly open the log file that you created. If you open it with NotePad, then you'll see something like this:

PSQLVirtualBytes_000001.csv - Notepad	
<u>File Edit Format View H</u> elp	
<pre>["(PDH-CSV 4.0) (Central Daylight Time)(300)", "\\DEATHSTAR\Proce "09/07/2010 12:07:43.250", "541900800" "09/07/2010 12:08:43.250", "541900800" "09/07/2010 12:10:43.250", "541900800" "09/07/2010 12:11:43.250", "541900800" "09/07/2010 12:11:43.250", "541900800"</pre>	ss(ntdbsmgr)\virtua▲
	► F
	Ln 1, Col 1

You can scroll through the data file and watch the Virtual Bytes values go up and down with respect to the timestamp field in the first column. This amount of detail can be overwhelming, though, especially for a long log file where the numbers are rapidly changing, so we'll look for a better solution.

Graphing a Log File In Microsoft Excel

An easier way to analyze the resulting log file data is to quickly graph it via Microsoft Excel. To do this, we'll be using Excel 2007 as an example, but other versions should work similarly.

First, start Excel, then go to the Data menu and select From Text. Select your CSV file containing the log data, and click OK. You'll see the Text Import Wizard page.

Text Import Wizard - Step 1 of 3	? X
The Text Wizard has determined that your data is Fixed Width. If this is correct, choose Next, or choose the data type that best describes your data. Original data type	Need Delimited
Choose the file type that best describes your data: Delimited Characters such as commas or tabs separate each field. Fixed width Fields are aligned in columns with spaces between each field. 	
Start import at row: 1 File origin: 437 : OEM United States	•
Preview of file \\Deathstar\Archives\Air Tran Airways\VirtualBytesLog_000001.csv.	
1 "(PDH-CSV 4.0) (Morocco Standard Time)(0)","\\MCODISPSRV01 2 "08/05/2009 20:49:40.493","1753931776","Track Virtual Byte 3 "08/05/2009 20:50:40.491","1752870912","Track Virtual Byte 4 "08/05/2009 20:51:40.490","1757065216","Track Virtual Byte 5 "08/05/2009 20:52:40.488","1756016640","Track Virtual Byte	Process (NTDBSM * s for NTDBSMGR s for NTDBSMGR s for NTDBSMGR s for NTDBSMGR +
Cancel Sada	ext > Einish

Be sure that you have selected "Delimited" and click Next.

Text Import Wizard - Step 2 of 3
This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below. Delimiters Comma Delimited Semicolon Teat consecutive delimiters as one Comma Space Other: Data greview Data greview
(PDH-CSV 4.0) (Morocco Standard Time) (0) \\MCODISPSRV01\Process(NTDBSMGRmg: 08/05/2009 20:49:40.493 1753931776 08/05/2009 20:50:40.491 1752870912 08/05/2009 20:51:40.490 1757065216 08/05/2009 20:52:40.488 1756016640 <

Be sure that you have selected **Comma** as the delimiter and click **Next** again.

Text Import Wizard - Step 3 of 3	? <u>×</u>
This screen lets you select each col Column data format © <u>G</u> eneral © <u>T</u> ext © <u>D</u> ate: <u>MDY</u> © Do not import column (skip) Data greview	umn and set the Data Format. 'General' converts numeric values to numbers, date values to dates, and all remaining values to text. <u>A</u> dvanced
General	General
(PDH-CSV 4.0) (Morocco	Standard Time)(0) \\MCODISPSRV01\Process(NTDBSMGRmg: 🔺
08/05/2009 20:49:40.493	1753931776
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08/05/2009 20:51:40.490	1757065216
08/05/2009 20:52:40.488	1756016640 🔻
•	4
	Cancel < Back Next > Einish

On the last dialog, just click **Finish** to leave all of the defaults and load the data. You'll now see that Excel has loaded the data for you. However, there are some problems with it, as you see here:

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4	51:40.5	j		1757065216	Track Virtual Byt	es for NTDBSMG	R
5	52:40.5	i		1756016640	Track Virtual Byt	es for NTDBSMG	R
6	53:40.5	<u> </u>		1757089792	Track Virtual Byt	es for NTDBSMG	R
7	54:40.5	i		1770692608	Track Virtual Byt	es for NTDBSMG	R
8	55:40.5	i		1766502400	Track Virtual Byt	es for NTDBSMG	R
9	56:40.5	<i>i</i>		1758113792	Track Virtual Byt	es for NTDBSMG	R
10	57:40.5	<i>i</i>		1760215040	Track Virtual Byt	es for NTDBSMG	R
11	58:40.5	-		1/51822336	Track Virtual Byt	es for NTDBSMG	R
12	59:40.5	-		1/53915392	Track Virtual Byt	es for NTDBSMG	K v
	▶ ▶ Sheet1 Sheet2 Sheet3	1	[•	1/01/595/0		PS TOT INTERSIME	
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The first thing we want to do is remove the third column, since this is just a comment field. So, click on the Column C and delete the column completely. Next, replace the two header elements with shorter names to make it easier to work with, and you should have something more resembling this page:

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5	52:40.5	1756016640							
6	53:40.5	1757089792							
7	54:40.5	1770692608							
8	55:40.5	1766502400							
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1/	01-40 5 Sheet1 Sheet2	1770020402 Sheet3		Π	4			▶ 1	*
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Next, we need to fix the formatting of the first column. Select the entire column, then right-click and select **Format Cells...** to get to this dialog box.

Format Cells		? ×
Number Alignmen Se	lect Time r Fill Protection	
Category: General Number Currency Accounting Date Percentage Fraction Scientific Text Special Custom	Sample Timestamp Type: 1:30 PM 13:30:55 1:30:55 PM 30:55.2 37:30:55 3/14/01 1:30 PM 3/14/01 1:30 PM 3/14/01 1:330 Locale (location): English (United States) Pick Las and time serial numbers as date values. Tim anges in regional date and time settings that an asterisk are not affected by operating sys	Scroll Down
		OK Cancel

Reformat the data as a time field, then click OK.

Now, we just need to add a graph to make it easier to see the changes when they occur. Select the Insert menu, then insert a new Line graph using the first 2D graph option:

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5	8/5/09 20:52	1756016640								
6	8/5/09 20:53	1757089792								
7	8/5/09 20:54	1770692608								
8	8/5/09 20:55	1766502400								
9	8/5/09 20:56	1758113792								
10	8/5/09 20:57	1760215040								
11	8/5/09 20:58	1751822336								
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13	8/5/09 21:00	1761259520								
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Move the graph over so that you can see it better, and you'll get something like this:

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3	8/5/	/09 20:50	17528	370912				virtu	Idip	ytes					
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16	8/5/	/09 21:03	17801	33888	<u>}</u>										J 🖵
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Another problem that we have is the two axes do not allow for good analysis of the data. In fact, if we just look at this, it looks like the memory just jumps all at once. This is a problem with the automated graphing tool, so let's fix it.

First, right-click on the vertical axis and select Format Axis... to get to the next dialog box.

Format Axis	Y X
Axis Options Number Fill Line Color Line Style	Axis Options Minimum: Auto Eixed 1.7E9 Maximum: Auto Fixed 2.0E9 Major unit: Auto Fixed 5.0E7 Minor unit: Auto Fixed 1.0E7
Shadow 3-D Format Alignment	Yakues in reverse order Qagnthmic scale Base: Display units: None Show display units label on chart Major tick mark type: Outside Mijnor tick mark type: None Axis labels: Next to Axis Horizontal axis crosses: Axis valug: Axis valug: 1.7E9 Maximum axis value Maximum axis value
	Close

In this case, we've manually modified the minimum value to "1.7E9", or about 1.7GB, which will give us a better graph picture. Next, do the same with the horizontal axis across the bottom of the graph.



For the date axis, we need to get rid of the automated formating, so first click on the Text axis option radio button. This changes the dialog box considerably.

Format Axis	
Axis Options Number Fill Line Color Line Style Shadow 3-D Format Alignment Major tick mark type: Outside Outside Therval between takels: Interval between takels: Shadow 3-D Format Automatically select based on data Outst agis Date agis	
Minor tick mark type: Axis labels: Vertical axis crosses: Autgmatic At category number: At maximum category Postion Axis: On tick marks Between tick marks Close	

Now, that THOSE changes are out of the way, the entire graph will have changed to show a LOT more detail. You can expand the size of the window and then the size of the graph to get a much better picture of the changes to the Virtual Bytes.



What we really see now is a lot more interesting. We can see several points in time where the Virtual Bytes value jumps up quickly, and it never seems to go back down. By looking for these points in the raw data, we can then ascertain the exact time the memory was used up, and then try to determine what was going on during that time within the engine. This information can be then used to help pinpoint the processes and/or queries which might be leaking memory in the process.