Sitecore CMS 6.0 - 6.5

CMS Diagnostics Guide

A developer's guide to diagnosis of Sitecore CMS performance

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Chapter 1

Introduction

This guide is designed as a companion guide to the Sitecore CMS Performance Guide. It provides you with a series of diagnostic procedures that can help you identify performance issues, as well as a means to measure performance gains through tuning.

This manual contains the following chapters:

- **Chapter 1 —Introduction**
- **Chapter 2 — Diagnostic Procedures**

Chapter 2

Diagnostic Procedures

Diagnostic procedures are a series of tests that help identify performance issues in a Sitecore implementation.

The procedures defined are complimentary to the CMS tuning. By running the diagnostic procedures before and after tuning the Sitecore CMS, performance improvements can be recorded.

This chapter contains the following sections:

- Browser Page Test
- Investigating Page Performance (using the IIS Logs)
- Rendering Performance
- Investigating Memory Leaks with the Sitecore Logs

2.1 Browser Page Test

"The size of the average web page of the top 500 websites has more than quintupled since 2003. From 2003 to 2009 the average web page grew from 93.7K to over 507K (see Figure 1), over 5.4 times larger (Domenech et al. 2007, Flinn & Betcher 2008, Charzinsk 2010). During the same six-year period, the number of objects in the average web page more than doubled from 25.7 to 64.7 objects per page. Longer term statistics show that since 1995 the size of the average web page has increased by 35 times, and the number of objects per page has grown by 28 times." - http://www.websiteoptimization.com/speed/tweak/average-web-page/

What the previous statement means, is that in today's webpages it is crucial to understand the number and size of objects that are loaded into a webpage. Also, how a web server is setup to cache objects and minimize the number of requests that are made is important.

There is a lot of information that can be gathered by analyzing what takes place when a webpage is loaded into a browser. Information about what is being requested, time to response, size of objects, and so on is available. Also how the server is setup in terms of caching, compression, CDN usage, and keep-alive information can be viewed.

This task looks at using an open source plug-in, AOL Pagetest, along with how to interpret the results.

2.1.1 Setup

The AOL Pagetest browser plug-in can be downloaded from:
http://sourceforge.net/projects/pagetest/files/

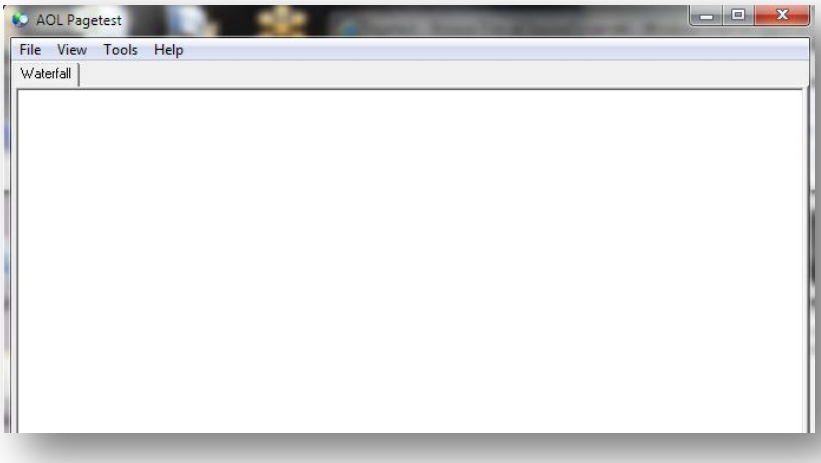
Once it has been downloaded, install in its default location. The AOL Pagetest plug-in works with IE 7+ browsers, and appears in the Tools menu.

Note
If IE was opened during the installation, you must restart IE for the AOL Pagetest to appear in the Tools menu.

2.1.2 How to Use the AOL Pagetest Browser Plug-in

To launch AOL Pagetest:

1. Launch IE.
2. In the **Tools** menu, *click* **AOL Pagetest** .



2.1.3 Capturing Information

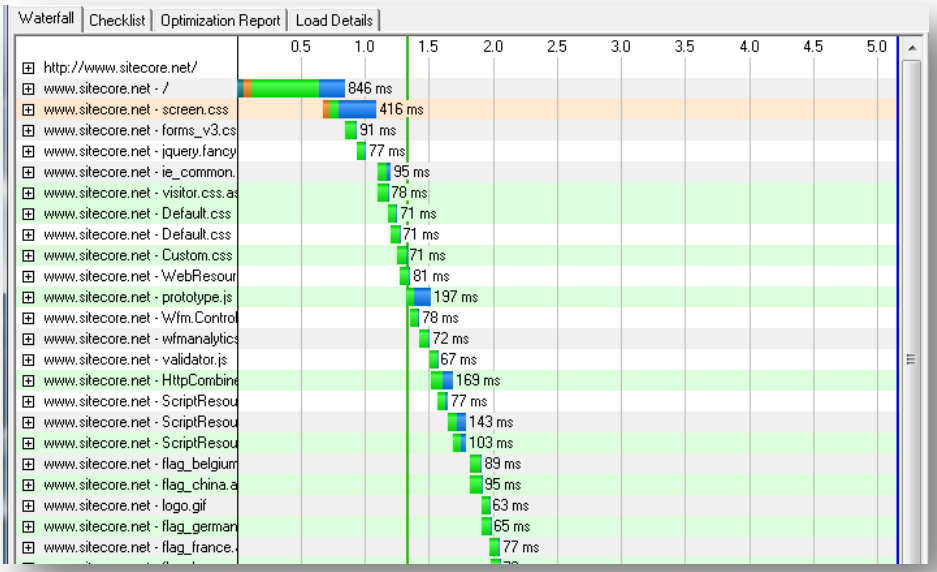
There are 3 useful page loading scenarios that are gathered during this exercise to see how the webpage reacts to a cleared browser cache, a webpage reload, and a webpage request with a loaded cache.

- Cleared browser cache — this simulates the first time a page is visited from the browser being used.
  - To clear the browser cache for **IE 8** and above:
  - In the **Safety** menu, click **Delete browsing history...**
  - Clear **Preserve Favorites website data**, and select **Temporary Internet Files**, **Cookies**, and **History**.
- To clear the browser cache for **IE 7**:
  - In the **Tools** menu, click **Internet Options**
  - Under **Browsing History**, click **Delete**...
  - To delete your cache, click **Delete files**...
  - Click **Close**, **OK**.
- Webpage reload or refresh — This forces requests to be made to objects in cache, resulting in 304 status codes. When a 304 status appears, a request is still made for an object, even though no download occurs.
- Accessing a recently visited webpage (typing in the URL) — This results in a page with a much reduced request chain, since items that were previously loaded into the browser cache are accessed without making any requests.

First Pass — Cleared Browser Cache

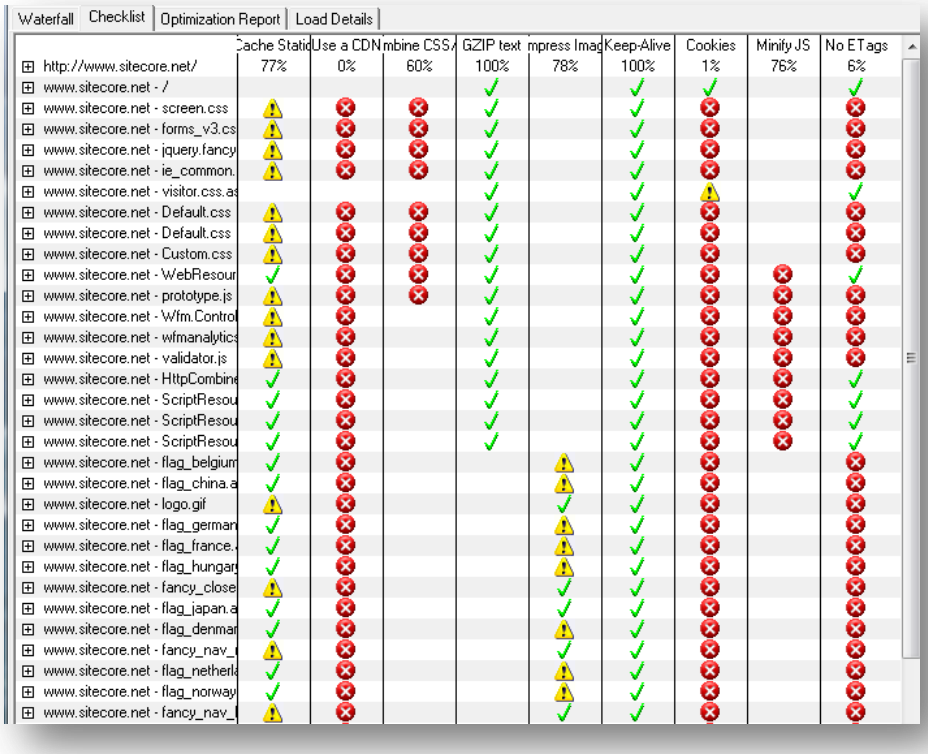
1. Launch ***IE***.
2. Clear the browser cache (see above).
3. Launch AOL Pagetest.
4. Type in the URL you wish to test (for example: http://www.sitecore.net).
5. The AOL Pagetest window now contains 4 tabs (**Waterfall**, **Checklist**, **Optimization Report**, and **Load Details**). The following section explains how to interpret the information presented in each tab.

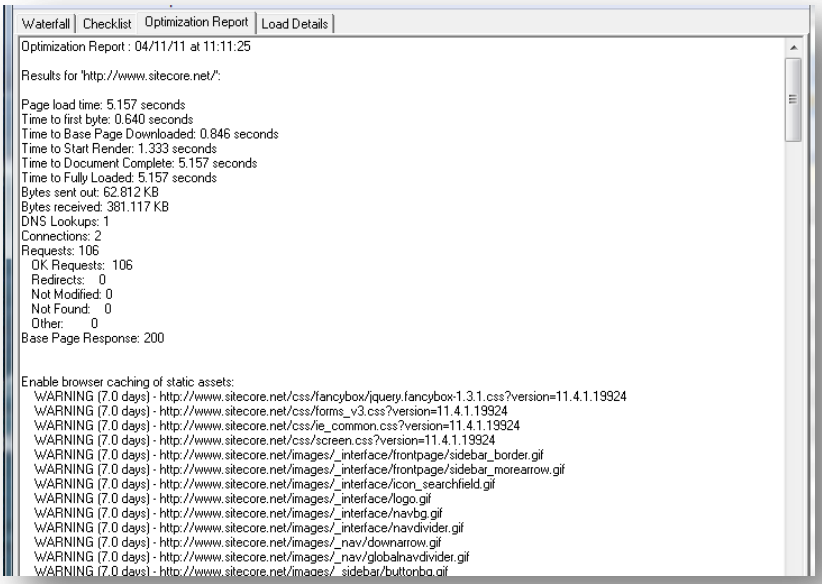
A view of the 4 tabs:



Observations:

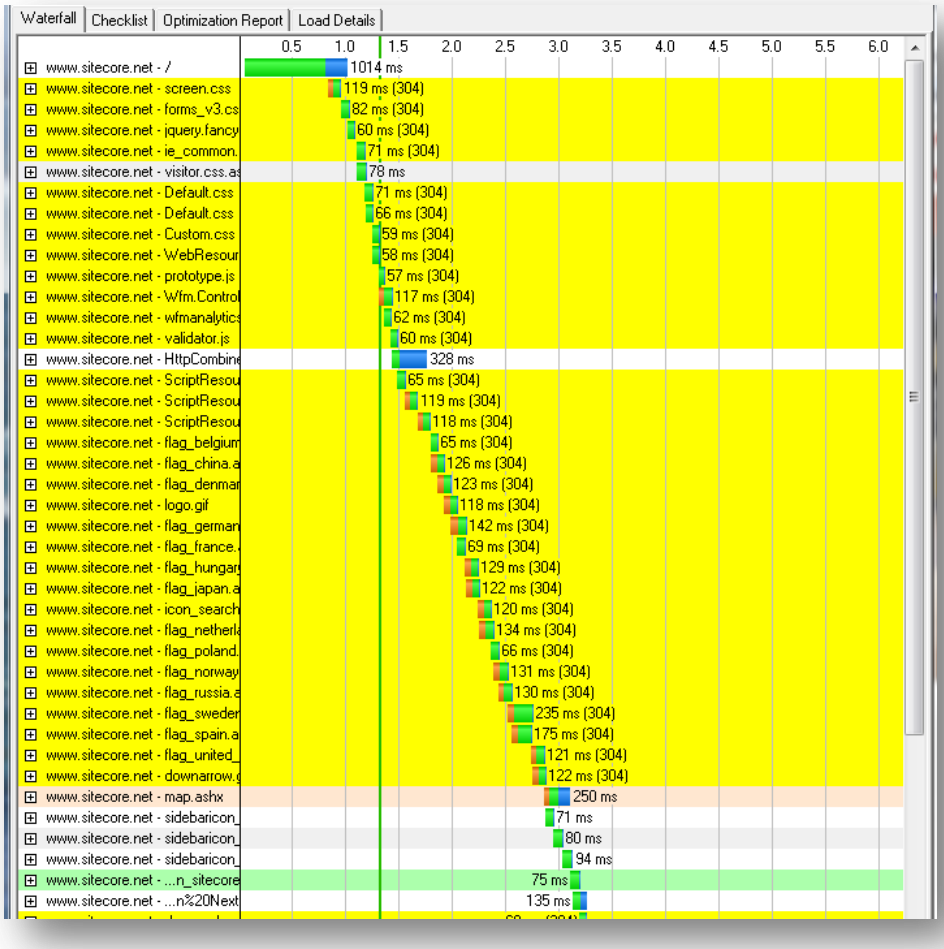
- Notice that the **Waterfall** tab shows a full request made to each object in the webpage.
- That assets such as CSS and JS files have not been combined, so multiple requests are being made to download them. By combining all of your CSS and JS files, the time line is pushed to the left, due to a single request being made, shortening the time to render the page.





Second Pass - Refresh Browser Page

1. In the **AOL Pagetest File** menu, click **New**
2. Refresh the browser page — click refresh page, or press F5.
3. View the results in the **Waterfall** tab, and compare to the results from the first pass.



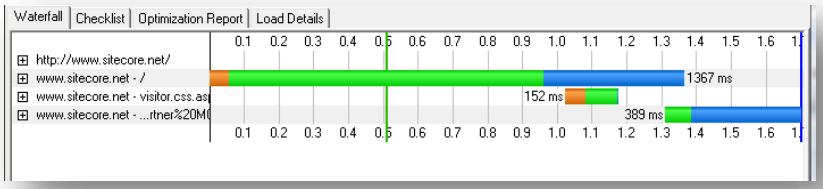
Observations:

- The objects highlighted in yellow are 30x status codes.
- The results show that cached items are requested, but not downloaded. This is expected behavior for a page that has been refreshed.
- What can be taken from this view is that those items with a 304 status code should not be requested during the 3rd pass, "A recently visited page".

Third Pass — Recently Visited Webpage

1. In the **AOL Pagetest File** menu, click **New**.
2. In the browser select the URL and hit enter (do not click the browser's refresh button).

3. View the results in the **Waterfall** tab, and compare to the results from the first and second passes.



Observations:

- The request tree has been reduced significantly.
- It is known that the first two requests, / and visitor.css, are dynamic and not cached.
- The third item requires investigation as to why it is not coming from cache. Upon further investigation it was found that this request is a rotating image, which changes across visits. (OK not to be in cache).

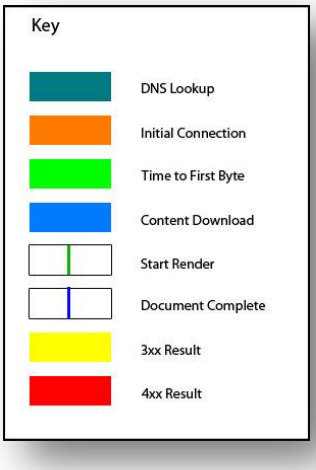
2.1.4 Interpreting the Results

Here we dive into the **Waterfall**, **Checklist**, **Optimization Report**, and **Load Details** tabs, explaining the information that is presented.

Waterfall Tab

The **Waterfall** tab presents a view of the request chain that makes up the requested objects for a web page. The requested objects are listed down the left side, and the time is listed along the top.

The colors that make up a request / response are:



- **DNS Lookup** — This is the time it takes to look up the IP Address for the requested URL.
- **Initial Connection** — This is the time that it takes to go from the client to the server to open up a socket. Note, if an initial connection is made on every request, this could be an indication that the HTTP keep-alive has not been enabled on the server.
- **Time to First Byte** — This is the time that it takes from request to receiving the first byte of the object. Extended Time to First Byte times could be an indicator of a problem at the server (for example, performance issues), or network issues.

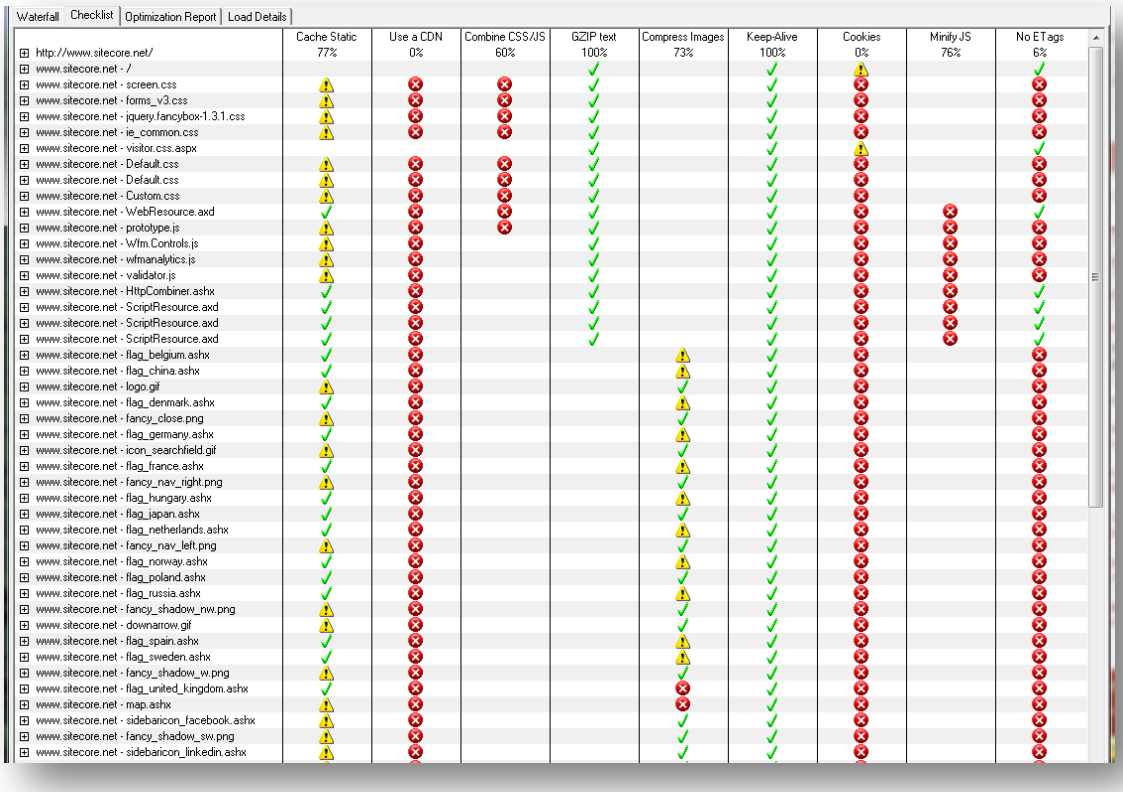
- **Content Download** — This is the time required to download an object. Extended Content Download times could be an indicator of large objects. An inspection of the size of the object may be required. For example: images that have not been optimized or compressed could have an effect on the performance of the web page.
- **Start Render** — This is the green vertical line shown on the Waterfall. This indicates when the user starts to see content appear in the browser. Technically this represents the time when the web page has a height and width > 0.
- **Document Complete** — This is the time when the document complete event had fired.
- **3xx Result** — Objects that are highlighted in yellow indicate that 3xx status code has occurred, such as a request or cache request.
- **4xx Result** — Objects that are highlighted in red indicate that a 4xx status, or error code has occurred. These should be investigated ASAP.

Checklist Tab

The **Checklist** tab is a report card of how well your site takes advantage of performance related settings and procedures.

Topics are listed from left to right in order of importance:

- A green check mark indicates a *pass.*
- A yellow triangle indicates a *warning.*
- A red X indicates a "failure"



The following table contains information about the meaning of each topic, what objects they apply to, as well as what is checked:

Cache Static	Applicable Objects	Any non-html object with a mime type of "text/*",

		"*javascript*" or "image/*" that does not explicitly have an Expires header of 0 or -1, a cache-control header of "private", "no-store" or "no-cache" or a pragma header of "no-cache"
	What is checked	An "Expires" header is present (and is not 0 or -1) or a "cache-control: max-age" directive is present and set for an hour or greater. If the expiration is set for less than 30 days you get a warning (only applies to max-age currently).
Use A CDN	Applicable Objects	All static non-html content (css, js and images)
	What is checked	Checked to see if it is hosted on a known CDN (CNAME mapped to a known CDN network). The known CDN's are Akamai, Amazon CloudFront, Coral Cache, Edgecast, Google, Highwinds, Internap, Limelight, Mirror Image, Panther and Yahoo
Combine CSS/JS	Applicable Objects	All css and javascript objects
	What is checked	If multiple files of the same type are served then each additional css file beyond 1 subtracts 5 percent and each Javascript file beyond the first subtracts 10 percent
GZIP Text	Applicable Objects	All objects with a mime type of "text/*" or "*javascript*"
	What is checked	Transfer-encoding is checked to see if it is gzip. If it is not then the file is compressed and the percentage of compression is the result (so a page that can save 30% of the size of it's text by compressing would yield a 70% test result)
Compress Images	Applicable Objects	Any object with a mime type of "image/*"
	What is checked	GIF - All pass PNG - Must be 8 bit or lower (no 24-bit PNGs pass) JPEG - Within 10% of a photoshop quality 50 pass, up to 50% larger warns and anything larger than that fails. The overall score is the percentage of image bytes that can be saved by re-compressing the images.
Keep-Alive	Applicable Objects	All objects that are from a domain that serves more than one object for the page — for example, if only a single object is served from a given domain it is not checked.
	What is checked	The response header contains a "keep-alive" directive or the same socket was used for more than one object from the given host
Cookies	Applicable Objects	All requests
	What is checked	Any request for a static object that sends up a cookie fails. All other requests that send up cookies warn.
Minify JS	Applicable Objects	All html, javascript and json responses
	What is checked	Javascript is run through jsmin. If the original content was gzip encoded, the minified version is also gzipped for comparison. If > 5KB or 10% is saved then it fails. If > 1KB is saved, it warns, otherwise it passes.
No Etags	Applicable Objects	All requests
	What is checked	If the response headers include an ETag header then the request fails.

Information to Solving Failures and Warnings:

- Failures in the Cache Statics column indicate that the HTTP Expires Web content header is not set, refer to: *IIS Expire Web Content Header.*
- Warnings in the Cache Statics column indicate that the HTTP Expires Web content header has a value set to less than 30 days. Refer to: *IIS Expire Web Content Header.*

- Failures in the Combine CSS /JS column indicate that CSS and or JS files are not combined into fewer files, indicating that multiple requests are being made to pull in these objects.
- Failures in the GZIP text column indicate that static compression is not enabled on the web server. Refer to*: Enable IIS Static Content Compression.*
- Failures in the Keep-Alive column indicate that HTTP keep-alive is not enabled on the web server, causing a connection having to be initiated for every object requested. Refer to: *Enable IIS HTTP keep-alive*.

Optimization Report Tab

The **Optimization Report** tab provides general information related to load times for the page, as well as where improvements can be made (based on the topics in the **Checklist** tab). In some cases, such as compression settings, an estimate of how much savings in terms of size is provided.

The **Optimization Report** tab is a textual view of what is presented in both the **Waterfall** and **Checklist** tabs.

Load Details Tab

The **Load Details** tab is a detailed account of what happens with every request. This information is useful for narrowing down issues with a particular request.

2.2 Investigating Page Performance (using the IIS Logs)

This Investigating Page Performance Task is designed to find pages that take longer than 4000 ms (4 sec) round trip, using the IIS logs. The results are recorded and used as a starting point for further investigation into which rendering component, or components, may be the culprit leading to poor performance.

The advantage of parsing information from the IIS logs vs. measuring page performance directly is that you also are able to look at geo-location information (possible network issues that occur due to location), and issues that may occur during peak usage (indicators of capacity problems).

2.2.1 Required Skills

- A working knowledge of Log Parser.
- A working knowledge of the IIS Logs.

2.2.2 Symptoms

- Slow page round trip times.

2.2.3 Talk to the Partner / Customer

The first step in determining where problem / slow loading pages exist is to ask the partner / customer / website owner if they are aware of any pages that appear to be slow. Record the URIs for further investigation into what is causing the performance issues.

Also, find out what are the peak run times for the web site. This information is used to determine if the web site has the capacity to handle load during peak usage.

2.2.4 Procedure to Query IIS Logs for Long Running Requests

Information about installing the **Log Parser** can be found at http://www.microsoft.com/en-us/download/details.aspx?id=24659

This query looks at the requested URLs ordered by time required to process the requests in descending order. This allows you focus on a rendering, or set of renderings in which to investigate.

Note that we are removing any URLs that include /sitecore/ to avoid looking at Sitecore client tools traffic.

To query the IIS Logs, looking for long running requests:

1. Launch the command line in a directory where the **Log Parser** is installed.
2. Run the following command (change the **#logs location#** and **#output file#**):

```
logparser -i:IISW3C -o:CSV

"SELECT TO_TIMESTAMP(date, time) as [Timestamp], cs-uri-stem as [URI], c-ip AS [Client IP],
time-taken as [Time], sc-status as [Status]
INTO #output file#
FROM #logs location#
WHERE ((EXTRACT_EXTENSION(URI) = 'aspx' OR EXTRACT_EXTENSION(URI) = '') AND URI NOT LIKE
'%/sitecore%')
AND time-taken > 4000
AND Status = '200'
ORDER BY time-taken DESC"
```

2.2.5 Understanding the Results

Open the output file in **Excel** and look at the results in two parts. The first is a series of long running requests that are all coming from the same client IP address. For this purpose you can use sorting or filtering functionality in **Excel**. This could be an indication of in-house testing. Or could show the IP addresses with the slow or limited bandwidth. The second is a more typical set of results coming from external traffic to the site.

Results Part 1

Timestamp	URI	Client IP	Time	Status
27.01.2011 16:24:40	/Sverige.aspx	88.131.15.18	567,640	200
30.01.2011 08:35:30	/en/Norge.aspx	195.184.101.130	468,644	200
30.01.2011 08:35:30	/Danmark.aspx	195.184.101.130	468,363	200
30.01.2011 08:35:31	/Sverige.aspx	195.184.101.130	467,082	200
30.01.2011 08:35:31	/Sverige.aspx	195.184.101.130	466,504	200
30.01.2011 08:35:32	/	195.184.101.130	451,616	200
30.01.2011 08:35:33	/en/Norge.aspx	195.184.101.130	445,305	200
30.01.2011 08:35:32	/Danmark.aspx	195.184.101.130	444,945	200
30.01.2011 08:35:34	/Sverige.aspx	195.184.101.130	443,945	200
30.01.2011 08:35:33	/Sverige.aspx	195.184.101.130	443,492	200
30.01.2011 08:35:36	/UnitedKingdom.aspx	195.184.101.130	437,650	200
30.01.2011 08:35:36	/	195.184.101.130	437,462	200
30.01.2011 08:35:35	/Danmark.aspx	195.184.101.130	436,869	200
30.01.2011 08:35:35	/UnitedKingdom.aspx	195.184.101.130	436,791	200
30.01.2011 08:35:34	/en/Norge.aspx	195.184.101.130	436,588	200
30.01.2011 08:35:36	/	195.184.101.130	422,122	200

To check to see where the Client IP address is geo-located, go to http://ip2location.com/1.2.3.4, where 1.2.3.4 is replaced with the client IP address. For example, http://ip2location.com/195.184.101.130 would yield (note: this is also useful for tracking down possible network issues based on location):

IP Address	Country	Region	City	Latitude/ Longitude	ZIP Code	Time Zone	
195.184.101.130	DENMARK	KOBENHAVN	COPENHAGEN	55.676294 12.568116	-	+01:00	Map It
	Net Speed	ISP		Domain			
	COMP	RESULTMAKER A/S		RESULTMAKER.COM			
	IDD Code	Area Code		Weather Station			
	45	-		DAXX0009 - COPENHAGEN			
	MCC	MNC		Mobile Brand			
	-	-		-			

Results Part 2

Timestamp	URI	Client IP	Time	Status
31.01.2011 10:13:48	/en/Company/Contact/Japan.aspx	173.203.158.156	5,170	200
31.01.2011 11:59:07	/News/RSS/Feeds/Denmark-News.aspx	193.3.234.5	5,155	200
30.01.2011 21:54:23	/Danmark.aspx	195.184.101.130	5,139	200
30.01.2011 11:54:36	/de/Hungary.aspx	78.46.71.246	5,121	200
27.01.2011 10:36:27	/en/Products/Resources/Tours.aspx	65.61.164.180	5,092	200
31.01.2011 10:17:45	/en/Customers/Selected-Customers.aspx	173.203.158.156	5,077	200
30.01.2011 11:57:48	/en/Solutions/Best-CMS-Solutions-Education.aspx	78.46.71.246	5,076	200
28.01.2011 01:09:32	/en/Japan.aspx	166.205.138.71	5,061	200
31.01.2011 10:14:02	/en/Products.aspx	173.203.158.156	5,046	200
29.01.2011 10:47:10	/en/Partners.aspx	65.61.143.45	5,030	200
27.01.2011 07:33:24	/products/resources/whitepapers/gartner-magic-quadrant.aspx	202.155.14.116	5,030	200
31.01.2011 10:14:10	/en/Partners/Hosting-Partners.aspx	173.203.158.156	4,999	200
31.01.2011 10:17:50	/en/Customers/Selected-Customers.aspx	173.203.158.156	4,983	200
28.01.2011 10:37:16	/en/Products/Industry-Commentary.aspx	64.39.4.224	4,983	200
29.01.2011 10:50:27	/en/Customers.aspx	65.61.143.45	4,983	200
31.01.2011 10:16:31	/Japan.aspx	173.203.158.156	4,983	200
30.01.2011 11:58:36	/en/News/NewsAndEvents.aspx	78.46.71.246	4,982	200
30.01.2011 11:56:21	/en/Company/Contact.aspx	78.46.71.246	4,966	200
28.01.2011 15:37:03	/Sverige/Partners/KnowIT.aspx	67.195.37.153	4,952	200
27.01.2011 10:35:45	/en/Partners/Become-Partner.aspx	65.61.164.180	4,952	200

After identifying URIs that either result from testing efforts or possible network issues due to geo-location, record the remaining.

If there is a wide spread number of URIs that are above the threshold, in our case 4 seconds, that occur during peak operation could be an indicator of a web site that does not have enough capacity to handle the load

2.2.6 Sitecore Recommendation

Sitecore recommends that the round trip time for any given .aspx page be under 4 seconds.

Report Findings

Record the Results

The peak hours of usage for the web site are: _____

Record any URIs that have a round trip time of greater than 4 seconds. These URLs are used during the Analyze Rendering Components task.

Timestamp	URI	Client IP	Status Code	Time

There are requests have exceeded the 4 second threshold __ YES __ NO

There is a large number of different URLs during peak operation hours __ YES __ NO.

There are requests that have exceeded the 4 second threshold = NO

OK. There are no request round trips that exceed 4 seconds.

There are requests that have exceeded the 4 second threshold = YES

Error. There are request round trips that have exceeded 4 seconds. Further investigation is required. Refer to the Rendering Component Performance Task.

There is a large number of different URLs during peak usage hours = YES

Error. There is a large number of different URIs that have exceed the 4 second threshold during peak usage hours. This could be an indication of capacity problems and requires further investigation.

2.3 Rendering Performance

By using the Sitecore stats page, information about rendering can be collected.

The stats page provides the following information about the various rendering used in a page, or throughout the site (depending when the stats page is observed).

- Rendering — The name of the rendering.
- Site — The name of the site that the information for the rendering is being collected.
- Count — The number of times that the rendering has been called since the last time the stats page was reset.
- From cache — The number of times the rendering was pulled from cache.
- Avg. time (ms) — The average time taken to render to output.
- Avg. items — The average number of items included in the rendering.
- Max. time — The maximum amount of time taken to render the output.
- Max. items — The maximum number of items included in the rendering.
- Total time — The total amount of time taken for all instances of this rendering since the last stats page reset occurred.
- Total items — The total number of items included in all instances of this rendering since the last stats page reset occurred.
- Last run — This the last time that stats were collected.

2.3.1 Required Skills

- A working knowledge of the Sitecore stats.aspx page.

2.3.2 Symptoms

- Slow webpage round trip times.

2.3.3 Procedure to Use the Sitecore Stats Page

This procedure requires that you have permissions to access aspx pages in the /sitecore/admin folder. Also, we recommended that the stats page be opened up in a separate tab or browser window, so that you can keep it open while using another tab or window to navigate the site you are investigating.

To launch the stats page:

1. Launch either two web browser windows or tabs. We refer to these as the **stats** window and the **site** window.
2. In the **stats** window, go to `http://<site>/sitecore/admin/stats.aspx`.
3. The **stats** window shows information about the renderings that have been requested since the last time the stats page was reset. If you want to start from scratch, click the refresh button (for example, if you want to view information regarding an individual web page you must clear out the stats page).
4. If you wish to view rendering stats that have been collected since the last reset, use the information presented.

5. If you wish to collect information about a single page, reset the stats page. In the **site** window, go to the website or webpage that you are going to collect stats about the renderings it includes.

Note
Make several calls to the page so that information about caching and averages can be collected.

6. We recommended that you export the information in the stats page table to Excel, so that the information can be sorted for easier data analysis. To export, right click the table and click **Export to Microsoft Excel**.

2.3.4 Understanding the Results

The following stats table has been exported into Excel, sorted by Max. time, and has some of the columns hidden:

	A	B	C	D	E	G
1	Rendering	Site	Count	From cache	Avg. time (ms)	Max. time
2	Placeholder: content	nicam	20	0	185.3304	1670.1252
3	Sublayout: /layouts/Nicam/HomePageContent.ascx	nicam	2	0	1080.6819	1669.1879
4	Placeholder: rightcolumn	nicam	15	0	142.9569	1437.7889
5	/xsl/Nicam/NewsSpot.xslt	nicam	2	0	938.391	1419.1291
6	Sublayout: /layouts/Nicam/ThreeColumnContent.ascx	nicam	13	0	86.9166	362.6216
7	Placeholder: centercolumn	nicam	18	0	50.8885	328.2586
8	Sublayout: /layouts/Nicam/ProductForums.ascx	nicam	1	0	327.9864	327.9864
9	Sublayout: /layouts/Nicam/TwoColumnContent.ascx	nicam	5	0	82.8207	274.0745
10	Sublayout: /layouts/Nicam/ContactUsFormWrapper.ascx	nicam	1	0	260.099	260.099
11	FormRender1 (FormRender)	nicam	1	0	260.0562	260.0562
12	Placeholder: forum-content	nicam	1	0	178.4444	178.4444
13	Sublayout: /sitecore modules/Web/YAF/YAF_Forum.ascx	nicam	1	0	178.4045	178.4045
14	Placeholder: phxml	nicam	2	0	86.4851	162.7259
15	/xsl/FlashImageIterator/Flash_XMLOutput.xslt	nicam	2	0	86.4505	162.6944
16	/xsl/Nicam/Logo.xslt	nicam	21	7	12.5506	146.9511
17	Placeholder: frontpagebottomspotbar	nicam	2	0	84.1091	142.2216
18	Sublayout: /layouts/Nicam/Spots Three Column.ascx	nicam	4	0	42.0658	142.2035
19	Placeholder: spotbarcenter	nicam	4	0	33.869	121.6814
20	/xsl/Nicam/RotateSpots.xslt	nicam	6	0	32.8522	121.6473
21	/xsl/Nicam/FlexiblePersonalizationSpot.xslt	nicam	9	0	13.5927	111.2867
22	/xsl/Nicam/Top Menu.xslt	nicam	21	0	17.2713	106.0543
23	/xsl/Nicam/Product Catalog.xslt	nicam	12	0	17.6432	100.0303
24	Placeholder: frontflash	nicam	2	0	45.6854	89.0685

The following observations can be made from this table:

- All renderings that have *Max time* in excess of 100ms need to be investigated to see if recommended coding practices have been followed.
- 0's in the *From cache* column indicate that Rendering (HTML Output) caching has not been configured.

2.3.5 Sitecore Recommendation

We recommend that renderings have a *Max time* of < 100ms, and that Rendering (HTML Output) caching be enabled and configured.

Report Findings

Record the Results

Rendering *Max times* are < 100ms: __YES __NO

There is several *From cache* values equal to 0: __YES __NO

Rendering *Max times* are < 100ms = YES:

OK. No rendering has a *Max time* > 100ms, per Sitecore recommended practices.

Rendering *Max times* are < 100ms = NO:

Error. There are renderings with a *Max time* > 100ms. Sitecore recommended practices are to keep rendering *Max times* less than 100ms.

There are several *From cache* values equal to 0 = NO:

OK. Rendering (HTML Output) caching has been enabled and configured per Sitecore recommended practices.

There are several *From cache* values equal to 0 = YES:

Error. Rendering (HTML Output) caching is either not enabled, and/or not configured. Sitecore recommended practices are to enable and configure Rendering (HTML Output) caching to improve site performance. For more information on how to enable and configure the Rendering caching, see the *Cache Configuration Reference* and the *Presentation Component Reference* manuals

2.4 Investigating Memory Leaks with the Sitecore Logs

The Sitecore system provides a series of performance counters that are logged to the Sitecore log file(s) on a ten-minute interval:

- Process\Private Bytes
- Process\Virtual Bytes
- Process\Page File Bytes
- .net CLR Memory\# Bytes in all Heaps
- .net CLR Memory\% Time in GC
- .net CLR Memory\Large Object Heap size
- .net CLR Loading\Bytes in Loader Heap
- .net CLR Loading\Current Assemblies

If the Sitecore performance counters are not available, they can be downloaded from:

http://sdn.sitecore.net/upload/sdn5/faq/administration/sitecorecounters.zip.

This article explains possible problems with the counters and solutions for them:
http://sdn.sitecore.net/Scrapbook/Working%20with%20Sitecore%20Performance%20Counters.aspx

The two counters that are of interest for this task are the *Process\Private Bytes* and the *.net CLR Memory\# Bytes in all Heaps.*

The *Process\Private Bytes* counter reports all memory that is exclusively allocated for the process (w3wp.exe) and can't be shared with other processes on the system. And the *.net CLR Memory\# Bytes in all Heaps* counter reports the combined total size of the Gen0, Gen1, Gen2, and large object heaps.

Typically the Private Bytes and # Bytes in all Heaps rise and fall at the same rate. If the Private Bytes is increasing, but the # Bytes in all Heaps remains stable, unmanaged memory is leaking. If both are increasing, and not being cleared, then there is a potential for a leak in the managed memory.

By using the Sitecore log files, *Sitecore Log Analyzer* and *Excel*, we graph these two counters to look for potential leaks.

2.4.1 Required Skills

- A working knowledge of the Sitecore Logs.
- A working knowledge of Sitecore Log Analyzer.
- A working knowledge of graphing with Microsoft Excel.

2.4.2 Symptoms

- OutOfMemory Exceptions
- IIS App Pool recycling
- Sluggish performance as memory usage increases.

2.4.3 Parsing the Sitecore Log(s) using Sitecore Log Analyzer

Information about installing and setting up the **Sitecore Log Analyzer** can be found at
http://sdn.sitecore.net/Resources/Tools/Log Analyzer.aspx

This task requires retrieving the values of the necessary health monitor counters from the log files and exporting them in CSV file.

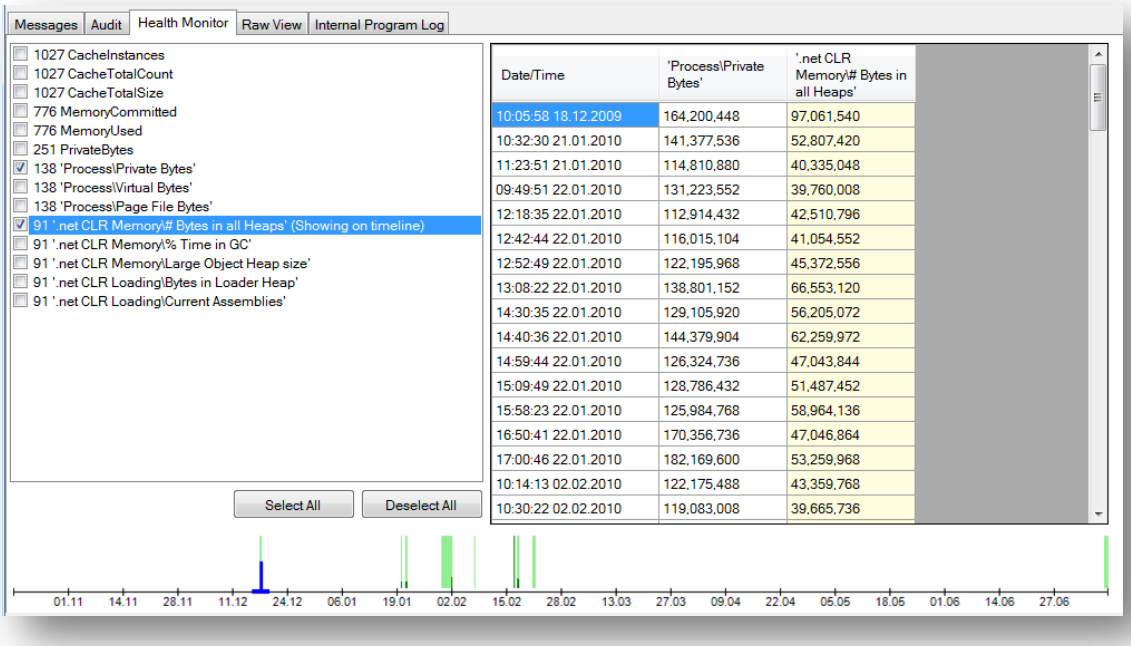
The exported results are opened in **Excel** so that they can be graphed and compared.

Getting the values of Process\Private Bytes and # Bytes in all Heaps counters

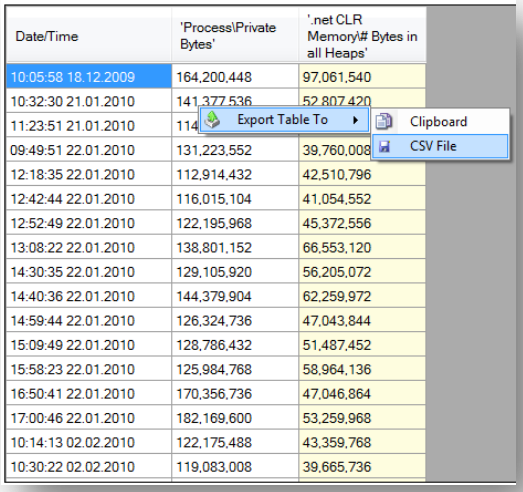
The **Health Monitor** tab of **Sitecore Log Analyzer** allows you to see and export all health monitor counters of the parsed log files in a convenient format.

Date/Time	'Process\Private Bytes'	'.net CLR Memory\# Bytes in all Heaps'
10:05:58 18.12.2009	164,200,448	97,061,540
10:32:30 21.01.2010	141,377,536	52,807,420
11:23:51 21.01.2010	114,810,880	40,335,048
09:49:51 22.01.2010	131,223,552	39,760,008
12:18:35 22.01.2010	112,914,432	42,510,796
12:42:44 22.01.2010	116,015,104	41,054,552
12:52:49 22.01.2010	122,195,968	45,372,556
13:08:22 22.01.2010	138,801,152	66,553,120
14:30:35 22.01.2010	129,105,920	56,205,072
14:40:36 22.01.2010	144,379,904	62,259,972
14:59:44 22.01.2010	126,324,736	47,043,844
15:09:49 22.01.2010	128,786,432	51,487,452
15:58:23 22.01.2010	125,984,768	58,964,136
16:50:41 22.01.2010	170,356,736	47,046,864
17:00:46 22.01.2010	182,169,600	53,259,968
10:14:13 02.02.2010	122,175,488	43,359,768
10:30:22 02.02.2010	119,083,008	39,665,736

1. Launch **Sitecore Log Analyzer**.
2. Select logs for analyzing.
3. Click **Analyze / Refresh** button.
4. Go to the **Health Monitor** tab and select necessary counters (Process\Private Bytes and .NET CLR Memory\# Bytes in all Heaps).



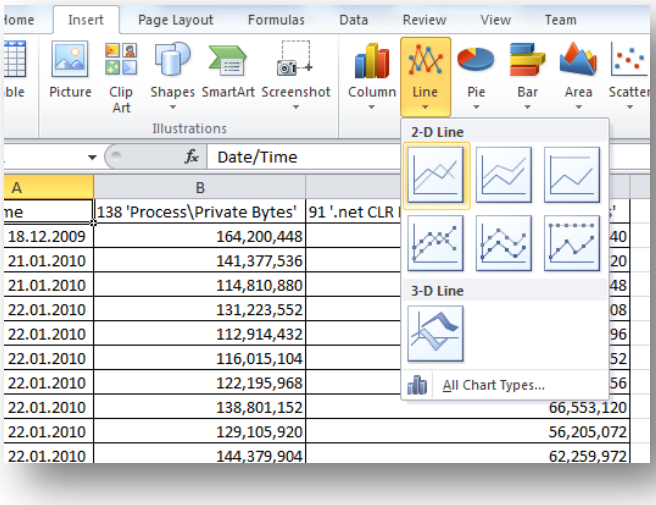
5. Right click on the table and select **Export Table To** > **CSV File**. Save with a meaningful name and open the csv file in **Excel**.



Graphing the Results

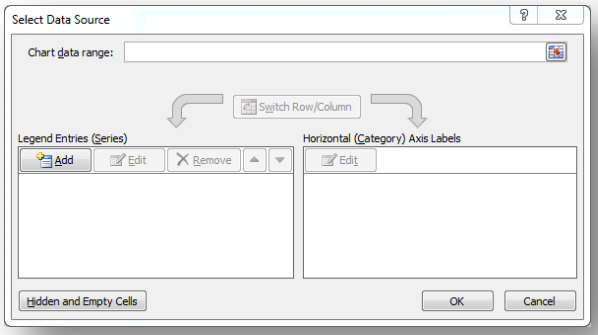
There are several ways to create graphs in **Excel**. The steps below are for creating a line graph to compare the Process\Private Bytes results set to the .net CLR Memory\# Bytes in all Heaps.

1. From the Insert tab click **Charts / Line / 2D Line**

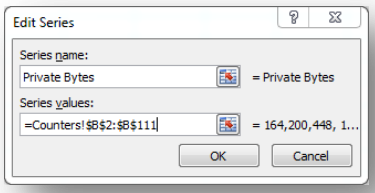


2. In the **Data** group, click **Select Data**. If something was selected on the sheet, it attempts to graph it. Clear the graph by removing any series and clear the Chart data range. You are

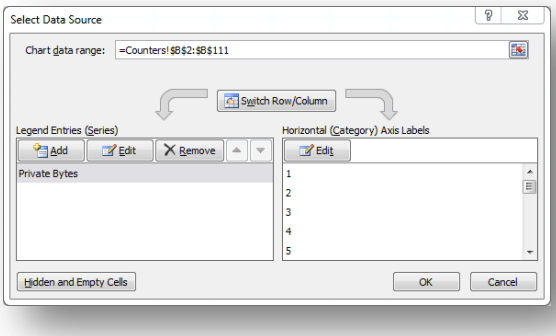
presented with the **Select Data Source** dialog box.

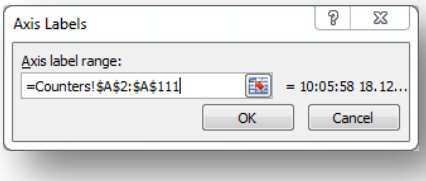


3. Click **Add**.
4. For the first series, name the series **Private Bytes** and select the data range from the Process\Private Bytes column (column B).

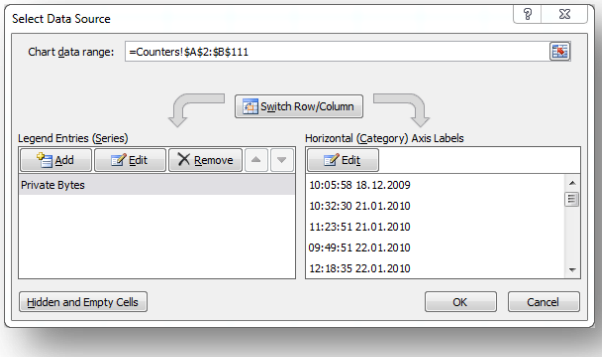


5. Next, set the Horizontal (x-axis) labels to the **Timestamp** column (column A), click **Edit** and selecting column A from sheet 1:

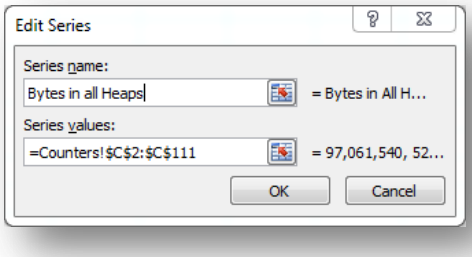


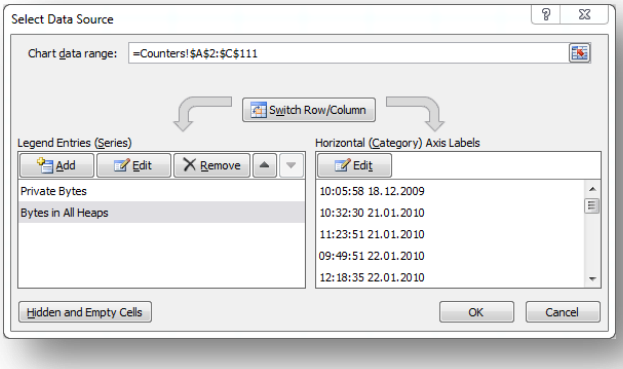


6. Click **OK**.



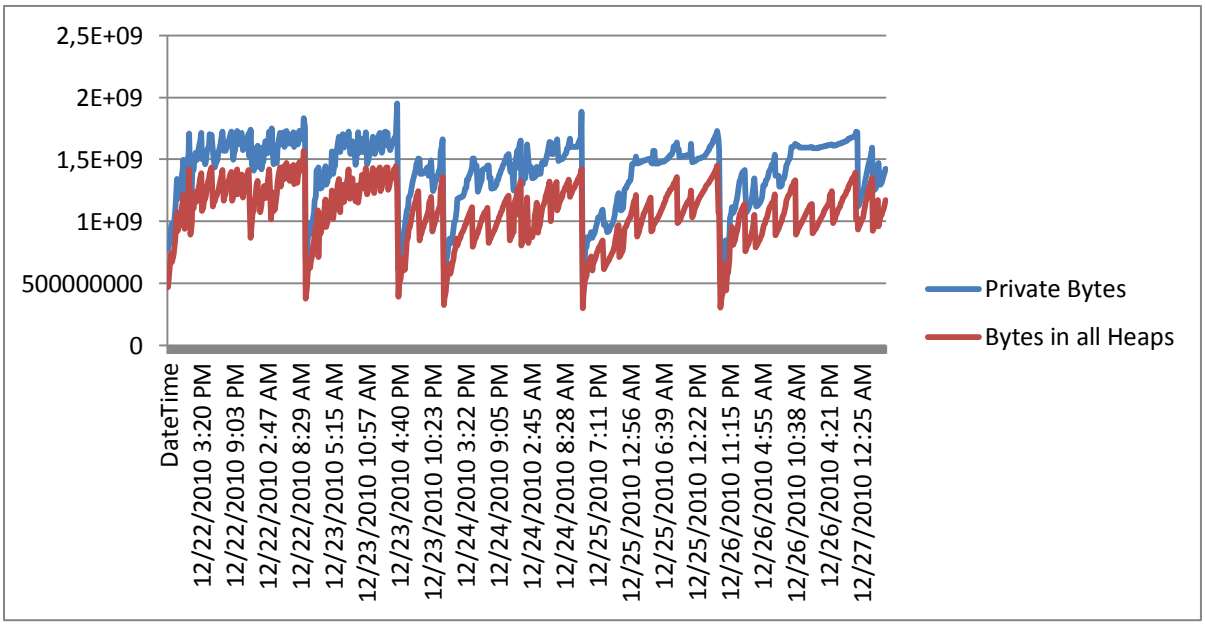
7. Click **Add** and do the same for the second series (Bytes in all Heaps), selecting the data range from the .net CLR Memory\# Bytes in all Heaps column (column C). Note, that you do not need to set the Horizontal (x-axis) labels again.





8. Click **OK**.

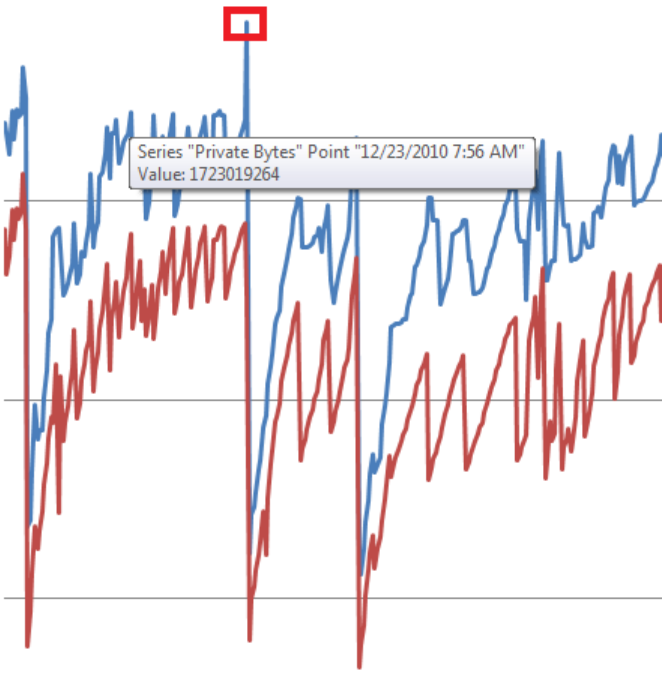
2.4.4 Understanding the Results (Graph)



Graph 1

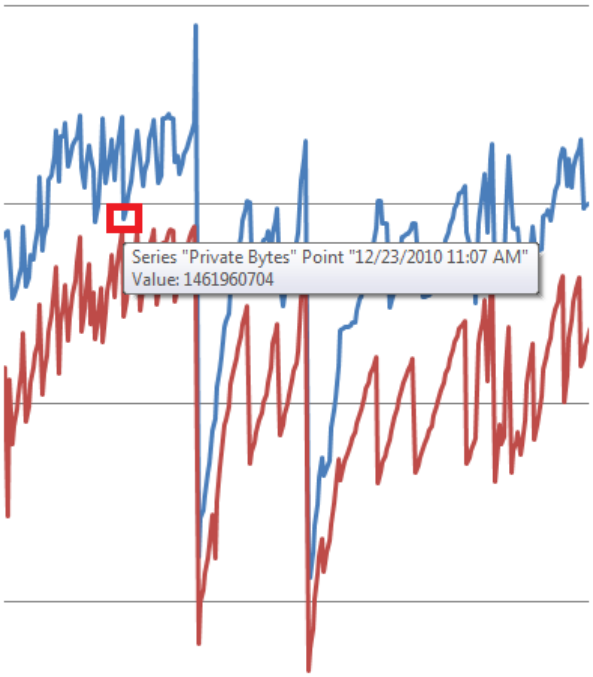
- This graph illustrates an example of a memory leak in the managed memory space. The five big dips represent app pool restarts due to either the app pool private memory limit being reached, or OOM exceptions. Between each dip you can see Private bytes and Heap bytes trending an increase in parallel. This is the symptom of a memory leak.
- Looking at our sample, we can see that both the Private Bytes and the Bytes in all Heaps are rising and falling at the same rate. It is OK for memory to raise to a stable point and remain there. Note however that our sample graph shows 5 events where memory is reset. Further investigation is explained later.
- If Private Bytes were rising, while Bytes in all Heaps were to remain constant, this would be an indication that there is a potential leak in the unmanaged memory space and further investigation would be required.

- Peaks indicate memory allocation. Moving the mouse over a peak provides information about the amount of memory allocated, as well as the time of the event:



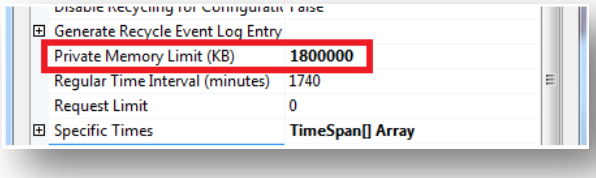
Graph 2

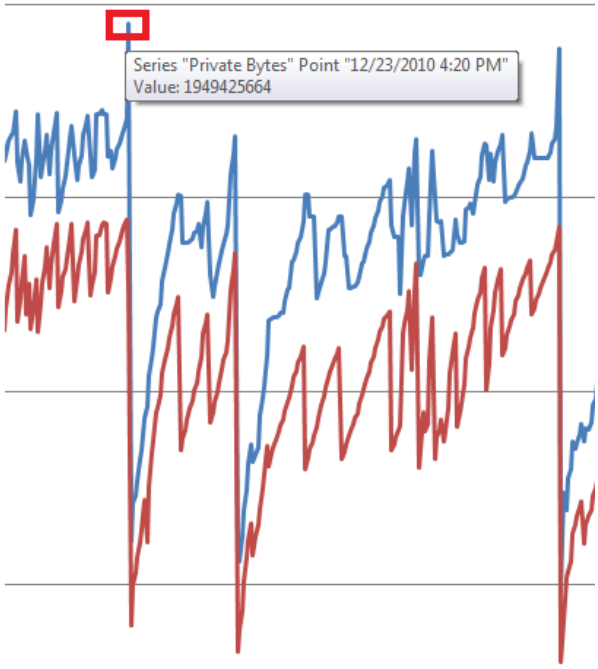
- Detail view of Private Bytes spike, indicating peak memory usage prior to an app pool recycle or OOM exception.
- Valleys indicate when a garbage collection event has occurred. Moving the mouse over a valley provides information as to the memory still allocated, as well as the time that the event occurred:



Graph 3

- Details of a valley or GC event. Note, this is not an app pool recycle or OOM exception, but the normal activity of the garbage collector.
- By looking at the highest peaks and the lowest valleys, we can use this information to correlate information that we can obtain from the Windows event logs.
- The high points, just prior to the memory being reset can be compared to the private memory limit set for the App Pool (Go to the IIS Manager, select the appropriate App Pool, and select Advanced Settings). Please note: If there is no value set for the Private Memory limit on the App Pool, check the Sitecore logs for OutOfMemory Exceptions occurring during the same time frame. (Below, we can see that the App Pool is set to reset when memory reaches 1800000KB).

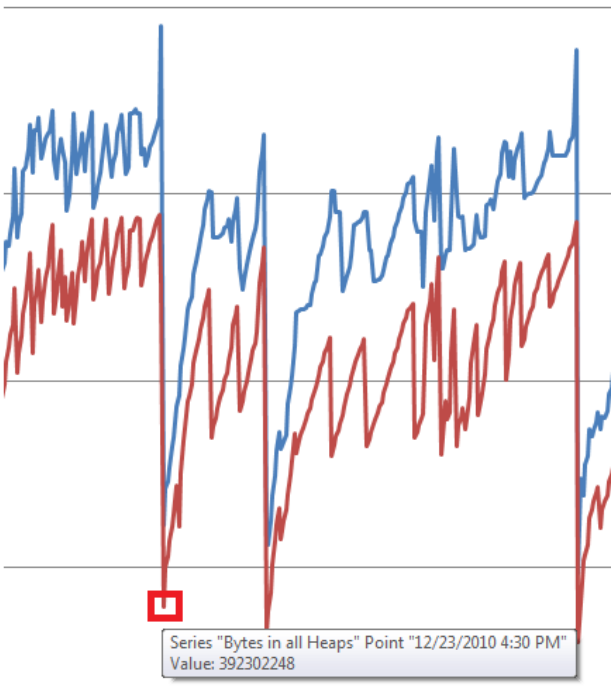




Graph 4

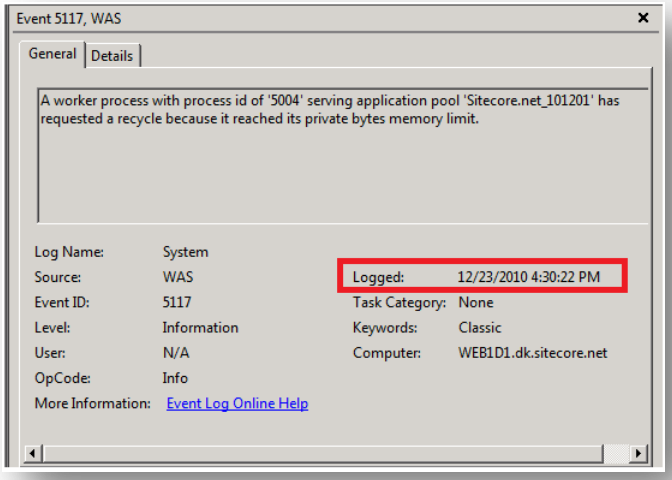
- Details of a memory spike just prior to an app pool recycle or OOM exception. This information can be used to determine if the memory usage exceeds that of the available memory for the app pool.
- By comparing the low point that follows the peak with information from the Windows event logs, we can see that an App Pool recycle did indeed take place. This constant increase in both Private Bytes and Bytes in all Heaps, followed by exceeding the memory limits set and a recycling of the App Pool could be a potential leak in the managed memory space. Further

investigation would be required.



Graph 5

- Details of a memory reset event. The date and time available can be used to correlate the information available from the Sitecore Logs and the Windows Event Logs to see if an OOM exception and / or an app pool recycling event has taken place.



(The time stamps match, indicating that the App Pool recycled.)

2.4.5 Notes

Additional information about .net memory usage and leak investigation can be found at:

- http://msdn.microsoft.com/en-us/magazine/cc163491.aspx
- http://msdn.microsoft.com/en-us/library/Ee817660(pandp.10).aspx