

# Code Solutions to Improve SharePoint Performance and Scalability via Caching



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Bitstream Foundry LLC



# Session Overview

Quick Introduction

Component Caching Options

- ASP.NET Cache, AppFabric Caching

Caching for Controls

- Fragment Caching, Post-Cache Substitution

Caching for Pages

- `IvaryByCustomHandler` Implementation

Q&A Throughout

Why I care about caching

okay ...

Why I



catching

okay ...

Why I



catching

Formerly the architect for a Fortune 25 company's publicly facing SharePoint presence

okay ...

Why I



First company of this  
size using MOSS 2007  
for Internet presence



Formerly the architect for a  
Fortune 25 company's publicly  
facing SharePoint presence

okay ...

Why I



caching

Formerly the architect for a Fortune 25 company's publicly facing SharePoint presence

Highly trafficked environment with about 75,000 page views per hour (peak) in 2009

okay ...

Why I



caching

Formerly the architect for a Fortune 25 company's publicly facing SharePoint presence

Highly trafficked environment with about 75,000 page views per hour (peak) in 2009

Averaging (at peak) 1,000 requests/second into IIS



with about 75,000 page views  
per hour (peak) in 2009

k) 1,000 requests/second into IIS



Supported initially with just 2 web  
front ends (WFEs). Eventually  
moved to 4 WFEs for growth.

... and finally

... and finally

I'm sick AND  
tired of hearing  
some people  
complain that  
"SharePoint  
doesn't scale"!!!



# In my experience ...



SharePoint  
scaling and  
performance  
issues are more  
often than not  
due to poorly  
performing  
custom code

due to poorly  
performing  
custom code



What I'm about to  
share might help

Let's get rolling



First up:

# Component-Level Caching



### Home

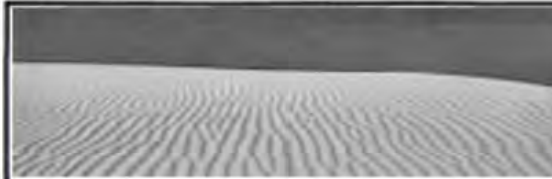
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Giedi Prime Gazette

Mentat Monitor

Spice World

## Welcome Back, Paul!



### Today's Forecast

- Hot and Dry, 120F
- Slight Change of Worms

Right Now: **118F**



### From Mentat News ...

- It is by will alone I set my mind in motion.
- It is by the juice of Sapho that thoughts acquire speed, the lips acquire stains, the stains become a warning.
- It is by will alone I set my mind in motion.

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(updated 15:23)





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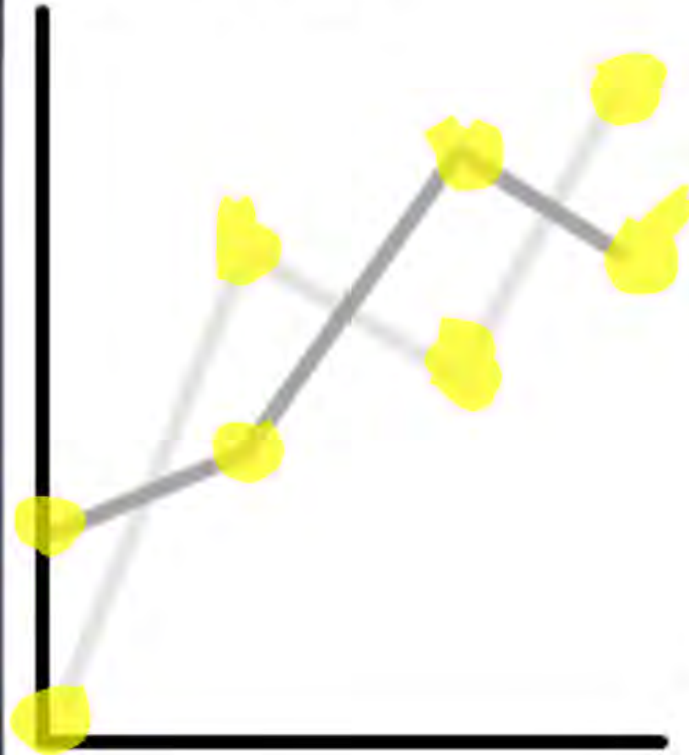
Central window design isn't as complicated, but

From  
Mentat  
News

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- Control rendering isn't complicated, but ...
- Data used is "expensive" (computation/latency)
- Need way to store expensive results between calls

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- Data used is "expensive" (computation/latency)
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Two real options

ASP.NET  
Cache

AppFabric  
Cache

# ASP.NET Cache

public sealed class **Cache**  
Member of [System.Web.Caching](#)

**Summary:**  
Implements the cache for a Web application. This class cannot be inherited.

- System.Web.Caching.Cache class
- One instance per application domain
- Basically a key/value object dictionary
- In-memory use and thread-safe\*
- Commonly accessed via Page and HttpContext objects
- Objects can be added with expiration windows, dependencies, & priority values
- Callbacks possible on object removal\*

```

private String GetSomePi()
{
    // Attempt to retrieve a PI value from the ASP.NET Cache
    Object piValue = Cache[PI_VALUE_CACHE_KEY];

    // If the value isn't yet cached, compute it and cache it for later.
    if (piValue == null)
    {
        piValue = PiCalculator.Process(DIGITS_OF_PI_TO_COMPUTE);

        // Insert for indefinite time period
        Cache[PI_VALUE_CACHE_KEY] = piValue;

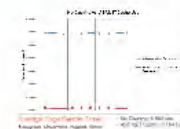
        //// Cache until a specific point in the future
        //Cache.Add(PI_VALUE_CACHE_KEY,
        //    piValue,
        //    null,
        //    DateTime.Now.AddSeconds(15),
        //    Cache.NoSlidingExpiration,
        //    CacheItemPriority.Normal,
        //    null);

        //// Cache for a sliding window of 3 seconds
        //Cache.Add(PI_VALUE_CACHE_KEY,
        //    piValue,
        //    null,
        //    Cache.NoAbsoluteExpiration,
        //    TimeSpan.FromSeconds(3),
        //    CacheItemPriority.Normal,
        //    null);
    }

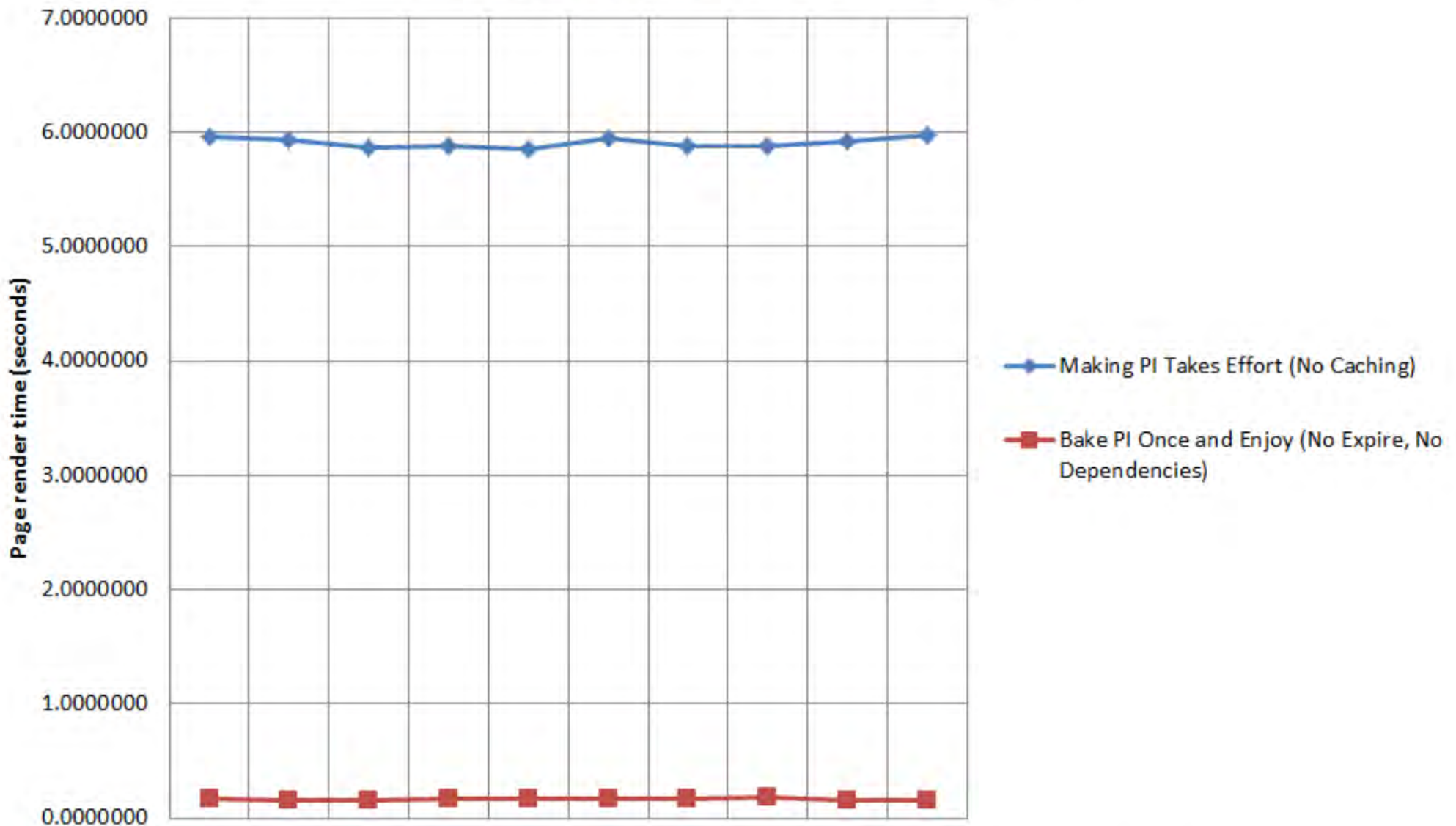
    return piValue.ToString();
}

```

# Demo



## No Caching vs. ASP.NET Cache Use



## Average Page Render Times

Anonymous client-side request times;  
10 samples each obtained using Fiddler

- No Caching: 5.909 sec
- ASP.NET Cache: 0.1641 sec

# Limitations and Watch-Outs

- Not a durable store
- Don't assume something you put in will always be available
- Cache contents not available across WFEs in a load-balanced environment

Sum-up: Safe for general use. Just remember the cache is shared.

- Control rendering isn't complicated, but ...
- Data used is "expensive" (computation/latency)
- Need way to store expensive results between calls

Two real options

ASP.NET  
Cache

AppFabric  
Cache




# AppFabric Cache

- Microsoft AppFabric (1.1) for Windows Server
- Provides highly available distributed caching
- Exists independent of SharePoint (and thus will work with any version of SharePoint)
- From a code perspective, very similar to writing code for the ASP.NET (local) cache
- Requires significant external configuration and setup, so you'll want to become good friends with your SharePoint administrators

# Limitations and Watch-Outs

*Straight from TechNet ...*

 **Important:**

If you are using custom applications in SharePoint Server 2013 which use the AppFabric client APIs, or are creating custom caches, you should create a separate AppFabric cache cluster to support your custom applications. Do not use the AppFabric cache cluster supporting your SharePoint Server 2013 farm. Run your separate AppFabric cache cluster for your custom applications on separate servers from the servers dedicated to your SharePoint Server 2013 farm.

- You will find code samples from people that use SharePoint's cache cluster
- Don't be tempted by the Dark Side; establish your own cache cluster on one or more non-SharePoint servers

# Here there be monsters!



This is relatively new territory, and the AppFabric caching service is unbelievably persnickety ...



Next-up:

Control-Level  
Caching





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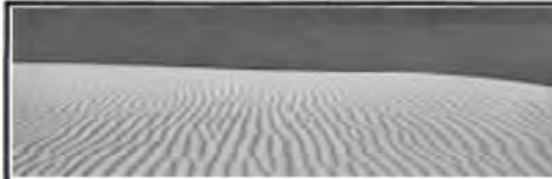
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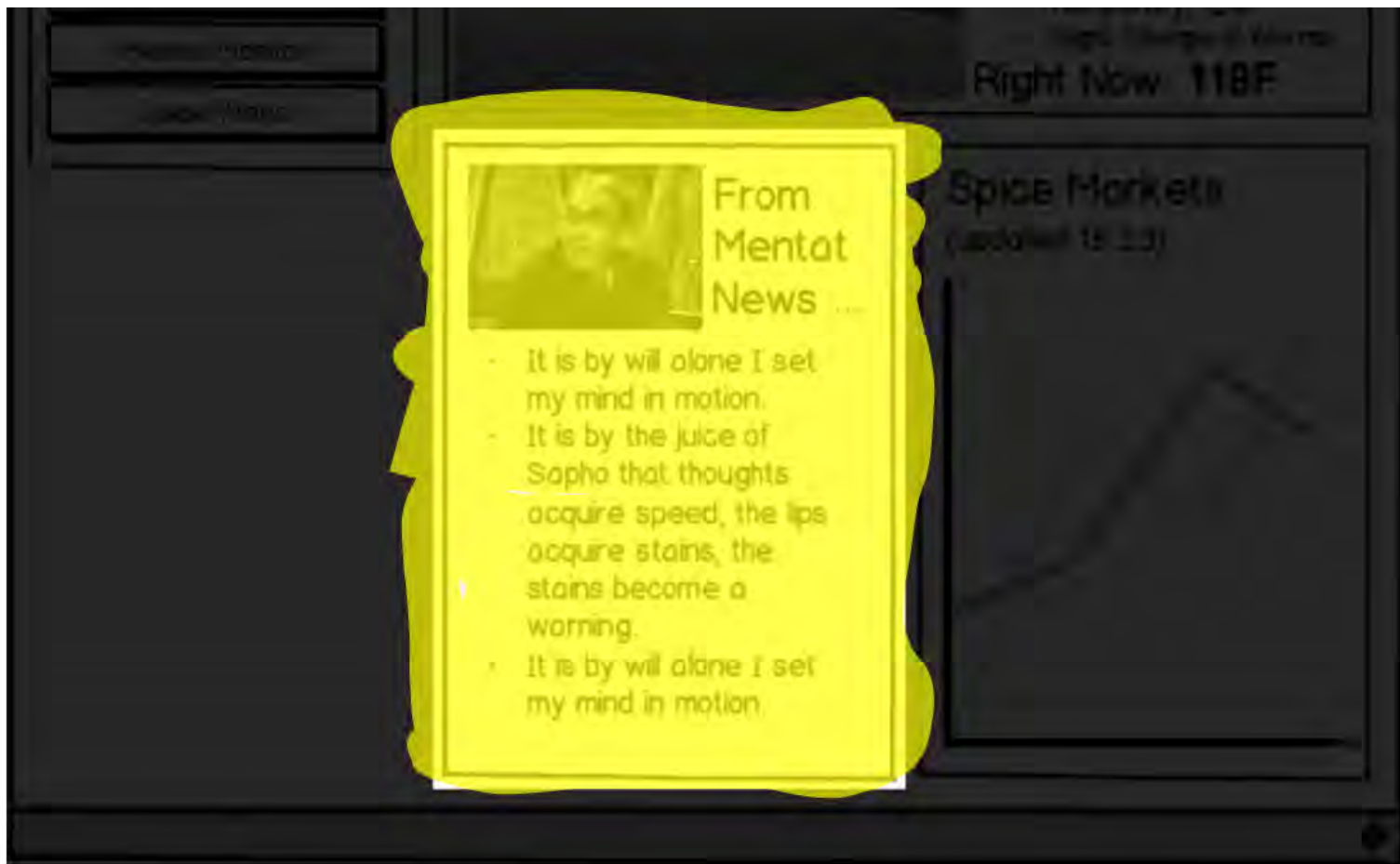
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- Control displays static content or ...
- Entire HTML output block generated by control changes infrequently and according to predictable variables/patterns

# Fragment Caching

An easily implemented way to cache the entire block of HTML that is generated by a control

To implement, simply add something like the following to an ASCX control file:

```
<%@ OutputCache Duration="120" VaryByParam="none" %>
```

(Common) options to vary output exist based on:

- HTTP Header
- Query string value (GET) or parameter (POST)
- Value of child control in ASCX

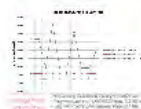


```
<%@ Assembly Name="$SharePoint.Project.AssemblyFullName$" %>
<%@ Assembly Name="Microsoft.Web.CommandUI, Version=14.0.0.0, Culture=neutral, PublicKeyToken=71e9bce11
<%@ Register Tagprefix="SharePoint" Namespace="Microsoft.SharePoint.WebControls" Assembly="Microsoft.Sh
<%@ Register Tagprefix="Utilities" Namespace="Microsoft.SharePoint.Utilities" Assembly="Microsoft.Share
<%@ Register Tagprefix="asp" Namespace="System.Web.UI" Assembly="System.Web.Extensions, Version=3.5.0.6
<%@ Import Namespace="Microsoft.SharePoint" %>
<%@ Register Tagprefix="WebPartPages" Namespace="Microsoft.SharePoint.WebPartPages" Assembly="Microsoft
<%@ Control Language="C#" AutoEventWireup="true" CodeBehind="WeatherRightNowScrapper.ascx.cs" Inherits='

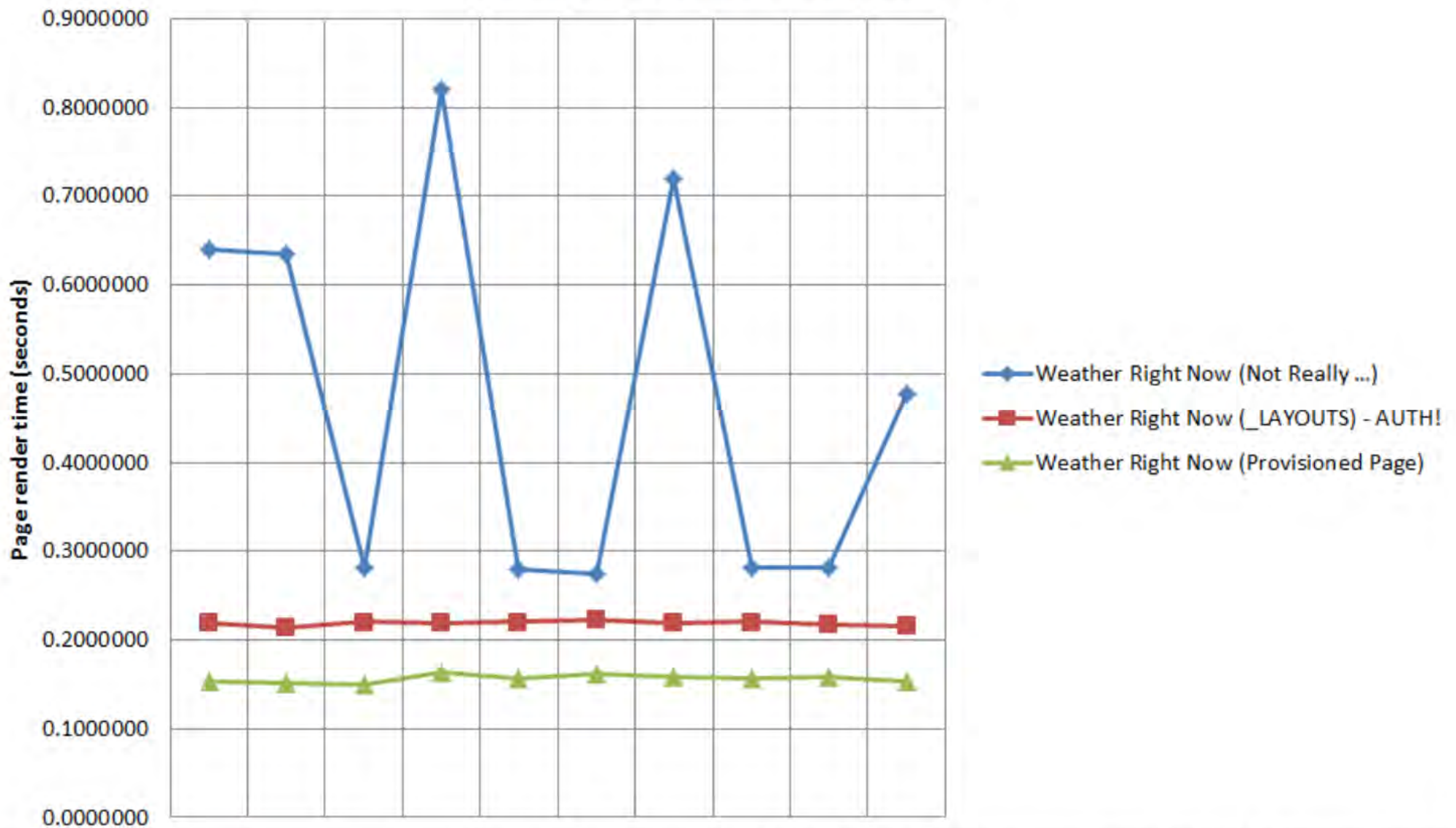
<%@ OutputCache Duration="120" VaryByControl="ZipCodeTextbox" %>
```

```
<asp:Panel ID="MainPanel" runat="server" BorderStyle="Solid" BorderWidth="1px" style="padding: 5px;">
    TIME WHEN CONTROL WAS RENDERED: <asp:Label ID="GenerationTimeLabel" runat="server"></asp:Label>
    <br />
    TIME TO GENERATE HTML OUPUT: <asp:Label ID="TimeToComputeLabel" runat="server"></asp:Label>
    <hr />
    ZIP CODE: <asp:TextBox ID="ZipCodeTextbox" runat="server">45244</asp:TextBox>
    <input id="SubmitButton" type="submit" value="Get Weather" />
    <br />
    <asp:Literal ID="WeatherLiteral" runat="server"></asp:Literal>
</asp:Panel>
```

# Demo



## Fragment Caching in Controls



## Average Page Render Times

- No Caching (Safe Mode Parsing\*): 0.4691 sec
- Fragment Caching (\_LAYOUTS Page): 0.2187 sec
- Fragment Caching (Provisioned Page): 0.1566 sec

# Limitations and Watch-Outs

- Test your VaryBy... parameter settings carefully
- If using both page-level and control-level caching, page-level will trump control-level (duration) settings
- If caching doesn't appear to work, consider that the safe mode parser may be engaged. Work around it with a provisioned page, \_layouts page, or another (safe) alternative

Sum-up: Safe way to cache control content that changes infrequently



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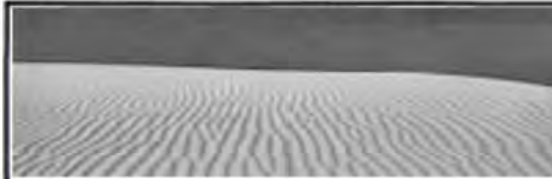
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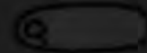
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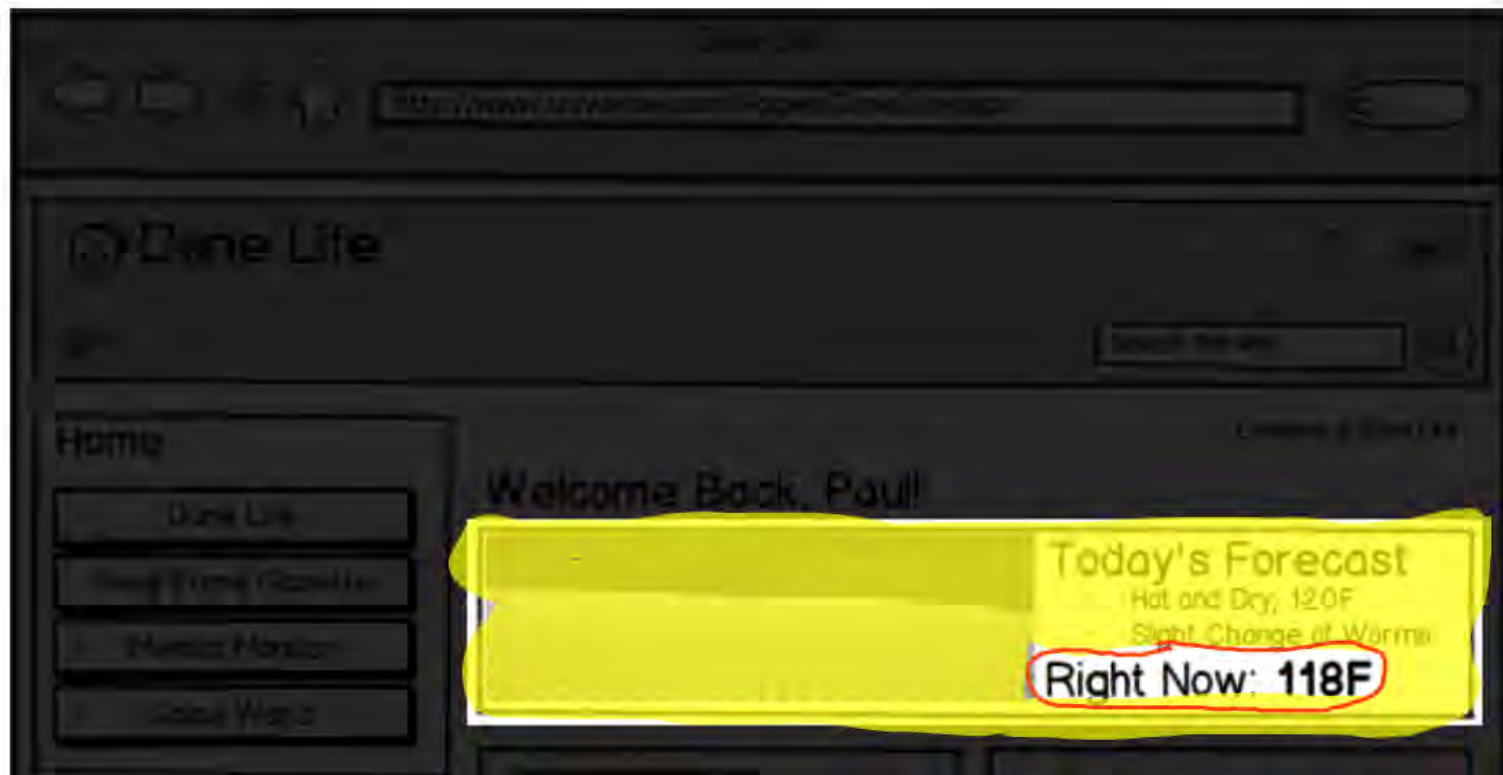
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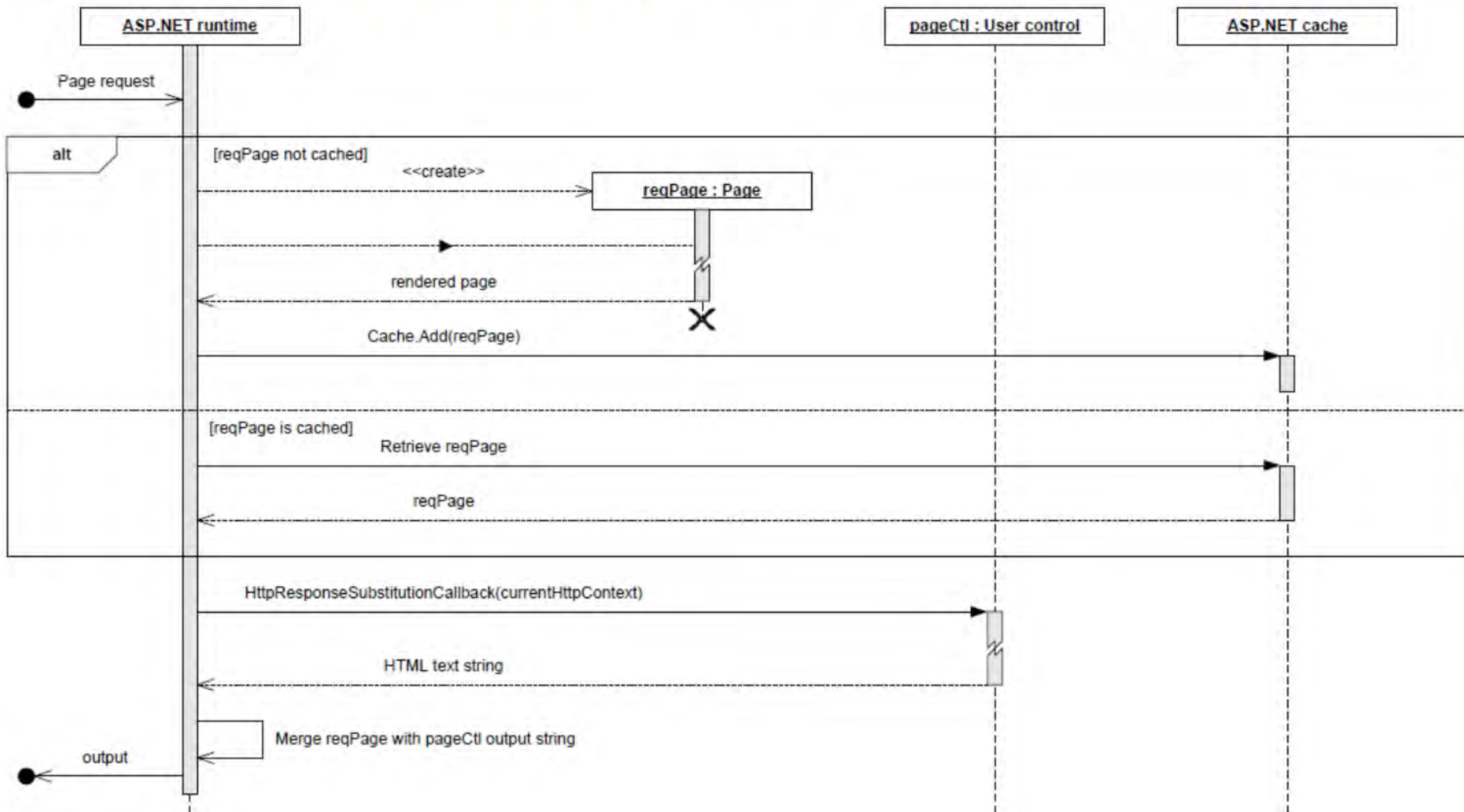
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- You are leveraging page output caching (i.e., the entire page's HTML output gets cached)
- Your control contains a mix of static and dynamic content
- You need a way to update the dynamic part (e.g., the "Right Now" temperature)



# Post-Cache Substitution



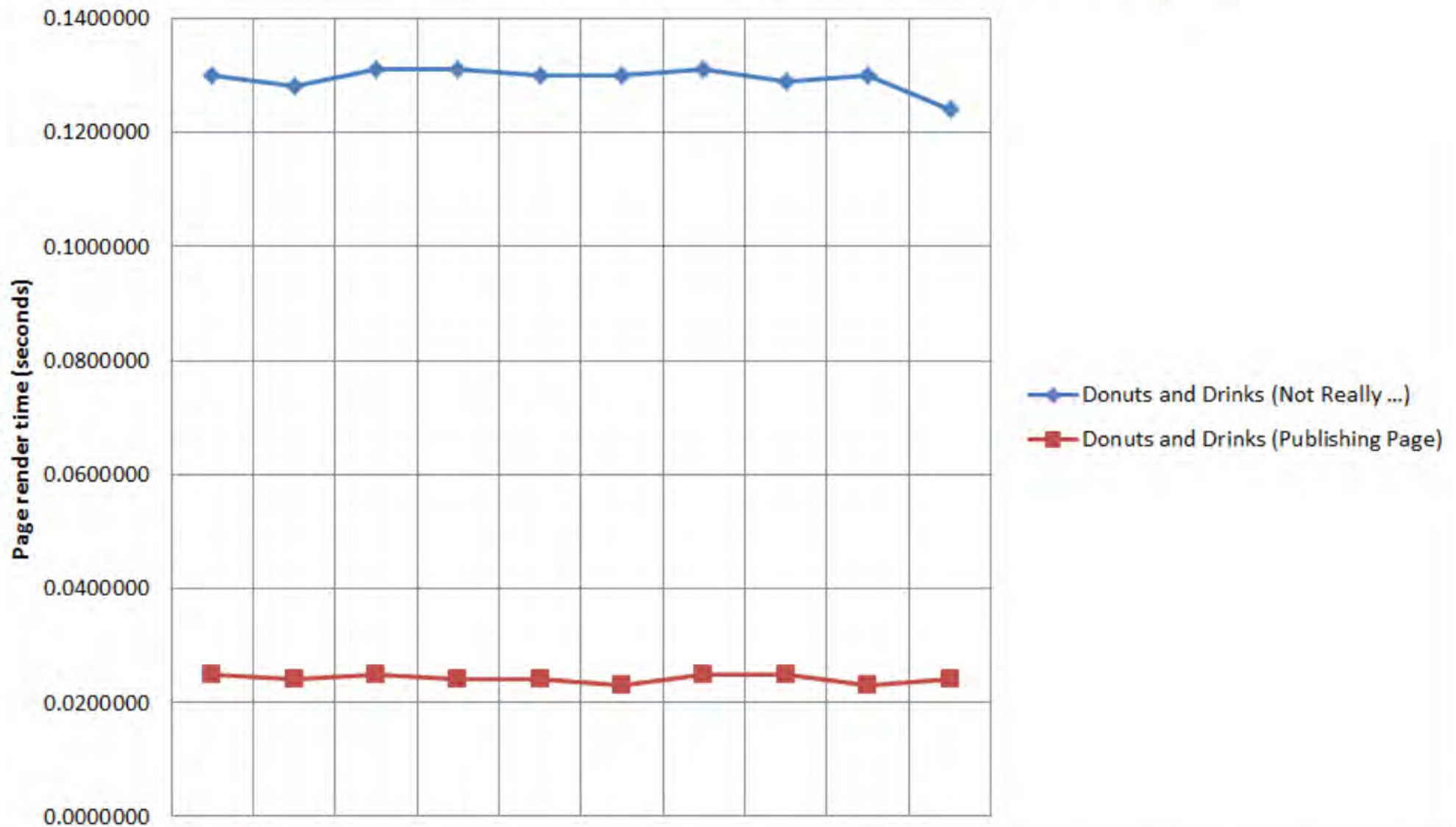
Page output caching "with benefits"

# Demo

```
<asp:Panel ID="MainPanel" runat="server">
  <div style="text-align: center">
    <h2>Donut Caching: Now with Beverage!</h2>
  </div>
  <div style="position: relative;">
    <div style="float: left; width: 50%; text-align: center;">
      
      <table style="font-family: Arial, Helvetica, sans-serif; text-align: center; width: 100%">
        <tr>
          <td>
            Enjoy a tasty donut and ...
          </td>
        </tr>
        <tr>
          <td>
            Prepared at <asp:Label runat="server" ID="DonutPreparedLabel"></asp:Label>
          </td>
        </tr>
      </table>
    </div>
    <asp:Substitution runat="server" ID="BeverageSubstitution" MethodName="GetBeverageHtmlBlock" />
  </div>
</asp:Panel>
```



## Post-Cache Substitution with Page Output Caching



Average Page  
Render Times

- Page Output Cache Disabled: 0.1294 sec
  - Post-Cache Substitution (Pub Page): 0.0240 sec
- This is page output caching in action!*

# Limitations and Watch-Outs

- Remember that page output caching needs to be enabled to make this technique useful
- If caching isn't working at all, use the Debug Cache Information option to determine if the host page is being output cached
- Obscure issue: if you override rendering at the page level (e.g., within the master page), post-cache substitution will break

*Sum-up: Great complement to page output caching for controls that contain some dynamic content*

Heading into  
home:



Customizing Page  
Output Caching



### Home

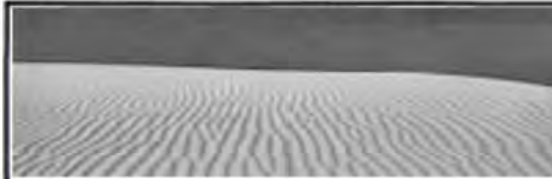
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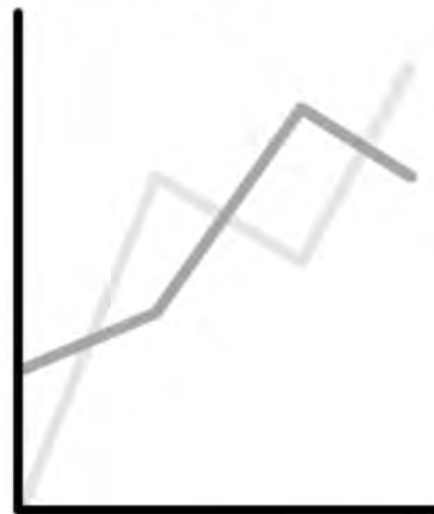


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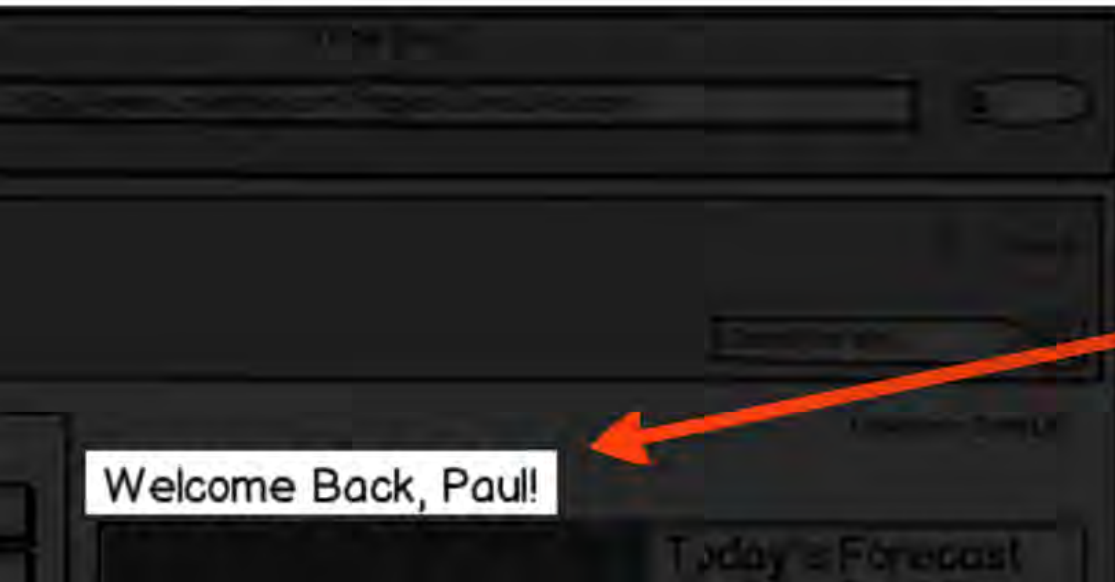
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- You need a way to more granularly control SharePoint's page output caching, or ...
- You need a way to alter page output caching from a key generation, object (page) lookup, or object storage perspective, or ...
- You want to affect output caching changes through SharePoint plumbing (w/o controls)



Conditionally  
include or  
exclude full  
page from page  
output cache

# VaryByCustomHandler

- Exposes one method for our use: the `GetVaryByCustomString` method
- Method gets called during `ResolveRequestCache` and `UpdateRequestCache` event stages
- You supply a return string that gets built into the key that is used to partition pages in the cache.
- You have additional levels of control, such as the ability to disable output caching.

# Implementation Process

- Create a class that derives from SPHttpApplication and implements both IHttpModule and IVaryByCustomHandler\*
- Register the derived class for notifications using RegisterGetVaryByCustomStringHandler
- Build detection & caching logic into the GetVaryByCustomString method\*
- Use a FeatureReceiver to register the class as an IHttpModule with help from the SPWebConfigModification type



\*  
→

Ignore the MSDN sample  
directing you to modify  
the Global.ASAX file

# Implementation Process

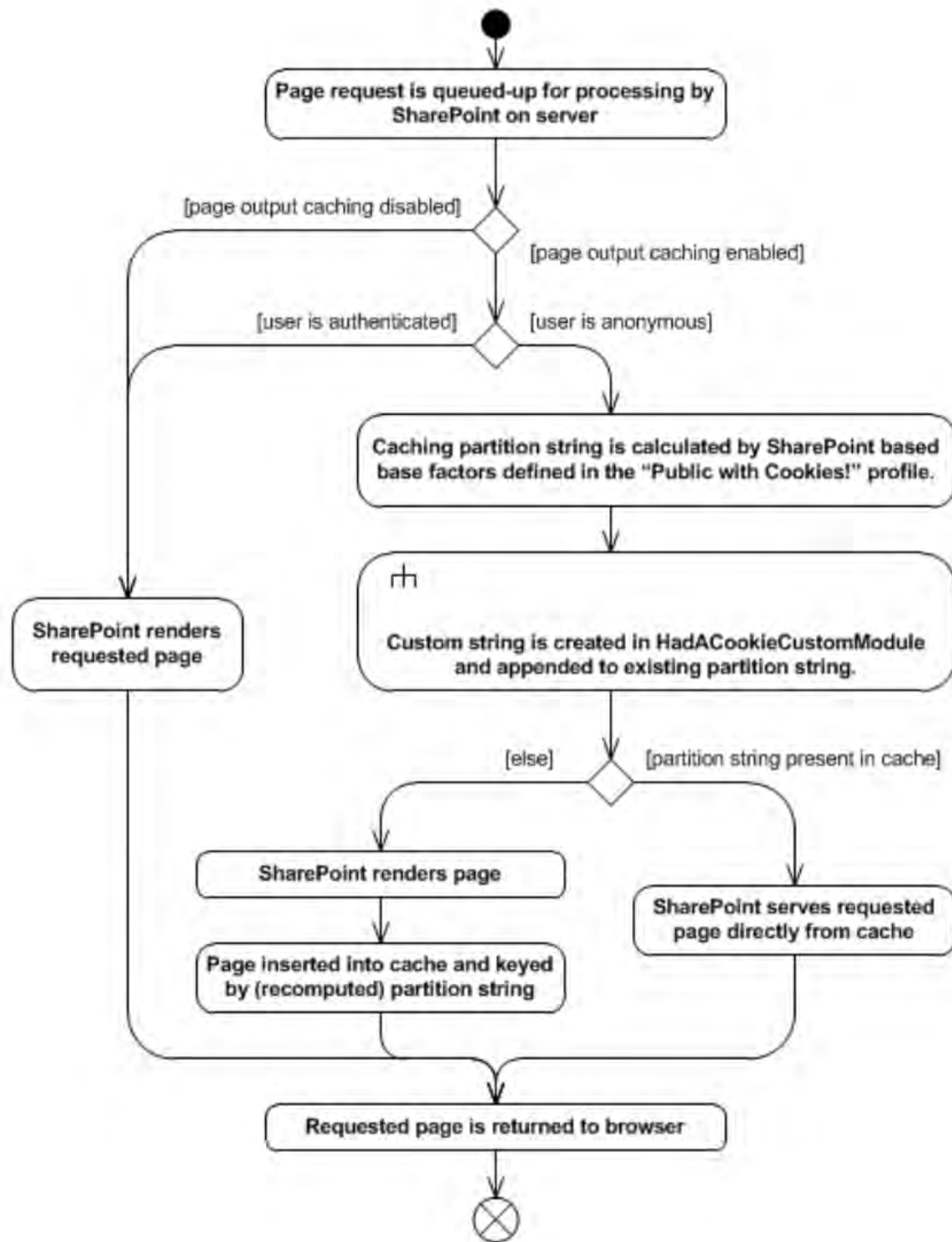
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PERFORMANCE CHECK	No
Enabled	Yes
Duration	120
Check for Changes	No
Vary by Custom Parameter	Browser, HadACookieCustomCaching
Vary by HTTP Header	
Vary by Query String Parameters	
Vary by User Rights	No

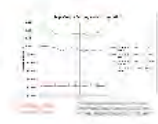
"Vary by Custom Parameter"  
in your output cache profile  
activates the handler!

# Implementation Process

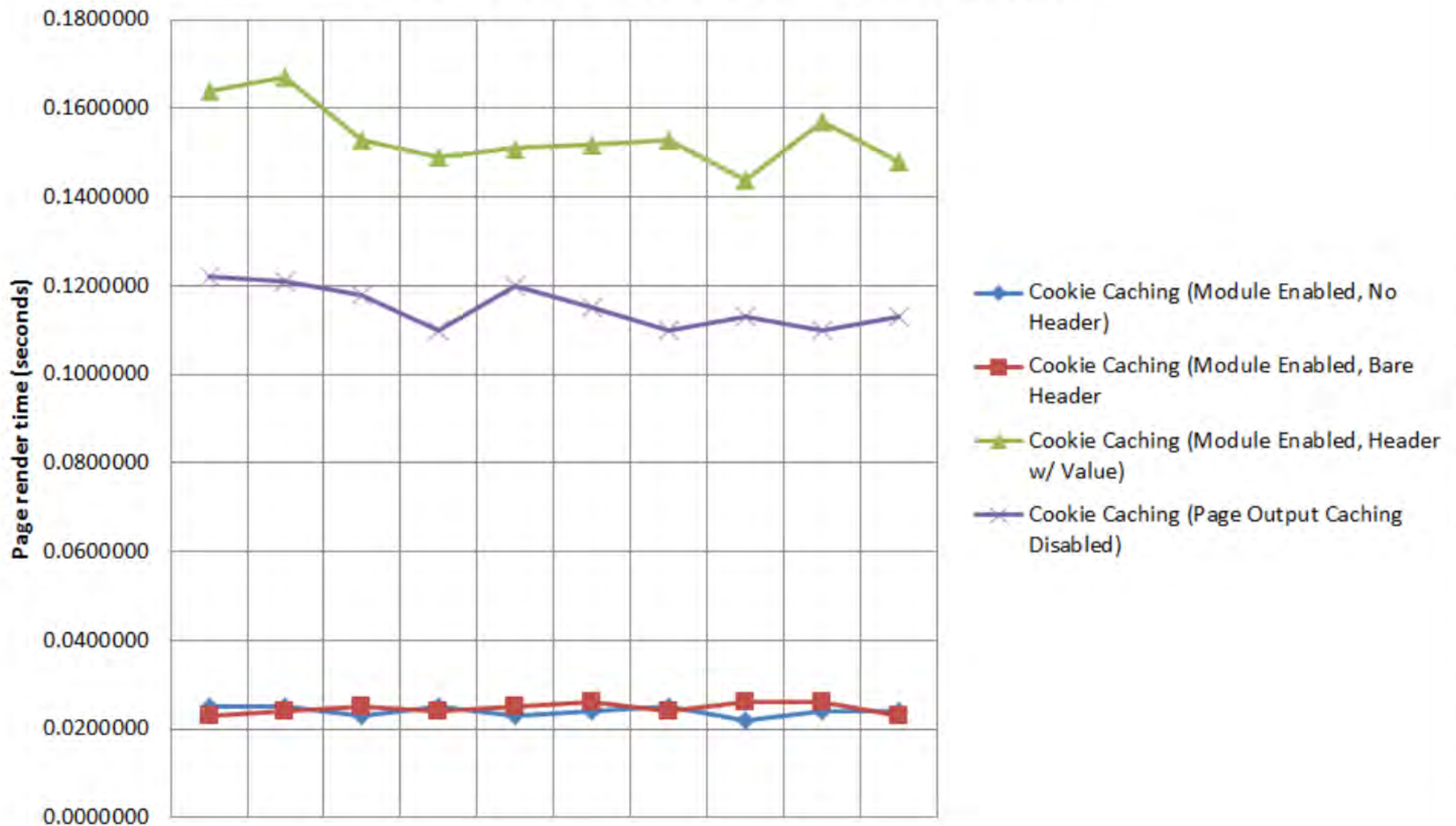
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**Demo**



## Page Output Caching and Customization



## Average Page Render Times

- No Page Output Caching: 0.1152 sec
- With Page Output Caching: 0.0243 sec
- Actively Disabling Caching: 0.1538 sec !!!!

# Limitations and Watch-Outs

- Don't forget to include the "Vary by Custom Parameter" in your cache profile - and check for it in the `GetVaryByCustomString` method
- If your code isn't getting called, ensure the `HttpModule` is properly wired-up
- Remember that `GetVaryByCustomString` can be called twice in a single page request: once for lookup, and second for cache insertion\*
- Avoid any costly or long-running operations in your `GetVaryByCustomString` method

*Sum-up: The nuclear option. In my experience, this is a last resort - not the place to actually start*

\*  
100

Second call (for insertion) only happens when page is being rendered - either on initial insert or re-rendering following ejection (cache time elapsed)



# Limitations and Watch-Outs

- Don't forget to include the "Vary by Custom Parameter" in your cache profile - and check for it in the `GetVaryByCustomString` method
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# References

Cache Class (System.Web.Caching)

<http://msdn.microsoft.com/en-us/library/system.web.caching.cache.aspx>

AppFabric 1.1 for Windows Server

<http://msdn.microsoft.com/en-us/windowsserver/ee695849>

Improve performance of your SharePoint 2010 applications using Windows Server AppFabric caching

<http://www.wictorwilen.se/Post/Improve-performance-of-your-SharePoint-2010-applications-using-Windows-Server-AppFabric-caching.aspx>

Plan for feeds and the Distributed Cache service in SharePoint Server 2013

<http://technet.microsoft.com/en-us/library/jj219572.aspx>

How To Perform Fragment Caching in ASP.NET by Using Visual C#.NET

<http://support.microsoft.com/kb/308378>

OutputCacheParameters Class

[http://msdn.microsoft.com/en-us/library/ms153449\(v=vs.90\)](http://msdn.microsoft.com/en-us/library/ms153449(v=vs.90))

# References

## Pages, Parsing, AND Safe Mode

[http://msdn.microsoft.com/en-us/library/gg552610.aspx#BKMK\\_PagesUI](http://msdn.microsoft.com/en-us/library/gg552610.aspx#BKMK_PagesUI)

## Dynamically Updating Portions of a Cached Page

[http://msdn.microsoft.com/en-us/library/ms227429\(v=vs.90\).aspx](http://msdn.microsoft.com/en-us/library/ms227429(v=vs.90).aspx)

## Substitution Class

[http://msdn.microsoft.com/en-us/library/system.web.ui.webcontrols.substitution\(v=vs.90\).aspx](http://msdn.microsoft.com/en-us/library/system.web.ui.webcontrols.substitution(v=vs.90).aspx)

## How to: Extend Caching by Using the VaryByCustom Event Handler in SharePoint Server 2010 (ECM)

<http://msdn.microsoft.com/en-us/library/ms550239.aspx>

## When Page Output Caching Does Not Output

<http://todd-carter.com/post/2012/01/31/When-Page-Output-Caching-Does-Not-Output.aspx>

## Fiddler Web Debugger - Script Samples

<http://www.fiddlertool.com/Fiddler/dev/ScriptSamples.asp>

## HTML Agility Pack

<http://htmlagilitypack.codeplex.com/>



# Sean P. McDonough

SharePoint Gearhead,  
Developer, AND Evangelist

My  
Company:



Twitter: @spmcdonough

Blog: <http://SharePointInterface.com>

About: <http://about.me/spmcdonough>