

Code Solutions to Improve SharePoint Performance and Scalability via Caching



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Chief SharePoint Evangelist
Idera

Session Overview

Quick Introduction

Component Caching Options

- ASP.NET Cache, Web Part Cache

Caching for Controls

- Fragment Caching, Post-Cache Substitution

Caching for Pages

- VaryByCustomHandler Implementation

Q&A Throughout

Why I care about caching

okay ...

Why I



caching

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

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

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

ak) 1,000 requests/second into IIS



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

... 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

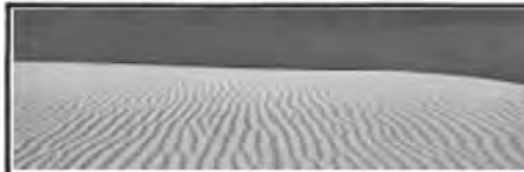
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Spice World

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Today's Forecast

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

Right Now: **118F**

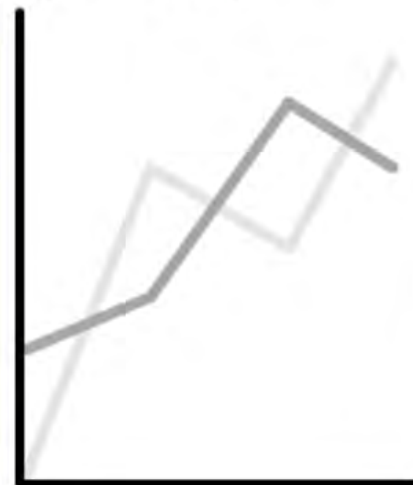


From Mentat News ...

- 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.
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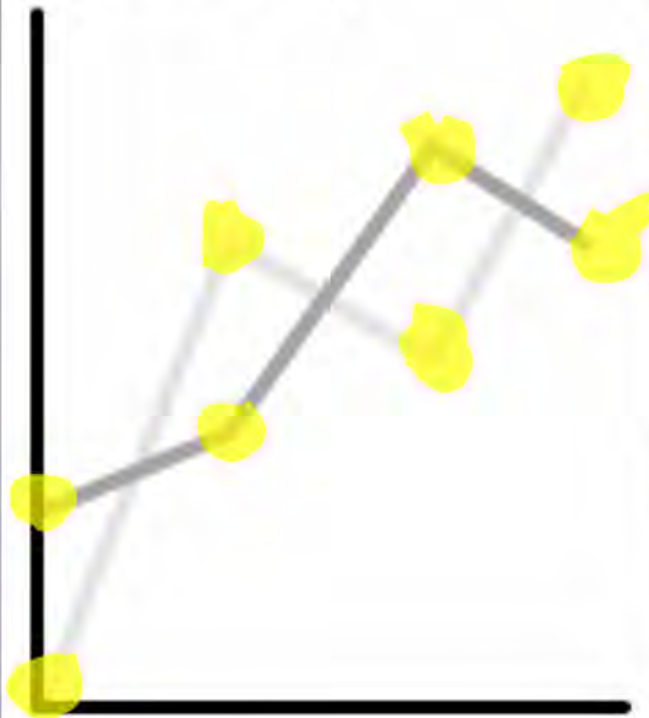
- Control rendering isn't complicated, but

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- Data used is "expensive" (computation/latency)
- Need way to store expensive results between calls

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- Data used is "expensive" (computation/latency)
- Need way to store expensive results between calls

Two possibilities

ASP.NET
Cache

Web Part
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;

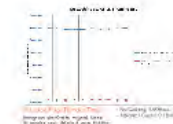
        //// Cache until a specific point in the future
        //Cache.Add(PI_VALUE_CACHE_KEY,
        //    piValue,
        //    null,
        //    DateTime.Now.AddSeconds(15),
        //    Cache.NoSlidingExpiration,
        //    CacheItemPriority.Normal,
        //    null);

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

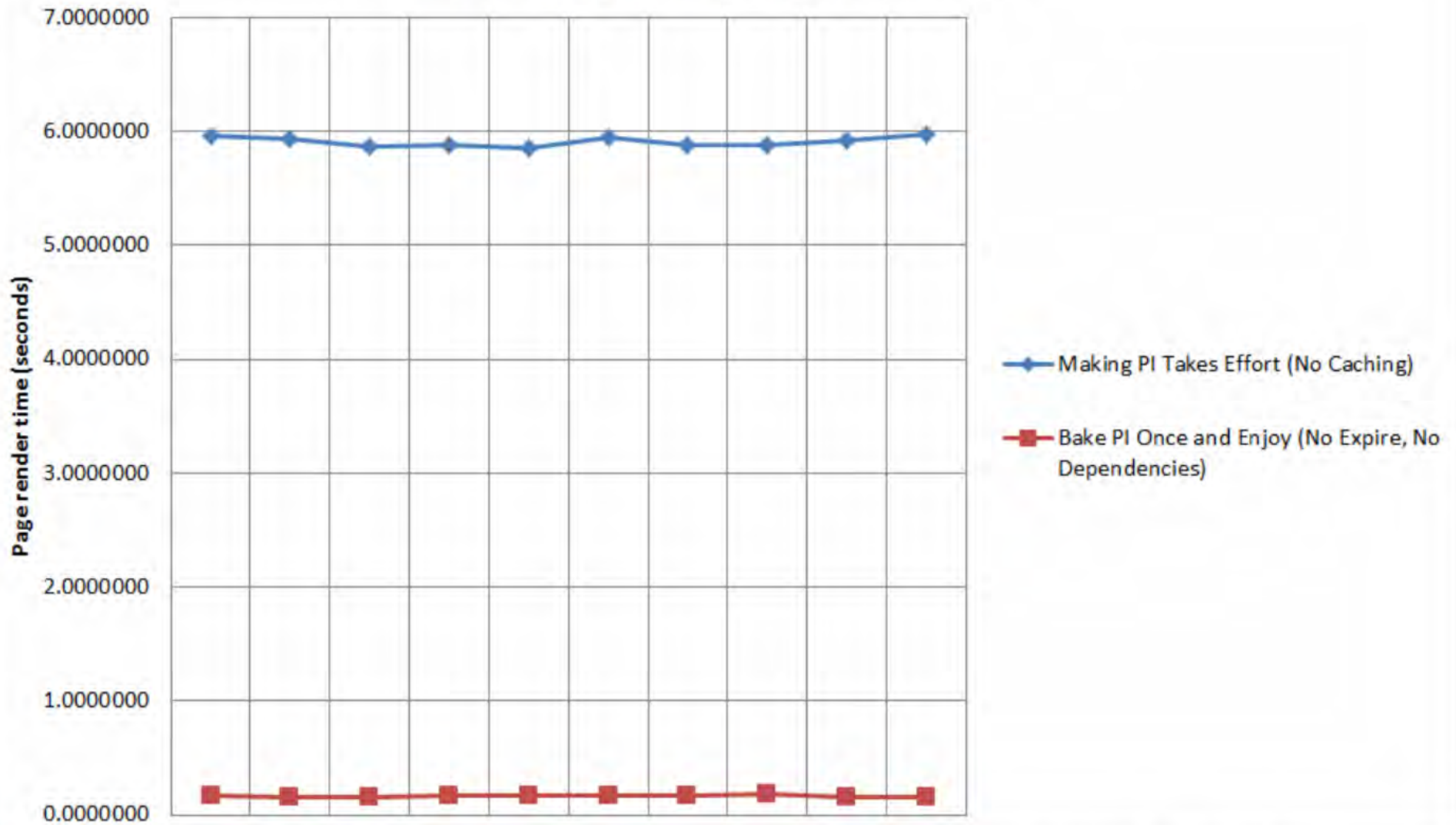
    return piValue.ToString();
}

```

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 possibilities

ASP.NET
Cache

Web Part
Cache

Web Part Cache

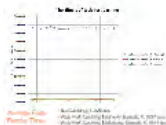
public abstract class **WebPart** : [System.Web.UI.WebControls.WebParts.WebPart](#)
Member of [Microsoft.SharePoint.WebPartPages](#)

Summary:

Provides the base class for creating Windows SharePoint Services Web Parts.

- Available to WebPart derivatives from Microsoft.SharePoint.WebPartPages
- Serializable objects can be cached
- Use PartCacheWrite and PartCacheRead methods to persist/retrieve values
- Can be configured for in-memory or SQL Server-based persistence
- Object expiration can be specified
- Supports shared or per-user caching

Demo



```
[ToolboxItemAttribute(false)]
[XmlRoot(Namespace="OptimusPrimePart")]
public class OptimusPrimePart : WebPart
{

    // Visual Studio might automatically update this path when you change the Visual Web Part
    private const string _ascxPath = @"~/_CONTROLTEMPLATES/SPMcDonough.CachingCodeSolutions.

    // Backing property variable for max prime to check
    private Int32 _maxValueToCheckForPrime;

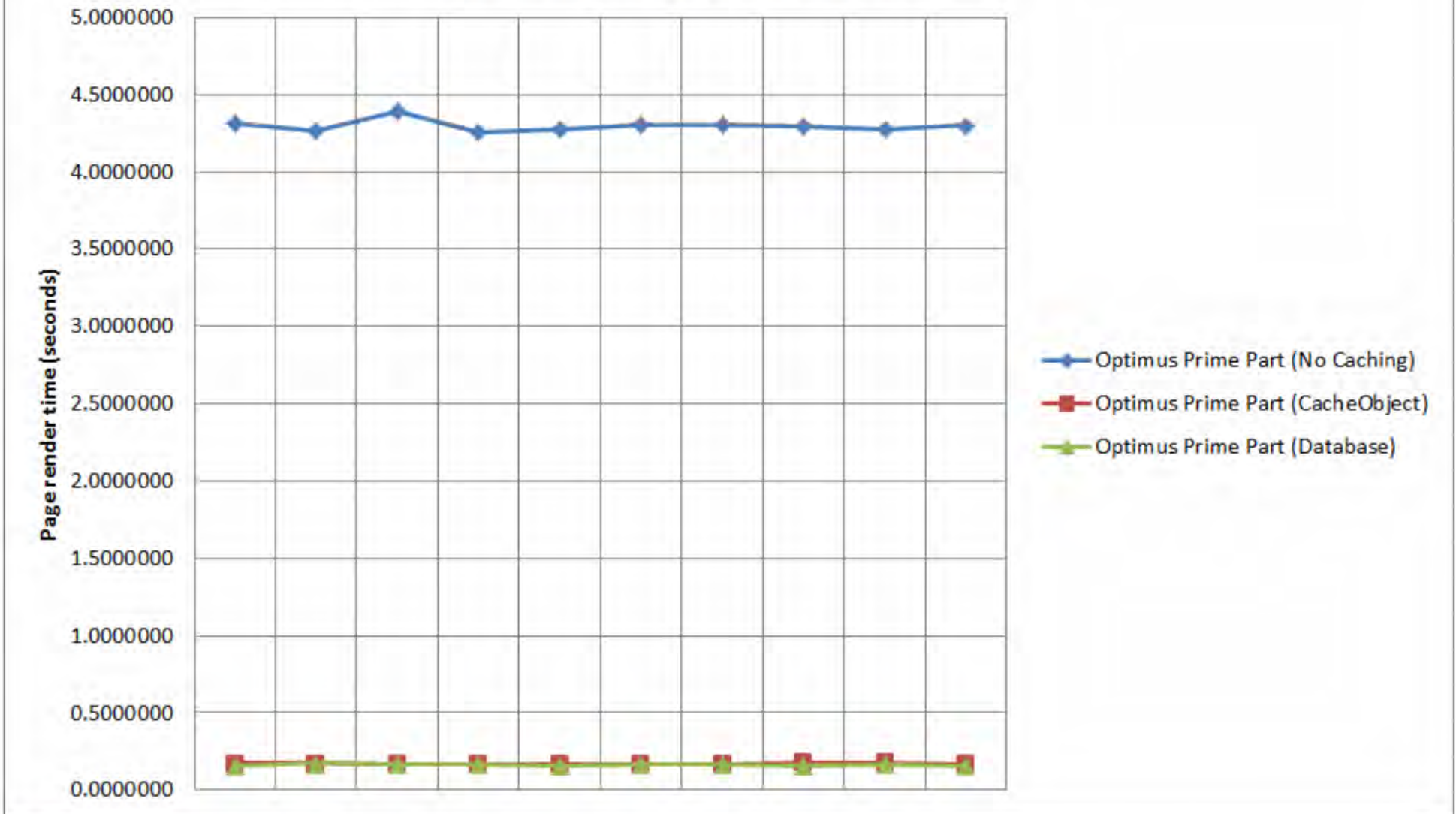
    protected override void CreateChildControls()
    {
        Control control = Page.LoadControl(_ascxPath);
        ((OptimusPrimePartUserControl)control).ParentWebPart = this;
        Controls.Add(control);
    }

    internal String GetSomePrimes(Int32 maxPrimeToFind, Boolean isCacheInUse)
    {
        const String CACHE_KEY = "ComputedPrimes";
        String primeList = String.Empty;

        if (isCacheInUse)
        {
            primeList = this.PartCacheRead(Storage.Shared, CACHE_KEY) as String;
            if (primeList == null)
            {
                primeList = PrimeFinder.FindPrimesUpTo(maxPrimeToFind);
                this.PartCacheWrite(Storage.Shared, CACHE_KEY, primeList, TimeSpan.MaxValue)
            }
        }
        else
        {
            // Straight fetch of the prime values; no caching involved.
            primeList = PrimeFinder.FindPrimesUpTo(maxPrimeToFind);
        }

        return primeList;
    }
}
```

The Effects of Web Part Caching



Average Page Render Times

- No Caching: 4.298 sec
- Web Part Caching (Memory-Based): 0.1687 sec
- Web Part Caching (Database-Based): 0.1644 sec

Limitations and Watch-Outs

- Older and somewhat less friendly way of creating Web Parts (different XML, code separation, and use of a .dwp file)
- Whether or not memory or SQL Server is the backing store is up to your admin
- Somewhat "flaky" in operation

Sum-up: Unless your use-case is specifically addressed, probably best to avoid this type of caching

Next-up:

Control-Level
Caching





Home

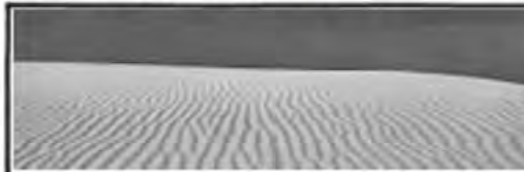
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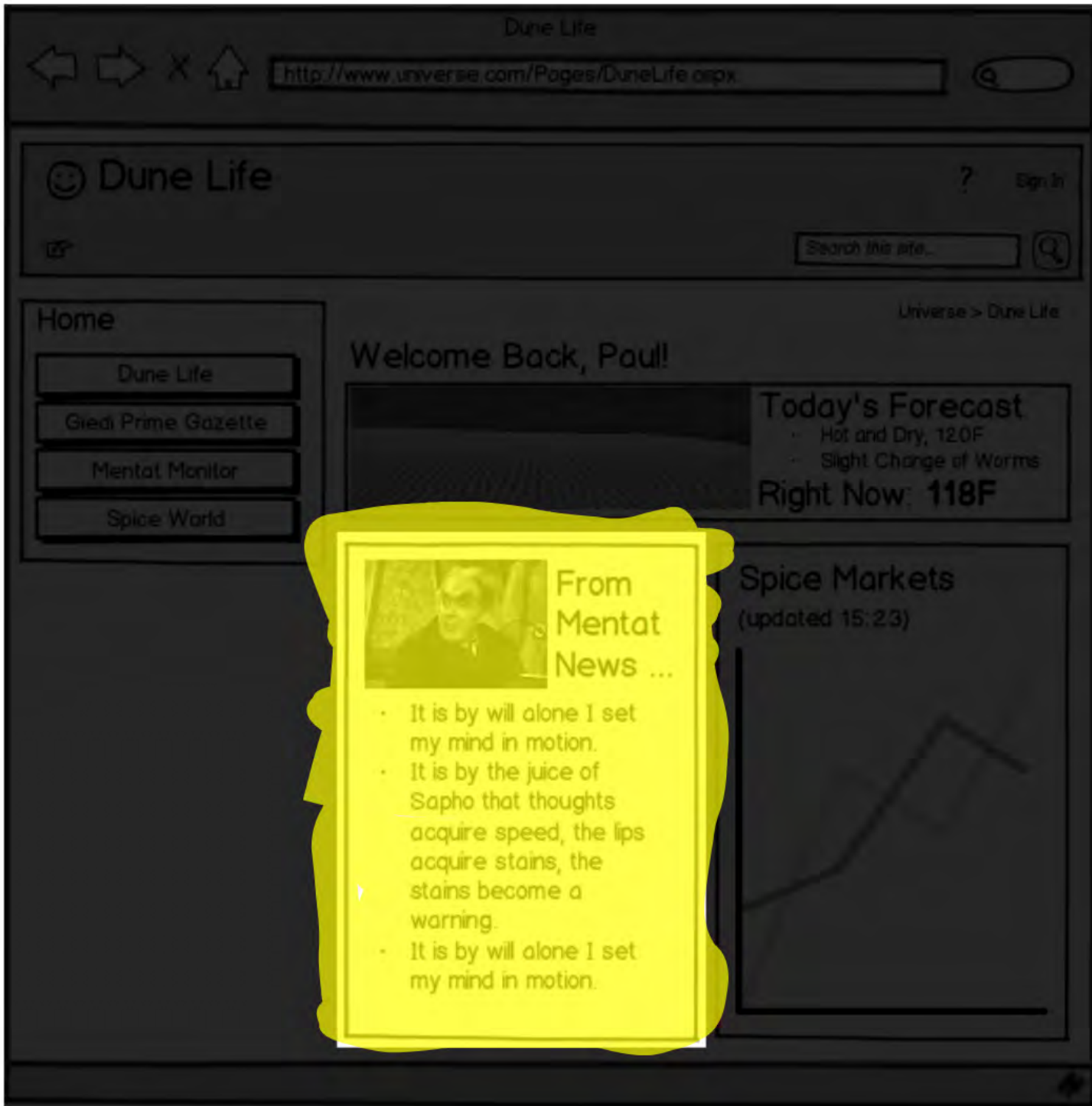
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- Control displays static content or ...
- Entire HTML output block generated by control changes infrequently and according to predictable variables/patterns

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="WeatherRightNowScraper.ascx.cs" Inherits='

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

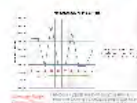
```

```

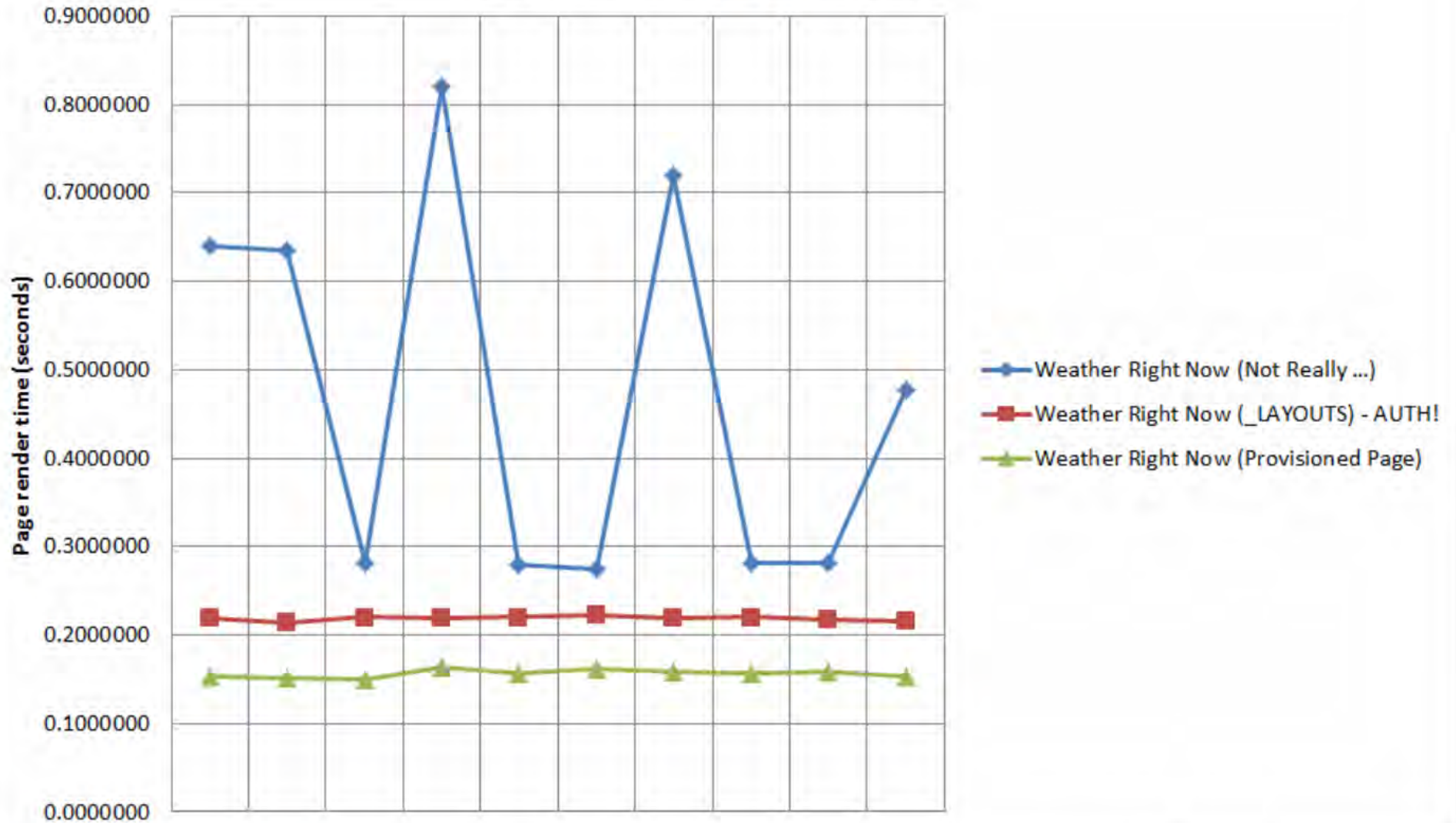
<asp:Panel ID="MainPanel" runat="server" BorderStyle="Solid" BorderWidth="1px" style="padding: 5px;">
    TIME WHEN CONTROL WAS RENDERED: <asp:Label ID="GenerationTimeLabel" runat="server"></asp:Label>
    <br />
    TIME TO GENERATE HTML OUPUT: <asp:Label ID="TimeToComputeLabel" runat="server"></asp:Label>
    <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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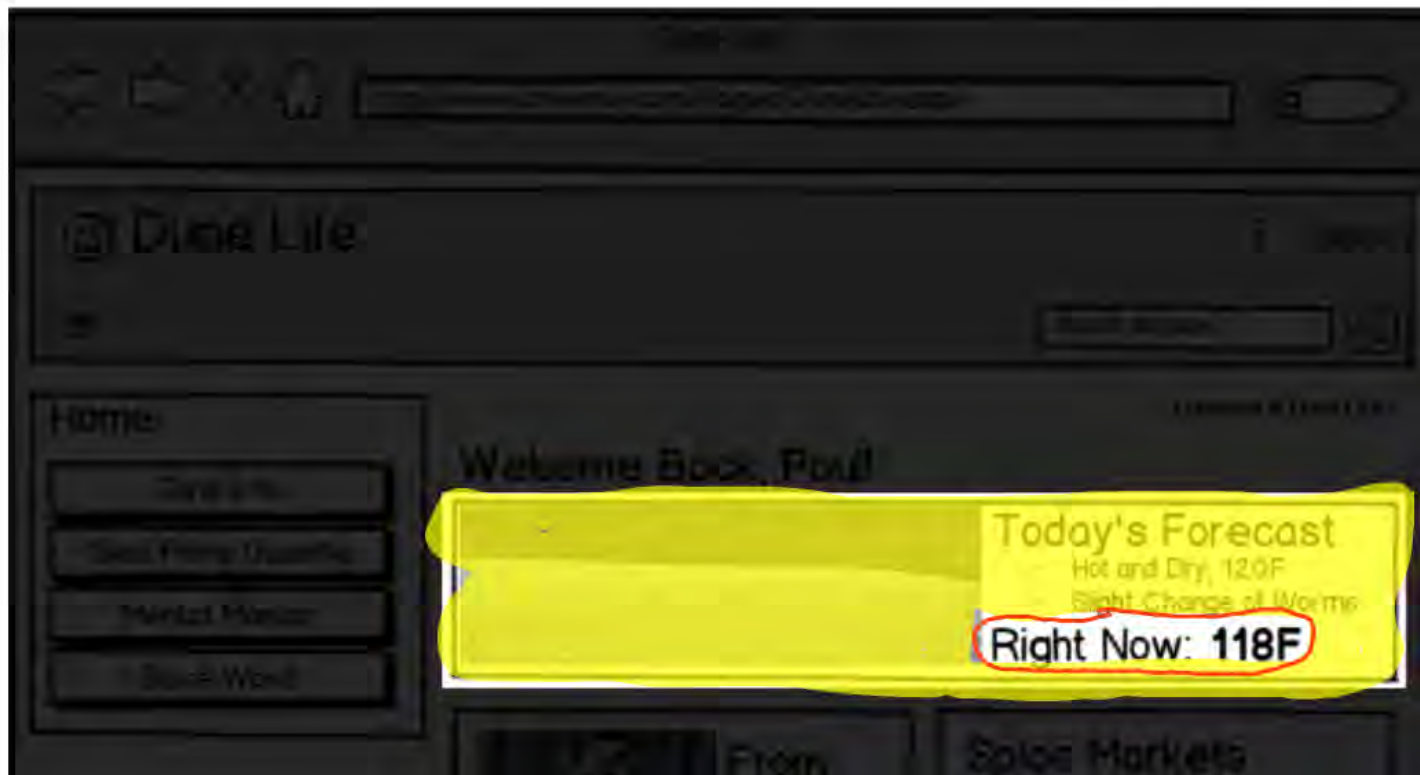
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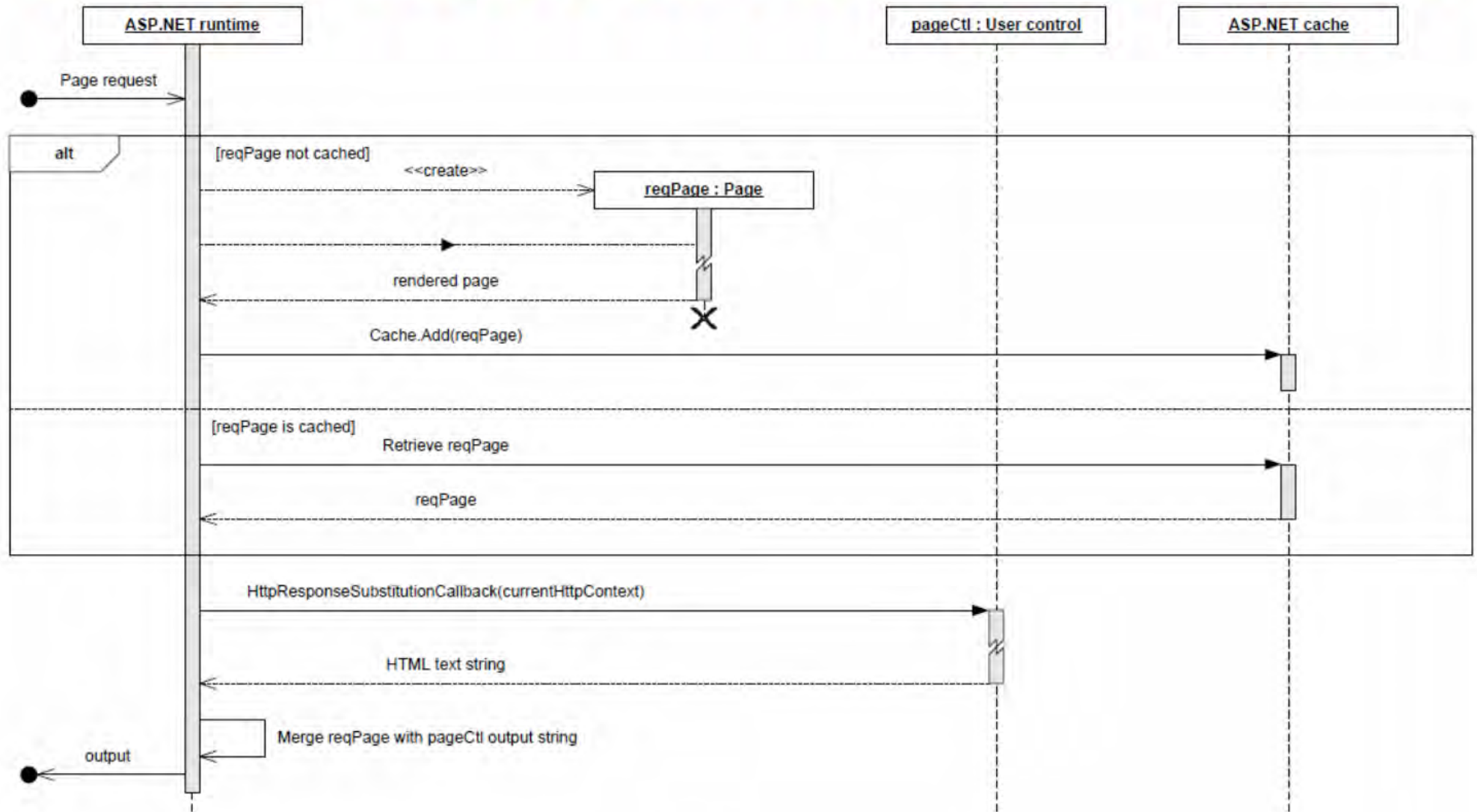
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- You are leveraging page output caching (i.e., the entire page's HTML output gets cached)
- Your control contains a mix of static and dynamic content
- You need a way to update the dynamic part (e.g., the "Right Now" temperature)

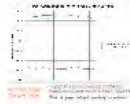


Post-Cache Substitution



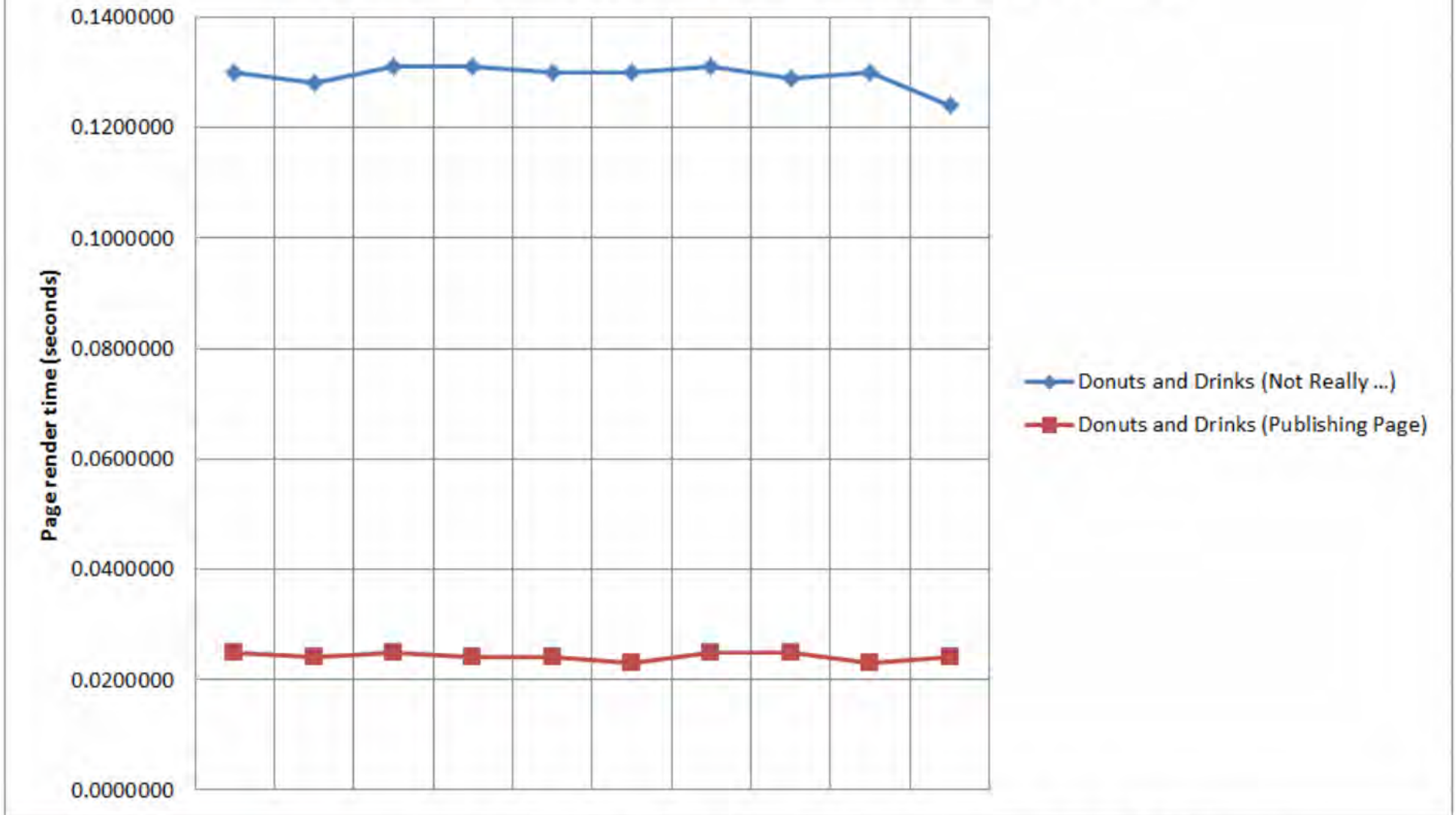
Page output caching "with benefits"

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

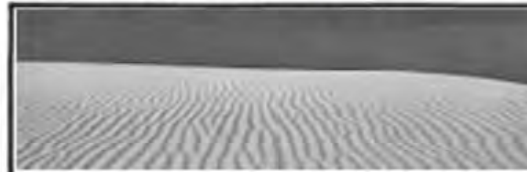
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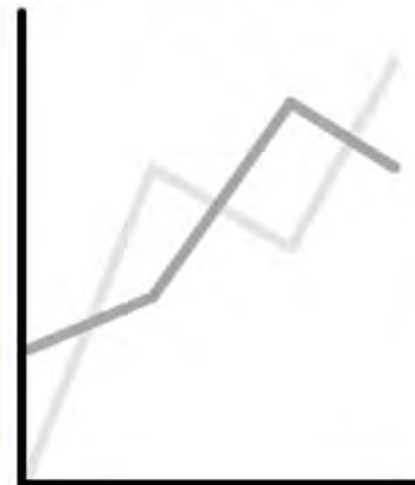


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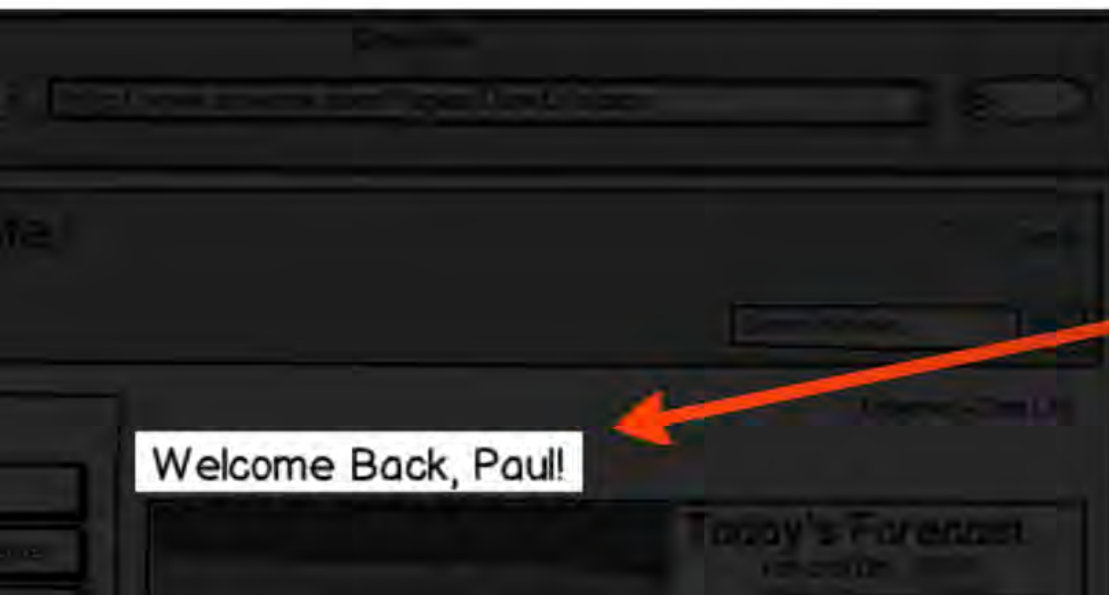
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- You need a way to more granularly control SharePoint's page output caching, or ...
- You need a way to alter page output caching from a key generation, object (page) lookup, or object storage perspective, or ...
- You want to affect output caching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



Conditionally
include or
exclude full
page from page
output cache

I 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

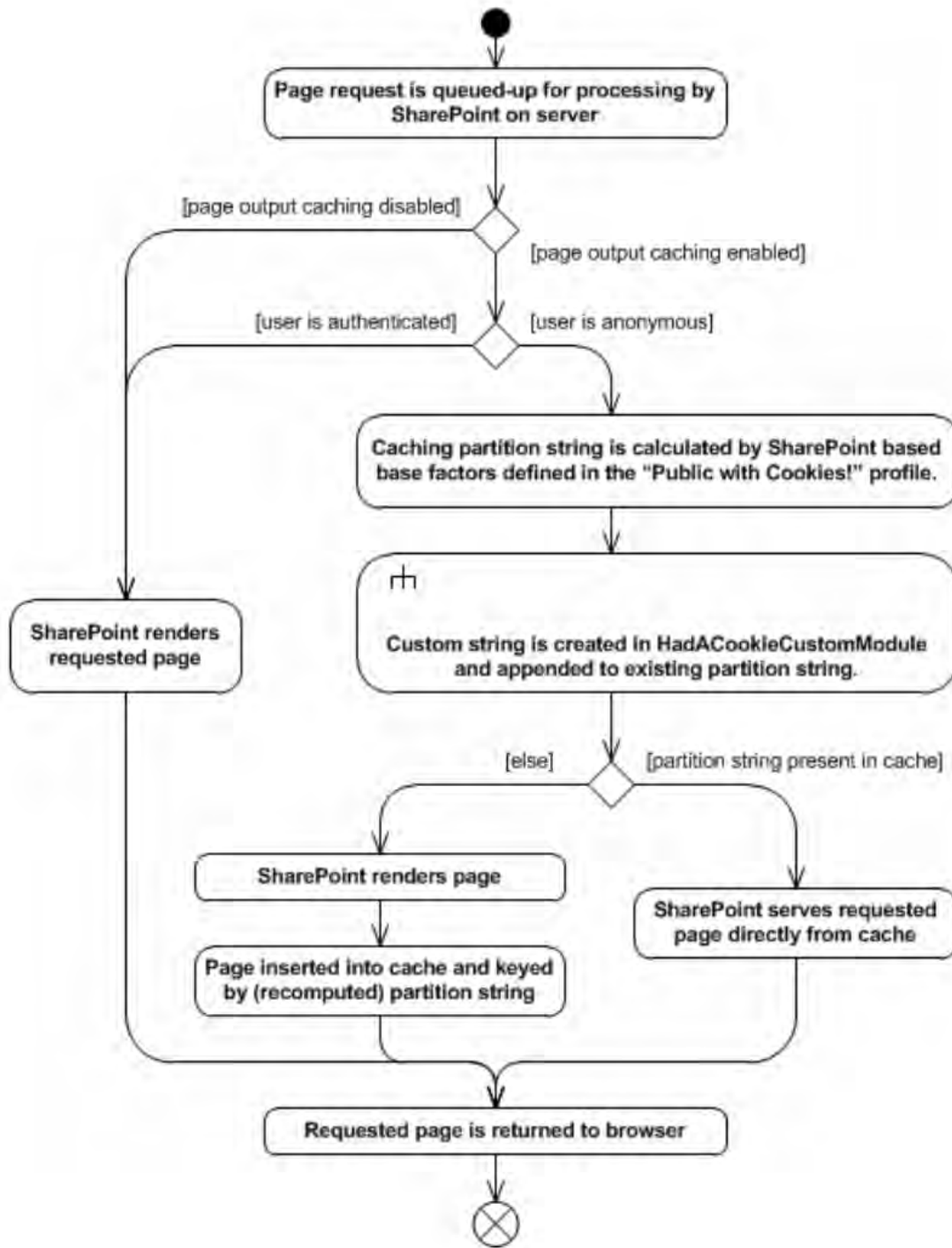
- Create a class that derives from SPHttpApplication and implements both IHttpModule and IVaryByCustomHandler*
- Register the derived class for notifications using RegisterGetVaryByCustomStringHandler
- Build detection & caching logic into the GetVaryByCustomString method*
- Use a FeatureReceiver to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

↖ *

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

PERFORM ACE 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

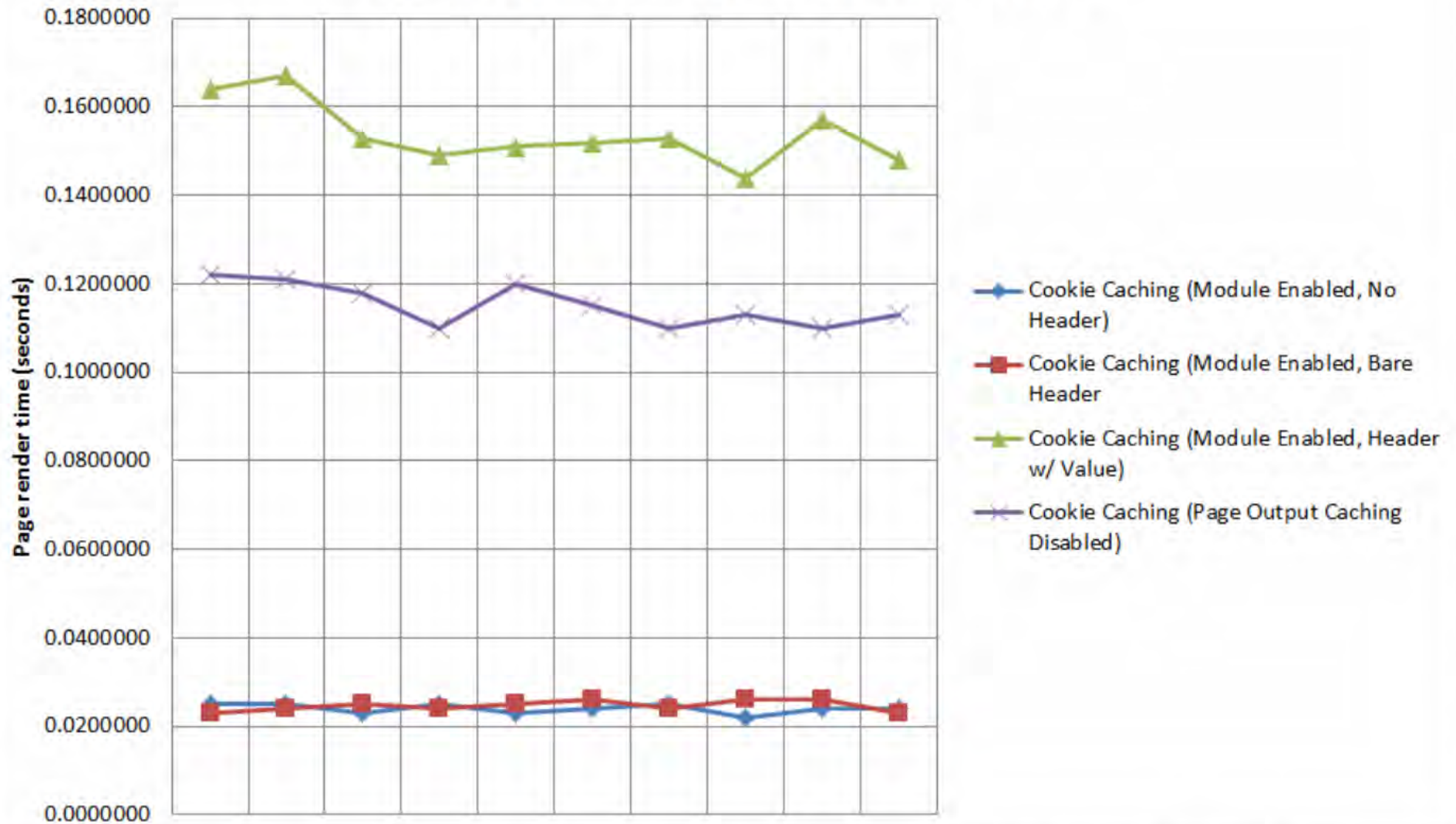
"Vary by Custom Parameter"
in your output cache profile
activates the handler!



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

U*
rce
U

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

References

Cache Class (System.Web.Caching)

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

Web Parts and Caching

[http://msdn.microsoft.com/en-us/library/dd585600\(v=office.11\).aspx](http://msdn.microsoft.com/en-us/library/dd585600(v=office.11).aspx)

Web Part Caching Options, How To Choose

<http://blogs.msdn.com/b/modonovan/archive/2005/04/27/412505.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))

Pages, Parsing, and Safe Mode

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)

References

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

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When Page Output Caching Does Not Output

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Fiddler Web Debugger - Script Samples

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

Html Agility Pack

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



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