Web Applications

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WEB FORMS

2

ASP.NET Web Forms

- Web interaction as GUI interaction
- Stateful GUI
- Event handlers
- Problem: Web is stateless
- Web forms: virtual GUI state

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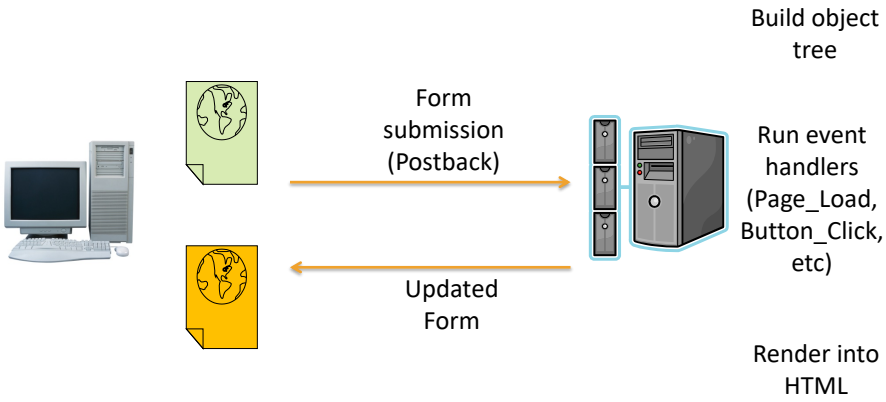
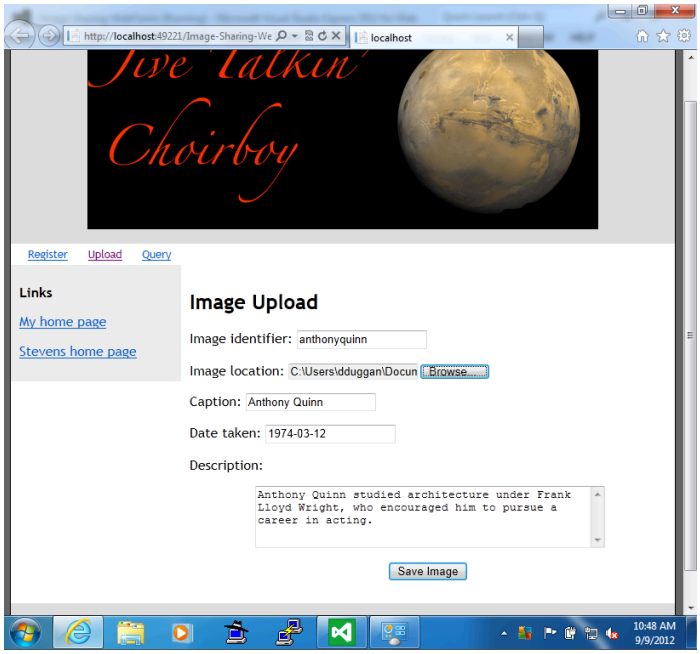
ASP.NET Web Forms



4


Jive Talkin' Choirboy
Register
Upload
Query
Links
My home page
Stevens home page
Image Upload
Image identifier: anthonyquinn
Image location: C:\Users\dduggan\Docun
Browse...
Caption: Anthony Quinn
Date taken: 1974-03-12
Description:
Anthony Quinn studied architecture under Frank Lloyd Wright, who encouraged him to pursue a career in acting.
Save Image

5

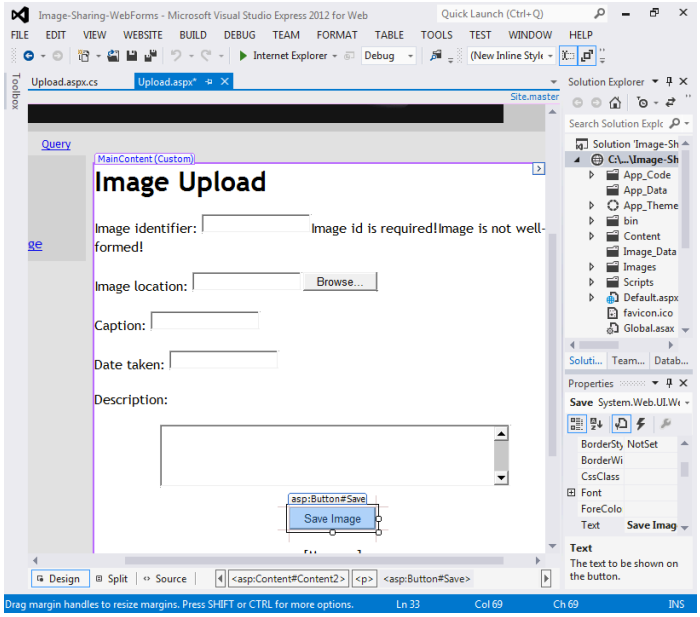


Image-Sharing-WebForms - Microsoft Visual Studio Express 2012 for Web
Upload.aspx.cs
Upload.aspx*
Site.master
Query
MainContent (Custom)
Image Upload
Image identifier:
Image id is required!Image is not well-formed!
Image location:
Browse...
Caption:
Date taken:
Description:
asp:Button#Save
Save Image
Solution Explorer
Properties
Text
The text to be shown on the button.

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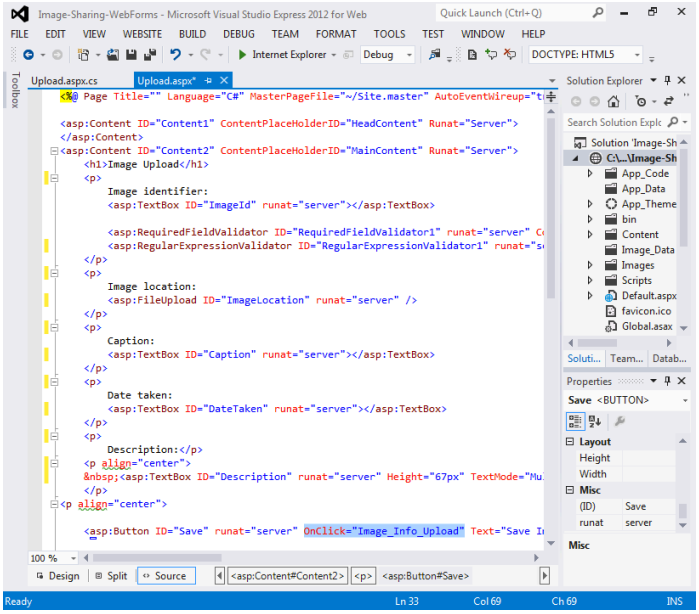
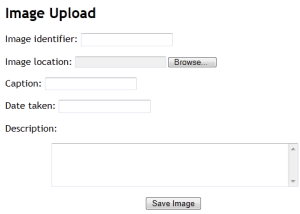


ASP.NET Markup

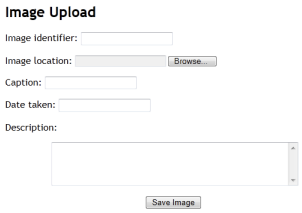



```
<h1>Image Upload</h1>
<p> Image location:
   <asp:FileUpload ID="ImageLocation" runat="server" />
   </p>
<p> Caption:
   <asp:TextBox ID="Caption" runat="server" />
   </p>

<asp:Button ID="Save" runat="server"
    OnClick="Image_Info_Upload"
    Text="Save Image" />

<asp:Label ID="Message" runat="server" />
```

ASP.NET Markup




```
<h1>Image Upload</h1>
<p> Image location:
   <asp:FileUpload ID="ImageLocation" runat="server" />
   </p>
<p> Caption:
   <asp:TextBox ID="Caption" runat="server” />
   </p>
...
<asp:Button ID="Save" runat="server"
    OnClick="Image_Info_Upload"
    Text="Save Image" />

<asp:Label ID="Message" runat="server” />
```

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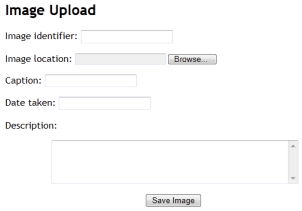
Rendered HTML




```
<p> Image location:
<input type="file"
   name="ctl00$MainContent$ImageLocation"
   id="MainContent_ImageLocation" /> </p>
<p> Caption:
<input type="text" name="ctl00$MainContent$Caption"
   id="MainContent_Caption" /></p>
...
<input type="submit" name="ctl00$MainContent$Save"
   value="Save Image"
   onclick=
        "javascript:WebForm_DoPostBackWithOptions(...)"
   id="MainContent_Save" />
```

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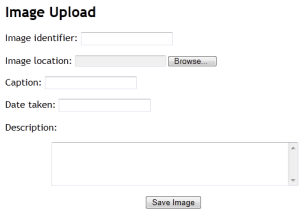
ASP.NET Markup




```
<h1>Image Upload</h1>
<p> Image location:
   <asp:FileUpload ID="ImageLocation" runat="server" />
   </p>
<p> Caption:
   <asp:TextBox ID="Caption" runat="server" />
   </p>

<asp:Button ID="Save" runat="server"
    OnClick="Image_Info_Upload"
    Text="Save Image" />

<asp:Label ID="Message" runat="server" />
```

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Code Behind

```
public partial class Upload : System.Web.UI.Page
{
    protected void Page_Load(object sender, EventArgs e)
    {

    }

    protected void Image_Info_Upload(object sender, EventArgs e)
    {
        ImageData data = new ImageData();
        data.caption = Caption.Text;
        ...
        // Save the image data on the server.

        // Updated form by default remembers previous inputs in fields.
        Message.Text = "Image information successfully uploaded!";
        Caption.Text = "";
        ...
    }
}
```

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Viewstate in Postback Form

```
<form name="form1" method="post" action="Default.aspx"
                id="form1">
  <div>
    <input type="hidden" name="__VIEWSTATE"
           id="__VIEWSTATE" value="viewStateValue" />
  </div>

  ... Rendered output of inner Web controls ...

</form>
```

The page's *view state* is encoded and stored in a hidden `<input>` field.

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ASP.NET Web Forms Summary

- Pattern: Page controller
- Similar to GUI programming
  - Wysiwyg editor
  - Event handling
  - Postbacks
- Problems
  - Unit testing
  - Event handler interactions
  - Viewstate
  - Control over rendered HTML

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ASP.NET MVC

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ASP.NET MVC

- Model-View-Controller
- Motivation: Separation of Concerns
- Benefits over Web Forms
  - Program control of app behavior
  - Test-driven development (TDD)
  - Routing
- Disadvantages
  - Relative (app) complexity

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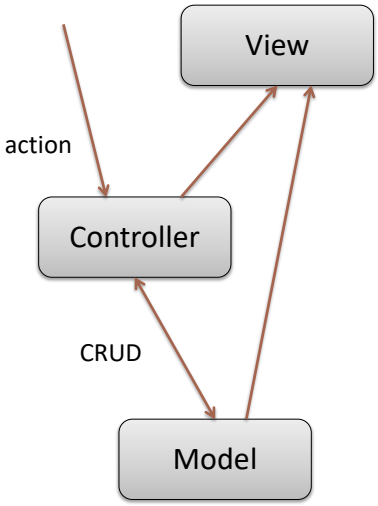
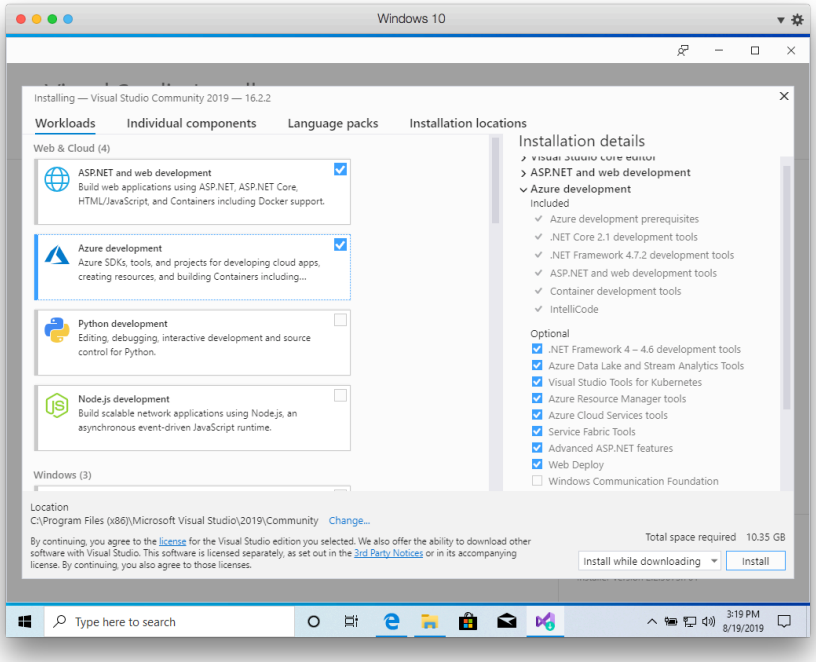
Model-View-Controller

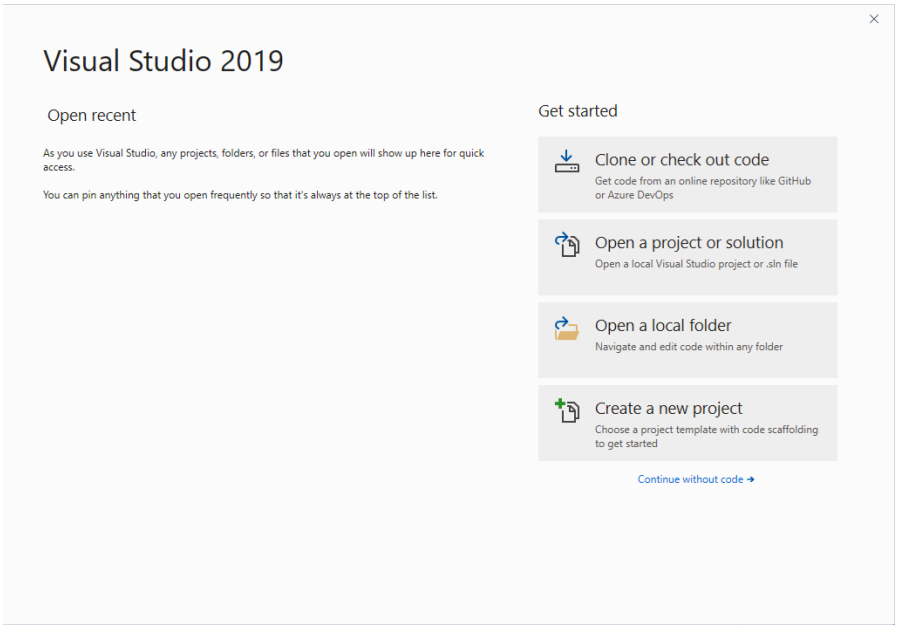
- Controller: business logic
- Model: application state
  - Database
- View: presentation logic
  - HTTP response



17



18


Visual Studio 2019
Open recent
As you use Visual Studio, any projects, folders, or files that you open will show up here for quick access.
You can pin anything that you open frequently so that it's always at the top of the list.
Get started
Clone or check out code
Get code from an online repository like GitHub or Azure DevOps
Open a project or solution
Open a local Visual Studio project or .sln file
Open a local folder
Navigate and edit code within any folder
Create a new project
Choose a project template with code scaffolding to get started
Continue without code →

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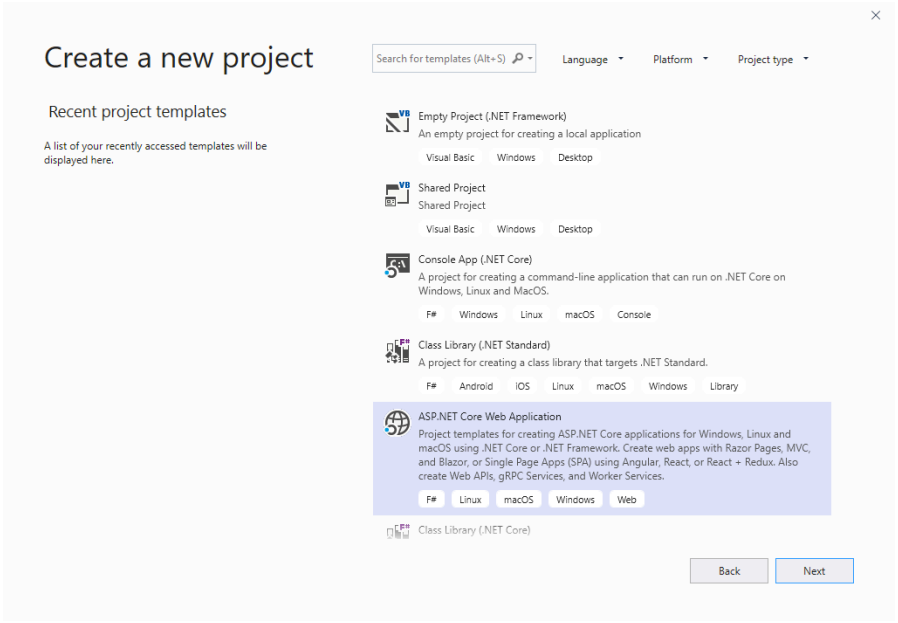
Create a new project
Search for templates (Alt+S)
Language
Platform
Project type
Recent project templates
A list of your recently accessed templates will be displayed here.
Empty Project (.NET Framework)
An empty project for creating a local application
Visual Basic Windows Desktop
Shared Project
Shared Project
Visual Basic Windows Desktop
Console App (.NET Core)
A project for creating a command-line application that can run on .NET Core on Windows, Linux and MacOS.
F# Windows Linux macOS Console
Class Library (.NET Standard)
A project for creating a class library that targets .NET Standard.
F# Android iOS Linux macOS Windows Library
ASP.NET Core Web Application
Project templates for creating ASP.NET Core applications for Windows, Linux and macOS using .NET Core or .NET Framework. Create web apps with Razor Pages, MVC, and Blazor, or Single Page Apps (SPA) using Angular, React, or React + Redux. Also create Web APIs, gRPC Services, and Worker Services.
F# Linux macOS Windows Web
Class Library (.NET Core)
Back
Next

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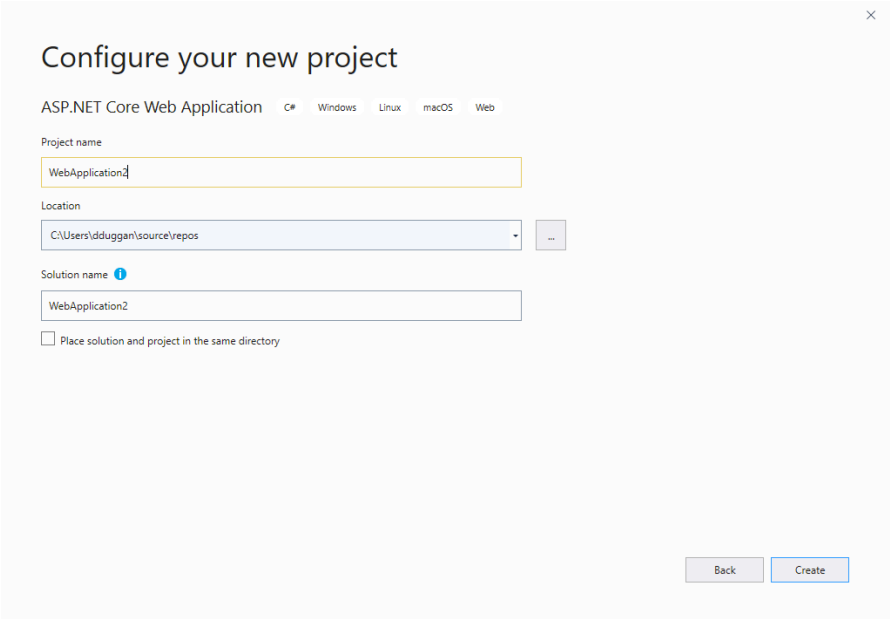
Configure your new project
ASP.NET Core Web Application
C#
Windows
Linux
macOS
Web
Project name
WebApplication2
Location
C:\Users\dduggan\source\repos
...
Solution name
WebApplication2
Place solution and project in the same directory
Back
Create

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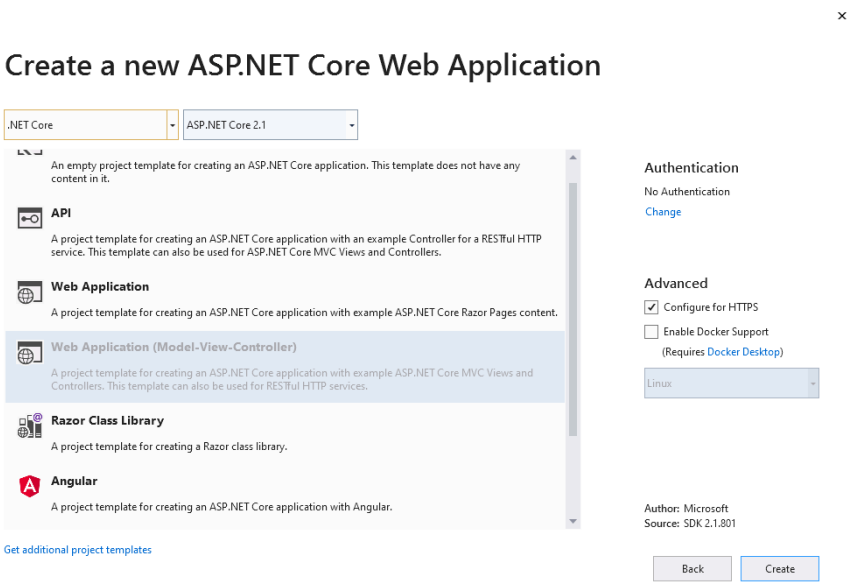
Create a new ASP.NET Core Web Application
.NET Core
ASP.NET Core 2.1
An empty project template for creating an ASP.NET Core application. This template does not have any content in it.
API
A project template for creating an ASP.NET Core application with an example Controller for a RESTful HTTP service. This template can also be used for ASP.NET Core MVC Views and Controllers.
Web Application
A project template for creating an ASP.NET Core application with example ASP.NET Core Razor Pages content.
Web Application (Model-View-Controller)
A project template for creating an ASP.NET Core application with example ASP.NET Core MVC Views and Controllers. This template can also be used for RESTful HTTP services.
Razor Class Library
A project template for creating a Razor class library.
Angular
A project template for creating an ASP.NET Core application with Angular.
Authentication
No Authentication
Change
Advanced
Configure for HTTPS
Enable Docker Support
(Requires Docker Desktop)
Linux
Author: Microsoft
Source: SDK 2.1.801
Get additional project templates
Back
Create

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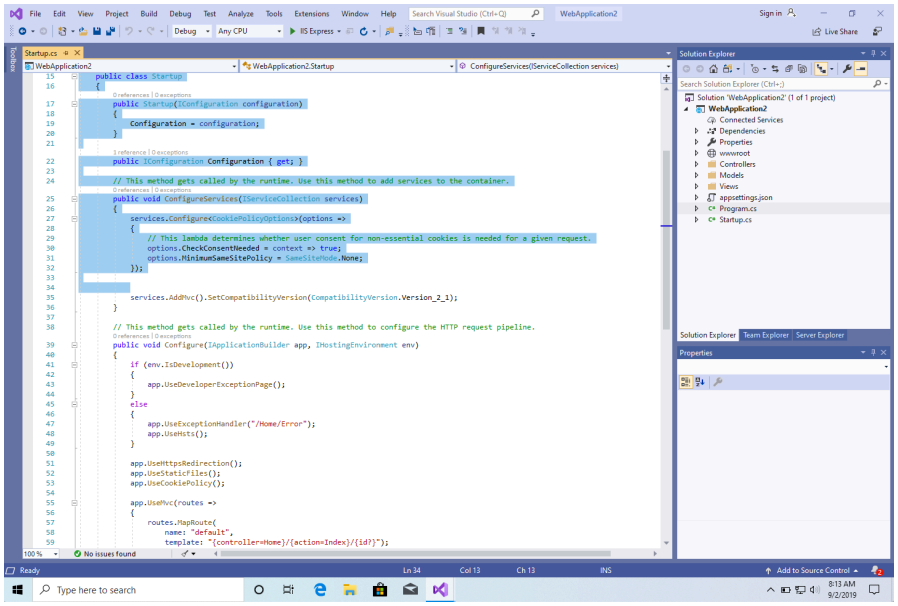

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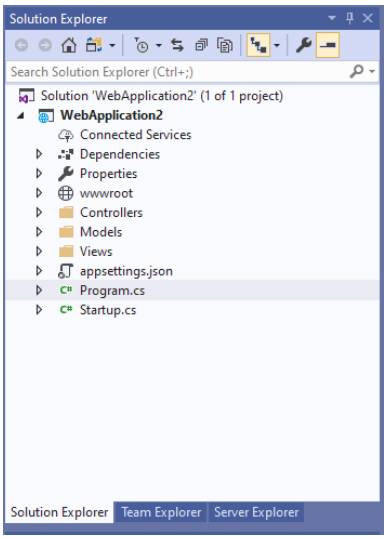
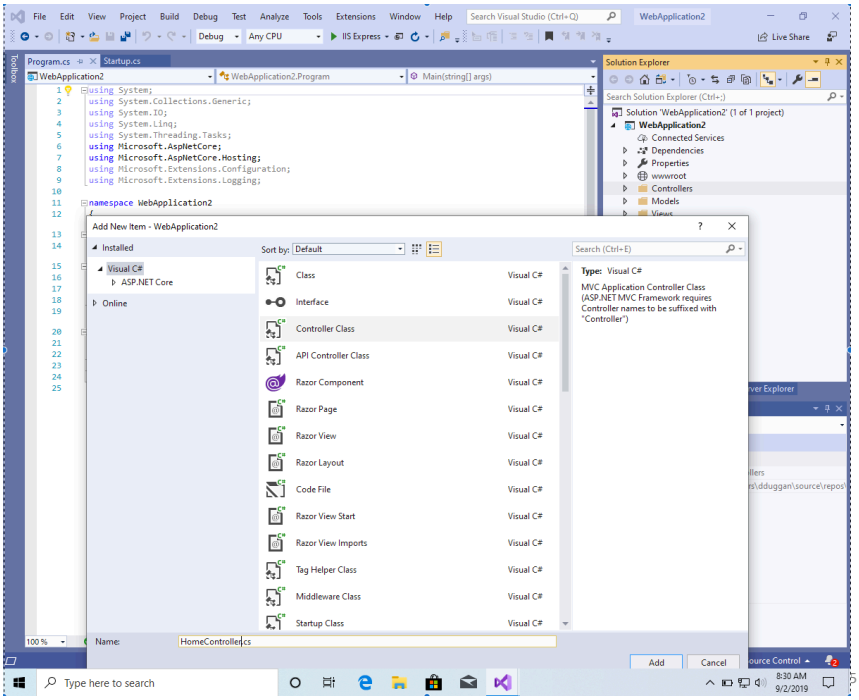
Structure of a Core MVC Project

- wwwroot
- appsettings.json
- Program.cs
- Startup.cs
- Controllers
- Models
- Views



24



Sample Controller

```
namespace HelloWorld.Controllers
{
    public class HomeController : Controller
    {
        public String Index()
        {
            return “Hello, Stranger”;
        }

        public String About()
        {
            return “This was created by me.”;
        }
    }
}
```

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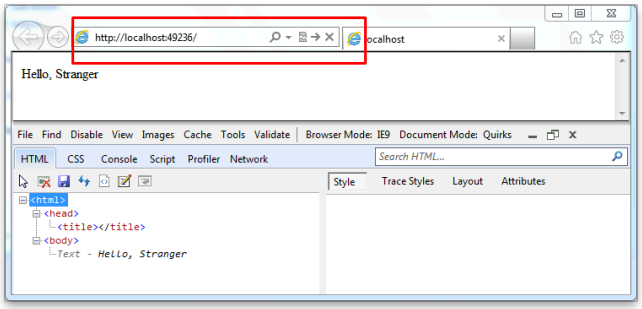
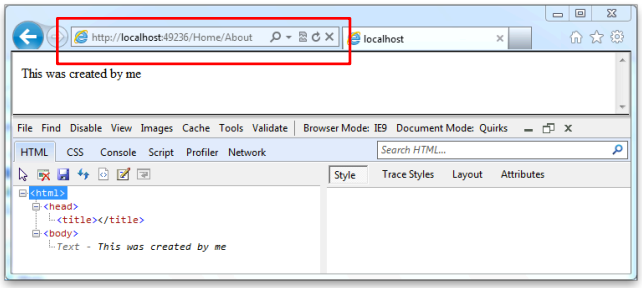
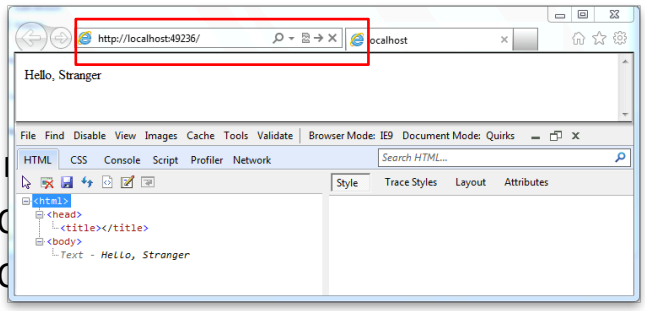




27



- Nai
  - C
  - C

- Routing Convention
  - URL: `http://host:port/control-id/action-id`
  - Ex: `http://localhost:49236/Home/About`
  - Default: `http://localhost:49236/Home/Index`

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Sample Controller

```
namespace HelloWorld.Controllers
{
    public class HomeController : Controller
    {
        public String Index(String name="Stranger")
        {
            return "Hello, "+name;
        }

        public String About()
        {
            return "This was created by me.";
        }
    }
}
```

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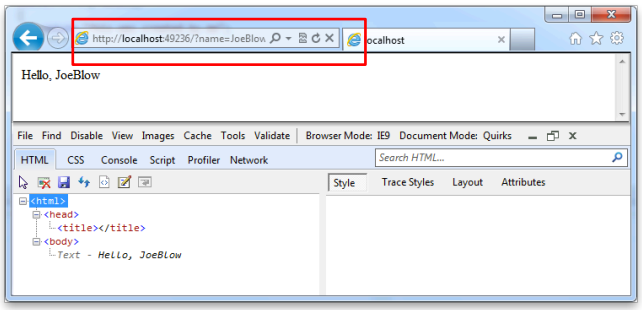

Danger, Will Robinson!

```
http://localhost:49236/?name=Joe<script>alert("Hah!");</script>
```

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Sample Controller

```
namespace HelloWorld.Controllers
{
    public class HomeController : Controller
    {
        public String Index(String name="Stranger")
        {
            return HttpUtility.HtmlEncode("Hello, "+name);
        }

        public String About()
        {
            return HttpUtility.HtmlEncode("...");
        }
    }
}
```

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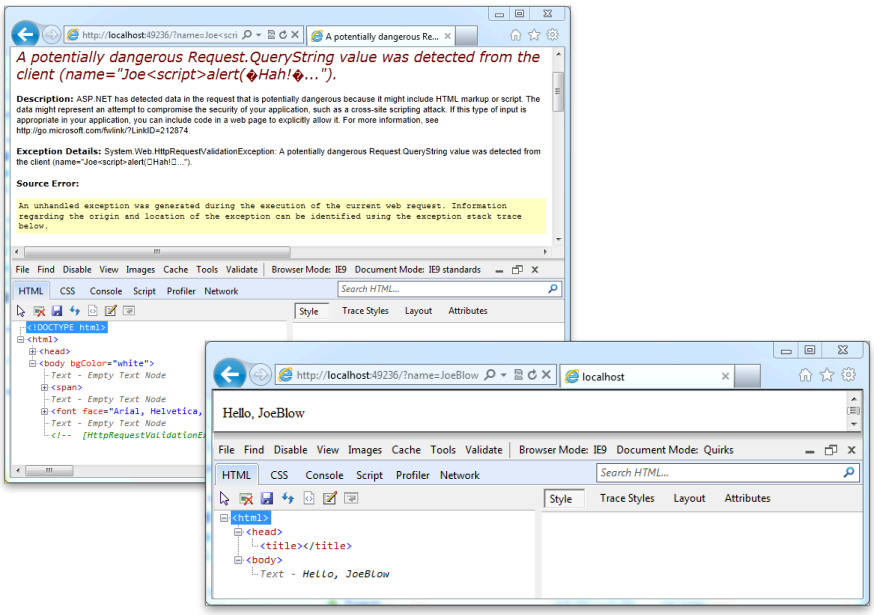

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VIEWS

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Presentation Logic

- Programmatic definition
  - e.g. `HttpUtility.HtmlEncode()`
- Declarative: ASPX markup (*`view`*`.aspx`)
  - XML
  - Designed for Web Forms
- Combined: Razor (*`view`*`.cshtml`)
  - Not XML
  - Integrated with C#

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Sample Controller

```
namespace HelloWorld.Controllers
{
    public class HomeController : Controller
    {
        public String Index()
        {
            return “Hello, Stranger”;
        }

        public String About()
        {
            return “This was created by me.”;
        }
    }
}
```

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Views for Results

```
namespace HelloWorld.Controllers
{
    public class HomeController : Controller
    {
        public ActionResult Index()
        {
            return View();
        }

        public ActionResult About()
        {
            return View();
        }
    }
}
```

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ViewData

```
namespace HelloWorld.Controllers
{
    public class HomeController : Controller
    {
        public ActionResult Index(String name="Stranger")
        {
            ViewData["name"] = name;
            return View();
        }

        public ActionResult About()
        {
            return View();
        }
    }
}
```

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ViewBag

```
namespace HelloWorld.Controllers
{
    public class HomeController : Controller
    {
        public ActionResult Index(String name="Stranger")
        {
            ViewBag.name = name;
            return View();
        }

        public ActionResult About()
        {
            return View();
        }
    }
}
```

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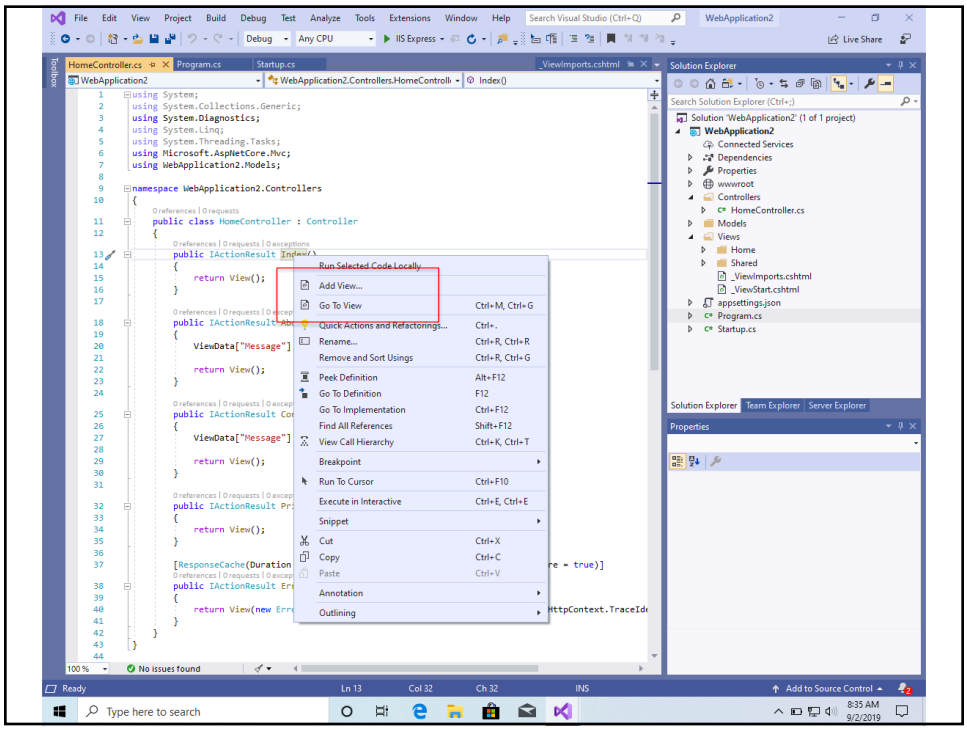
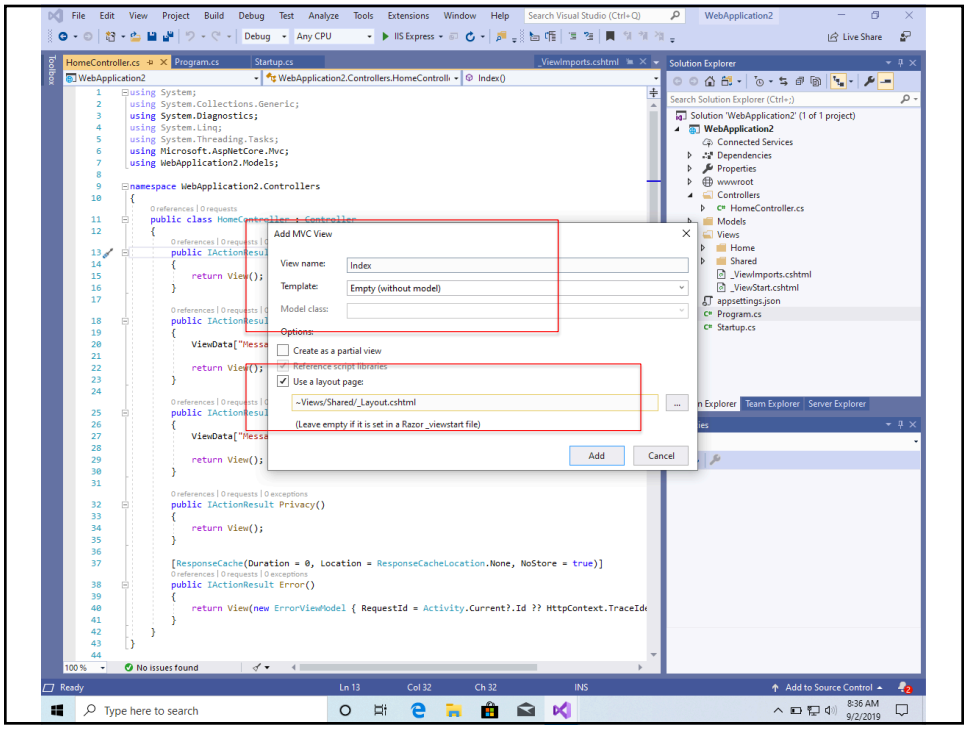
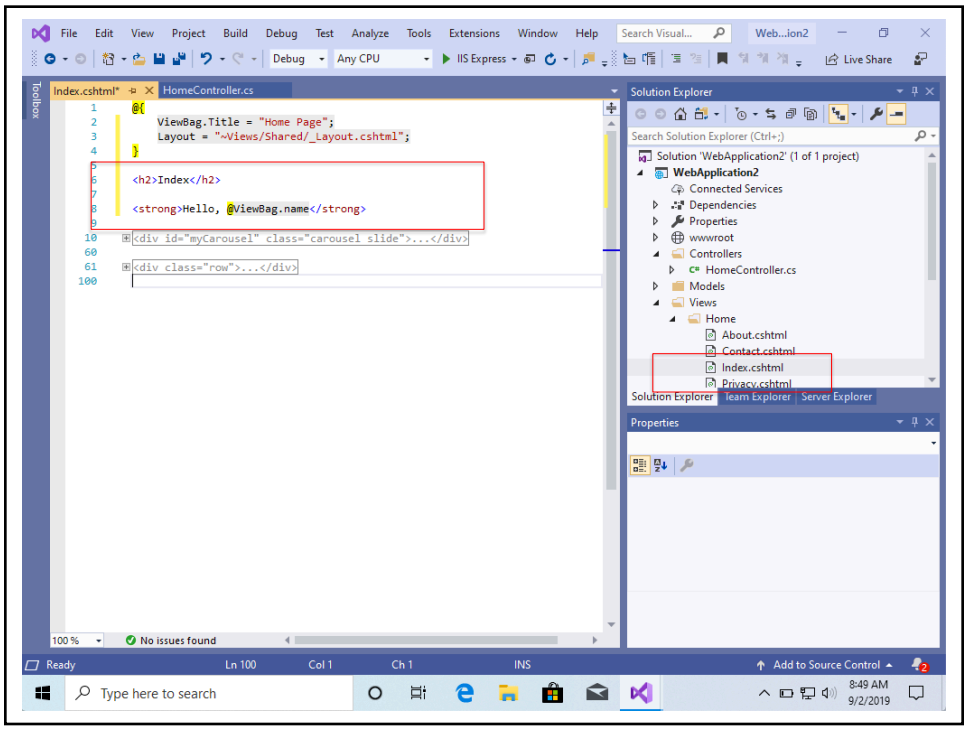
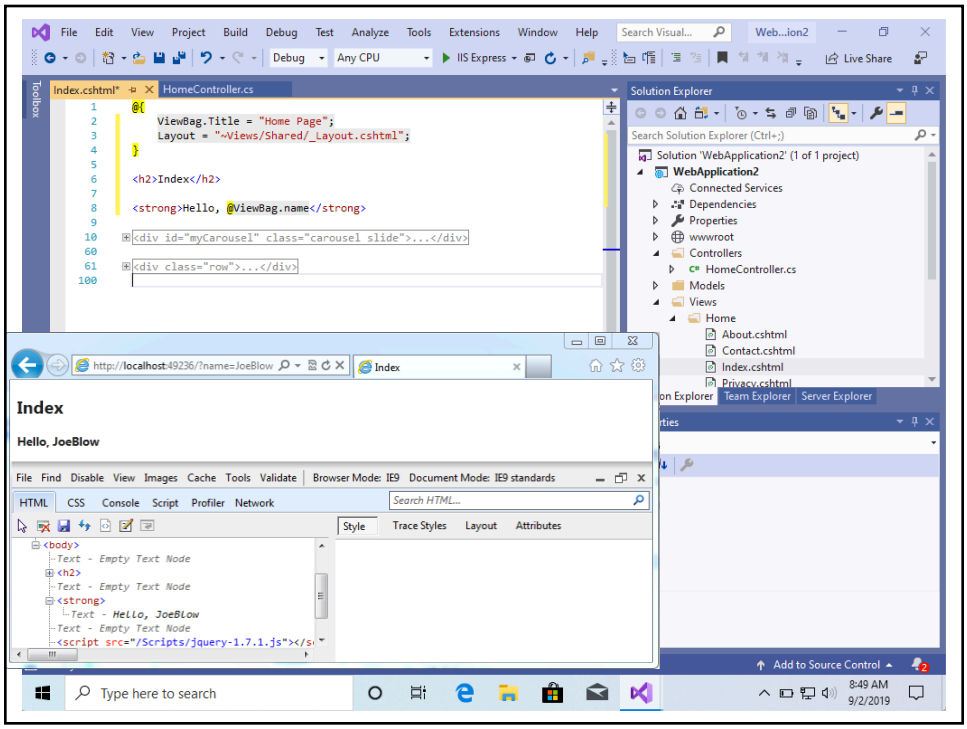

File Edit View Project Build Debug Test Analyze Tools Extensions Window Help
Search Visual Studio (Ctrl+Q)
WebApplication2
Debug
Any CPU
IIS Express
Live Share
HomeController.cs
Program.cs
Startup.cs
_ViewImports.cshtml
WebApplication2
WebApplication2.Controllers.HomeControll
Index()
using System;
using System.Collections.Generic;
using System.Diagnostics;
using System.Linq;
using System.Threading.Tasks;
using Microsoft.AspNetCore.Mvc;
using WebApplication2.Models;
namespace WebApplication2.Controllers
public class HomeController : Controller
public IActionResult Index()
return View();
ViewData["Message"]
[ResponseCache(Duration
Run Selected Code Locally
Add View...
Go To View Ctrl+M, Ctrl+G
Quick Actions and Refactorings... Ctrl+.
Rename... Ctrl+R, Ctrl+R
Remove and Sort Usings Ctrl+R, Ctrl+G
Peek Definition Alt+F12
Go To Definition F12
Go To Implementation Ctrl+F12
Find All References Shift+F12
View Call Hierarchy Ctrl+K, Ctrl+T
Breakpoint
Run To Cursor Ctrl+F10
Execute in Interactive Ctrl+E, Ctrl+E
Snippet
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Annotation
Outlining
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'WebApplication2' (1 of 1 project)
WebApplication2
Connected Services
Dependencies
Properties
wwwroot
Controllers
HomeController.cs
Models
Views
Home
Shared
_ViewImports.cshtml
_ViewStart.cshtml
appsettings.json
Program.cs
Startup.cs
Solution Explorer Team Explorer Server Explorer
Properties
No issues found
Ready
Ln 13 Col 32 Ch 32 INS
Add to Source Control
Type here to search
8:35 AM
9/2/2019

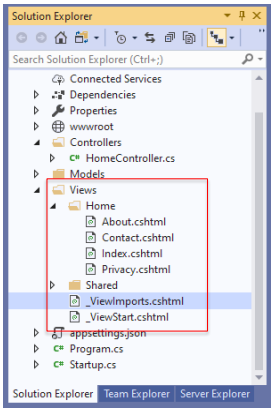

File Edit View Project Build Debug Test Analyze Tools Extensions Window Help
Search Visual Studio (Ctrl+Q)
WebApplication2
Debug
Any CPU
IIS Express
Live Share
HomeController.cs
Program.cs
Startup.cs
_ViewImports.cshtml
WebApplication2
WebApplication2.Controllers.HomeControll
Index()
using System;
using System.Collections.Generic;
using System.Diagnostics;
using System.Linq;
using Microsoft.AspNetCore.Mvc;
using WebApplication2.Models;
namespace WebApplication2.Controllers
public class HomeController : Controller
public IActionResult Privacy()
return View();
[ResponseCache(Duration = 0, Location = ResponseCacheLocation.None, NoStore = true)]
public IActionResult Error()
return View(new ErrorViewModel { RequestId = Activity.Current?.Id ?? HttpContext.TraceIde
Add MVC View
View name: Index
Template: Empty (without model)
Model class:
Options:
Create as a partial view
Reference script libraries
Use a layout page:
~/Views/Shared/_Layout.cshtml
(Leave empty if it is set in a Razor _viewstart file)
Add
Cancel
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'WebApplication2' (1 of 1 project)
WebApplication2
Connected Services
Dependencies
Properties
wwwroot
Controllers
HomeController.cs
Models
Views
Home
Shared
_ViewImports.cshtml
_ViewStart.cshtml
appsettings.json
Program.cs
Startup.cs
Team Explorer Server Explorer
No issues found
Ready
Ln 13 Col 32 Ch 32 INS
Add to Source Control
Type here to search
8:36 AM
9/2/2019


File Edit View Project Build Debug Test Analyze Tools Extensions Window Help
Debug
Any CPU
IIS Express
Live Share
Index.cshtml*
HomeController.cs
@{
ViewBag.Title = "Home Page";
Layout = "~Views/Shared/_Layout.cshtml";
}
<h2>Index</h2>
Hello, @ViewBag.name
...
...
Solution Explorer
Solution 'WebApplication2' (1 of 1 project)
WebApplication2
Connected Services
Dependencies
Properties
wwwroot
Controllers
HomeController.cs
Models
Views
Home
About.cshtml
Contact.cshtml
Index.cshtml
Privacy.cshtml
Properties
No issues found
Ready
Ln 100
Col 1
Ch 1
INS
Add to Source Control
Type here to search
8:49 AM
9/2/2019


http://localhost:49236/?name=JoeBlow
Index
Index
Hello, JoeBlow
File Find Disable View Images Cache Tools Validate Browser Mode: IE9 Document Mode: IE9 standards
HTML CSS Console Script Profiler Network
Style Trace Styles Layout Attributes
<body>
Text - Empty Text Node
<h2>
Text - Empty Text Node

Text - Hello, JoeBlow
Text - Empty Text Node
<script src="/Scripts/jquery-1.7.1.js"></s
Add to Source Control
Type here to search
8:49 AM
9/2/2019

Naming Views



- Default view

```
public ActionResult Index(..
{
    ViewBag.name = name;
    return View();
}
```

- Named view

```
return View("Index2");

return View("~/Views/Example/Index.shtml");
```

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VIEWS AND MODELS

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Image Model

- Model for photographic image

```
public class Image {
   public String Id { get; set; };
   public int TagId { get; set; };
   public String Caption { get; set; };
   public String Description { get; set; };
   public Date DateTaken { get; set; };
   public String UserId { get; set; };
}
```

45

Dynamically Typed Views

- Controller Action

```
public ActionResult Index(...)
{
   List<Image> images;
   ...
   ViewBag.images = images;
   return View();
}
```

- View

```
IEnumerable<Image> images =
       ViewBag.images as IEnumerable<Image>;
foreach (Image img in images)
  <li> @img.Caption </li>
```

46

Statically Typed Views

- Controller Action

```
public ActionResult Index(...)
{
   List<Image> images;
   ...
   return View(images);
}
```

- View

```
@model IEnumerable<ImageSharing.Models.Image>
...
foreach (Image img in Model)
  <li> @img.Caption </li>
```

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RAZOR

48

Razor

- Presentation language for ASP.NET MVC
- HTML Markup
  - Delimited by tags
- C# code fragments
  - Delimited by '@'

49

Code in Presentation

- Web Forms View

```
<title> <%: Page.Title %> </title>
```

- Razor

```
<title> @ViewBag.Title </title>
```

50

Code in Presentation

- Web Forms View

```
<title> <%: Page.Title %> </title>
```

- Razor

```
@{
    var title = ViewBag.Title;
}
<title> @title </title>
```

51

Code in Presentation

- Shifting between code and literal

```
@{
  IEnumerable<Image> images =
     ViewBag.images as IEnumerable<Image>;
  foreach (Image img in images)
     <li>
        @img.Caption
     </li>
}
```

52

Code in Presentation

- Shifting between code and literal

```
@foreach (Image img in
      (ViewBag.images as IEnumerable<Image>))
      <li>
         @img.Caption
      </li>
```

53

Edge Cases

```
@{ String root = "MyApp"; }
```

```
<span> @root.Models </span>
```

Output: Error (`root.Models` undefined)

```
<span> @(root).Models </span>
```

Output: `MyApp.Models`

`@@foobar` evaluates to "@foobar"

54

HTML Encoding

```
@{ var mesg =
   “<script>alert(‘Hah!’);</script>”
}
<span> @mesg </span>
```

outputs

```
<span> &lt;script&gt;...&gt; </span>
```

- HtmlString versus String
- Html.Raw(model.Message)

55

Mixing code and text

```
@if (showMessage) {
   This is plain text.
}

@if (showMessage) {
   <text> This is plain text. </text>
}

@if (showMessage) {
   @: This is plain text.
}
```

56

Comments

```
@{
   var title = ViewBag.title;
}

@*
   This is a comment.
   @if (showMessage)
      <h1>
         @title
      </h1>
*@
```

57

LAYOUTS

58

Layouts

- Purpose: Templates for views
  - Main body
  - Sections
- Consistent look-and-feel
  - ADA
- Maintenance

59

Layout

```
<!DOCTYPE html>
<html>
<head>
  <title> @ViewBag.Title </title>
</head>
<body>
  <h1> @ViewBag.Title </h1>
  <div id="main">
    @RenderBody()
  </div>
</body>
```

60

Instance

```
@{
  Layout = "~/Views/Shared/Layout.cshtml";
  ViewBag.Title = "The Index!";
}
<p> This is the main content! </p>
```

61

Response Document

```
<!DOCTYPE html>
<html>
<head>
  <title> The Index! </title>
</head>
<body>
  <h1> The Index! </h1>
  <div id="main">
    <p>This is the main content!</p>
  </div>
</body>
```

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Layout

```
<!DOCTYPE html>
<html>
<head>
  <title> @ViewBag.Title </title>
</head>
<body>
  <h1> @ViewBag.Title </h1>
  <div id=“foo”>@RenderSection(“Foobar”)</div>
  <div id=“main”>@RenderBody()</div>
</body>
```

63

Instance

```
@{
  Layout = "~/Views/Shared/Layout.cshtml";
  ViewBag.Title = "The Index!";
}
@section Foobar {
  <p>This is featured.</p>
}
<p>This is the main content!</p>
```

64

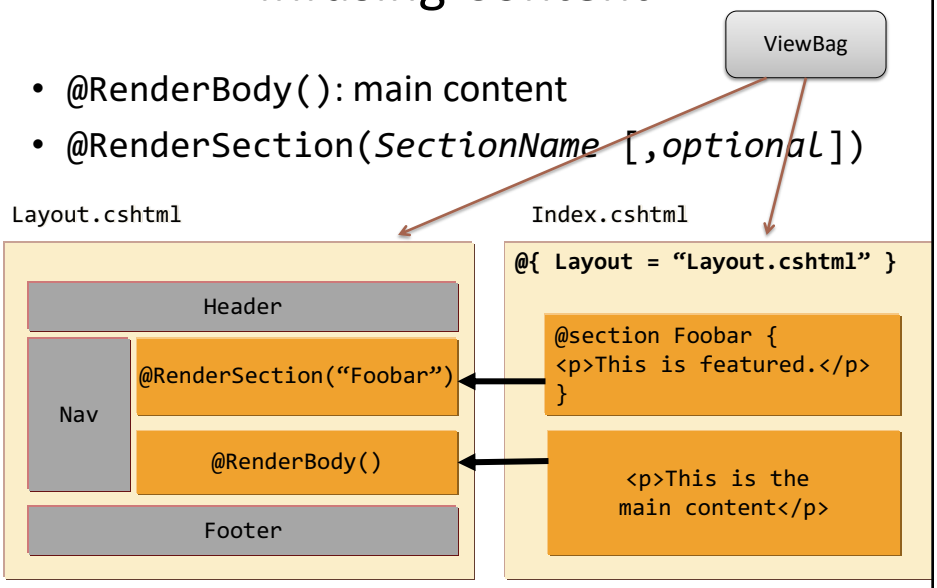
Response Document

```
<!DOCTYPE html>
<html>
<head>
  <title> The Index! </title>
</head>
<body>
  <h1> The Index! </h1>
  <div ...><p>This is featured.</p></div>
  <div id="main">
    <p>This is the main content!</p>
  </div>
</body>
```

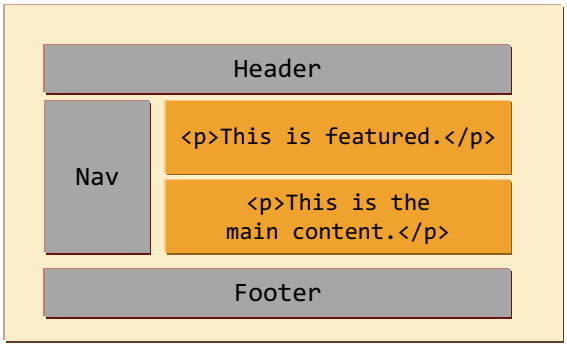
65

Infusing Content

- @RenderBody(): main content
- @RenderSection(*SectionName* [,*optional*])



Result of Infusion



67

Default Content

```
<footer>
@if (IsSectionDefined("Footer")) {
  RenderSection("Footer");
} else {
  <span>
    This is the default footer.
  </span>
}
</footer >
```

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ViewStart

- Default layout in `~/Views/_ViewStart.cshtml`:

```
@{
  Layout = "~/Views/Shared/_Layout.cshtml";
}
```

- Override default layout for all views
- Consolidate common custom settings

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PARTIAL VIEWS

70

Partial View

- Server-side:

```
public class HomeController : Controller {
  public ActionResult Message() {
    ViewBag.Message = "This is partial.";
    return PartialView();
  }
```

- Client-side: Web service call

```
<div id =“result”> </div>
<script type=“text/javascript”>
$(function(){
    $(‘#result’).load(‘/home/message’);
});
</script>
```

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Partial View

- Server-side:

```
public class HomeController : Controller {
  public ActionResult Message() {
    ViewBag.Message = "This is partial.";
    return PartialView();
  }
```

- Client-side: Web service call

```
<div id =“result”> </div>
<script type=“text/javascript”>
$(function(){
    $(‘#result’).load(‘/home/message’);
});
</script>
```

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FORMS AND HTML HELPERS

73

HTML Form

- Collect user data for submission to server

```
<form action="http://www.bing.com/search"
      method="GET">
  <input type="text" name="q"/>
  <input type="submit" value="Search!"/>
</form>
```

- Request URL:
  `http://www.bing.com/search?q=`*`search-str`*

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HTML Form

- Collect user data for submission to server

```
<form action="http://www.bing.com/search"
      method="GET">
  <input type="text" name="q"/>
  <input type="submit" value="Search!"/>
</form>
```

- GET method: Result can be cached
- POST method: May cause state change in server

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HTML Form

- Define view for search form (in `/Home/Views/Index.cshtml`):

```
<form action="/Home/Search"
      method="GET">
  <input type="text" name="q"/>
  <input type="submit" value="Search!"/>
</form>
```

- Problem: hard-coded routing logic

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HTML Form

- Define search view with HTML helpers:

```
@{ Html.BeginForm("Search", "Home",
                  FormMethod.Get); }
  <input type="text" name="q"/>
  <input type="submit" value="Search!"/>
@{ Html.EndForm(); }
```

- HTML helpers encapsulate routing logic

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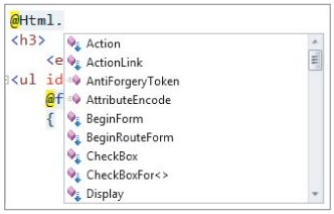
HTML Helpers

- Automatic HTML Encoding
  - Protection against XSS
- Close to the metal
  - Unlike Web Forms controls
- `Html`: property of every view
  - Type `System.Web.Mvc.HtmlHelper<`*`model-type`*`>`
  - Namespace `System.Web.Mvc.Html`



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HTML Form

- Add attributes:

```
@{ Html.BeginForm("Search", "Home",
                  FormMethod.Get,
                  new { target="_blank" }))
  <input type="text" name="q"/>
  <input type="submit" value="Search!"/>
@{ Html.EndForm(); }
```

- may produce:

```
<form action="/Home/Search" method="get"
      target="_blank"> ... </form>
```

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HTML Form

```
@{ Html.BeginForm(); }
  <fieldset>
    <legend> Edit Image</legend>
    <p> @Html.Label("TagId")
        @Html.DropDownList("TagId",
           ViewBag.Tags as SelectList) </p>
    <p> @Html.Label("Caption")
        @Html.TextBox("Caption", Model.Caption)
        @Html.ValidationMessage("Caption") </p>
    <input type="submit" value="Save" />
  </fieldset>
@{ Html.EndForm(); }
```

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Actions and Forms

GET /Home/Upload

```
[HttpGet]
public ActionResult Upload()
{
   ... return View(...);
}
```

```
<form ...>
  <input id="Caption"
    type="text" .../>
  <input id="DateTaken"
    type="text" .../>
</form>
```

```
@Html.BeginForm(...)
@Html.TextBox("Caption")
@Html.TextBox("DateTaken")
@Html.EndForm(...)
```

POST /Home/Upload

```
[HttpPost]
public ActionResult Upload(...)
{
   ... return View(...);
}
```

81

TextBox Helper

- View code:

  `@Html.TextBox("Caption")`

- HTML output:

```
<input id="Caption" name="Caption"
       type="text"
       value="Image caption here" />
```

82

```
@model ImageShare.Models.Image;

delegate String GetProperty(Image m);

void TextBoxFor (GetProperty lambda);
```

- View code:

```
@Html.TextBoxFor(m ⇒ m.Caption)
```

- HTML output:

```
<input id="Caption" name="Caption"
       type="text"
       value="Image caption here" />
```

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Templated Helper

- View code:

```
@Html.EditorFor(m ⇒ m.Caption)
```

- HTML output:

```
<input id="Caption" name="Caption"
       type="text"
       value="Image caption here" />
```

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Templated Helper

- View code:

```
@Html.EditorFor(m ⇒ m.Description)
```

- HTML output:

```
<input id="Description"
       name="Description"
       type="text"
       value="I took this picture." />
```

85

```
public class Image {
   ...
   [DataType(DataType.MultiLineText)]
   public String description;
}
```

- View code:

```
@Html.EditorFor(m ⇒ m.Description)
```

- HTML output:

```
<textarea id="Description"
          name="Description"
          class="text-box multi-line" >
   I took this picture.
</textarea>
```

86

Explicitly Typed Form

```
@{ Html.BeginForm(); }
  <fieldset>
    <legend> Edit Image</legend>
    <p> @Html.LabelFor(m ⇒ m.TagId)
        @Html.DropDownListFor(m ⇒ m.TagId,
           ViewBag.Tags as SelectList) </p>
    <p> @Html.LabelFor(m ⇒ m.Caption)
        @Html.EditorFor(m ⇒ m.Caption)
        @Html.ValidationMessageFor
           (m ⇒ m.Caption) </p>
    <input type="submit" value="Save" />
  </fieldset>
@{ Html.EndForm(); }
```

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FORMS AND TAG HELPERS

88

Problems with HTML Helpers

- Difficult to customize underlying HTML
  - Attribute values clumsy
- Unfamiliar to Web designers

- Tag helpers: Transform instead of generate HTML

```
@addTagHelper *,
    Microsoft.AspNetCore.Mvc.TagHelpers
```

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HTML Form

- Define search view with Tag helpers:

```
<form method="get"
  asp-controller="Home" asp-action="Search">
  <input type="text" name="q"/>
  <input type="submit" value="Search!"/>
</form>
```

- Tag helpers encapsulate routing logic

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HTML Form

- Define search view with Tag helpers:

```
<form method="get"
  asp-controller="Home" asp-action="Search">
  <input asp-for="q"/>
  <input type="submit" value="Search!"/>
</form>
```

- Model-based input type and validation

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Actions and Forms

GET /Home/Upload

```
[HttpGet]
public ActionResult Upload()
{
   ... return View(...);
}
```

```
<form asp-action="Upload">
<input asp-for="Caption"/>
<input asp-for="DateTaken"/>
</form>
```

```
<form ...>
  <input id="Caption"
    type="text" .../>
  <input id="DateTaken"
    type="text" .../>
</form>
```

POST /Home/Upload

```
[HttpPost]
public ActionResult Upload(...)
{
   ... return View(...);
}
```

92

Consuming Form Input

- Use `Request` property from the context:

```
[HttpPost]
public ActionResult Upload () {
   Image data = new Image();
   data.Id = Request.Form[“Id”];
   data.Caption = Request.Form[“Caption”];
   ...
}
```

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Consuming Form Input

- Use `FormCollection`:

```
[HttpPost]
public ActionResult Upload
                    (FormCollection values) {
   Image data = new Image();
   data.Id = values[“Id”];
   data.Caption = values[“Caption”];
   ...
}
```

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Consuming Form Input

- Use named parameters (preferred!):

```
[HttpPost]
public ActionResult Upload (String Id,
          String Caption, ...) {
   Image data = new Image();
   data.Id = Id;
   data.Caption = Caption;
   ...
}
```

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Consuming Form Input

- Use a model (preferred!):

```
[HttpPost]
public ActionResult Upload (Image image) {
   ...
   // Save the data to a file
   return RedirectToAction("Query",
                    new {id=image.Id})
}
```

96

Consuming Form Input

- Use a model (preferred!):

```
[HttpPost]
public ActionResult Upload (Image image) {
   if (ModelState.IsValid()) {
      ...
      // Save the data to a file
      return RedirectToAction("Query",
                              new {id=image.Id})
   } else {
      return View(image);
   }
}
```

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MODELS IN VIEWS

98

Models in Views

- Controller Action

```
public ActionResult Index(...)
{
    Image image;
    ...
    return View(image);
}
```

- View

```
@model ImageShare.Models.Image
...
@{ Image img = Model; }
```

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Controller

```
public ActionResult Edit (...)
{
   Image image;
   ...
   return View(image);
}
```

View

```
@model ImageShare.Models.Image

<form asp-action="Edit">
<input asp-for="Caption"/>
<input asp-for="DateTaken"/>
</form>
```

```
class Image
String Caption
Date DateTaken
```

I took this.

2012-09-12

Model

```
<form ...>
  <input id="Caption"
    type="text" .../>
  <input id="DateTaken"
    type="text" .../>
</form>
```

Form

100

Tag Helper

- View code:

```
<input asp-for="Caption"/>
```

- HTML output:

```
<input id="Caption" name ="Caption"
       type ="text"
       value ="Image caption here" />
```

101

Tag Helper

- View code:

```
<textarea asp-for="Description"
          cols="80" rows="5" >
   write &lt;br/&gt; here
</textarea>
```

- HTML output:

```
<textarea id="Description"
          name="Description"
          cols="80" rows="5" >
   write &lt;br/&gt; here
</textarea>
```

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Label Helper

- View code:

```
<label asp-for="TagId"/>
<input asp-for="TagId"/>
```

- HTML output:

```
<label for="TagId">Tag</label>
<input id="TagId" type="text" .../>
```

- Purpose:
  - Attach info
  - Transfer focus

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TAG HELPERS AND MODEL STATE

104

Image Model

- Model for photographic image

```
public class Image {
   public String Id { get; set; };
   public String Caption { get; set; };
   public String Description { get; set; };
   public Date DateTaken { get; set; };
   public String UserId { get; set; };
}
```

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Controller

```
public ActionResult Edit (...)
{
   Image image;
   ...
   return View(image);
}
```

View

```
@model ImageShare.Models.Image

<form asp-action="Edit">
<input asp-for="Caption"/>
<input asp-for="DateTaken"/>
</form>
```

```
class Image
String Caption        I took this.
Date DateTaken        2012-09-12
```

Model

```
<form ...>
  <input id="Caption"
    type="text" .../>
  <input id="DateTaken"
    type="text" .../>
</form>
```

Form

106

Helpers and Model

- Model:
```
public class Image {
   public String Caption { get; set; };
}
```
- View:
```
<input asp-for="Caption"
       value="I took this."/>
```
- HTML Output:
```
<input id="Caption" name="Caption"
       type="text" value="I took this."/>
```

107

Validation

- Model:
```
public class Image {
   [Required(ErrorMessage="A caption is required")]
   public String Caption;
}
```
- Controller:
```
public ActionResult Edit(int imageId) {
   Image image = ...;
   return View(image);
}
```
- View:
```
<input asp-for="Caption"/>
<span asp-validation-for="Caption"/>
```

108

Validation

- Model:

```
public class Image {
   [Required(ErrorMessage="A caption is required")]
   public String Caption;
}
```

- View:

```
<input asp-for="Caption"/>
<span asp-validation-for="Caption"/>
```

- HTML Output:

```
<input id="Caption" name="Caption"
   data-val="true"
   data-val-required="A caption is required"/>
<span class="field-validation-valid"
      data-valmsg-for="Caption"
      data-valmsg-replace="true"/>
```

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Validation

- Model:

```
public class Image {
   [Required(ErrorMessage="A caption is required")]
   public String Caption;
}
```

- View:

```
<input asp-for="Caption"/>
<span asp-validation-for="Caption"/>
```

- HTML Output:

```
<input id="Caption" name="Caption"
   data-val="true"
   data-val-required="A caption is required"/>
<span class="field-validation-error"
      data-valmsg-for="Caption"
      data-valmsg-replace="true">
   A caption is required</span>
```

110

ModelState

- Used for state of input validation
- Helpers get field values from ModelState
  - Display current values for editing
  - Otherwise from ViewData, ViewBag
- Preserves validation errors
- Preserves bad input for editor

111

HTML Form

```
<form>
  <fieldset>
    <legend> Edit Image</legend>
    <p> <label asp-for="TagId"/>
        <select asp-for="TagId" .../> </p>
    <p> <label asp-for="Caption"/>
        <input asp-for="Caption" />
        <span asp-validation-for="Caption"/>
    </p>
    <input type="submit" value="Save" />
  </fieldset>
</form>
```

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TAG HELPERS AND INPUT TYPE

113

Helpers and Model

- Model:

```
public class Model {
   public string Foo { get; set; };
}
```

- View:

```
<input asp-for="Foo"/>
```

- HTML Output:

```
<input id="Foo" name="Foo"
       type="text"/>
```

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Input Element Type

C# Type for Model Property	Input Element Type Attribute
byte, sbyte, int, uint, short, ushort, long, ulong	number
float, double, decimal	text with attributes for model validation
bool	checkbox
String	text
DateTime	datetime

115

Helpers and Model

- Model:

```
public class Model {

    public string Password { get; set; };
}
```

- View:

```
<input asp-for="Password" type="password"/>
```

- HTML Output:

```
<input id="Password" name="Password"
       type="password"/>
```

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Helpers and Model

- Model:

```
public class Model {
    [UIHint("Password")]
    public string Password { get; set; };
}
```

- View:

```
<input asp-for="Password"/>
```

- HTML Output:

```
<input id="Password" name="Password"
       type="password"/>
```

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UIHint and Input Element Type

UIHint Value	Input Element Type
HiddenInput	hidden
Password	password
Text	text
PhoneNumber	tel
Url	url
EmailAddress	email
Time	time
Date	date
DateTime-local	datetime-local

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OTHER HELPERS

119

Hosting Environment Tag Helper

- Include context in HTML based on hosting environment names

```
<body>
  <environment names="development">
    <h2>This is Development</h2>
  </environment>
  <environment names="production">
    <h2>This is Production</h2>
  </environment>
  <div>@RenderBody()</div>
</body>
```

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Hosting Environment Tag Helper

- Include context in HTML based on hosting environment names

```
<body>
  <environment names="development">
    <script asp-src-include=“...js”>
  </environment>
  <environment names="production">
    <script asp-src-include=“...min.js”>
</environment>
  <div>@RenderBody()</div>
</body>
```

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Hosting Environment Tag Helper

- Include context in HTML based on hosting environment names

```
<head>
  <environment names="development">
    <link asp-href-include=“/.../**/...css”
          rel=“stylesheet>
  </environment>
  <environment names="production">
    <link asp-href-include=“/.../**/...min.css”
          rel=“stylesheet>
  </environment>
  <div>@RenderBody()</div>
</head>
```

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Anchor Tag Helpers

Tag Helper Attribute	Description
asp-action	Action method
asp-controller	Controller class
asp-fragment	Fragment appears after # character
asp-host	Host in URI
asp-protocol	Protocol in URI
asp-route	Route name
asp-route-*	asp-route-id provides value for id segment to the routing system

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Anchor Tag Helpers

- Routes

```
routes.MapRoute( name: "default",
  template:
    "{controller=Home}/{action=Index}");
```

- View

```
<a asp-controller="Image"
   asp-action="Query"
   asp-route-id="anthonyquinn"/>
```

- Output

```
<a href="/Image/Query?id=anthonyquinn"/>
```

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Anchor Tag Helpers

- Routes

```
routes.MapRoute( name: "default",
  template:
    "{controller=Home}/{action=Index}/{id?}");
```

- View

```
<a asp-controller="Image"
   asp-action="Query"
   asp-route-id="anthonyquinn"/>
```

- Output

```
<a href="/Image/Query/anthonyquinn"/>
```

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URL Tag Helper

- Startup: Prefix URL for shared app environment

```
app.Map("/mvcapp", appBuilder => { ...
  appBuilder.UseStaticFiles();
  appBuilder.UseMvcWithDefaultRoute();
});
```

- View

```
<link rel="stylesheet"
 href="/lib/bootstrap/dist/css/bootstrap.min.css"/>
```

- Output HTML

```
<link rel="stylesheet"
 href="/lib/bootstrap/dist/css/bootstrap.min.css"/>
```

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URL Tag Helper

- Startup: Prefix URL for shared app environment

```
app.Map("/mvcapp", appBuilder => { ...
  appBuilder.UseStaticFiles();
  appBuilder.UseMvcWithDefaultRoute();
});
```

- View

```
<link rel="stylesheet"
 href="~/lib/bootstrap/dist/css/bootstrap.min.css"/>
```

- Output HTML

```
<link rel="stylesheet"
 href="/mvcapp/lib/.../bootstrap.min.css"/>
```

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Partial Helper

- Partial view

```
<partial name="view-name"
         for="model-expr" />

<partial name="view-name"
         for="model-expr"
         view-data="ViewData"/>
```

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Partial Helper

```
public class MyController {
   public IActionResult ImageInfo() {
      return new PartialView {
         ViewName = “ImageInfo”,
         ViewData = ViewData
      };
   }
}

<ul>
@foreach (var image in Model.Images) {
   <li>
      <partial name=“ImageInfo” for=“image” />
   </li>
}
</ul>
```

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Summary

- ASP.NET MVC
  - Powerful abstractions for Web applications
  - Strong typing possible
  - Still “close to the metal”
- Next: Models
  - Entity Framework
  - LINQ

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