

October 10, 2017

Web 102 ASP .NET Fundamentals

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Course Objectives

- Get an overview of ASP.NET Architecture
- Access to key components of ASP.NET that are common to almost all Web applications
- Be able to build dynamic websites with ASP.NET using standard libraries shipped with .NET Framework



Agenda

- ASP.NET Architecture
 - ASP.NET page request processing in IIS
 - Evolution of ASP.NET
 - Code behind model
 - Page life cycle and event handling
 - State management overview
- Standard controls & Validations
- Designing Websites with Master Pages & Themes
- Building Site Navigation

Course Audience and Prerequisite

- Designed for professional programmers who need to create rich, interactive websites
- Fundamentals of .NET Framework, C#/VB.NET programming language.
- Background in ADO.NET-related data access would be helpful
- Attendance of “Web 101 – Web Development Fundamentals” course would be helpful

Duration and Course Timetable

- Course Duration: 6 hrs
- Course Timetable:
 - From 9:00AM to 12:00PM
 - Break 5 minutes between 10:15AM and 10:30AM



Set Up Environment

- To complete the course, your PC must install:
 - Visual Studio 2013 or higher
 - ASP.NET



Course Administration

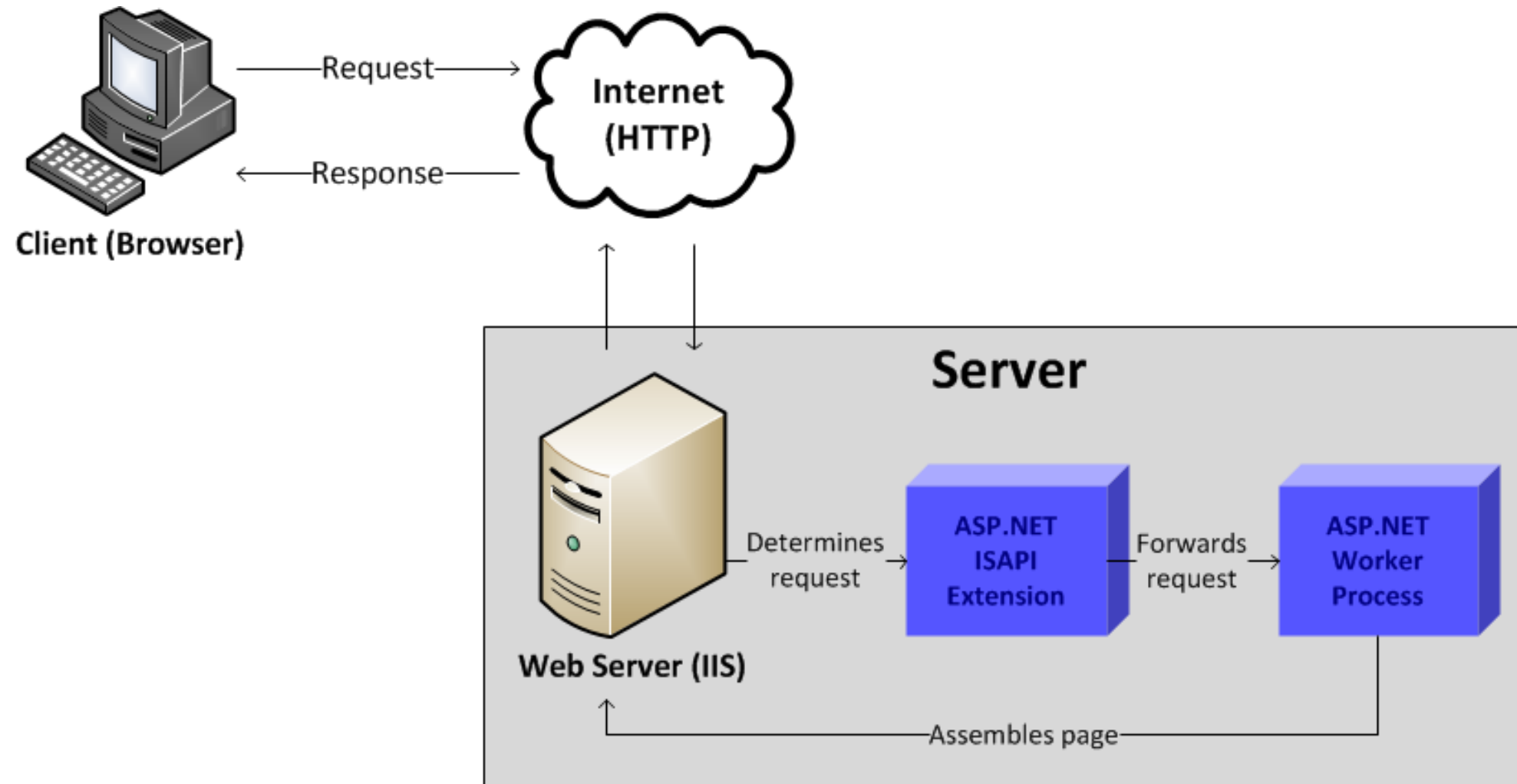
- In order to complete the course you must:
 - Sign in the Class Attendance List
 - Participate in the course
 - Provide your feedback in the End of Course Evaluation

ASP.NET Architecture

What is ASP.NET?

- A Web platform that provides all the services that are required to build enterprise-class server-based Web applications.
- Built on the .NET Framework → all .NET Framework features are available to ASP.NET applications.
- Don't need to paste together a jumble of HTML and script code in order to program the Web.
- Allow to use a full featured programming language such as C# or VB.NET to build web applications easily.
- Run inside IIS (Internet Information Services) server.

How a web server processes ASP.NET pages?



Evolution of ASP.NET

- Dynamic content in classic ASP
 - Interspersed server-side script notation
 - Maintainability, testability... problems

```
<h2>List of items:</h2>
<ul>
  <% for (int i = 0; i < _itemCount; i++) { %>
    <li><%=GetItem(i)%></li>
  <% } %>
</ul>

<% Response.Write("<h2>Number of items: " +
  _itemCount.ToString() + "</h2>"); %>
```

Evolution of ASP.NET (cont.)

- Introducing server controls
 - Elements are marked with runat="server"
 - Clean alternative to the interspersed server-side script
 - Define member variables in class
 - Programmatically interact with object model of controls
 - State is retained implicitly

```
protected override void OnLoad(EventArgs e)
{
    bllItems.Items.Clear();
    for (int i = 0; i < _itemCount; i++)
    {
        bllItems.Items.Add(new ListItem(GetItem(i)));
    }
    base.OnLoad(e);
}
```

```
<asp:BulletedList runat="server" ID="bllItems">
    <asp:ListItem>Default item #1</asp:ListItem>
    <asp:ListItem>Default item #2</asp:ListItem>
</asp:BulletedList>
```

Evolution of ASP.NET (cont.)

- Introducing data binding to list-typed server controls with server code
- Introducing declarative model

```
string[] _items = { "Item #1", "Item #2", "Item #3",  
                    "Item #4", "Item #5", "Item #6",  
                    "Item #7", "Item #8", "Item #9", "Item #10" };  
  
protected override void OnLoad(EventArgs e)  
{  
    bl1Items.Items.Clear();  
  
    bl1Items.DataSource = _items;  
    bl1Items.DataBind();  
  
    base.OnLoad(e);  
}
```

Code-behind model

- ASP.NET supports two methods to author pages: in-line code and code-behind
- Code-behind allows a clean separation of HTML from presentation logic
- Wire up the code-behind class to layout file by using **CodeFile** attribute (point to code-behind file) and **Inherits** attribute (class name with namespace)

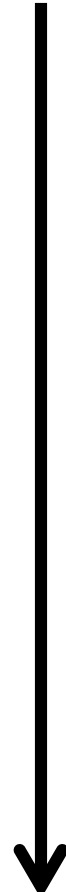
```
<head id="Head1" runat="server">
  <title>Simple Page</title>
</head>
<script runat="server" language="C#">
  void btnSample_OnClick(Object sender, EventArgs e)
  {
    lblSample.Text = txtSample.Text;
  }
</script>
<body>
  <form id="MyForm" runat="server">
    <asp:TextBox id="txtSample" Text="Hello World!" runat="server">
    </asp:TextBox>
    <asp:Button id="btnSample" Text="Send" OnClick="btnSample_OnClick" runat="server">
    </asp:Button>
    <asp:Label id="lblSample" runat="server">
    </asp:Label>
  </form>
</body>
```

```
namespace ASPNETFundamentals
{
  public partial class SamplePage : Page
  {
    protected void btnSample_OnClick(Object sender, EventArgs e)
    {
      lblSample.Text = txtSample.Text;
    }
  }
}
```

```
<%@ Page Language="C#" CodeFile="~/Default.aspx.cs" Inherits="ASPNETFundamentals.SamplePage" %>
```

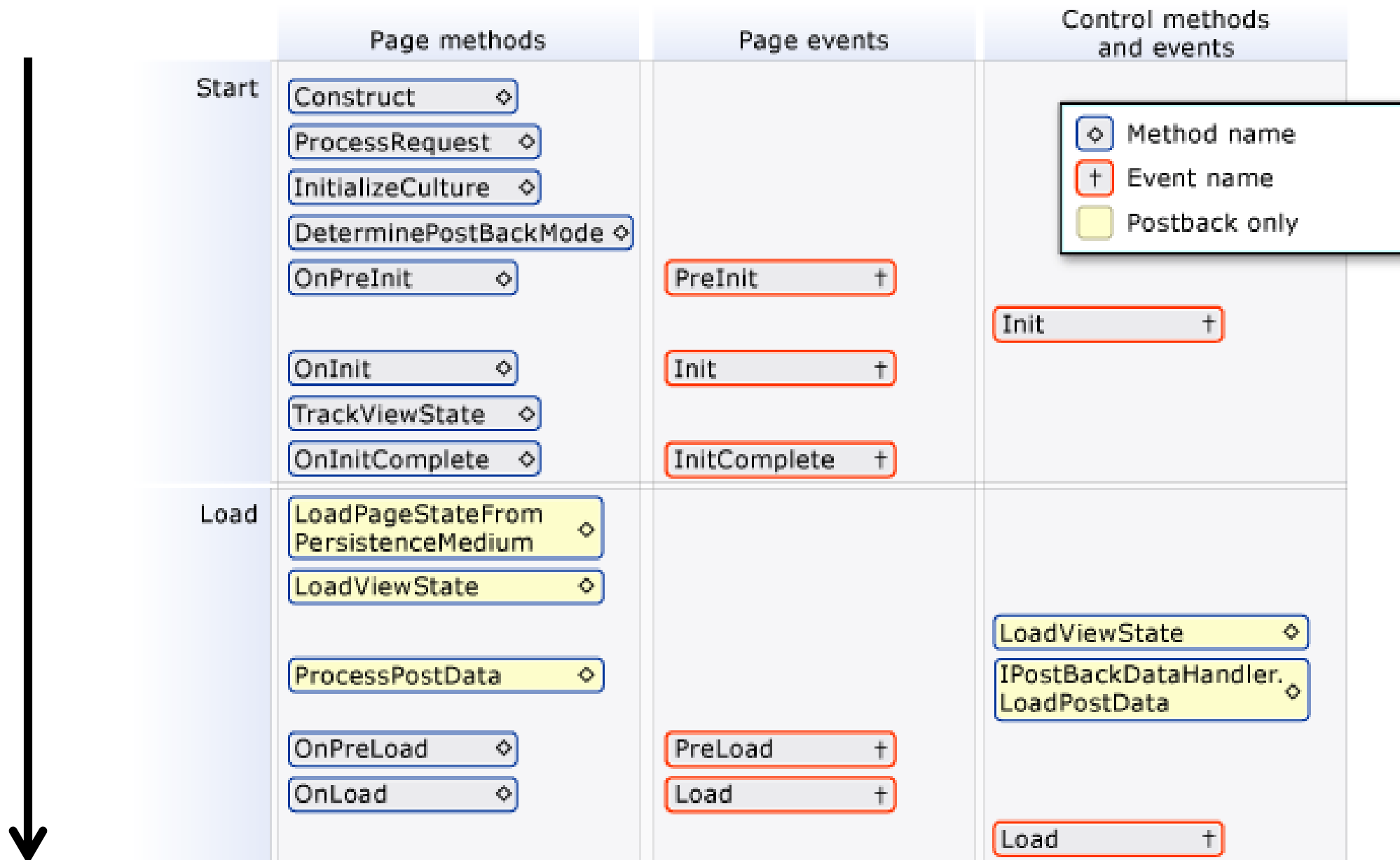
Page life-cycle stages

- Allow to write code at the appropriate stage

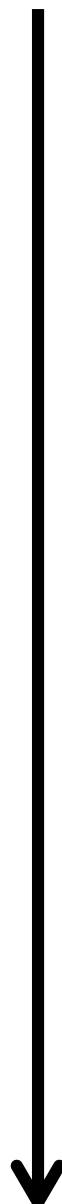


Stage	Description
Page request	Begin the life of a page or load a cached version of the page.
Start	Page properties (e.g. <u>Request</u> and <u>Response</u>) are set. If a new request → set <u>IsPostBack</u> property.
Initialization	Controls on the page are available. Themes initialized, master pages applied, control skins applied.
Load	If IsPostBack, control properties are loaded with information recovered from view state and control state.
Postback event handling	If IsPostBack, control event handlers are called → <u>Validate</u> method of all validator controls is called → <u>IsValid</u> flag is set.
Rendering	Control/View state saved. <u>Render</u> method of controls is called.
Unload	Raised after the page has been fully rendered, sent to the client, and is ready to be discarded.

Page life-cycle events



Page life-cycle events (cont.)



Event handling	RaisePostBackEvent ◊		Control-changed events
Validation	Validate ◊		
PreRendering	OnLoadComplete ◊	LoadComplete †	
	OnPreRender ◊	PreRender †	
			PreRender †
			Data binding events
	OnPreRenderComplete ◊	PreRenderComplete †	
	SaveViewState ◊		SaveViewState ◊
	SavePageStateToPersistenceMedium ◊		
	OnSaveStateComplete ◊	SaveStateComplete †	
Rendering	RenderControl ◊		
	Render ◊		
	RenderChildren ◊		Render ◊
Unload			Unload †
	OnUnload ◊		
	Dispose ◊		

State management overview

- HTTP protocol is stateless
- Methods to maintain state:
 - View State
 - Transferring information between pages
 - Cookie
 - Session State
 - Application State
 - Profile Properties

State management – View State

- View State uses hidden field to store information
- Used for multiple postbacks in a single web page
- Not limited to web controls
- Can be used to retain class member variables
- Can be used to store serializable objects
- EnableViewState property is, by default, always set to true to web controls

```
public partial class SamplePage : System.Web.UI.Page
{
    protected void Page_Load(object sender, EventArgs e)
    {
        Employee emp = new Employee("Them", "Pham");
        ViewState["EmployeeInfo"] = emp;
        //get back
        emp = (Employee)ViewState["EmployeeInfo"];
    }
}

[Serializable]
public class Employee
{
    public string FirstName { get; set; }
    public string LastName { get; set; }
    public Employee(string firstName, string lastName)
    {
        FirstName = firstName;
        LastName = lastName;
    }
}
```

State management – Maintain information between pages

- Cross Page Posting:
 - Postback mechanism that sends user to another page by settingPostBackUrl property
 - Posted page accesses to previous page via its PreviousPage object

Page1.aspx →

```
<asp:TextBox ID="TextBox1" runat="server" />
<asp:Button ID="Button1" runat="server" Text="Button"
            PostBackUrl="~/Page2.aspx" />
```

Page2.aspx →

```
protected void Page_Load(object sender, EventArgs e)
{
    if (PreviousPage != null)
    {
        string sName = string.Empty;
        sName = ((TextBox) (PreviousPage.FindControl("TextBox1"))).Text;
        Response.Write("Hello: " + sName);
    }
}
```

State management – Maintain information between pages (cont.)

- Transferring with Query String:
 - Query string is common to web regardless of server technology
 - A key/value pair which is appended to the URL after question mark
 - Release the pressure of the server
 - Limitations?
- Ensure query string value is encoded before appending them to the URL

```
//set query string and redirect
string url = "Page2.aspx?";
url += "fName=Them&";
url += "lName=" + Server.UrlEncode("Pham Van");
Response.Redirect(url);
//retrieve query string
string lName = Server.UrlDecode(Request.QueryString["lName"]);
```

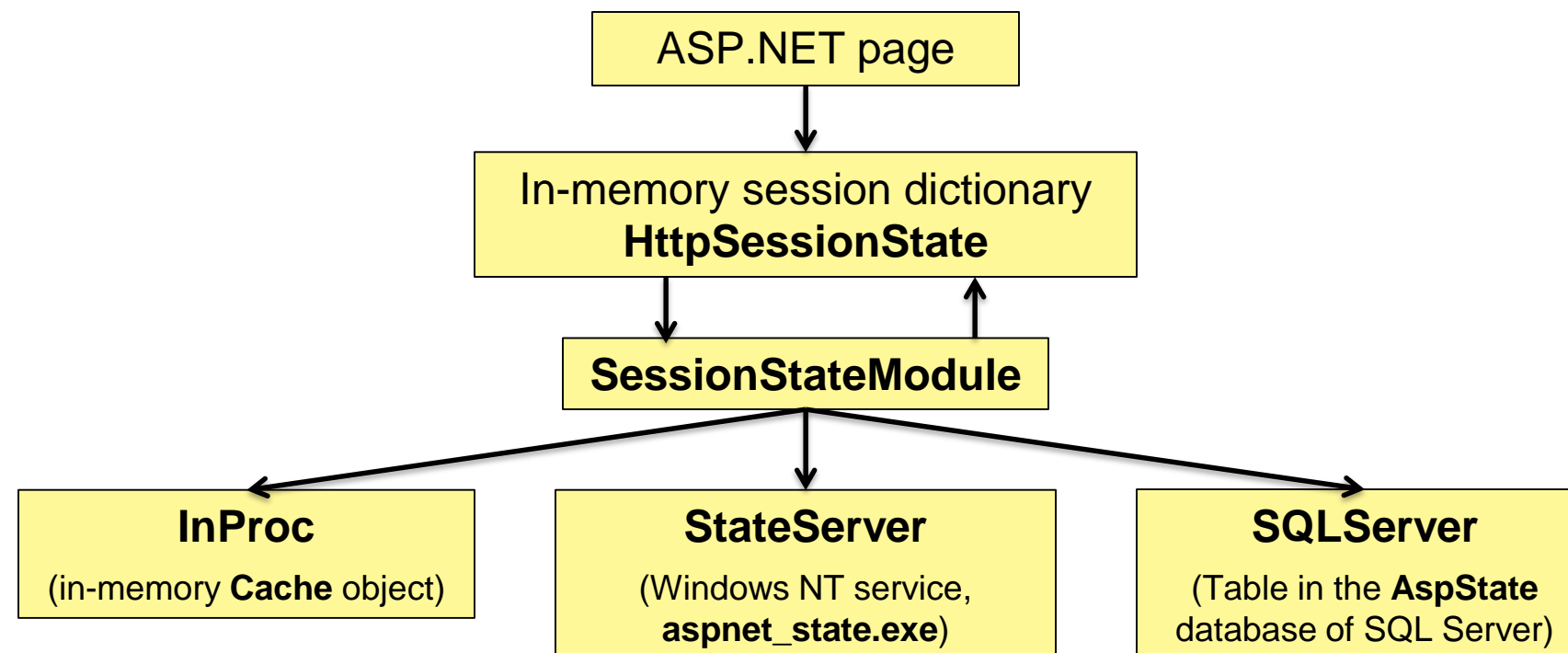
State management – Cookie

- Cookie is stored at client machine
- Transient (or temporary) cookie
 - A cookie without expiration date
 - Stored in the web browser's memory
 - Cleared when user closes the browser
- Persistent (or permanent) cookie
 - A cookie with a specific expiration date set
 - Stored in the client's hard disk.
 - Expired when the expiration date is exceeded

```
//create cookie and set a value
HttpCookie cookie = new HttpCookie("lang", "en-US");
cookie.Expires = DateTime.Now.AddDays(7d); //expired after 7 days
Response.Cookies.Add(cookie);
//retrieve cookie
string lang = Request.Cookies["lang"] != null ? Request.Cookies["lang"].Value : "n/a";
```

State management – Session State

- Used to store complex information/objects per session in the server memory
- No size limitations
- Accessible across pages
- By default, session times out after 20 minutes of inactivity



State management – Application State

- Store global objects that are accessible over the application
- Never time out
- Set exclusive access to the block of code

```
//set exclusive access
Application.Lock();
int counter = 0;
if (Application["counter"] != null)
{
    counter = (int)Application["counter"];
}
counter++;

Application["counter"] = counter;
// release exclusive access.
Application.Unlock();
```


State management – Profile Properties

- Store information permanently using a back-end data source
- A profile is specific to an authenticated user
- Profile properties are strongly-type ones

```
<profile>
  <properties>
    <group name="MandatoryInfo">
      <add name="FirstName" type="System.String"/>
      <add name="LastName" type="System.String"/>
    </group>
    <group name="OptionalInfo">
      <add name="DateOfBirth" type="System.DateTime"/>
      <add name="Address" type="System.String"/>
    </group>
  </properties>
</profile>
```

```
Profile.MandatoryInfo.FirstName = "Them";
Profile.MandatoryInfo.LastName = "Pham";
Profile.OptionalInfo.Address = "My address";
```

Standard controls & Validations

HTML Server Controls

- Provide an object interface for standard HTML elements by marking `runat="server"`
- Retain state automatically
- Convenient for manipulating elements in server-side code without changing markup significantly
- Useful when migrating ordinary HTML pages or ASP pages to ASP.NET

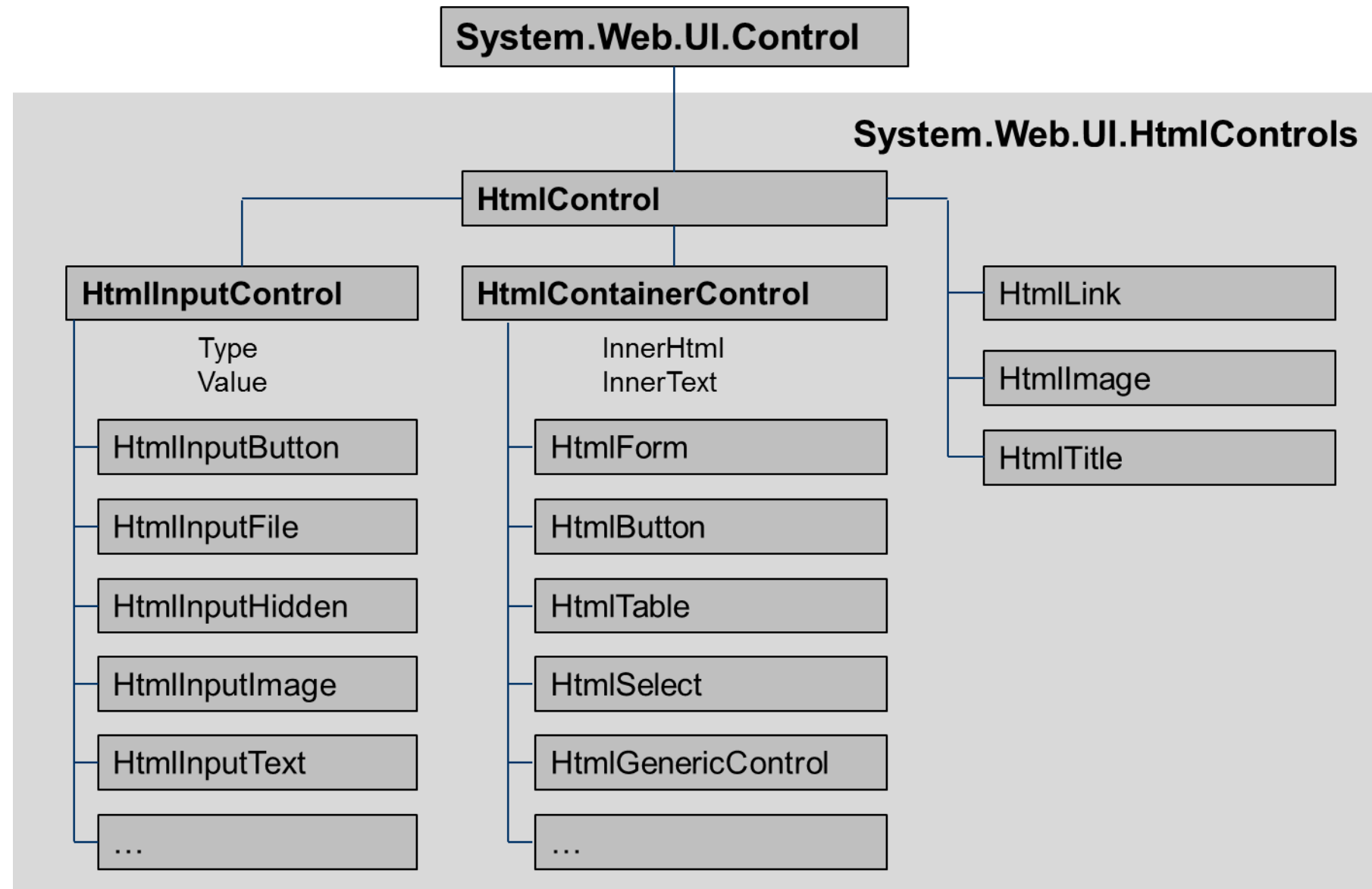
```
<div id="mainContainer" runat="server">  
    This content is from HTML.  
</div>
```

```
mainContainer.Attributes.Add("style", "color:red;");  
mainContainer.InnerHtml = "This content is from server-side";
```

HTML Control Classes

Class Name	HTML Element	Class Name	HTML Element
HtmlForm	<form>	HtmlTextArea	<textarea>
HtmlAnchor	<a>	HtmlInputImage	<input type="image">
HtmlImage		HtmlInputFile	<input type="file">
HtmlTable HtmlTableRow HtmlTableCell	<table>, <tr>, <th>, <td>	HtmlInputHidden	<input type="hidden">
HtmlInputButton HtmlInputSubmit HtmlInputReset	<input type="button"> <input type="submit"> <input type="reset">	HtmlInputText HtmlInputPassword	<input type="text"> <input type="password">
HtmlButton	<button>	HtmlSelect	<select>
HtmlInputCheckBox	<input type="checkbox">	HtmlHead HtmlTitle	<head> <title>
HtmlInputRadioButton	<input type="radio">	HtmlGenericControl	Other HTML element

HTLM Controls Hierarchy



Web Controls

- Alternative to server-side HtmlControls
 - Do not have restriction that HtmlControls have
 - More consistent property naming
 - Consistent object model
- Provide a rich user interface, not just a single element
- Adaptive rendering
- Begin with **asp:** prefix in the tag. For example,

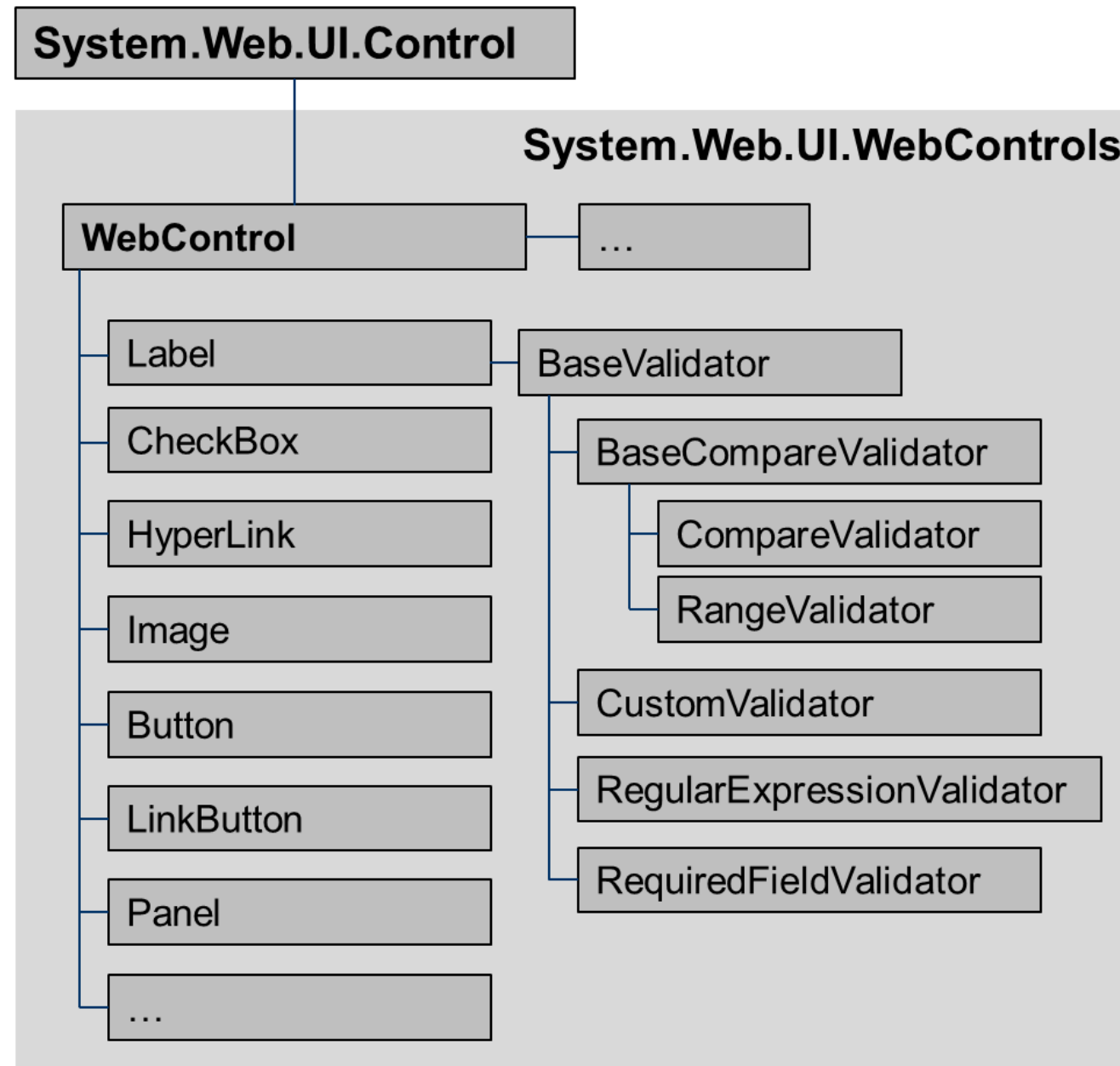
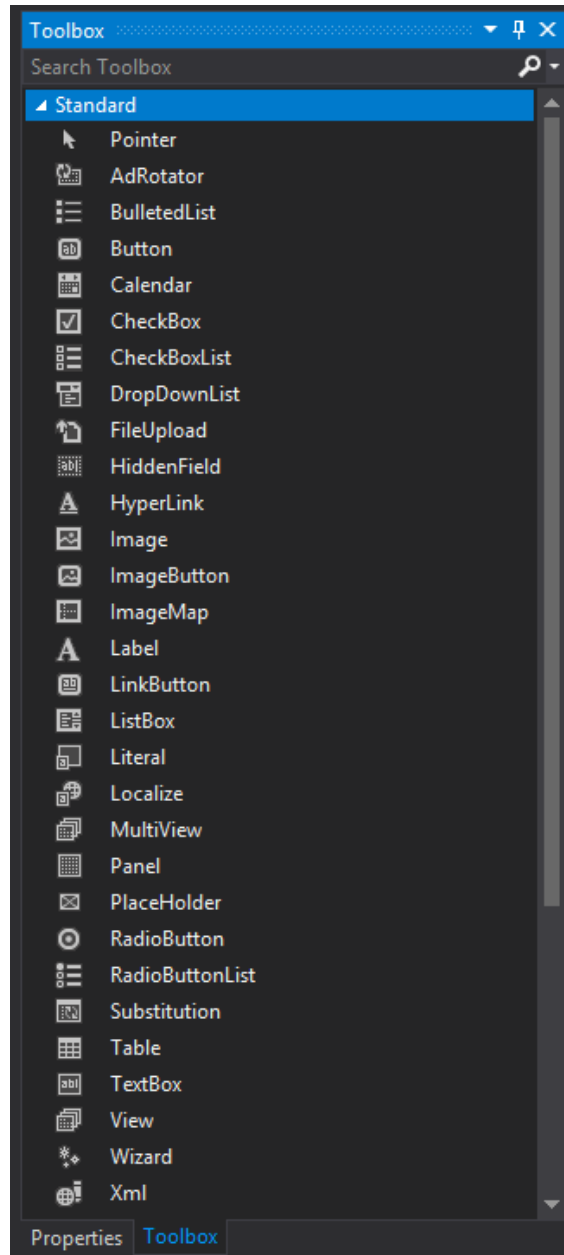
```
<asp:TextBox ID="TextBox1" runat="server" />
```

Question: when to choose html controls and when for web controls?

Basic Web Controls Classes

Class Name	HTML Element	Class Name	HTML Element
Label		Image	
Button	<input type="submit"> <input type="button">	ListBox	<select size="N">
CheckBox	<input type="checkbox">	DropDownList	<select>
TextBox	<input type="text"> <input type="password"> <textarea>	CheckBoxList	Multiple <input type="checkbox">
RadioButton	<input type="radio">	RadioButtonList	Multiple <input type="radio">
Hyperlink	<a>	BulletedList	An or list
LinkButton	<a> with a contained tag	Panel	<div>
ImageButton	<input type="image">	Table TableRow TableCell	<table> <tr> <td> or <th>

Web Controls Hierarchy



Validation Controls

- Why validation?

Validation Control	Description
CompareValidator	Compares the value of one input control to the value of another input control or to a fixed value
RequiredFieldValidator	Makes an input control a required field
RangeValidator	Validates whether a value is within a range of values (e.g. specific numeric, alphabetic, or date range)
RegularExpressionValidator	Ensures that the value of an input control matches a specified pattern
CustomValidator	Validation is performed by a user-defined function
ValidationSummary	Displays a report of all validation errors occurred in a Web page

Custom Validation Controls

- All built-in validators inherit BaseValidator class
 - Custom validation controls must also inherit the BaseValidator
- BaseValidator is an abstract class
 - **EvaluateIsValid**: true if form fields are validated as valid
 - GetControlValidationValue: get the value of the control being validated

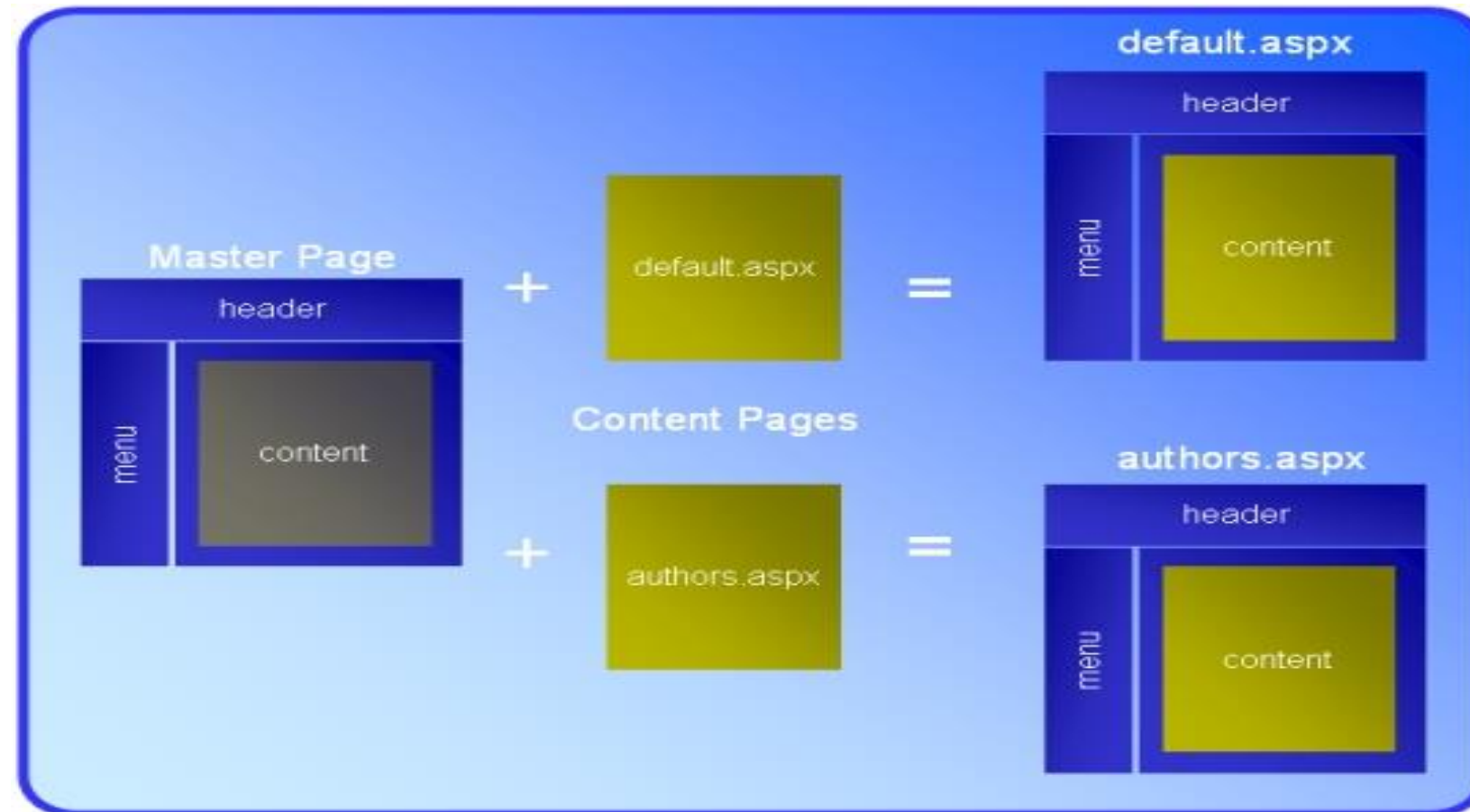


Exercise 01

Designing Websites with Master Pages & Themes

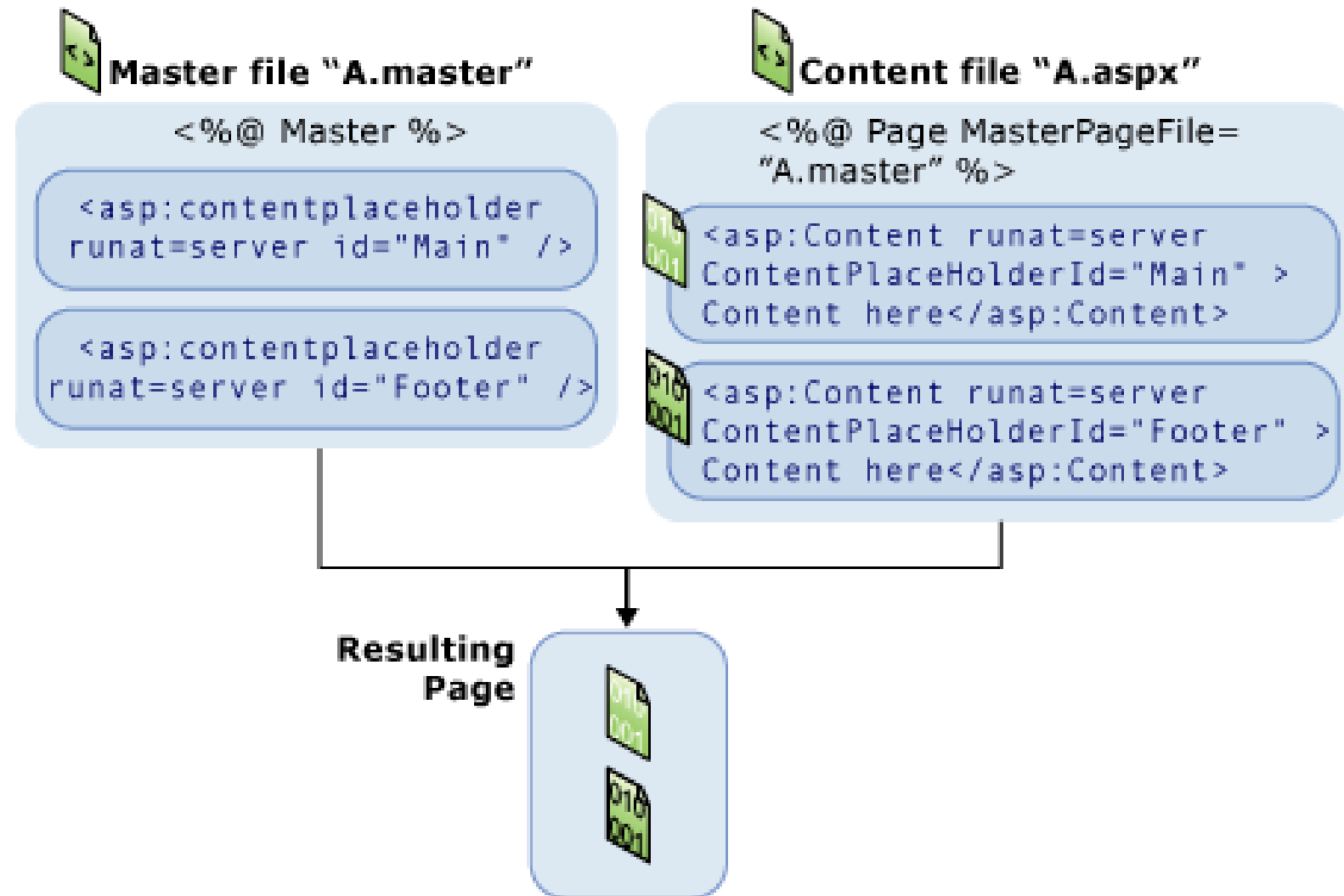
Master Pages

- A “visual-inheritance” page-template based system
- A Master Page is just a type of file with .master extension



How Master Pages Work?

- Master pages define common content and placeholders
- Content pages reference masters and fill placeholders with content

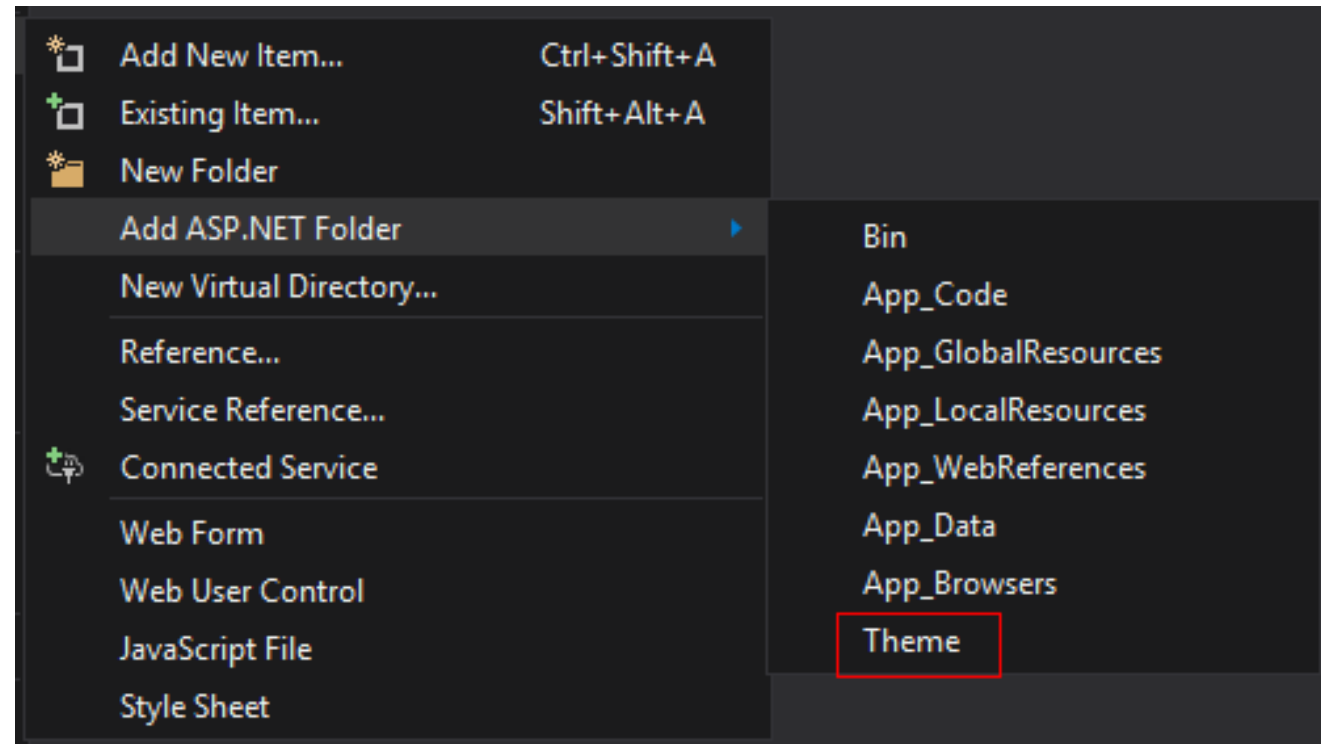


Advanced Master Pages

- Style-based layout:
 - Html tables: break a portion of a page into columns and rows
 - CSS positioning: used with <div> tags (more standard and modern)
- Coding in Master Page:
 - Master pages can include code portion like a normal ASP.NET web page
- Interacting with Master Pages programmatically:
 - Content pages access to master page via Page.Master property
 - Controls on master page are accessible to content pages
 - Public properties are accessible

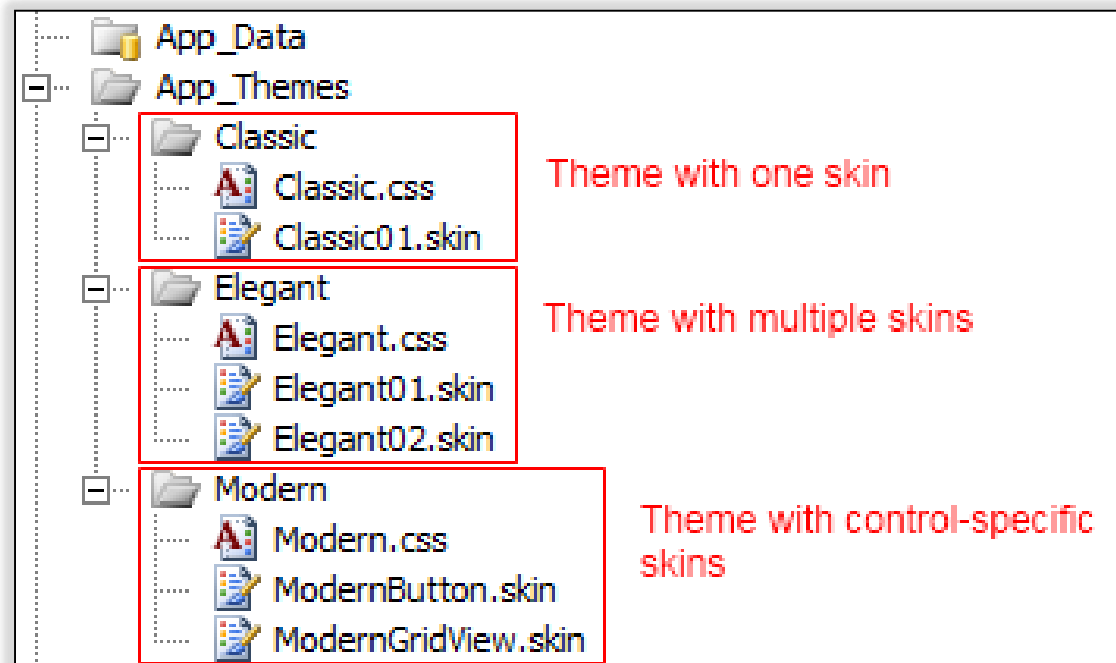
Themes and Skins

- What are themes?
 - Define a set of style details to be applied to controls in multiple pages
 - Themes are typically application specific
 - A theme is created as a folder beneath the special ASP.NET **App_Themes** folder
 - Used together with skins



Themes and Skins

- Skins
 - Enable modifying properties of ASP.NET controls



```
<!-- ModernButton.skin -->

<asp:ImageButton runat="server" SkinID="OKButton"
    ImageUrl="ButtonImages/buttonOK.jpg" />

<asp:ImageButton runat="server" SkinID="CancelButton"
    ImageUrl="ButtonImages/buttonCancel.jpg" />
```

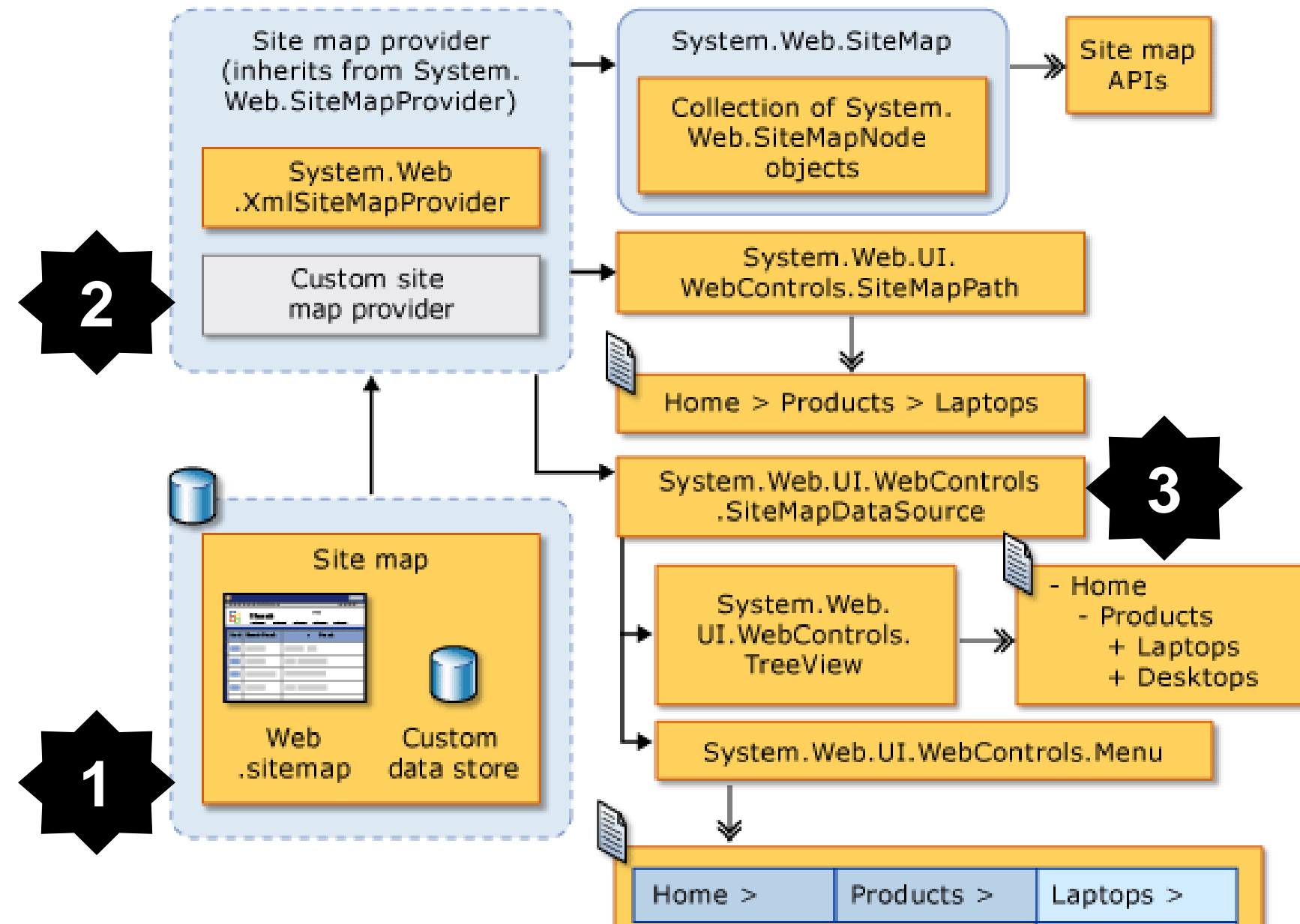


Exercise 02

Building Site Navigation

Site Maps

- A consistent way to navigate from one page to the next



SiteMap and SiteMapNode classes

- **SiteMap** represents an application's site map stored in different data sources: XML file, database or custom data source
- Pages/folders in a site map are represented by instances of **SiteMapNode**

```
void Application_Start(object sender, EventArgs e)
{
    SiteMap.SiteMapResolve += new
        SiteMapResolveEventHandler(SiteMapResolver);
}

SiteMapNode SiteMapResolver(object sender,
    SiteMapResolveEventArgs e)
{
    if (SiteMap.CurrentNode == null)
    {
        string url = e.Context.Request.Path;
        string title = Path.GetFileNameWithoutExtension(url);
        SiteMapNode newNode = new
            SiteMapNode(e.Provider, url, url, title);
        newNode.ParentNode = SiteMap.RootNode;
        return newNode;
    }
    return SiteMap.CurrentNode;
}
```

```
if (!Page.IsPostBack)
{
    SiteMapNode curNode = SiteMap.CurrentNode;
    string nodeTitle = curNode.Title;
    string nodeDesc = curNode.Title;
    string nodeUrl = curNode.Url;
}
```



Navigation Controls

- SiteMapPath
 - Builds “breadcrumbs” based on site map content: indicate the current position
- Menu
 - Supports hierarchical data
 - Supports horizontal and vertical layouts
 - Support templates
- TreeView
 - Supports hierarchical data
 - Only vertical layout is supported
 - No template supported

Remapping URLs

- Map a requested URL to different URL
- URL mappings are configured in web.config
 - Request.RawUrl: original URL (before being remapped)
 - Request.Path: current URL (after being remapped)

```
<system.web>
  <urlMappings enabled="true">
    <add url="/beverages.aspx"
        mappedUrl="/products.aspx?category=beverages" />
    <add url="/food.aspx"
        mappedUrl="/products.aspx?category=food" />
  </urlMappings>
```

URL Routing Engine

- New in ASP.NET 4
- Cleaner alternatives for complicated-looking URLs
- Better SEO (Search Engine Optimization)
 - <http://mysite.com/products/beverages/cokes/pepsi>
- Flexibility of using URL parameters
 - No concerns about figuring out what the query string parameter names are
 - <http://mysite.com/blog/2011/12/08>
- Implemented using code, not configuring in web.config
 - Typically implemented in Application_Start event



Exercise 03



- Thank you.

Revision History

Date	Version	Description	Updated by	Reviewed and Approved By
10/5/2017	1.0	Revamped from CSC template to DXC template	Them Pham	Quang Tran