ASP.NET

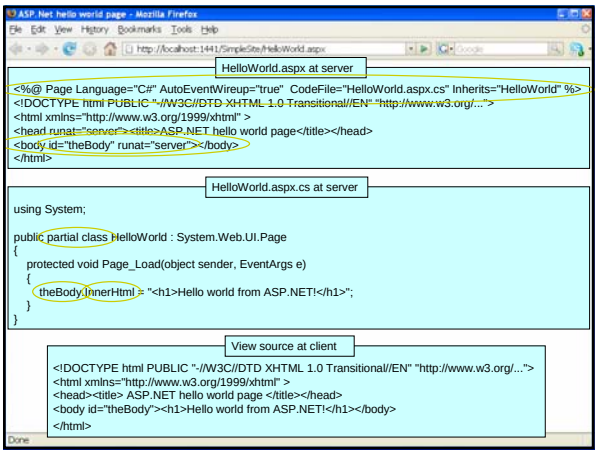
CS 640, Lecture 12

Lecture outline

- ASP.NET overview
- Keeping state
- ASP.NET page lifecycle
- Multi-page applications

Short history of ASP.NET

- Server side programming initially relied on external programs (CGI) -- inefficient
- Microsoft introduced **A**ctive **S**erver **P**ages in 1996
  - Pages include code executed inside web server process
- Latest framework ASP.NET 2.0 released in 2005
  - Better developer productivity and site maintainability
  - Some concepts inherited from desktop programming
  - Separation between HTML and code
  - Can use various languages for the code (Visual Basic, C#)
  - Also uses client-side programs (JavaScript)

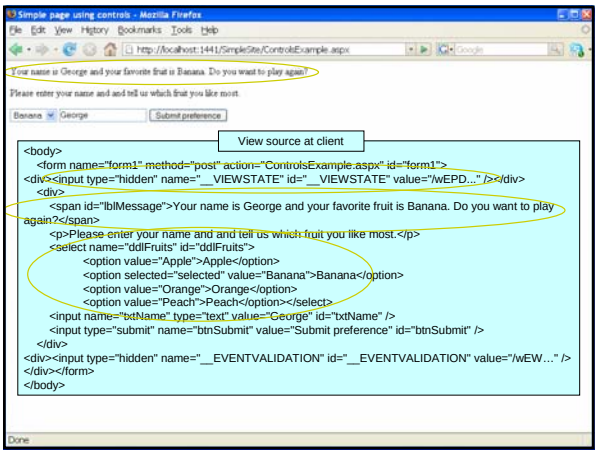


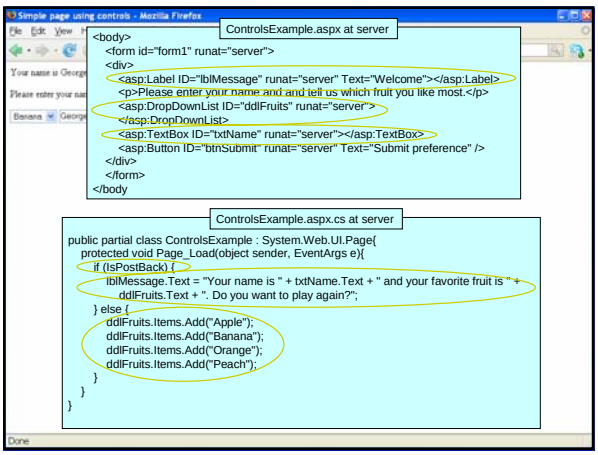
How it works – basics

- ASP.NET pages with .aspx extension and contain
  - Plain HTML – typically makes it to the client unmodified
  - The <% Page …%> directive – for web server only
  - Various server controls (discussed later)
- Code-behind file holds the code for the page
  - Parts of the class are defined in .aspx file – "partial class"
    - Tags with "runat=server" become members of page object
- Page lifecycle in a nutshell: server parses .aspx file, creates page object, invokes event handlers, page renders itself (into HTML), page object disposed

Server Controls

- HTML server controls are just HTML tags accessible to the page object (not used often)
- ***Web server controls*** are objects controlling properties of web page elements
  - Fundamental building blocks of ASP.NET pages
  - Tag names for ASP.NET controls start with `<asp:`
  - Some controls hold input from user
  - Validation controls check correctness of user input
  - Can bind data sources to HTML elements
  - Examples: drop-down lists, text boxes, tables, buttons



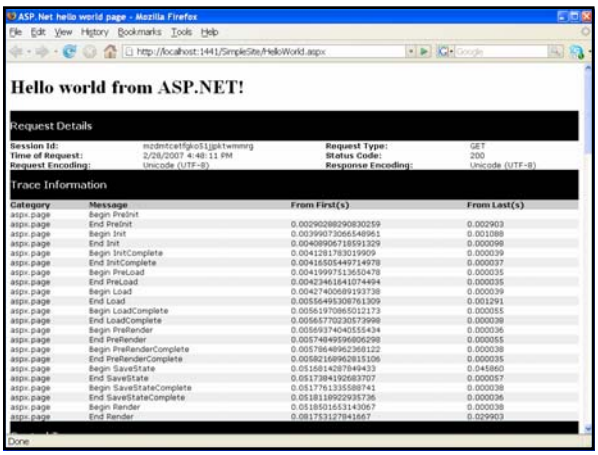


Conventional IDs of controls

- Label – lbl…
- TextBox – txt…
- Button – btn…
- LinkButton – lbtn…
- ImageButton – ibtn…
- Hyperlink – hlnk…
- Table – tbl…
- DropDownList – ddl…
- ListBox – lst…
- CheckBox – chk…
- CheckBoxList – cbl…
- RadioButton – rdo…
- RadioButtonList – rbl…
- Image – img…
- ImageMap – imap…
- BulletedList – blst…
- Calendar – cln…
- FileUpload – upl…

Debugging

- Can use VS debugging features for C# code
  - Browser will be waiting for reply from server while you stop C# code
- Can set `Trace="True"` in `Page` directive
  - Outputs generous details at end of web page
    - Profiling information for important steps
    - Hierarchy of elements (control tree) with rendered sizes
    - Request and response details and headers
    - Details about server
    - Much more



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Keeping state between pages

- http is stateless protocol – web server may reboot between two requests from client
- Need to pass information between pages
- Also between postbacks of same page
- ASP.NET uses multiple mechanisms
  - Viewstate
  - Session state
  - Application state

Viewstate

- Preserves values of server control properties that are set from code
  - E.g. preserving selections in drop-down list
- Encoded into a hidden input field
  - If it gets too large can be a performance problem
  - Can be disabled setting to `False` control's `EnableViewState` property
  - Trace also shows how many bytes of view state each control uses

Session state object

- The session state object is used to store key-value pairs the programmer needs
  - Accessible through the Session property of page object (e.g. `Session["Email"]="foo@bar"`)
  - Accessible to all pages of web site
- Separate session for each visitor
  - Session ID identifies individual session
  - Typically stored as a cookie at the client
  - If cookies disabled, encoded in URLs
  - New visitors start with empty session object

Session configuration

- In site's web.config file
- Where is session data stored?
  - By default inside the web server's memory
  - Can be at separate "state server"
    - Web servers in server farm get consistent view
  - At database server
- Timeout specifies after how much inactivity the session data gets discarded
  - Defaults to 20 minutes

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When is a page submitted?

- Explicit postback by the user – pushing the submit button
- Implicitly by changing the value of an input control with the AutoPostBack property
  - Works for check boxes, drop-down lists, text fields, radio buttons, etc.
  - Not needed for buttons – they always cause a postback

How is a page processed?

- The web server builds the page through a well-defined succession of events
  - Events associated with page or individual control
  - Handlers are methods of the page object
- How to specify/override handlers for events
  - `<asp:Button … OnClick="btnClick" />` means `btnClick()` runs when user clicks button
  - Overriding say `OnLoad()` handler of page
  - `Page_Load()` method invoked on page load
    - The `OnLoad()` method of base class called implicitly

Page lifecycle (1)

1. Server receives request
   - If page dynamic, server parses it and compiles code behind file if source newer than the .dll
2. Object initialization
   - Page's `Init_Page()/OnInit()` and controls' `OnInit` handlers called
   - Should not reference other controls, they may be uninitialized
   - Suggested use: read/initialize control properties
3. ViewState data loaded into controls

Page lifecycle (2)

4. Postback data loaded into controls
5. `Load` event for page and controls
   - Suggested use: open DB connections, set / change properties of page/control
6. Postback change events for controls
   - E.g. `OnTextChanged()` handler for a text box
7. `PreRender` for page and controls
   - Suggested use: final changes to page/controls

Page lifecycle (3)

8. ViewState data saved
9. Rendering: the page asks the controls to produce the HTML code they contribute and the document is built
10. `Unload` event for page and controls
    - Suggested use: close DB connections, close files, other cleanup operations

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Moving to another page

- Links work just as for normal web pages
- The `PostBackURL` attribute of a button may specify a different page
  - `PreviousPage` refers to page generating post
    - Use its `FindControl(`*`id`*`)` to access values user filled in
  - `Request.Form[`*`id`*`]` has values submitted to server
- Within code-behind use `Server.Transfer(`*`URL`*`)` or `Response.Redirect(`*`URL`*`)` to go to other page
  - `Redirect` involves an extra roundtrip time, but it updates the URL displayed by browser – more user friendly

A consistent look and feel

- The problem
  - The pages of your site site/application should incorporate some common elements
    - E.g. navigation menu, logo, footer
  - When common element changes, manual update of pages can lead to inconsistencies
- The solutions (centralize common elements)
  - The old solution: using server side includes (SSI)
  - ASP.NET: using master pages

ASP.NET master pages

- The master page contains all elements common among pages of a site
- Individual pages replace the `<asp:contentplaceholder>` element
- Master page may contain controls, has code behind file
  - MasterPage object accessible to the code of the individual page as the `Master` property
- Can have multiple Master pages per site