Unit 1 – Framework and Web Contents and Validation Controls

Introduction to ASP.NET

ASP.NET stands for **Active Server Pages.NET.**
"ASP.NET is an open source, server side web application framework used for developing web applications and services."
ASP.NET was developed by Microsoft. It was released on 5th January 2002.
Its latest version is 4.8. It was released on 18th April 2019.

Features of ASP.NET

The following are the features of ASP.NET :
1) A clean separation between presentation and code. With classic ASP, the coding logic was often written throughout the HTML of the page, making it hard to make changes to the page later.
2) A feature rich development tool called Visual Studio.NET that allows developers to create and code their web applications visually.
3) A choice between many object-oriented programming languages like C#, Visual Basic.NET, Visual C++.NET etc.
4) ASP.NET includes a new technology called Web Services. You can use Web Services to access methods and properties and transfer database data across the Internet.
5) ASP.NET is part of Microsoft's .NET Framework. You can access thousands of .NET classes in your code that enable you to perform complex tasks very easily.
6) ASP.NET includes Page and Data Caching mechanisms that enable you to easily and dramatically improve the performance of your Web site.

Overview of ASP.NET Framework

ASP.NET is an open source web application framework used for developing web applications and services with .NET.
ASP.NET is server-side and it is a cross-platform framework.
ASP.NET is a part of .NET framework.
The Common Language Runtime (CLR) is used for executing the application code. The CLR gives many advantages to the developer such as memory management, security, debugging etc. ASP.NET is built on the CLR, allowing programmers to write ASP.NET code using any supported .NET language like C#, VB.NET etc.
The Framework/Base Class Library contains thousands of classes that you can directly use while creating an application in ASP.NET.
ASP.NET provides Web Forms for creating web applications. With ASP.NET Web Forms, you can build dynamic websites using drag-and-drop, event-driven model. A design surface and hundreds of controls and components let you rapidly build powerful UI-driven sites with data access.

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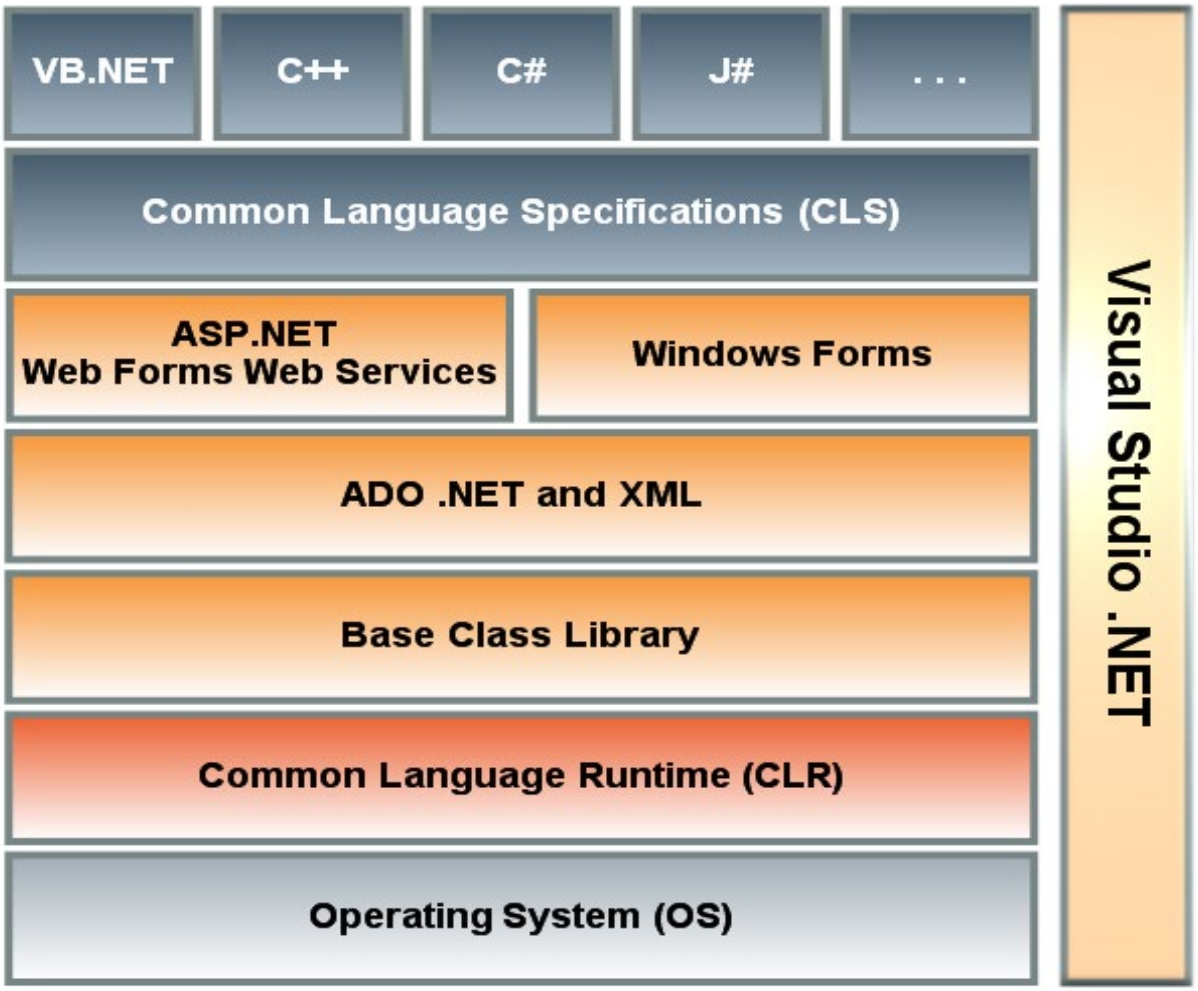
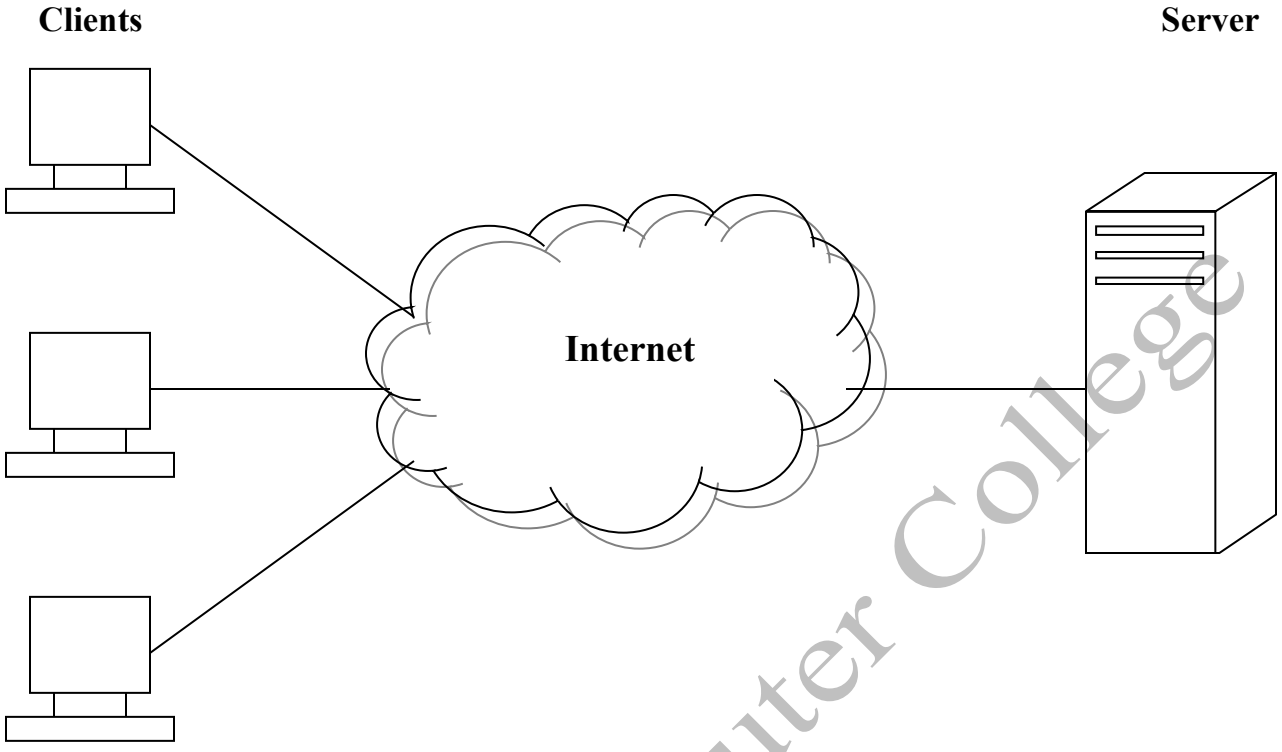
The following diagram shows the architecture of .NET:



Client Server Architecture

Networks in which some computers give services to other computers in the network are called client-server networks.
The computer that provides the services is called Server.
The computer that requests the server for any services is called Client.
In client-server architecture, clients and servers communicate over a network on different hardware but both can remain in the same system.
A server runs one or more server programs which share their resources with clients. A client does not share any of its resources, but it requests a server's content or service function. So client starts communication with server which gives response to incoming request.
Thus, the client-server architecture distributes the work load between server and clients.
Examples of computer applications that use the client-server architecture are e-mail, network printing and world wide web.
The following diagram shows the clients communicating with a server via internet.



Client-Server Architecture

Application Web Servers

Web pages are created using HTML syntax. These pages must be organized and stored at a central computer.

Computers that store web pages in the form of folders and files and provide these files to other computers are called Web Servers.

Web Servers are like service providers that serve the need for information.

Web server computers run special software called Web Server Software that does the website management. This software accepts a client's request and responds to it by providing the webpage with required information.

Some of the most popular web server software or Application Web Servers are as follows:

1) Internet Information Services (IIS)
2) Apache Web Server
3) Netscape Server

Thus, in short an application web server store and manages web pages. When required, it accepts request for these web pages, retrieves these web pages from the hard disk and sends the pages back to the client who requested for it.

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Installation of IIS

The following are the steps for installing IIS :

1. Click "**Start**" menu.
2. Go to "**Control Panel**".
3. Click on "**Programs and Features**". The programs and features window will appear.
4. Now click on "**Turn Windows Features On or Off**" on the left part of the window. A Windows Features dialog box appears.
5. Select "**Internet Information Services**" checkbox.
6. Click the "**OK**" button to start installing IIS in your system.

Types of files in ASP.NET

ASP.NET allows you to create many types of files. They are as follows :

No.	File Type	Description
1	**.aspx**	These are ASP.NET web pages or web forms. They contain user interface and logic
2	**.cs /.vb /.js**	These are code behind files that contain C# code, VB code or J# code. They allow you to separate the application logic from the user interface.
3	**Global.asax**	This is a global application file. You can use this file to define global variables and respond to global events.
4	**Web.config**	This is a XML based configuration file for ASP.NET application. It has the settings for security, database, state management etc.
5	**.asmx**	These are ASP.NET Web Services. Web Services are used to access methods and properties of a class and transfer data over internet.
6	**.ascx**	These are ASP.NET User Controls. User control allows you to create a new control according to your requirements
7	**.ashx**	These are handler files. They are used for image processing
8	**.mdf**	Microsoft SQL Server database file
9	**.mdb, .ldb**	Microsoft Access database file
10	**.sln**	A Solution file
11	**.csproj**	A C# project file
12	**.master**	A Master page
13	**.skin**	A Skin file to apply a theme.

Types of Controls in ASP.NET

ASP.NET controls are the main part of ASP.NET framework.

"An ASP.NET control is a .NET class that has visual appearance."

The ASP.NET framework includes over 70 controls that allow you to do everything from displaying a list of records to displaying a rotating banner advertisement.

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ASP.NET controls can be divided into following groups :

1) **Standard Controls** (Web Controls, Web Server Controls, Server Controls) : These controls allows you to use standard form elements such as buttons, textboxes, labels etc.
2) **Validation Controls** : These controls enable you to validate (check) form data before you submit to the server.
3) **Rich Controls** : These controls enable you to provide facilities such as calendars, file uploading, rotating banner advertisements, wizards etc.
4) **Data Controls** : The Data controls enable you to work with data of a database. For example, you can use these controls to submit new records to a database table or display a list of database records.
5) **Navigation Controls** : These controls enable you to display navigation elements such as menus, tree views etc.
6) **Login Controls** : These controls enable you to display login, change password and register form.
7) **HTML Controls** : These controls enable you to use form elements such as text-field, buttons, listboxes etc. HTML controls are also called Client Controls.

Web forms

ASP.NET simplifies web page development with form-based programming. In ASP.NET these forms are called Web Forms.

Web forms are similar to VB forms, replacing ASP pages. Similar to VB, Web Forms programming is also event based. Similar to VB, ASP.NET also provides a rich set of controls to the programmers.

ASP.NET's Web Forms also allow for the separation of the application logic (server-side code) and the presentation layer (HTML markup).

Web forms have .aspx extension.

Web forms are thus the core of any ASP.NET web application. They are the actual pages that users see in their browser when they visit your site.

Web forms can contain a mixture of HTML, ASP.NET server controls, client-side JavaScript , CSS and programming code (C# code).

The following are the characteristics of a Web form :

1) A Web form of your design can run on any browser and it automatically displays the browser's HTML.
2) It is built on the CLR, so it provides type safety, inheritance, and dynamic compilation.
3) It can be programmed in any CLR-supported language.
4) It supports WYSIWYG editing tools and development tools such as VS.NET.
5) It supports a rich set of controls.
6) It allows for separation between code and content on a page.
7) It provides a set of state management features that preserves the view state of a page between requests.

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Running an ASP.NET application

You can run the an ASP.NET application as follows :
Click “Debug” menu -> Click “Start Debugging” option.
The shortcut key to run an ASP.NET application is **F5**.
You can stop running of an ASP.NET application as follows :
Click “Debug” menu -> Click “Stop Debugging” option.
You can press “**Shift + F5**” keys to stop debugging or close the web application.

Page Architecture

ASP.NET pages are the text files with an .aspx extension which contain the code to implement a Web application.
When the request for a page is received for the first time, then .aspx file is compiled to generate the class file. This class file is then used to process the request.
The ASP.NET page architecture consists of the following –
1) **Directives** – ASP.NET Page directives are instructions to specify general settings such as page language, AutoEventWireUp etc . Page directive are generally given at the top of the file. A directive controls how an ASP.NET page is compiled. A directive is written <%@ and %>. Examples of page directives are @Page, @Control, @Import, @Master, @Assembly etc.

2) **Code Declaration blocks** – A code declaration block contains all the application logic for your ASP.NET page and all the global variable declarations, subroutines, and functions. It must appear within a <script runat="server"> tag.

3) **Code render blocks** – Code render blocks are used to write the inline code inside the .aspx page. Code render block is used to display information on the browser without calling the Write method. These blocks are given on a page by using the <% and %> tags.

4) **ASP.NET controls** – ASP.NET controls are the main part of the page. They include server controls, HTML controls and custom controls.

5) **Server-side Comments** - You can add comments to your ASP.NET pages by using server-side comment blocks. The server-side comment is given between <%-- and --%> characters.

6) **Server-side include directives** - You can include a file in an ASP.NET page by using the server-side include directive. If you want to include a file that is located in the same directory or in a subdirectory of the page including the file, you would use the following directive:

```
<!-- #INCLUDE file="includefile.aspx" -->
```

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7) **Literal Text and HTML Tags** - The final type of element that you can include in an ASP.NET page is HTML content. It is the static portion of your page. HTML content in a page is represented with the LiteralControl. You can use the Text property of the LiteralControl to give HTML portion of an ASP.NET page.

The Page Class

The Page class represents an .aspx file, also known as a Web Forms page, requested from a server.
The Page Class is the parent of every web page i.e. every web page is inherited from System.Web.UI.Page.
If you want to create a Web Forms page using the code-behind technique, your class is derived from this class. Microsoft Visual Studio, automatically use this model to create Web Forms pages.
The following are the properties of page class –

Properties	Description
Application	It stores information that is shared between all users in the website.
Session	It stores information for a single user, so it can be used in different pages.
Request	It refers to an HTTPRequest object that contains information about the current web request.
Response	It refers to an HTTPResponse object that represents the response ASP.NET will send to browser.
User	If the user has been authenticated, this property will be initialized with user information.

The following are the main events of page class :

Event	Description
Load	Occurs when page is loaded
Init	Occurs when it is initialized
Unload	Occurs when the page is unloaded from memory

Standard Controls of ASP.NET

The TextBox Control

The TextBox Web Server control is an input control that allows the user to enter data.
The TextBox control exists within the System.Web.UI.WebControls namespace.
When you add a TextBox control on a web form, the following code is added :
<asp:TextBox ID=”TextBox1” runat=”server”> </asp:TextBox>
The following are the properties of TextBox control :

Properties	Description
AutoCompleteType	Obtains or sets a value that indicates the auto-complete behavior of the control

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AutoPostBack	Obtains or sets a value that indicates whether or not an automatic post back to the server occurs when the control loose its focus.
MaxLenth	Obtains or sets the maximum number of characters allowed in the textbox
ReadOnly	Obtains or sets a value indicating whether or not the content of the control can be changed
TextMode	Obtains or sets the behavior mode (single line, multiple line, password) of the control

The important event of the TextBox control is "**Textchanged**" event which occurs when user changes the text of TextBox control.

The Button Control

The button control is used to create button that sends a request to a web page. The button control exists within the System.Web.UI.WebControls namespace.
The web server button control posts (sends) data to the server when it is clicked.
The following are the properties of button control :

Properties	Description
OnClientClick	Obtains or sets the client side script that runs when click event is fired
PostBackUrl	Obtains or sets the URL of the page to post when the control is clicked
Text	Obtains or sets the text displayed on the control
UseSubmitBehavior	Obtains or sets a value indicating whether or not the control uses the client browser's submit mechanism or ASP.NET postback mechanism.

The most important event of button control is **click** event. It is fired when the button control is clicked.

The Label Control

The label control is used to display the text. The user cannot change the text at runtime.
The label control exists within the System.Web.UI.WebControls namespace.
The following are the properties of label control :

Properties	Description
Text	Obtains or sets the text displayed on the control
BorderStyle	Obtains or sets different styles of the border for the control
BackColor	Obtains or sets the background color of the control
Visible	Obtains or sets the value that indicates whether or not the control will be displayed at runtime

The Literal Control

You can add HTML in a web page while using the code designer without switching to the .aspx page using literal control. In other words to edit the HTML directly, you can use the literal web server control.

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The literal control exists within the System.Web.UI.WebControls namespace.
You can directly insert text by using the "**Text**" property of literal control. This control does not have any visual appearance on the web page.
The following are the properties of literal control :

Properties	Description
Text	Obtains or sets the text displayed in the control
Mode	Obtains or sets the value that specifies how the content of the control is set.

The Image Control

The image control creates an area that is used to display an image. You can set the path of an image file with "**ImageUrl**" property of this control.
The image control exists within the System.Web.UI.WebControls namespace.
The following are the properties of image control :

Properties	Description
AlternateText	Obtains or sets the alternate text displayed in the control when the image is not available
ImageAlign	Obtains or sets the alignment of the control in relation to other controls on the webpage
ImageUrl	Obtains or sets the location (path) of an image to display in the control

The ImageButton Control

This control creates a button that displays an image instead of text. You can use the image button control to display images that can handle the click event.
The imagebutton control exists within the System.Web.UI.WebControls namespace.
The following are the properties of imagebutton control :

Properties	Description
OnClientClick	Obtains or sets the client side script that runs when this control's click event is fired
PostBackUrl	Obtains or sets the URL of the page to post when the control is clicked
Enabled	Obtains or sets a value indicating whether or not the control can be clicked

The important event of this control is "**click**" event.

The DropDownList Control

This control displays data as a dropdown list from which you can make a selection. You cannot select multiple items in this control because when you make a selection, the list closes automatically.
After you have selected an item, you can use SelectedItem, SelectedIndex and SelectedValue properties to work with the selection.
The dropdownlist control exists within the System.Web.UI.WebControls namespace.
The following are the properties of dropdownlist control :

Properties	Description
SelectedItem	Obtains or sets the text of the selected item in the control

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SelectedIndex	Obtains or sets the position of selected item in the control

The CheckBox Control

This control creates a checkbox that is selected by clicking it. Checkboxes display check marks that allow the user to toggle between a true or false condition.
The checkbox control exists within the System.Web.UI.WebControls namespace.
The following are the properties of checkbox control :

Properties	Description
AutoPostBack	Obtains or sets a value indicating whether or not the checkbox automatically post back to the server when clicked.
Checked	Obtains or sets a value indicating whether or not the checkbox is checked
Text	Obtains or sets the text of the control

The main event of this control is "CheckedChanged". This event occurs when the value of checked property changes between post to the server.

The RadioButton Control

Unlike checkboxes, radio buttons are presented in groups, where only one radio button can be selected at a time. In web forms you have to set the "groupname" property to the same value to put them into a group.
The radiobutton control exists within the System.Web.UI.WebControls namespace.
The following are the properties of radiobutton control :

Properties	Description
AutoPostBack	Obtains or sets a value indicating whether or not the radiobutton automatically post back to the server when selected.
Checked	Obtains or sets a value indicating whether or not the control is checked
GroupName	Obtains or sets the name of the group that radio button belongs to

The main event of this control is "CheckedChanged". This event occurs when the value of checked property changes between post to the server.

The Panel Control

The panel control is used to create a division on the form that acts as a container for other controls. These controls are useful when you want to show or hide a group of controls at once, or when you want to add controls to a web page through code.
The panel control exists within the System.Web.UI.WebControls namespace.
The following are the properties of panel control :

Properties	Description
BackImageUrl	Obtains or sets the path of background image.
Direction	Obtains or sets the direction in which to display control that include text in a panel control
ScrollBars	Obtains or sets the type of scrollbar in panel control
Wrap	Obtains or sets a value indicating whether the contents wraps within the panel

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The HyperLink Control

This control is used to create a link to another web page either in you current web application or anywhere else on the internet. You can specify the location of link page by giving its URL on the current page. You can use text as well as an image in the hyperlink control.

The hyperlink control exists within the System.Web.UI.WebControls namespace.

The following are the properties of hyperlink control :

Properties	Description
ImageUrl	Obtains or sets the path of an image to display for the control
NavigateUrl	Obtains or sets the URL to link to when the control is clicked
Text	Obtains or sets the text of the link
Target	Obtains or sets the target window in which to display the web page content when the control is clicked.

The ListBox Control

The listbox is used to display a list of items from which the user can select the required item. You can select multiple items from the listbox.

The listbox control exists within the System.Web.UI.WebControls namespace.

The following are the properties of listbox control :

Properties	Description
SelectionMode	Obtains or sets the selection mode (single or multiple)
SelectedItem	Obtains or sets the item selected from the control
SelectedIndex	Obtains or sets the position of selected item from the control

The main event of listbox control is "SelectedIndexChanged" event. It occurs when the new item is selected. Set the AutoPostBack property to true when required.

The HiddenField Control

The hiddenfield control is used to store a value that needs to be preserved across the post to the server.

The hiddenfield control exists within the System.Web.UI.WebControls namespace.

The following is the property of hiddenfield control :

Properties	Description
Value	Obtains or sets the value of hiddenfield control

The FileUpload Control

This control is designed to upload files from the client side to server side. This control has one textbox and a browse button. With the browse button you can open the dialog box of client machine. From this dialog box you can select the required file to be uploaded. The full path will be given in the textbox.

This control will not upload the file automatically. For this "**SaveAs**()" method must be used. The SaveAs() method will not be able to upload file if it does not have written access on the selected folder or server.

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The following is the property of fileupload control :

Properties	Description
FileName	Obtains or sets the name of the file to be uploaded
HasFile	Obtains or sets a value indicating whether the control contains the file or not
PostedFile	Obtains or sets the HTTPPostedFile object for a file uploaded using this control

Common properties of controls

AccessKey	BackColor	ForeColor	BorderColor	BorderStyle
BorderWidth	CssClass	Enabled	Font	Height
Width	TabIndex	ToolTip	Visible	

Form Validation

It is very likely that user makes mistake while entering data into a form. For example,

1. A user may leave a field blank.
2. A user may not enter data in proper format.

In such situations, it is the job of the programmer to see whether correct or valid data must be entered and stored in the database.

For this a programmer writes some code which acts as check points on data entered by the user. Such check points or code is known as a validation.

ASP.NET gives a set of validation controls that manages validations by checking field data and reporting an error automatically.

These controls can even use client side JavaScript to provide a more dynamic interface.

It also provides another way of writing validations.

What is Validation?

"The process of checking whether the data entered is correct or not is called validation."

There are 2 types of validations given in web applications :

1. Client-side validation
2. Server-side validation

1. **Client-side validation** : ASP.NET allows to add JavaScript code for giving client-side validation. In this case, when user tries to submit data then all the validations will be checked at client-side. Client does not need to wait till data or form goes to the server for checking. ASP.NET also provides a set of controls that can be used to give validations on the data entered at client-side. Validation controls checks the data each time it is entered. They also save time and increase the efficiency and quality of a web application. It is also possible that some person may interrupt JavaScript at client-side, passing data through it. In such case, ASP.NET again checks all the validations at server.

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2. **Server-side validation** : In every simple code server-side validation means when user submits the data, the data transmits to the server and then the server will check that data. If error is found in the data, the server will return that data with error description. The browser will display that data error. There are two ways by which we can validate data - automatically or manually. While we are using automatic validation, the user receives a normal page and fills in the input controls and submits the page and depends on CausesValidation property settings. The following actions may be taken :
    a. If CausesValidation property is false, ASP.NET will ignore the validation controls and the page will be posted back and your code will run automatically.
    b. If CausesValidation property is true (default), ASP.NET will automatically validate the page when user clicks the submit button. It does this by performing validation for each control. If any control fails to validate, ASP.NET returns the page with some error information.

Validation Controls

ASP.NET gives a set of validation controls used to give validations in the web application easily and quickly.
When user enters invalid data in a control (like TextBox), the validation control checks the data and displays an error message on the screen.
Validation controls checks the data before a request is sent to the server.
The following are the validation controls of ASP.NET –

1) RequiredFieldValidator Control
2) CompareValidator Control
3) RangeValidator Control
4) RegularExpressionValidator Control
5) CustomValidator Control
6) ValidationSummary Control

RequiredFieldValidator Control

This control makes sure that the user has entered data in the input control (like TextBox). This control can be bound with the input control. If the user does not enter data in the input control, this control displays an error message.
The following are its properties –

Properties	Description
InitialValue	Obtains or sets the starting value of input control
ControlToValidate	Obtains or sets the input control name to validate
ErrorMessage	Obtains or sets the text for error message displayed
IsValid	Obtains or sets a value that indicates whether the bound input control passes validation

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SetFocusOnError	Obtains or sets a value that indicates whether focus is set to the control when there is an error

The main event of this control is "Validate". It performs validation on the input control bound and updates the IsValid property.

CompareValidator Control

This control is used to compare the value entered by the user into an input control with the value entered into another input control or with a constant value.
The following are the properties of CompareValidator control –

Properties	Description
ControlToValidate	Obtains or sets the input control name to validate
ControlToCompare	Obtains or sets the input control name to compare with another control
ValueToCompare	Obtains or sets a constant value to compare with the value entered in the input control
Operator	Obtains or sets the comparison (relational) operator which specifies the comparison
Type	Obtains or sets the data type of both comparison values. Both values are automatically converted to the type given.

RangeValidator Control

This control checks if the value of an input control is inside a given range of values. There are three main properties like – ControlToValidate, MinimumValue and MaximumValue.
If you set one of the MinimumValue and MaximumValue properties, you also must set the other. The following are its properties –

Properties	Description
ControlToValidate	Obtains or sets the input control name to validate
MinimumValue	Obtains or sets the minimum value of the range
MaximumValue	Obtains or sets the maximum value of the range

RegularExpressionValidator Control

This control is used to make sure that an input value matches a given regular expression. A regular expression is a pattern which specifies a format of a value such as email id, date format, telephone numbers etc.
The following are its properties –

Properties	Description
ControlToValidate	Obtains or sets the input control name to validate
ValidationExpression	Obtains or sets the regular expression that you want to match with the data for validation
EnableClientScript	Obtains or sets a Boolean value that specifies client side validation is enabled or not.

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CustomValidator Control

You cannot perform certain types of validations with the inbuilt controls. To handle any types of validations that are not covered by the validation controls, CustomValidator control is used.

This control checks that the input you have given such as prime number, even or odd number matches with a given condition or not.

This control exists within System.Web.UI.WebControls namespace. The following are its properties –

Properties	Description
ControlToValidate	Obtains or sets the input control name to validate
ClientValidationFunction	Obtains or sets the name of the custom client side script function used for validation
ValidateEmptyText	Obtains or sets a Boolean value indicating whether empty text should be validated

The main event of this control is "ServerValidate" event. It occurs when validation takes place on the server.

ValidationSummary Control

This control collects all the validation control error messages for centralized display. The summary can be displayed as a list, as a bulleted list or as a single paragraph based on the "DisplayMode" property.

This control exists within System.Web.UI.WebControls namespace. The following are its properties –

Properties	Description
DisplayMode	Obtains or sets the display mode of the validation summary
HeaderText	Obtains or sets the text displayed as a heading on top of the summary
ShowMessageBox	Obtains or sets the error message in a pop-up message box when true
ShowSummary	Enables or disables the summary of error messages

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