ASP DOT NET MVC

✅ 1. What is .NET Framework?

The **.NET Framework** is a software development platform made by Microsoft. It helps developers build and run apps, especially on Windows.

🔑 Key Points:

- It provides a **runtime** (called CLR – Common Language Runtime) that manages code execution.
- It includes a large **library** of reusable code (called the Framework Class Library or FCL).
- Developers can use languages like **C#, VB.NET, F#**, etc.
- You can create **Windows apps, web apps, console apps, web services**, and more.

Example: When you write code in C#, the .NET Framework helps convert it to something the computer understands and manages memory, errors, etc.

✅ 2. .NET Architecture

The architecture of .NET Framework includes several layers that work together:

🧱 Main Components:

1. **CLR (Common Language Runtime)**:
    - Heart of the .NET Framework.
    - Manages memory, security, exceptions, and more.
    - Converts your C#/VB.NET code into **MSIL** (Microsoft Intermediate Language) and then to **machine code**.
2. **FCL (Framework Class Library)**:
    - Collection of pre-written code to handle common programming tasks.
    - Includes classes for file handling, database access, web requests, etc.
3. **Languages (C#, VB.NET)**:
    - You write code using a language like C#.
    - CLR supports multiple languages.
4. **ASP.NET**:
    - A part of the .NET Framework for building **web applications**.

💡 **Flow:**

Your C# code → CLR compiles it to MSIL → JIT Compiler → Machine Code → Runs on your system

---

✅ **3. What is a Server?**

A **server** is a computer or system that provides data or services to other computers (called **clients**).

🔧 **Examples:**

- When you visit a website, your browser (client) sends a request to a **web server**.
- The server processes the request and sends back the webpage.

🖥️ **Types of Servers:**

- **Web Server**: Serves websites (like IIS, Apache)
- **Database Server**: Stores and manages data (like SQL Server)
- **Mail Server**: Handles email

✅ **4. What is XAMPP?**

XAMPP is a free software package that helps developers run and test web applications on their own computer.

🌐 **It includes:**

- **X** – Cross-platform
- **A** – Apache (Web Server)
- **M** – MySQL (Database)
- **P** – PHP
- **P** – Perl

Even though XAMPP is mostly used for PHP development, it's good to know it if you're comparing with ASP.NET.

🔎 **Why Use XAMPP?**

- Lets you run a server environment **locally**.
- Good for testing websites before uploading online.

✅ 5. What is MVC Structure?

MVC stands for **Model – View – Controller**. It's a **design pattern** used in ASP.NET to organize code in a better way.

🧩 Breakdown:

1. **Model**:
    - Deals with **data and business logic**.
    - Example: Saving user info, calculations, etc.
2. **View**:
    - Deals with **UI (User Interface)** – what the user sees.
    - Example: HTML pages with data.
3. **Controller**:
    - Handles **user input** and controls the flow.
    - Takes user requests, interacts with the Model, and returns a View.

💡 Real-Life Example:

Think of a **food delivery app**:

- **Model** = Menu data, orders, payment logic
- **View** = The screen where you see the food menu
- **Controller** = When you click "Order," it fetches the right food data and places the order

---

✅ 6. What is a Framework?

A **framework** is a **ready-made structure** that helps developers write programs without starting from scratch.

🔧 Key Points:

- Provides **reusable tools, libraries, and guidelines**.
- Makes coding **faster and more organized**.
- Helps reduce bugs and increases productivity.

Example:

ASP.NET is a **web development framework**. It gives you tools to make websites quickly without writing everything from zero.

✅ 1. What is ASP.NET?

ASP.NET is a **web development framework** made by Microsoft. It allows you to build **dynamic websites, web apps, and web services** using .NET technologies like C# and VB.NET.

🔧 Key Features:

- Works with the **.NET Framework** or **.NET Core/.NET 5+**
- Supports **MVC architecture**
- Allows creation of **HTML, CSS, and JavaScript-based pages**
- Secure and supports **session management, authentication, authorization**, etc.

🖥️ Example:

If you want to create a website like an online shop, you can use **ASP.NET** to build the backend (processing orders, storing data) and generate the frontend (HTML pages shown to users).

✅ 2. What is Razor?

Razor is a **syntax** used in ASP.NET for combining **HTML and C# code** in the same file.

📄 Example:

html

CopyEdit

<h1>Hello, @name!</h1>

If name = "Tishat", the output will be:

html

CopyEdit

Hello, Tishat!

🔑 Key Points:

- Starts C# code with @ symbol
- Used in **.cshtml** files
- Makes web pages **dynamic** by embedding server-side logic

⚡ Why Use Razor?

- Clean and easy to read
- No need for separate backend/frontend files
- Works seamlessly with MVC views

✅ 4. Routing in MVC

Routing is the system that decides **which controller and action** should handle a user's request.

🔍 Example:

If the user visits:

ruby

CopyEdit

https://yourapp.com/student/details/5

Routing will match this to:

csharp

CopyEdit

Controller: StudentController

Action: Details(int id) => id = 5

💡 Default Route Pattern:

csharp

CopyEdit

```
routes.MapRoute(
  name: "Default",
  url: "{controller}/{action}/{id}",
  defaults: new { controller = "Home", action = "Index", id = UrlParameter.Optional }
);
```

⚙️ Key Terms:

- **Controller**: Class that handles logic
- **Action**: Method inside a controller
- **id**: Optional parameter

✅ 5. Life Cycle of an ASP.NET Page

The **life cycle** is the series of steps an ASP.NET page goes through **from request to response**.

🌀 Key Stages (Simplified):

1. **Page Request**
   Browser sends a request to the server.
2. **Start**
   Page properties like Request, Response, User, etc. are set.
3. **Initialization**
   Controls (like buttons, textboxes) are initialized with default values.
4. **Load**
   Controls get actual data (e.g., from database or ViewBag/ViewData).
5. **Postback Event Handling**
   If a user clicked a button or submitted a form, that event is processed here.
6. **Rendering**
   ASP.NET converts page + controls into **HTML**.
7. **Unload**
   Clean-up operations, closing DB connections, etc.

🔁 Extra:

- If the request is a **PostBack**, previous values are retained.
- You can write code in Page_Load() to perform actions when the page is loaded.

✅ ASP.NET vs ASP.NET Core

Feature/Topic	ASP.NET (Classic)	ASP.NET Core
Platform	Runs **only on Windows**	Runs on **Windows, macOS, Linux (Cross-platform)**
Release Year	Introduced in **2002**	Released in **2016**
Performance	**Slower** compared to Core	**Faster**, lightweight
Modular	**Monolithic** (everything bundled together)	**Modular**, you only include what you need

Web Server	Uses **IIS** (Internet Information Services)	Can use **Kestrel** + IIS, Apache, or Nginx
Development Model	Based on **.NET Framework**	Based on **.NET Core / .NET 5+**
Dependency Injection	**Not built-in** by default	**Built-in** by design
Razor Pages & Blazor	Limited or Not Available	**Supported natively**
Open Source	Partially open-source	**Fully open-source**
Support/Future	**No new major updates**; legacy support only	**Actively developed and improved**

🔧 1. ASP.NET (Classic)

ASP.NET is the **older version** built on the **.NET Framework**. It includes:

- **Web Forms**
- **MVC (ASP.NET MVC 5)**
- **Web API**

You'll mostly use it if:

- You're working on **existing enterprise projects**
- You are **deploying on Windows servers**

⚡ 2. ASP.NET Core

ASP.NET Core is the **modern, fast, cross-platform** version of ASP.NET.

It supports:

- **MVC**
- **Razor Pages**
- **Blazor**
- **Minimal APIs**
- And more...

Use ASP.NET Core if:

- You're starting a **new project**
- You want **better performance**
- You want to run your app on **Linux, Mac, or Docker**

🔍 **Example Differences in Code:**

ASP.NET MVC Controller (Old)

csharp

CopyEdit

```
public class HomeController : Controller
{
    public ActionResult Index()
    {
        return View();
    }
}
```

ASP.NET Core Controller (New)

csharp

CopyEdit

```
public class HomeController : Controller
{
    public IActionResult Index()
    {
        return View();
    }
}
```

Looks similar, but ASP.NET Core has many **new features** under the hood!

📌 **Summary:**

- 🔹 **ASP.NET** = Old, Windows-only, suitable for legacy projects
- 🔹 **ASP.NET Core** = New, fast, modern, cross-platform, and the future of .NET development

✅ ASP.NET MVC (.NET Framework) Project Structure

When you create a new **ASP.NET MVC project**, you'll see folders like this:

arduino

CopyEdit

YourProjectName/

│

├── Controllers/

├── Models/

├── Views/

├── App_Start/

├── Scripts/

├── Content/

├── App_Data/

├── Global.asax

├── Web.config

Let's break down each one 👇

📁 1. Controllers Folder

- Contains **controller classes** — the brain of your app.
- A controller handles user input, processes data, and returns a **view** or **data**.

✅ Example:

csharp

CopyEdit

public class HomeController : Controller

```
{
    public ActionResult Index()
    {
        return View(); // goes to Views/Home/Index.cshtml
    }
}
```

📁 2. Models Folder

- Contains **C# classes** that hold your **data structure** or **business logic**.
- Represents **database tables** or any data you're using.

✅ Example:

```
csharp
CopyEdit
public class Student
{
    public int Id { get; set; }
    public string Name { get; set; }
}
```

📁 3. Views Folder

- Holds the **.cshtml** files (Razor files) — these generate the **HTML pages** the user sees.
- Organized by controller name.

✅ Example:

```
pgsql
CopyEdit
Views/
├── Home/
│   └── Index.cshtml
```

├── Shared/

│ └── _Layout.cshtml <-- common layout for all pages

📁 4. App_Start Folder

- Contains **configuration files** like:
  - RouteConfig.cs – handles **routing**
  - FilterConfig.cs – registers filters (like error handling)
  - BundleConfig.cs – bundles and minifies JS/CSS

📁 5. Scripts Folder

- Holds all **JavaScript** files including:
  - jquery.js
  - bootstrap.js
  - Your custom JS

Used for making pages interactive (dropdowns, validation, etc).

📁 6. Content Folder

- Contains **CSS stylesheets** and **images**
  - Example: Site.css, Bootstrap, background images, logos, etc.

📁 7. App_Data Folder

- Used for **local database storage** (like .mdf files)
- Not always used, but useful for small DBs

📄 8. Global.asax

- Global application file
- Runs code when the app **starts** or **errors happen**
- Sets up routing and events

⚙️ 9. Web.config

- The **configuration file** for your whole web app
- Sets up:
    - Connection strings
    - Authentication
    - Session settings
    - Custom error pages

🧠 MVC Flow Recap:

rust

CopyEdit

User --> Controller --> Model (Data) --> View (UI) --> Browser

---

📝 Example Flow:

User visits /Home/Index

🔽

HomeController.cs gets the request

🔽

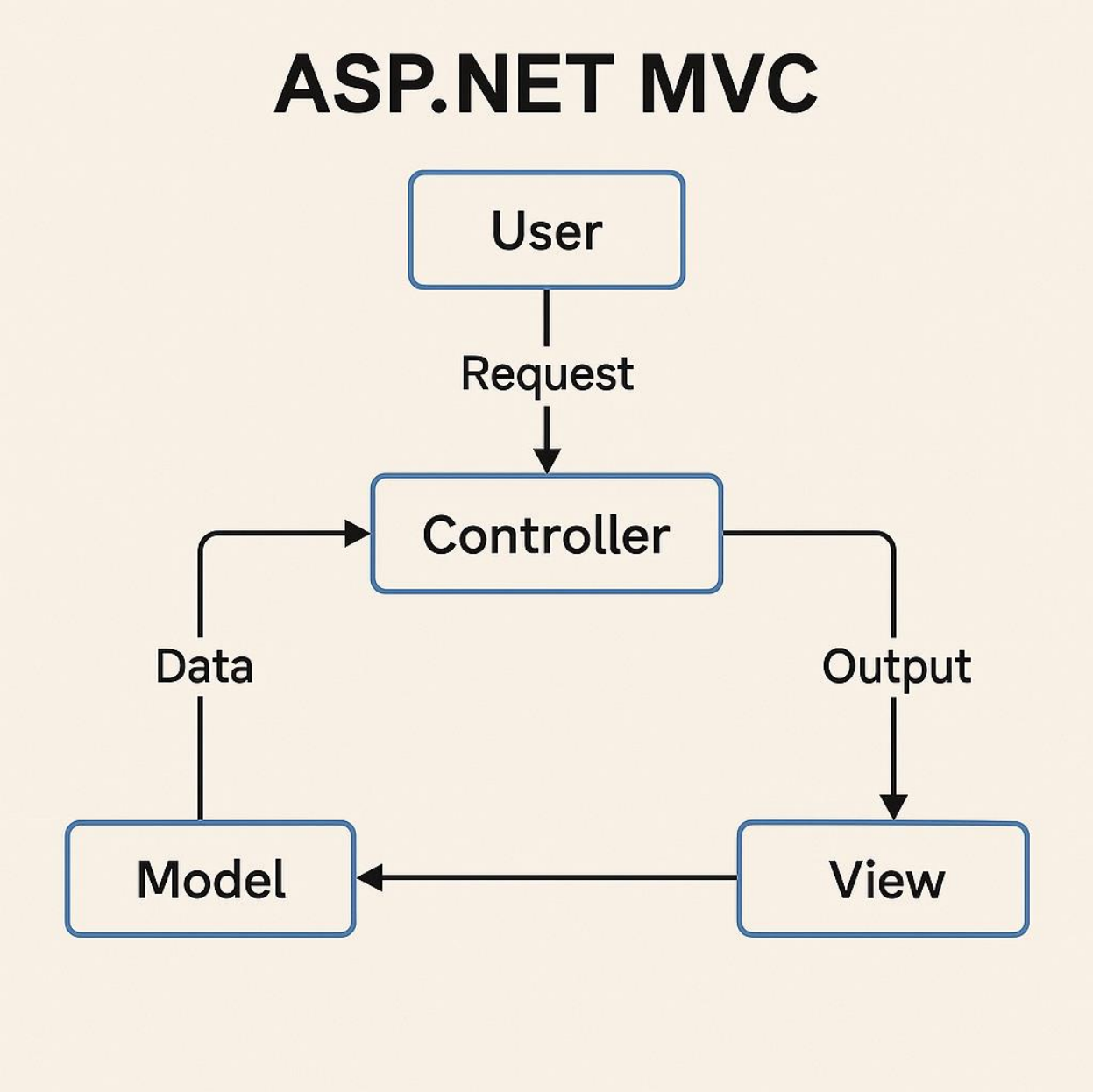
Controller talks to the **Model** if needed

🔽

Controller sends data to the **View (Index.cshtml)**

🔽

View shows HTML to the user



🧠 **Basic Concepts**

✅ **What is a Controller?**

A **Controller** is the **brain** of your web application.

- It **handles user requests**

- It **talks to the model** (data)
- Then it **returns a view** (HTML page) to the user

📌 Example:

csharp

CopyEdit

```
public class HomeController : Controller
{
   public ActionResult Index()
   {
      return View();
   }
}
```

✅ **What is an Action?**

An **Action** is just a **method inside the controller**.

- Each **action** handles one **task or page**
- Returns a view or data

📌 Example:

csharp

CopyEdit

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

✅ **What is a View?**

A **View** is the **HTML page** that the user sees.

- It uses **Razor syntax** (@) to show data from the controller.

📌 Example: Views/Home/Contact.cshtml

html

CopyEdit

<h1>Welcome, @ViewBag.Name</h1>

🔁 **Value Passing from Action to View**

Here are 4 ways to pass data from a controller's **action method** to a **view**:

✅ **1. ViewBag**

📌 ViewBag is a **dynamic object** used to pass data from Controller to View.

🔧 **Example:**

csharp

CopyEdit

public ActionResult Index()

{

ViewBag.Message = "Hello from ViewBag!";

return View();

}

html

CopyEdit

<!-- Index.cshtml -->

@ViewBag.Message

✅ **Advantages:**

- Easy to use
- No need to define any class or model

❌ **Disadvantages:**

- **No IntelliSense** (autocomplete)

- Type issues may occur (it's dynamic)
- Works **only for one request**

✅ **2. ViewData**

📌 ViewData is a **dictionary** object (key-value pair).

- You pass data like you do in a dictionary.

🔧 **Example:**

csharp

CopyEdit

```
public ActionResult Index()
{
   ViewData["Message"] = "Hello from ViewData!";
   return View();
}
```

html

CopyEdit

```
<!-- Index.cshtml -->
<p>@ViewData["Message"]</p>
```

✅ **Advantages:**

- Works in similar way as ViewBag
- Can store multiple values with keys

❌ **Disadvantages:**

- No IntelliSense
- Must cast to the correct type
- Works only for **current request**

✅ **3. TempData**

📌 TempData is also a dictionary, but it **persists data for the next request**.

- Useful for **Redirects**

🔧 **Example:**

csharp

CopyEdit

```
public ActionResult First()
{
   TempData["Notice"] = "You are redirected!";
   return RedirectToAction("Second");
}

public ActionResult Second()
{
   var msg = TempData["Notice"];
   return View();
}
```

html

CopyEdit

```
<!-- Second.cshtml -->
<p>@TempData["Notice"]</p>
```

✅ **Advantages:**

- **Can persist across redirects**
- Great for **passing small messages (alerts, notices)**

❌ **Disadvantages:**

- Stored in session — not good for large data
- Can be lost if not accessed properly

✅ **4. Model Binding (Strongly Typed View)**

📌 Pass a **model (class)** to the view — the cleanest and safest way.

🔧 **Model Class:**

csharp

CopyEdit

```
public class Student
{
    public string Name { get; set; }
    public int Age { get; set; }
}
```

🔧 **Controller:**

csharp

CopyEdit

```
public ActionResult Details()
{
    Student s = new Student { Name = "Rifat", Age = 22 };
    return View(s);
}
```

🔧 **View (Details.cshtml):**

csharp

CopyEdit

```
@model YourNamespace.Models.Student

<p>Name: @Model.Name</p>
<p>Age: @Model.Age</p>
```

✅ **Advantages:**

- **Type-safe**
- **IntelliSense** available
- Clean and maintainable

❌ **Disadvantages:**

- Need to create a model class
- A bit more setup than ViewBag/ViewData

🔚 **Summary Table:**

Technique	Type-Safe?	Use Across Redirect?	Easy to Use?	IntelliSense	Best Use Case
ViewBag	❌	❌	✅	❌	Small data for current view
ViewData	❌	❌	✅	❌	Similar to ViewBag, dictionary-style
TempData	❌	✅	✅	❌	Flash messages across actions
Model Binding	✅	✅ (if used with TempData or Session)	⚠️ (more setup)	✅	Passing structured data (best for real apps)

✅ **Ways to Process Data from View to Action**

🔹 **1. HttpRequest Base Object**

This is the **rawest** way to get form data — using Request.Form["key"].

✅ **Example:**

View (HTML):

html

CopyEdit

```
<form method="post" action="/Home/Submit">
    <input type="text" name="username" />
    <button type="submit">Send</button>
</form>
```

Controller:

csharp

CopyEdit

```
[HttpPost]
public ActionResult Submit()
{
    string user = Request.Form["username"];
    return Content("Hello " + user);
}
```

✅ **Advantages:**

- Direct access to form data
- Works without needing models

❌ **Disadvantages:**

- Not type-safe
- Prone to errors (spelling, data type mismatch)

🔹 **2. FormCollection Object**

This is a slightly more structured version of Request.Form, using a FormCollection parameter.

✅ **Example:**

View:

html

CopyEdit

```
<form method="post" action="/Home/Submit">
    <input type="text" name="username" />
    <input type="text" name="email" />
    <button type="submit">Send</button>
</form>
```

Controller:

csharp

CopyEdit

```
[HttpPost]
public ActionResult Submit(FormCollection form)
{
    string name = form["username"];
    string email = form["email"];
    return Content($"Name: {name}, Email: {email}");
}
```

✅ **Advantages:**

- Slightly more organized than Request.Form
- Easy to loop through all form fields

❌ **Disadvantages:**

- Still not type-safe
- Still dependent on correct field names

🔹 **3. Variable Name Mapping (Parameter Matching)**

This is a **cleaner way** where the input names match method parameters directly.

✅ **Example:**

View:

html

CopyEdit

```
<form method="post" action="/Home/Submit">
    <input type="text" name="username" />
    <input type="number" name="age" />
    <button type="submit">Submit</button>
</form>
```

Controller:

csharp

CopyEdit

```
[HttpPost]
public ActionResult Submit(string username, int age)
{
    return Content($"User: {username}, Age: {age}");
}
```

Field names **must exactly match** the parameter names!

✅ **Advantages:**

- Type-safe
- Clean and readable
- No need to create a model

❌ **Disadvantages:**

- Limited to few fields
- Not ideal for complex data

🔹 **4. Model Binding with Class (Strongly Typed Model)**

The **best and most professional** method — bind all form fields into a model (class).

✅ **Step 1: Create a Model**

csharp

CopyEdit

```
public class User
{
    public string Username { get; set; }
    public int Age { get; set; }
}
```

✅ **Step 2: View**

html

CopyEdit

```
@model YourApp.Models.User

@using (Html.BeginForm("Submit", "Home", FormMethod.Post))
{
    <input type="text" name="Username" />
    <input type="number" name="Age" />
    <button type="submit">Submit</button>
}
```

✅ **Step 3: Controller**

csharp

CopyEdit

```
[HttpPost]
public ActionResult Submit(User user)
{
    return Content($"Hello {user.Username}, age {user.Age}");
}
```

✅ **Advantages:**

- **Type-safe**
- **Cleaner and scalable**
- Good for **forms with many fields**
- Easy validation with [Required], [EmailAddress], etc.

❌ **Disadvantages:**

- Requires model class
- More setup for small/quick forms

🔚 **Summary Table**

Method	Type-Safe	Clean Code	Best For
Request.Form["key"]	❌	❌	Very basic form inputs
FormCollection	❌	⚠️	Simple multi-field forms
Variable Mapping	✅	✅	1-3 input fields
Model Binding (class)	✅ ✅	✅ ✅	Complex forms (recommended)

✅ What is Annotation in ASP.NET MVC?

Annotations are special tags (called attributes) that you write **above model properties** to add:

- Validation rules (like required, length, email format)
- Metadata (like display name)

They belong to the namespace:

csharp

CopyEdit

using System.ComponentModel.DataAnnotations;

✅ Why use Data Annotations?

To **automatically validate user input** without writing manual if-else checks.
You write rules **once** in the model, and MVC uses them both:

- On the **server** (C#)
- On the **client** (JavaScript validation in browser)

✅ Example with Explanation

🔷 Step 1: Create a Model with Annotations

csharp

CopyEdit

using System.ComponentModel.DataAnnotations;

```
public class User
{
    [Required(ErrorMessage = "Name is required")]
    [StringLength(20, ErrorMessage = "Name can't be more than 20 characters")]
    public string Name { get; set; }

    [Range(18, 60, ErrorMessage = "Age must be between 18 and 60")]
    public int Age { get; set; }

    [EmailAddress(ErrorMessage = "Invalid Email format")]
    public string Email { get; set; }

    [DataType(DataType.Password)]
    [Required(ErrorMessage = "Password is required")]
    public string Password { get; set; }

    [Compare("Password", ErrorMessage = "Passwords do not match")]
    public string ConfirmPassword { get; set; }
}
```

🔷 Step 2: Create the View (Razor Form)

```
html
CopyEdit
@model YourApp.Models.User

@using (Html.BeginForm())
{
```

```
    @Html.LabelFor(m => m.Name)
    @Html.TextBoxFor(m => m.Name)
    @Html.ValidationMessageFor(m => m.Name)

    @Html.LabelFor(m => m.Age)
    @Html.TextBoxFor(m => m.Age)
    @Html.ValidationMessageFor(m => m.Age)

    @Html.LabelFor(m => m.Email)
    @Html.TextBoxFor(m => m.Email)
    @Html.ValidationMessageFor(m => m.Email)

    @Html.LabelFor(m => m.Password)
    @Html.PasswordFor(m => m.Password)
    @Html.ValidationMessageFor(m => m.Password)

    @Html.LabelFor(m => m.ConfirmPassword)
    @Html.PasswordFor(m => m.ConfirmPassword)
    @Html.ValidationMessageFor(m => m.ConfirmPassword)

    <button type="submit">Submit</button>
}

@section Scripts {
    @Scripts.Render("~/bundles/jqueryval")
}
```

⚠️ @Scripts.Render("~/bundles/jqueryval") enables **client-side validation**. Make sure your project includes jQuery validation bundles.

🔷 Step 3: Controller Action

csharp

CopyEdit

```
[HttpPost]
public ActionResult Register(User user)
{
    if (ModelState.IsValid)
    {
        // Save user, redirect, or show success
        return Content("Registration successful!");
    }

    // If not valid, return the same view with errors
    return View(user);
}
```

✅ Common Data Annotations

Annotation	Description
[Required]	Field must not be empty
[StringLength(max)]	Max allowed characters
[Range(min, max)]	Value must fall in given range
[EmailAddress]	Must be a valid email format
[DataType(DataType.Password)]	Show as password input
[Compare("OtherField")]	Compares with another field (e.g., password)
[Display(Name = "Full Name")]	Custom label name

✅ Advantages

- Clean code: validation logic stays in the model
- Less repeated code
- Automatic error display in view
- Both client-side and server-side validation

❌ Disadvantages

- Cannot handle **very complex conditions** (e.g., if A is true, then B must be X)
- Still need custom validation for some logic