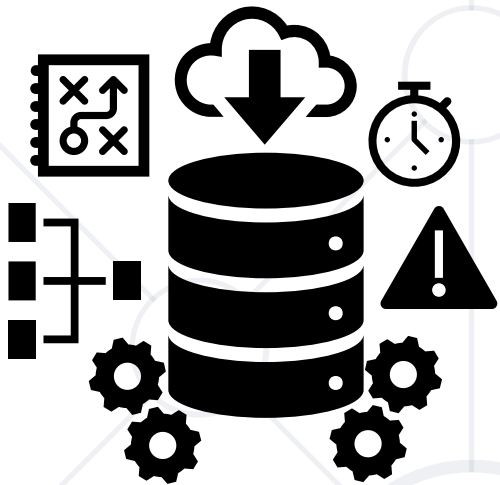


Routing and Binding, Views, DI and Services

Custom Model Binding and Validation, Files, Razor Syntax, Special Views, Routing and Dependency Injection



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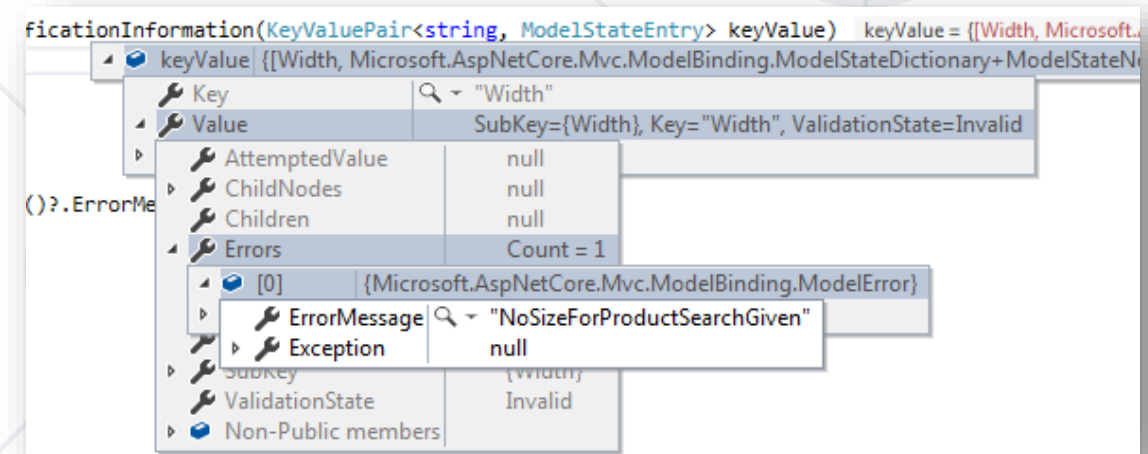




Custom Model Binding

Model Binding Overview

- Bridge between **HTTP request** and **action method parameters**
- Data from HTTP requests is used by controllers
 - Retrieved from **route data, form fields, query strings**, etc.
- Request data is bound to action parameters by **name**
 - If binding is **not** successful, an error is **not** thrown
- The model binding behavior can be **customized**



- Built-in Model binding behavior can be directed to a different source
 - The framework provides several attributes for that

| Attribute | Description |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------|
| [BindRequired] | Adds a model state error if binding cannot occur. |
| [BindNever] | Tells the model binder to never bind this parameter. |
| [From{source}] | Used to specify the exact binding source. [FromHeader] , [FromQuery] , [FromRoute] , [FromForm] |
| [FromServices] | Uses dependency injection to bind parameters from services. |
| [FromBody] | Use configure formatters to bind data from request body. Formatter is selected based on Content-Type of Request. |
| [ModelBinder] | Used to override the default model binder , binding source and name . |

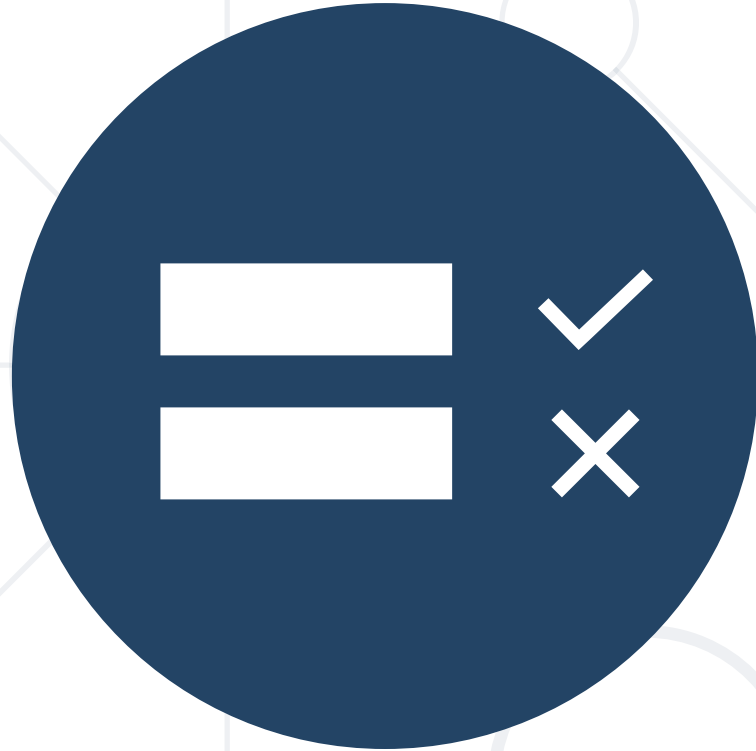
- **Custom Model Binding** can be completely customized
 - You need to create a **BindingProvider** and a **Binder**

```
[ModelBinder(BinderType = typeof(StudentEntityBinder))]  
public class Student  
{  
    public int Id { get; set; }  
    public string Name { get; set; }  
    public int Age { get; set; }  
}  
  
public class StudentEntityBinder : IModelBinder  
{  
    public Task BindModelAsync  
        (ModelBindingContext bindingContext)  
    {  
        // TODO: Do Magic ...  
        bindingContext.Result  
            = ModelBindingResult.Success(model);  
        return Task.CompletedTask;  
    }  
}
```

Custom Model Binder

```
public class StudentEntityBinderProvider : IModelBinderProvider
{
    public IModelBinder GetBinder(ModelBinderProviderContext context)
    {
        if(context == null)
        {
            throw new ArgumentNullException(nameof(context));
        }
        if(context.Metadata.ModelType == typeof(Student))
        {
            return new BinderTypeModelBinder(typeof(StudentEntityBinder));
        }
        return null;
    }
}
```

```
services.AddControllerWithViews(options =>
{
    options.ModelBinderProviders
        .Insert(0, new StudentEntityBinderProvider());
    // Add custom binder to beginning
});
```

Custom Model Validation

- Model validation occurs **after** model binding
 - Reports **errors** that originate from model binding
- Two types of validation
 - Server-side
 - Client-side
- **ModelState.IsValid** property indicates if the model validation is successful
 - Iterates over the errors

- **Validation attributes** work for most needs, but not for all
 - Sometimes you need to implement your own validation attributes

```
public class IsBefore : ValidationAttribute
{
    private const string DateTimeFormat = "dd/MM/yyyy";
    private readonly DateTime date;

    public IsBefore(string dateInput)
    {
        date = DateTime.ParseExact(dateInput, DateTimeFormat, CultureInfo.InvariantCulture);
    }

    protected override ValidationResult IsValid(object value, ValidationContext validationContext)
    {
        if ((DateTime)value >= date) return new ValidationResult(ErrorMessage);
        return ValidationResult.Success;
    }
}
```

- Then you can use it in your model

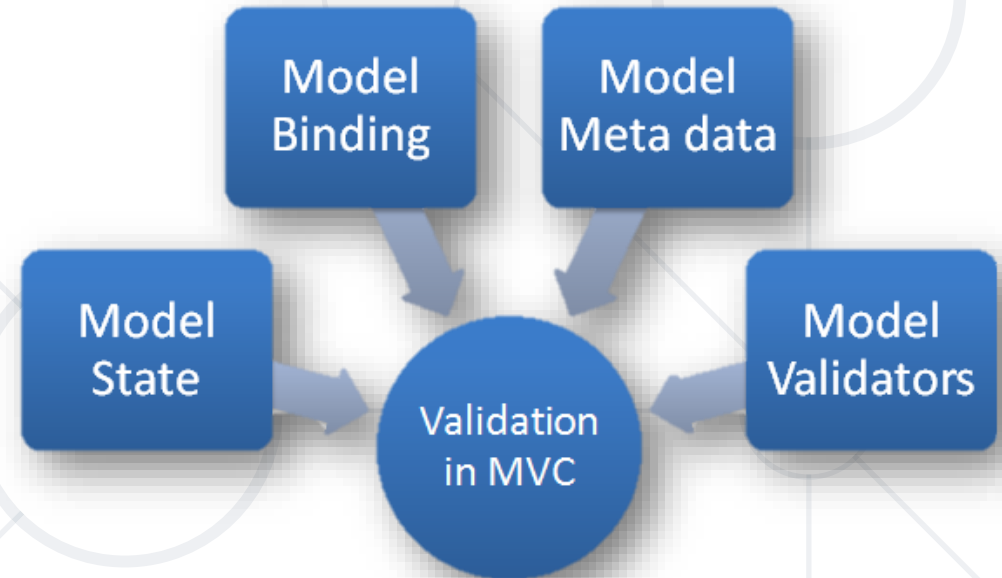
```
public class RegisterUserModel
{
    [Required]
    public string Username { get; set; }

    [Required]
    [StringLength(20)]
    public string Password { get; set; }

    [Required]
    public string FirstName { get; set; }

    [Required]
    public string LastName { get; set; }

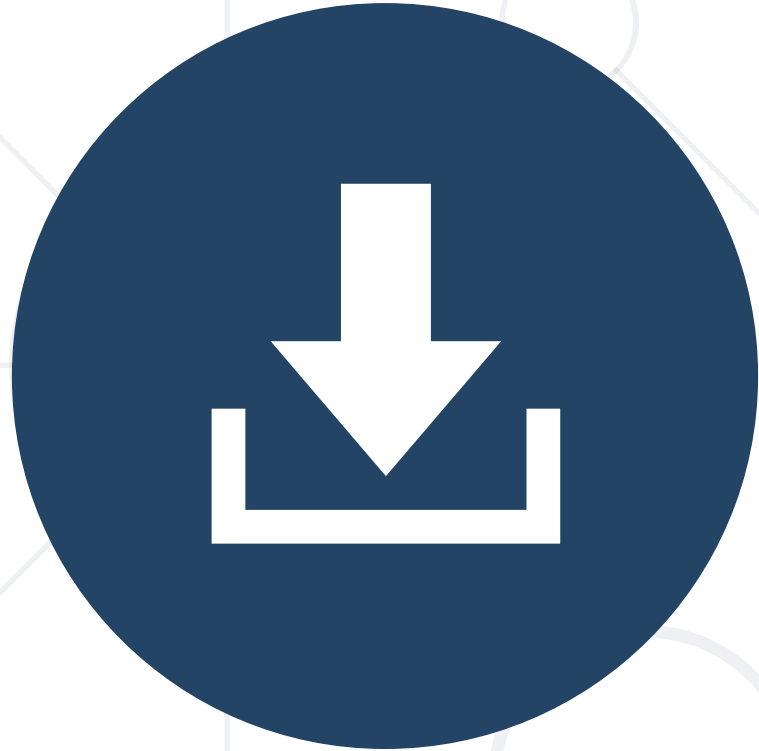
    [IsBefore("01/01/2000")]
    public DateTime BirthDate { get; set; }
}
```



- You can also use validation **directly** in the Binding Model
 - This is done by using the **IValidatableObject** interface

```
public class RegisterUserModel : IValidatableObject
{
    public string Username { get; set; }
    public string Password { get; set; }
    public string ConfirmPassword { get; set; }

    public IEnumerable<ValidationResult> Validate(ValidationContext validationContext)
    {
        if(string.IsNullOrEmpty(Username)) yield return new ValidationResult("Username cannot be empty");
        if(string.IsNullOrEmpty>Password)) yield return new ValidationResult("Password cannot be empty");
        if(ConfirmPassword != Password) yield return new ValidationResult("Passwords do not match");
    }
}
```



Uploading and Downloading Files

Files

- **ASP.NET Core MVC** supports **File Upload** using simple model binding
 - For larger files, **Streaming** is used

```
<form method="post" enctype="multipart/form-data"
      asp-controller="Files" asp-action="Upload">
  <input type="file" name="file">
  <button type="submit" value="Upload" />
</form>
```

- **Multiple-file** upload is also supported

```
<form method="post" enctype="multipart/form-data"
      asp-controller="Files" asp-action="Upload">
  <input type="file" name="files" multiple >
  <button type="submit" value="Upload" />
</form>
```

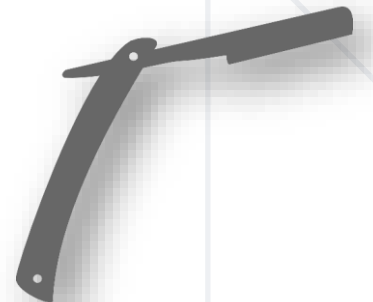
- When uploading files using model binding, your action should accept
 - **IFormFile** (for single file) or **IEnumerable<IFormFile>** (or **List<IFormFile>**)

```
[HttpPost("Upload")]
public async Task<IActionResult> Upload(List<IFormFile> files)
{
    var filePath = Path.GetTempFileName(); // Full path to file in temp location

    foreach (var formFile in files.Where(f => f.Length > 0))
    {
        using (var stream = new FileStream(filePath, FileMode.Create))
        {
            await formFile.CopyToAsync(stream);
        }
    } // Copy files to FileSystem using Streams

    var bytes = files.Sum(f => f.Length);
    return Ok(new { count = files.Count, bytes, filePath });
}
```


- **ASP.NET Core** abstracts file system access through **File Providers**
 - File Providers are used throughout the ASP.NET Core framework
- Examples of where **ASP.NET Core** uses **File Providers** internally
 - **IHostingEnvironment** exposes the app's **content root** and **web root**
 - **Static File Middleware** uses **File Providers** to locate static files
 - **Razor** uses **File Providers** to locate pages and views



- To access physical files, you have to use **PhysicalFileProvider**
 - You'll have to initialize it with your server physical files folder path
 - Then you can extract information about the **File**

```
public IActionResult Download(string fileName)
{
    // Construct the path to the physical files folder
    string filePath = this.env.ContentRootPath + this.config["FileSystem:FilesFolderPath"];

    IFileProvider provider = new PhysicalFileProvider(filePath); // Initialize the Provider
    FileInfo fileInfo = provider.GetFileInfo(fileName); // Extract the FileInfo

    var readStream = fileInfo.CreateReadStream(); // Extract the Stream
    var mimeType = "application/octet-stream"; // Set a mimeType

    return File(readStream, mimeType, fileName); // Return FileResult
} // NOTE: There is no check if the File exists. This action may result in an error
```



Razor Syntax

What is Razor?

- Simple-syntax **view engine**
- **Code-focused** templating approach
- Easy transition between HTML and code
- Combining **HTML** and **C#**

```
<div class="article">
  <div>@article.Title</div>
  <div>@article.Content</div>
</div>
```

```
<ul id="products">
  @foreach (var p in products)
  {
    <li>@p.Name ($@p.Price)</li>
  }
</ul>
```

- **@** – For values (HTML encoded)

```
<p>  
    Current time is: @DateTime.Now  
    Not HTML encoded value: @Html.Raw(someVar)  
</p>
```

- **@{...}** – For code blocks (keep the view simple)

```
@{  
    var productName = "Energy drink";  
    if (Model != null) { productName = Model.ProductName; }  
    else if (ViewBag.ProductName != null) { productName = ViewBag.ProductName; }  
}  
<p>Product "@productName" has been added in your shopping cart</p>
```

- **If, else, for, foreach**, etc. C# statements
 - HTML markup lines can be included at any part
 - **@:** – For plain text line to be rendered

```
<div class="products-list">
@if (Model.Products.Count() == 0) { <p>Sorry, no products found!</p> }
else
{
    @:List of the products found:
    foreach(var product in Model.Products)
    {
        <b>@product.Name, </b>
    }
}
</div>
```

■ Comments

```
@*  
A Razor Comment  
*@  
@{  
    // A C# comment  
    /* A Multi  
       line C# comment  
    */  
}  
<!-- HTML Comment -->
```

■ Escaping @

```
<p>  
    This is the sign that separates email names from domains: @@<br />  
    And this is how smart Razor is: spam_me@gmail.com  
</p>
```

- **@(...)** – Explicit code expression

```
<p>  
    Current rating(0-10): @Model.Rating / 10.0    @* 6 / 10.0 *@  
    Current rating(0-1): @(Model.Rating / 10.0)  @* 0.6 *@  
    spam_me@Model.Rating                        @* spam_me@Model.Rating *@  
    spam_me@(Model.Rating)                     @* spam_me6 *@  
</p>
```

- **@using** – for including namespace into view
- **@model** – for defining the model for the view

```
@using MyWebApp.Models;  
@model UserModel  
<p>@Model.Username</p>
```


Views – Dependency Injection

- **ASP.NET Core** supports **dependency injection** into views
 - You can inject a **Service** into a **View** by using **@inject**

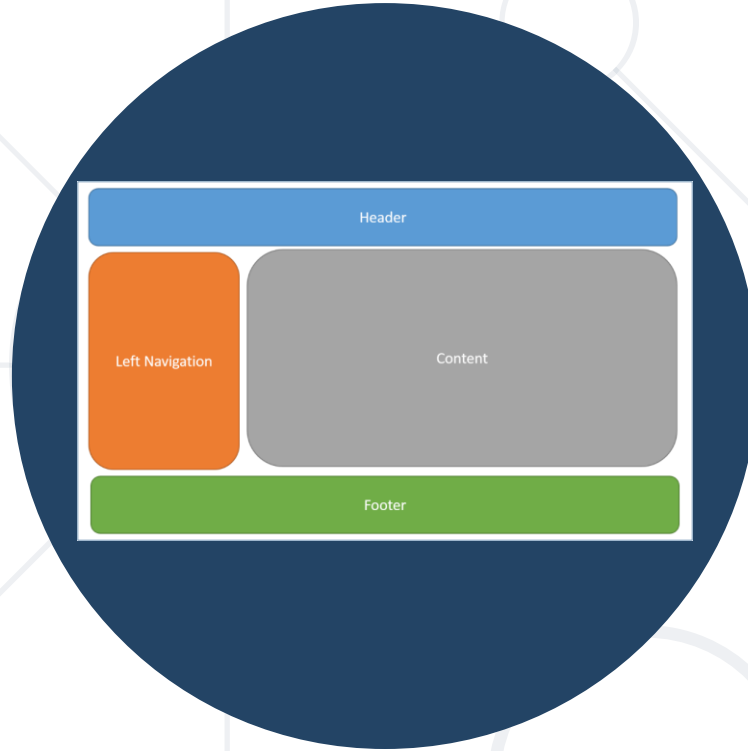
```
public class DataService
{
    1 reference
    public IEnumerable<string> GetData()
    {
        return new[] { "David", "John", "Max", "George" };
    }
}
```

```
builder.Services.AddScoped<DataService, DataService>();
```

```
@using Demo.Services
@inject DataService DataService

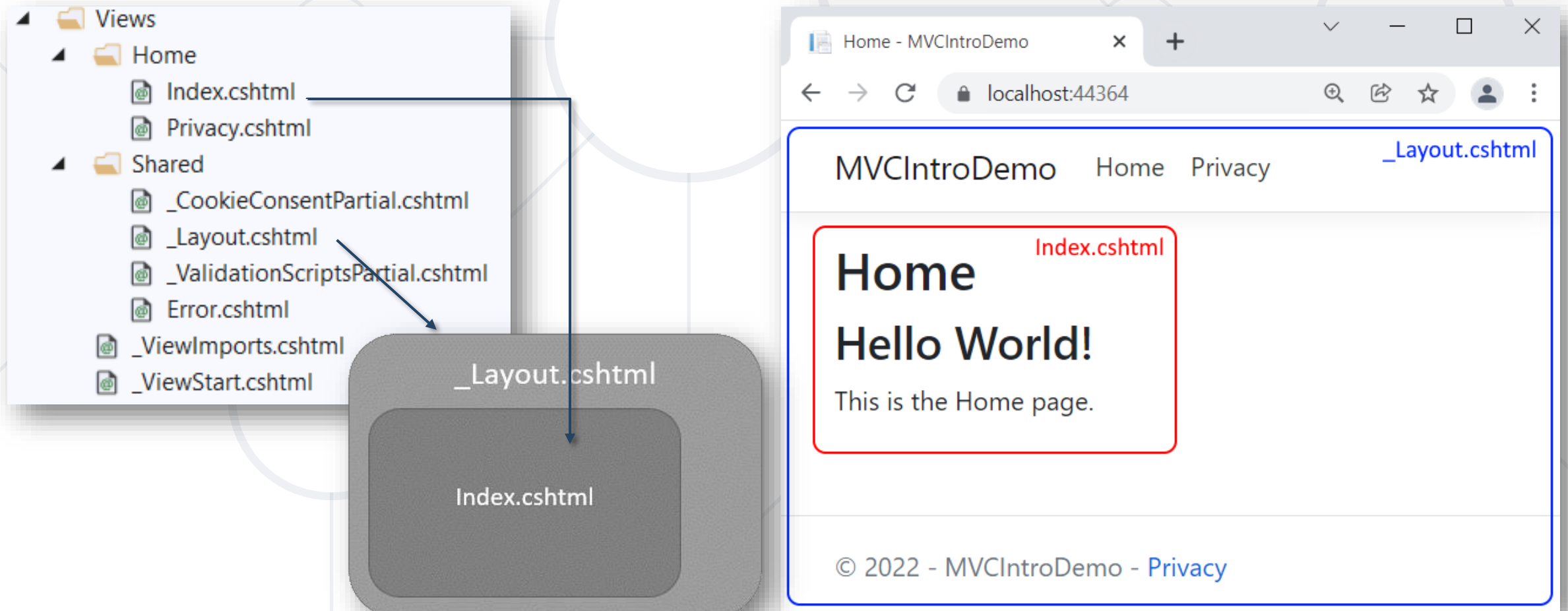
<div class="list">
    @foreach(var item in DataService.GetData)
    {
        <h1>@item</h1>
    }
</div>
```

David
John
Max
George



Layout and Special View Files

- Defines a **common site template** (~Views/Shared/_Layout.cshtml)



- Razor View engine renders content **inside-out**
 - First the **View** is rendered, and after that – the **Layout**
- **@RenderBody()** – indicate where we want the views based on this layout to "**fill in**" their core content at that location in the HTML

```
<!DOCTYPE html>
<html>
<head>
    <meta name="viewport" content="width=device-width" />
    <title>@ViewBag.Title</title>
</head>
<body>
    <nav>@* Menu *@</nav>
    <div>
        @RenderBody()
    </div>
</body>
</html>
```

- You can have one or more "sections" (optional), defined in views

```
Index.cshtml  X
@section SideBar {
    <aside> Some side info</aside>
}
```

- Can be rendered anywhere in the layout page using the method **RenderSection()**

- @RenderSection(string name, bool required)**
- If the section is required and not defined, an exception will be thrown (**IsSectionDefined()**)

```
<!DOCTYPE html>
<html lang="en">
<head>
    <title>@ViewBag.Title</title>
    <link href="@Url.Content("~/Content/site.css")"
          rel="stylesheet" type="text/css" />
</head>
<body>
    <div id="header">
        <h1>My Site Header</h1>
    </div>

    <div id="sidebar">
        @RenderSection("SideBar", required: false);
    </div>

    <div id="content">
        @RenderBody();
    </div>

    <div id="footer">
        <h1>Site Footer - &copy; </h1>
    </div>
</body>
</html>
```

Index.cshtml

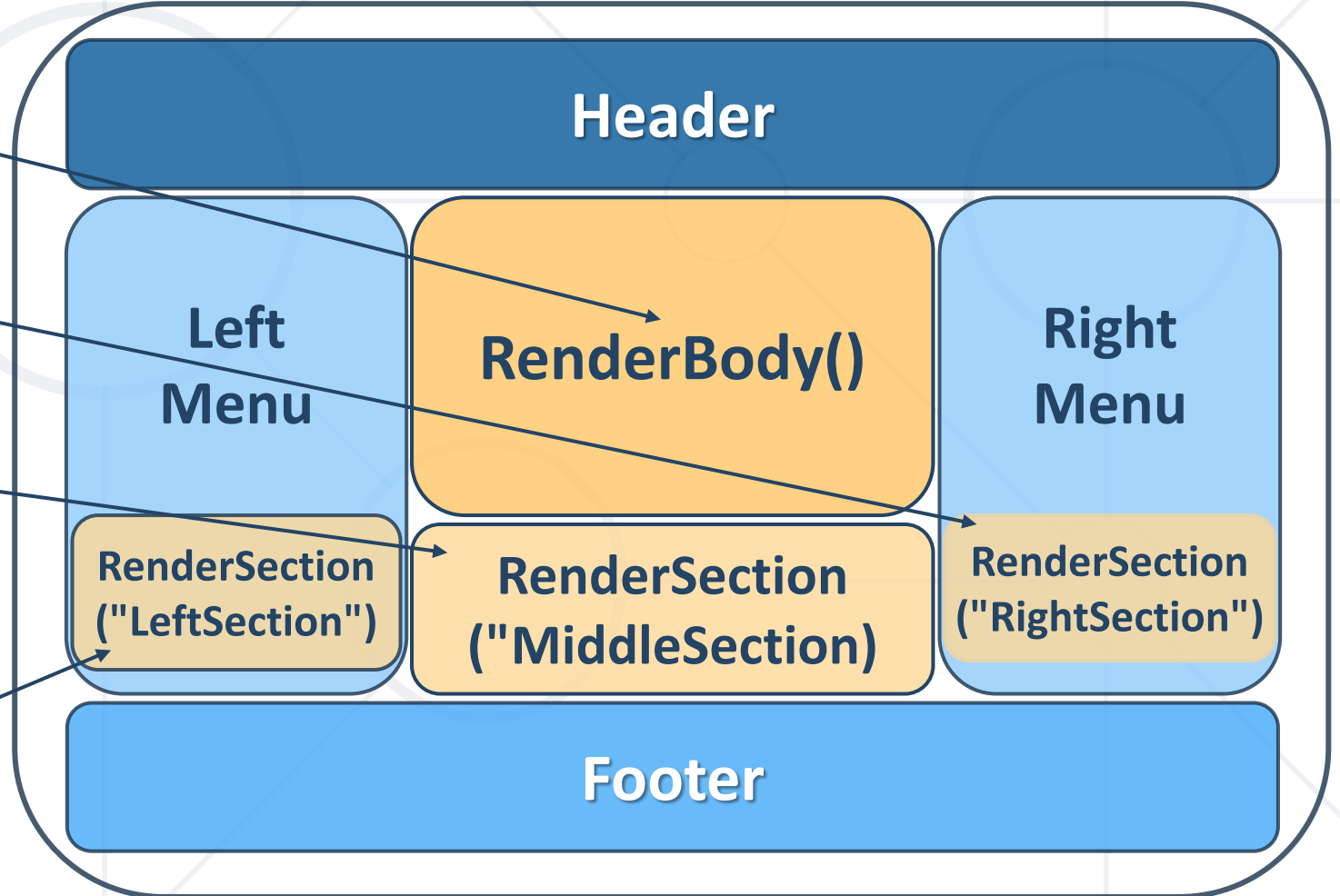
```
<div>
  This is the main content
</div>

@section RightSection {
  <text>
    This is the right section
  </text>
}

@section MiddleSection {
  <text>
    This is the middle section
  </text>
}

@section LeftSection {
  <text>
    This is the middle section
  </text>
}
```

_Layout.cshtml



- Views don't need to specify layout since their default layout is set in their **_ViewStart** file
 - **~/Views/_ViewStart.cshtml** (code for all views)
- Each view can specify custom layout pages

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

- Views without layout

```
@{  
    Layout = null;  
}
```

- If a directive or a dependency is shared between many Views, it can be specified globally in the **ViewImports**
 - **~/Views/_ViewImports.cshtml** (code for all views)

```
@using MyWebApp
@using MyWebApp.Models
@using MyWebApp.Models.AccountViewModels
@using MyWebApp.Models.ManageViewModels
@using Microsoft.AspNetCore.Identity
@addTagHelper *, Microsoft.AspNetCore.Mvc.TagHelpers
```

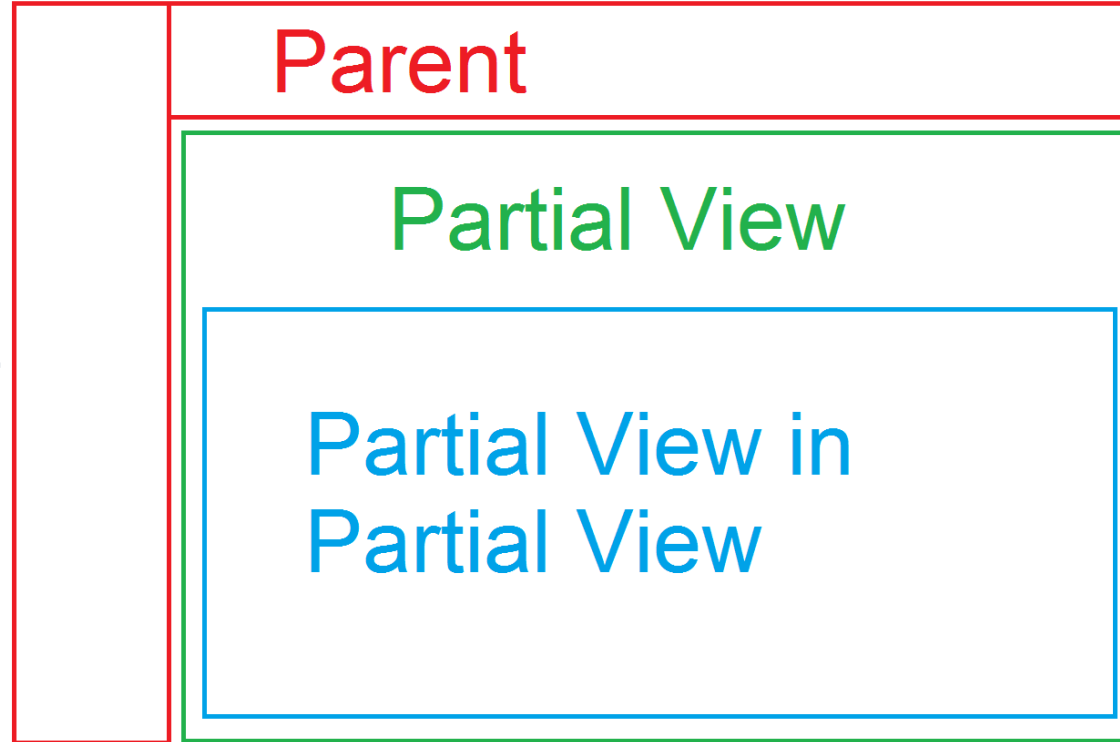
- This file does not support other Razor features

- This file contains **validation scripts** in the form of a partial view
 - **~/Views/Shared/_ValidationScriptsPartial.cshtml**

```
<script
  src="~/lib/jquery-validation/dist/jquery.validate.min.js">
</script>
<script
  src="~/lib/jquery-validation-unobtrusive/jquery.validate.unobtrusive.min.js">
</script>
```

- To use them, render the **partial view** inside a **view** in a **section**

```
@section Scripts {
  <partial name="_ValidationScriptsPartial" />
}
```



Partial Views and View Components

- **Partial Views** render portions of a page
 - Break up large markup files into smaller components
 - Reduce the duplication of common view code
- Razor partial views are normal views (**.cshtml** files)
 - Usually placed in **/Shared/** or in the same directory where used



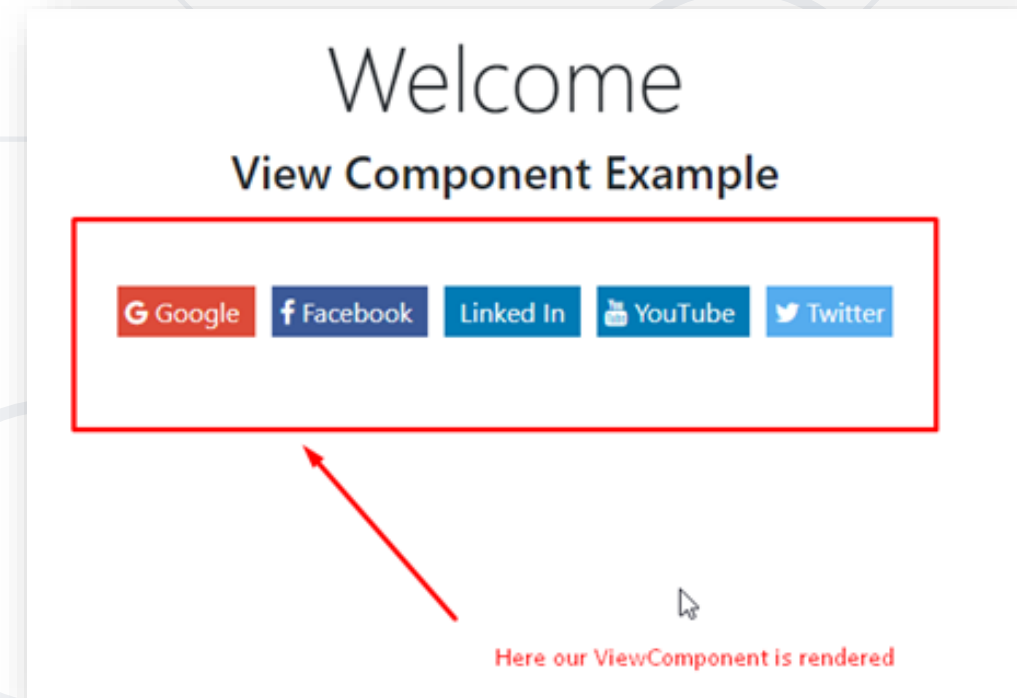
■ HTML Helper for Partial Views

```
@using WebApplication.Models;  
@model ProductsListViewModel  
  
@foreach (var product in Model.Products)  
{  
    @await Html.PartialAsync("_ProductPartial", product);  
}
```

■ Tag Helper for Partial Views

```
@foreach (var product in Model.Products)  
{  
    <partial name="_ProductPartial" model="product" />  
}
```

- **View Components** are similar to **Partial Views**, but much more powerful
 - No model binding
 - Depend only on the data provided to it
- **View Components**
 - Render a **chunk** rather than a whole response
 - Can have parameters and business logic
 - Typically invoked from a **Layout** page
 - Include the same **separation of concerns** and testability benefits between controller / view



- **View components** are intended anywhere you have reusable rendering logic that's too complex for a partial view
 - Dynamic navigation menus
 - Login panels
 - Shopping carts
 - Sidebar content
 - Recently published articles
 - Tag cloud

AspNetCoreViewComponent Home About Contact

View Component Example using Tag Helper

Students

- 0 - Student 0
- 1 - Student 1
- 2 - Student 2

Student List

- 0 - Student 0
- 1 - Student 1
- 2 - Student 2
- 3 - Student 3
- 4 - Student 4
- 5 - Student 5

```
@await Component.InvokeAsync("StudentList", new { noOfStudent = 2 })
```

```
<vc:student-list no-of-student="5">  
</vc:student-list>
```

- **View Components** consist of 2 parts
 - A **class** – typically derived from **ViewComponent**
 - A **result** – typically a **View**
- **View Components**
 - Define their logic in a method called **InvokeAsync()**
 - Never directly handle a **Request**
 - Typically initialize a **Model** which is passed to the **View**

Defining Your Own ViewComponent

`\ViewComponents\HelloWorldViewComponent.cs`

```
public class HelloWorldViewComponent : ViewComponent
{
    private readonly DataService _dataService;
    public HelloWorldViewComponent(DataService dataService)
        => _dataService = dataService;

    public async Task<IViewComponentResult> InvokeAsync(string name)
    {
        string helloMessage =
            await _dataService.GetHelloAsync();

        ViewData["Message"] = helloMessage;
        ViewData["Name"] = name;

        return View();
    }
}
```

Inherit the
ViewComponent class

Components **don't**
handle requests
directly

Async method with **logic**

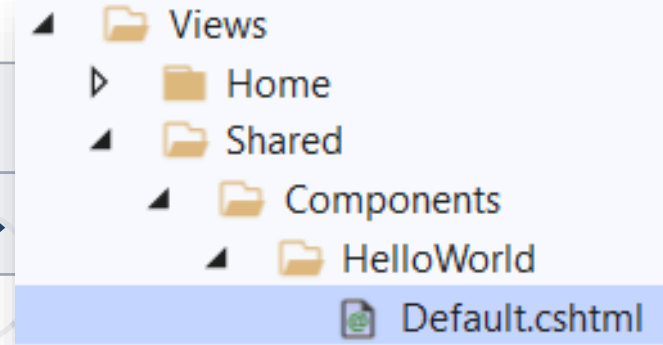
Typically return a **view**

They often initialize a
model which is
passed to the **view**

Defining Your Own ViewComponent

```
\Views\Shared\Components\HelloWorld\Default.cshtml
```

```
<h1>@ViewData["Message"]!!! I am @ViewData["Name"]</h1>
```



```
\Views\Home\Index.cshtml
```

```
...  
<div class="view-component-content">  
    @await Component.InvokeAsync("HelloWorld", new { name = "David" });  
    <vc:HelloWorld name="John"></vc:HelloWorld>  
</div>
```

To use a **Tag Helper**, register the **assembly** of the view component using the **@addTagHelper** directive



HTML Helpers and Tag Helpers

- Each view inherits **RazorPage**
 - **RazorPage** has a property named **Html**
- The **Html** Property has methods that return string can be used to
 - Create inputs
 - Create links
 - Create forms
- **Avoid** using HTML Helpers
 - Use Tag Helpers instead

```
@using (Html.BeginForm("Search", "Users",  
                        FormMethod.Post))  
{  
    @Html.TextBox("username")  
    <input type="submit" />  
}  
@Html.Raw(htmlContent)
```

| HTML Helpers | |
|--------------------|----------------|
| @Html.ActionLink | @Html.TextBox |
| @Html.BeginForm | @Html.TextArea |
| @Html.CheckBox | @Html.Password |
| @Html.Display | @Html.Hidden |
| @Html.Editor | @Html.Label |
| @Html.DropDownList | @Html.Action |

- **Tag Helpers** enable the participation of Server-side code in the HTML element creation and rendering, in **Razor views**
 - There are built-in **Tag Helpers** for many common tasks
 - Forms, Links, Assets, etc.
 - There are **custom** Tag Helpers in **GitHub** repos and **NuGet**

Often start
with **asp-**

```
<div class="form-group">
  <label asp-for="Password" class="col-md-2">Password</label>
  <div class="col-md-10">
    <input asp-for="Password" class="form-control" />
    <span asp-validation-for="Password" class="text-danger"></span>
  </div>
</div>
```

Tag Helpers vs HTML Helpers

- **Tag Helpers** attach to HTML elements in Razor Views
- **Tag Helpers** reduce the explicit transitions between **HTML** & **C#**
- **Tag Helpers** make the Razor markup quite **clean** and the views – quite **simple**
- **HTML Helpers** are invoked as methods which generate content
- **HTML Helpers** tend to include a lot of C# code in the markup
- **HTML Helpers** use complex and very **C#-specific** Razor syntax in some cases

```
<label asp-for="firstName">First Name: </label>
```

```
@Html.Label("firstName", "FirstName: ");
```



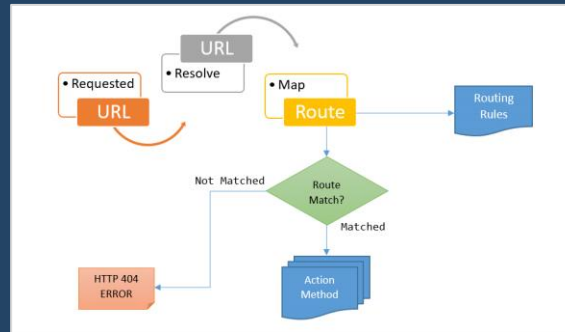
Creating Your Own Tag Helper

```
[HtmlTargetElement("h1")]
public class HelloTagHelper : TagHelper
{
    private const string MessageFormat = "Hello, {0}";
    public string TargetName { get; set; }

    public override void Process(TagHelperContext context, TagHelperOutput output)
    {
        string formattedMessage = string.Format(MessageFormat, this.TargetName);
        output.Content.SetContent(formattedMessage);
    }
}
```

```
@using WebApplication;
@addTagHelper *, Microsoft.AspNetCore.Mvc.TagHelper
@addTagHelper WebApplication.TagHelpersHelloTagHelper, WebApplication

<div class="tag-helper-content">
    <h1 target-name="John"></h1>
</div>
```

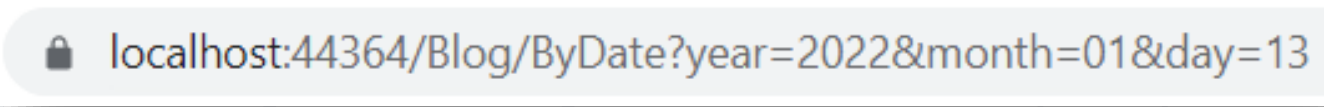


Routing

- **Route Constraints** are rules on the URL segments

```
endpoints.MapControllerRoute(  
    name: "blog",  
    pattern: "{year}/{month}/{day}",  
    defaults: new { controller = "Blog", action = "ByDate" },  
    constraints: new { year = @"\d{4}", month = @"\d{1,2}", day = @"\d{1,2}" }  
);
```

- All the constraints are **regular expression compatible** with the **Regex** class



```
class BlogController : Controller {  
    public IActionResult ByDate(  
        string year, string month, string day)  
    { ... }  
}
```


- It uses a set of attributes to map **actions** directly to **route template**
- It can also directly define the **request method**
- **Http{Action}** attributes are quite often used in **REST APIs**

```
public class HomeController : Controller
{
    [Route("/")]
    public IActionResult Index() => View();
}
```

```
public class HomeController : Controller
{
    [HttpGet("/")]
    public IActionResult Index() => View();
}
```

```
public class UsersController : Controller
{
    [HttpPost("Login")]
    public IActionResult Login() => View();
}
```

- **Attribute routing** allows you to create multiple routes for a single action
- It also allows you to **combine** a route for a **controller** and an **action route**

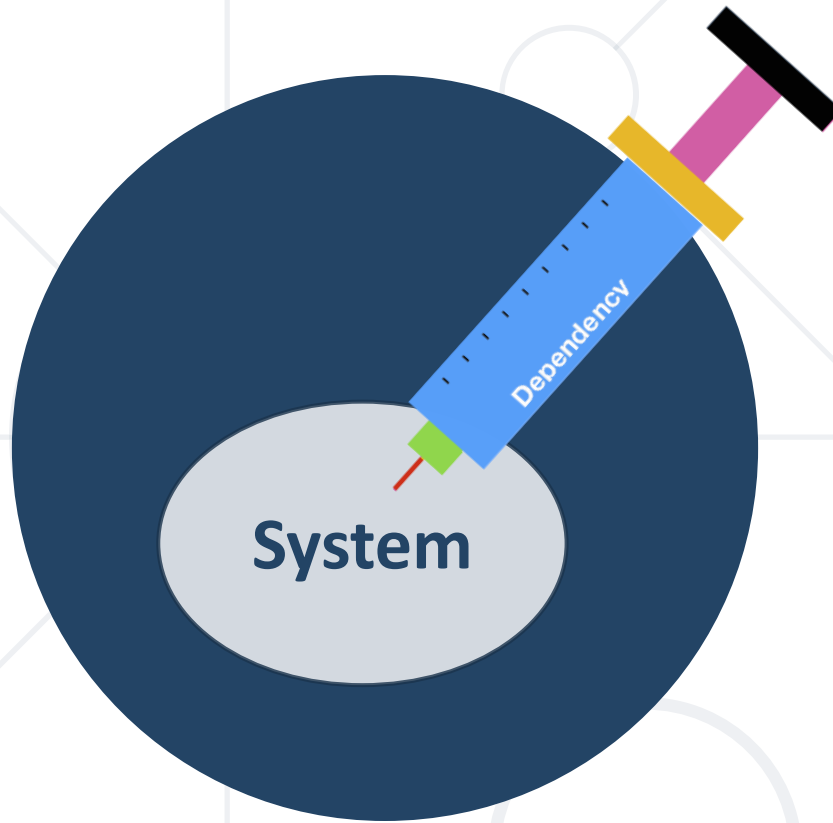
```
public class HomeController :  
Controller  
{  
    // ...  
    [Route("/")]  
    [Route("Index")]  
    public IActionResult Index()  
    {  
        return View();  
    }  
}
```

```
[Route("Home")]  
public class HomeController : Controller  
{  
    // ...  
    [Route("/")] // Does not combine, Route - /  
    [Route("Index")] // Route - /Home/Index  
    [Route("")] // Route - /Home  
    public IActionResult Index()  
    {  
        return View();  
    }  
}
```

- Can be modified to serve other folders

```
app.UseStaticFiles(  
    new StaticFileOptions()  
    {  
        FileProvider = new PhysicalFileProvider(  
            Path.Combine(Directory.GetCurrentDirectory(), "OtherFiles")),  
        RequestPath = new PathString("/files")  
    })
```

This will serve "**style.css**" file
upon request
"**http://{app}/files/style.css**" from "**OtherFiles**"
instead of "**wwwroot**"



Dependency Injection

Design Pattern for IoC Implementation

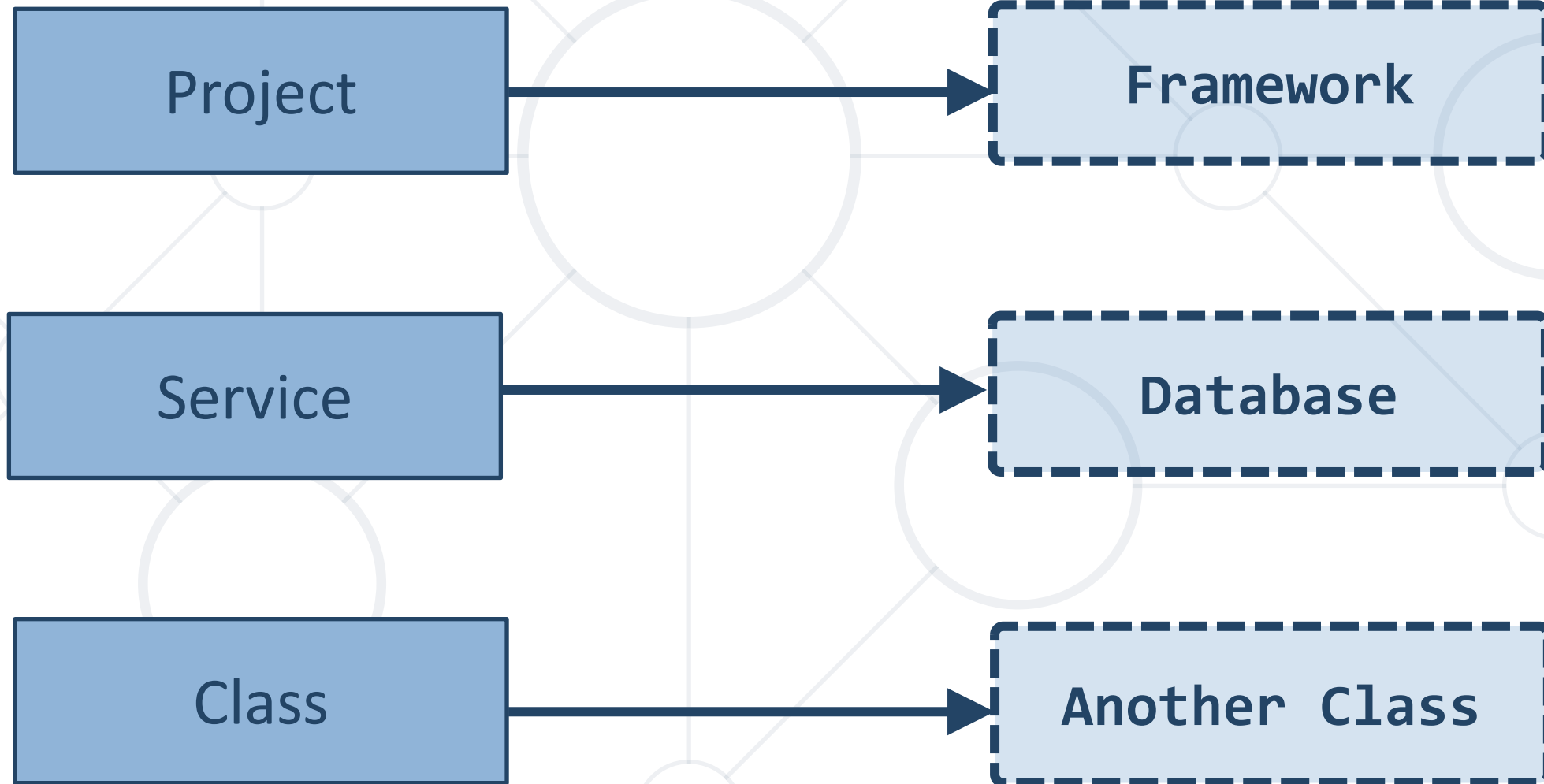
What is a Dependency?

- Another **object** that your class **needs**
 - Other examples (**Framework, Database, File System, Providers**)
- Classes **dependent** on each other are called **coupled**
- Dependencies are **bad** because they **decrease** reuse

```
public class Customer
{
    var customerService =
        new CustomerService('Service');
}
```

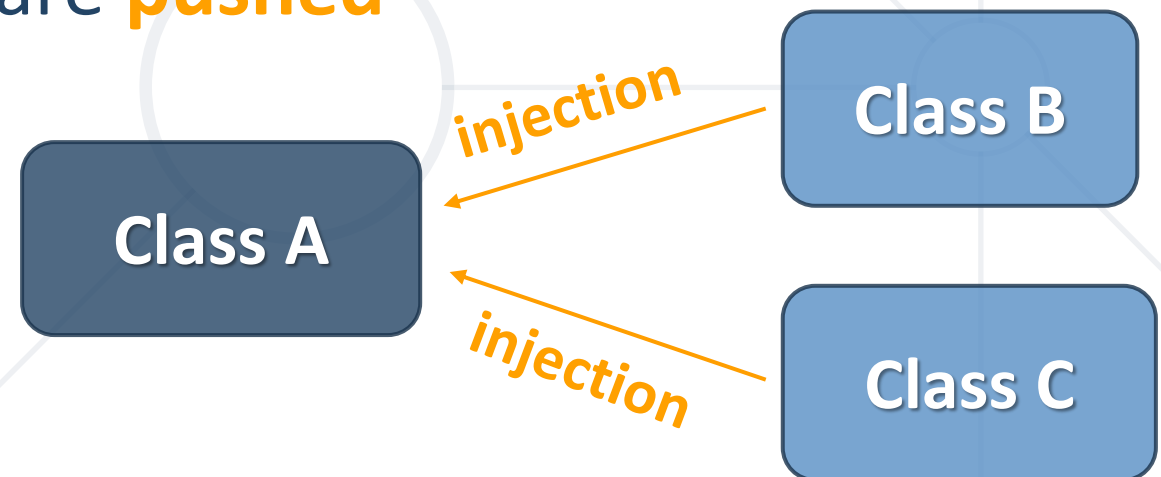
Customer class is **dependent**
on **concrete** service

Dependency Examples

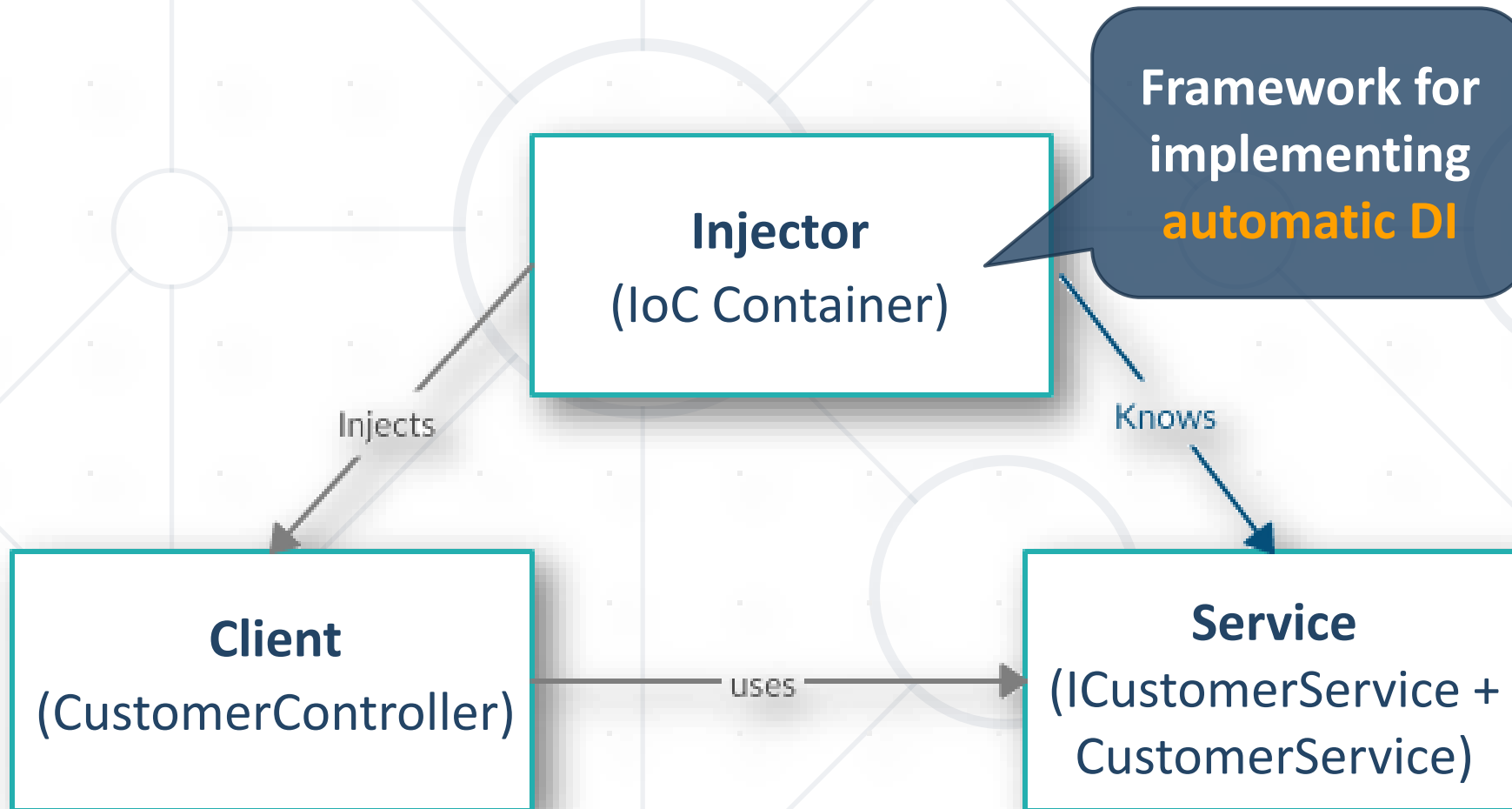


What is Dependency Injection?

- **Dependency Injection** (DI) is a popular **design pattern**
- It is a technique for achieving **Inversion of Control** (IoC)
 - Classes should declare what they need
 - Constructors should inject dependencies (**constructor injection**)
 - Dependencies (abstractions) are **pushed** in the class from the **outside**
 - Classes do **not** instantiate their dependencies



Dependency Injection Scheme

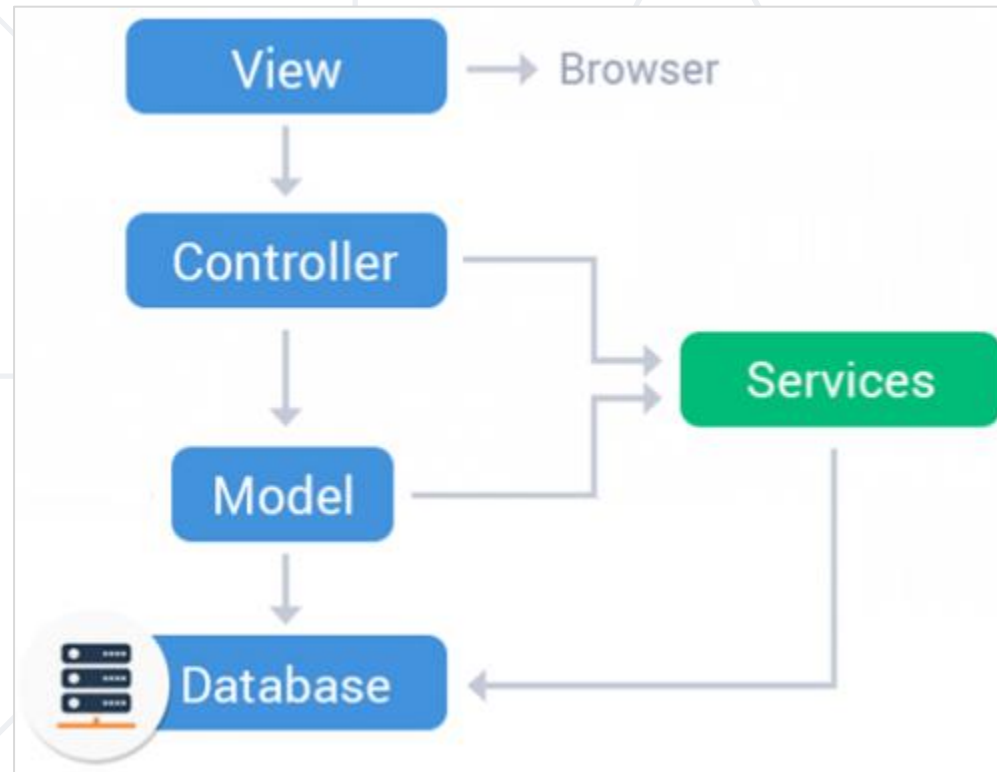


- Decouples dependencies
- **Pros**
 - Classes **self document** requirements
 - Works well **without** container
 - Always **valid** state

- **Cons**
 - Many **parameters**
 - Some methods may **not** need **everything**

```
public class Customer
{
    private ICustomerService _customerService;
    public Customer(ICustomerService service)
    {
        _customerService = service;
    }
}
```

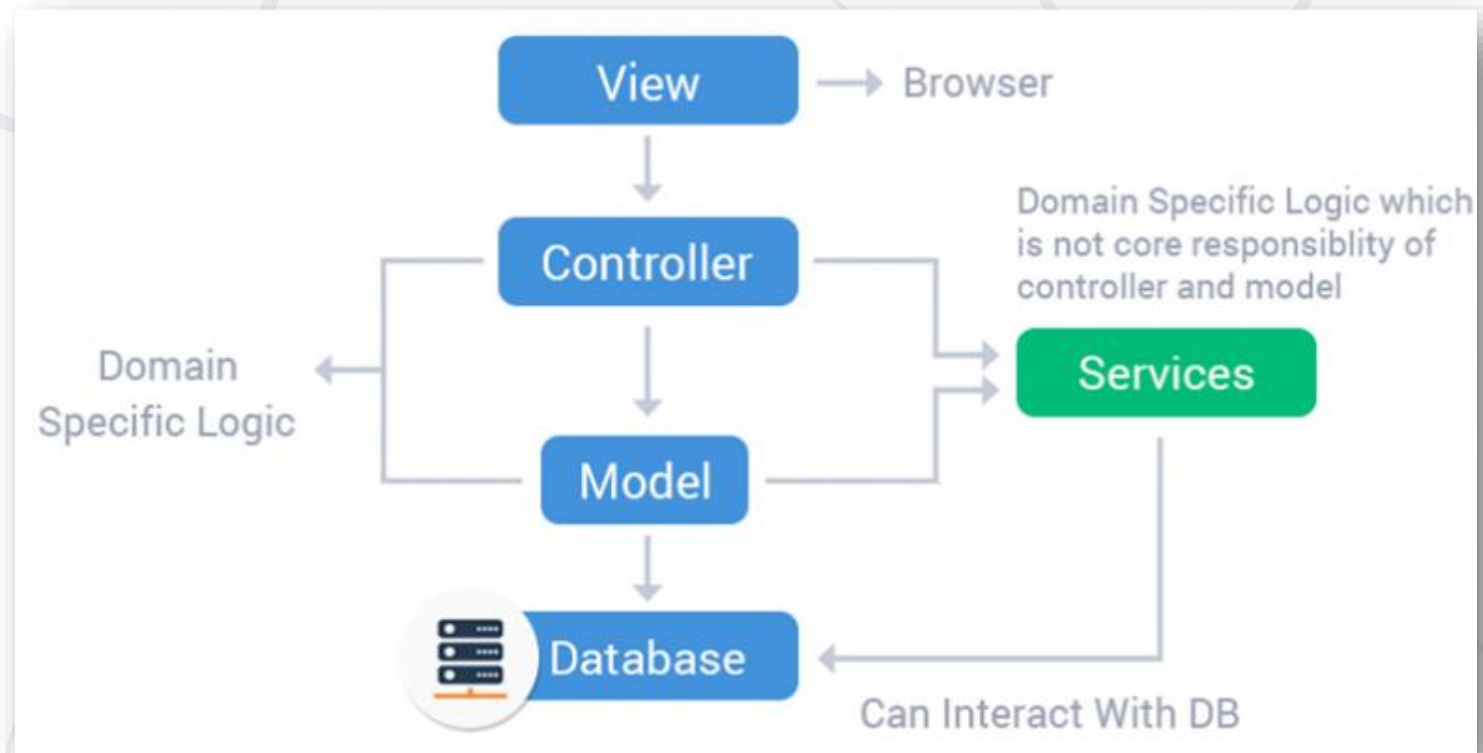
The service **comes**
from **outside**



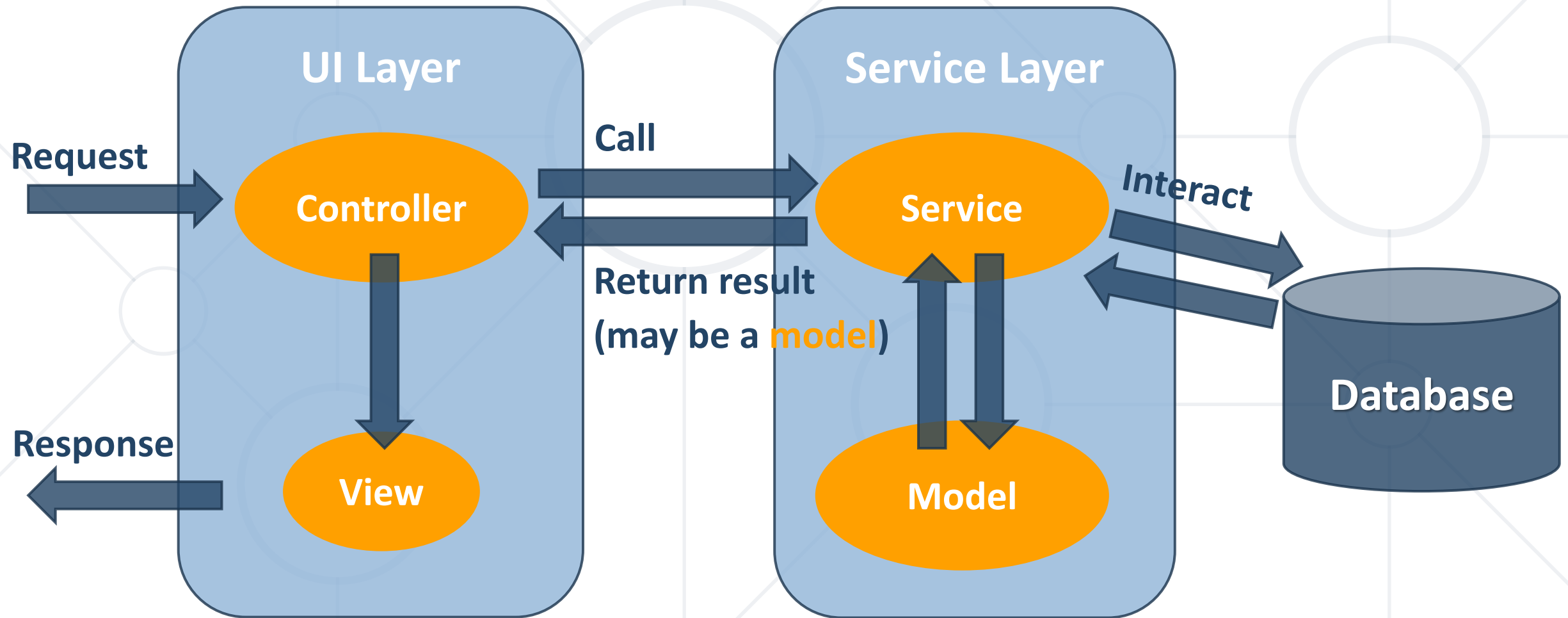
Services

Service Layer in MVC

- **Service layer** is an additional layer in an ASP.NET MVC app between controllers and database layer
- Resolves the problem with duplicating code in controller actions
- It contains **business logic**
 - Controller actions should **not contain database logic**
 - Controllers may get a **model** from the **service layer** and pass it to a **view**



MVC with Services



- **Configuration options**, by convention, are set in **Program.cs**
- Services can be configured for **Dependency Injection** differently

```
builder.Services.AddTransient<DataService>();  
builder.Services.AddScoped(typeof(DataService));  
builder.Services.AddSingleton<DataService>();
```

Transient objects are **always different**. A new instance is provided to every controller and service

Singleton objects are the **same for every object and request**

Scoped objects are the **same within a request**. They are different across different requests

Service Interface + Configuration

- Services are typically defined using **interfaces**

- Interfaces **define** service methods

```
public interface IProductService
{
    List<ProductServiceModel> All();

    void CreateProduct(string name, string description);
}
```

- Configure the **service** in the **Program.cs** class

```
builder
    .Services
    .AddTransient<IProductService, ProductService>();
```

Allows you to **inject** services into controller classes constructors via **DI**

- Should contain the **business logic**
- May interact with the **database context**

```
public class ProductService : IProductService
{
    private readonly ApplicationDbContext _data;
    public ProductService(ApplicationDbContext data)
        => _data = data;
    public void CreateProduct(string name, string description)
    {
        var product = new Product()
        { Name = name, Description = description };
        _data.Products.Add(product);
        _data.SaveChanges();
    }
}
```

Accept the **db context** through the constructor

Method contains **business logic** for creating a product

- Controllers should be responsible only for the **request** and **response**

```
public class ProductsController : Controller
{
    private IProductService _productService;

    public ProductsController(IProductService service)
        => _productService = service;

    public IActionResult Create() => View();

    [HttpPost]
    public IActionResult Create(ProductFormModel model)
    {
        if (!ModelState.IsValid)
        {
            return View(model);
        }
        _productService.CreateProduct(model.Name, model.Description);
        return RedirectToAction("All");
    }
}
```

Inject the **service**
through the **constructor**

Invoke **service methods**
for the business logic

Service with Service Model

```
public class ProductServiceModel
{
    0 references
    public int Id { get; set; }

    0 references
    public string Name { get; set; }
}
```

Special
model for
the service

```
public class ProductController : Controller
{
    private IProductService _productService;

    0 references
    public ProductController(IProductService service)
    => _productService = service;

    0 references
    public IActionResult All()
    {
        var model = _productService.All();
        return View(model);
    }
}
```

```
public class ProductService : IProductService
{
    private readonly ApplicationDbContext _data;

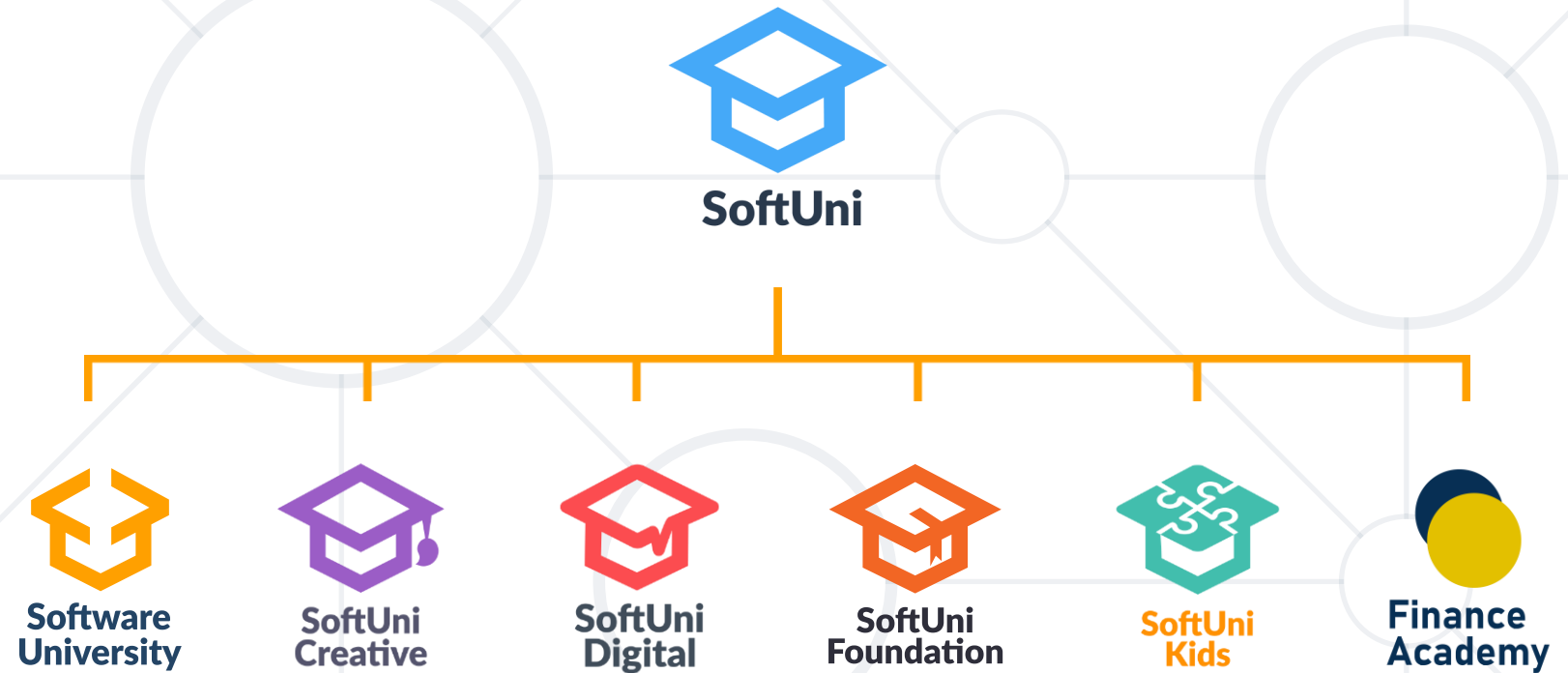
    0 references
    public ProductService(ApplicationDbContext data)
    => _data = data;

    0 references
    public List<ProductServiceModel> All()
    {
        var products = _data.Products
            .Select (p => new ProductServiceModel
            {
                Id = p.Id,
                Name = p.Name,
            })
            .ToList();
        return products;
    }
}
```

- Model **Binding**
- Model **Validation**
- Working with **Files**
- **Razor** syntax
- **Layout** and **Special** View Files
- **Partial** Views and View Components
- **HTML Helpers** and **Tag Helpers**
- **Routing**
- **Dependency Injection** and **Services**



Questions?



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