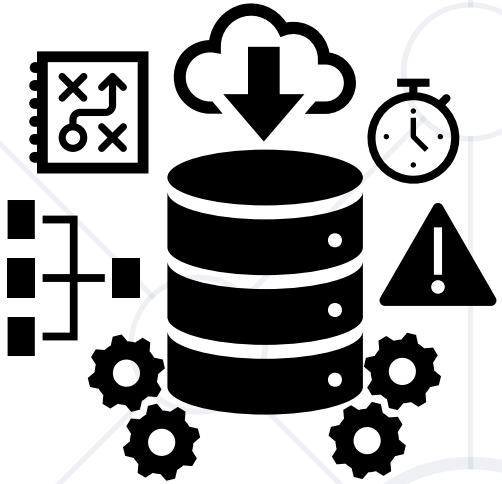
Routing and Binding, Views, DI and Services

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



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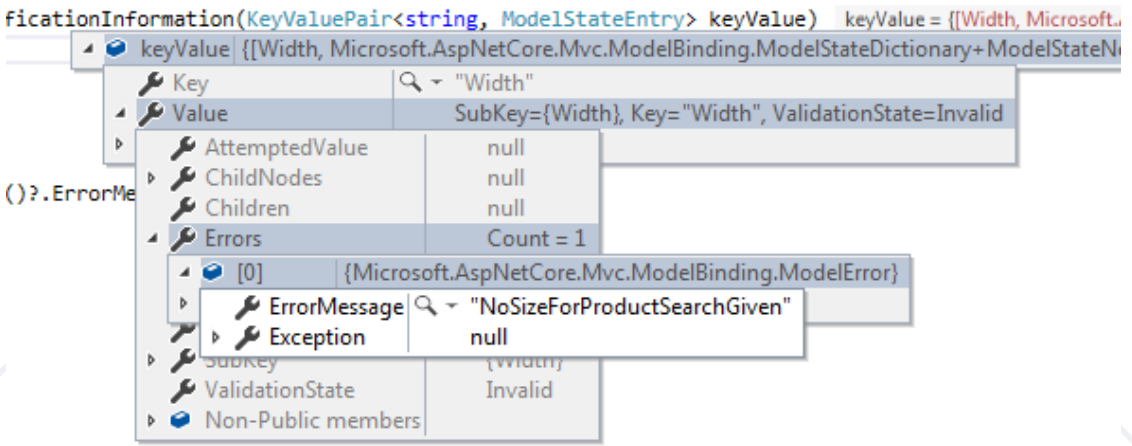
Custom Model Binding

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 bind to action parameters by **name**
  - If binding is **not** successful, an error is **not** thrown



- The model binding behavior can be **customized**

Attributes

- 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 Binder (1)

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

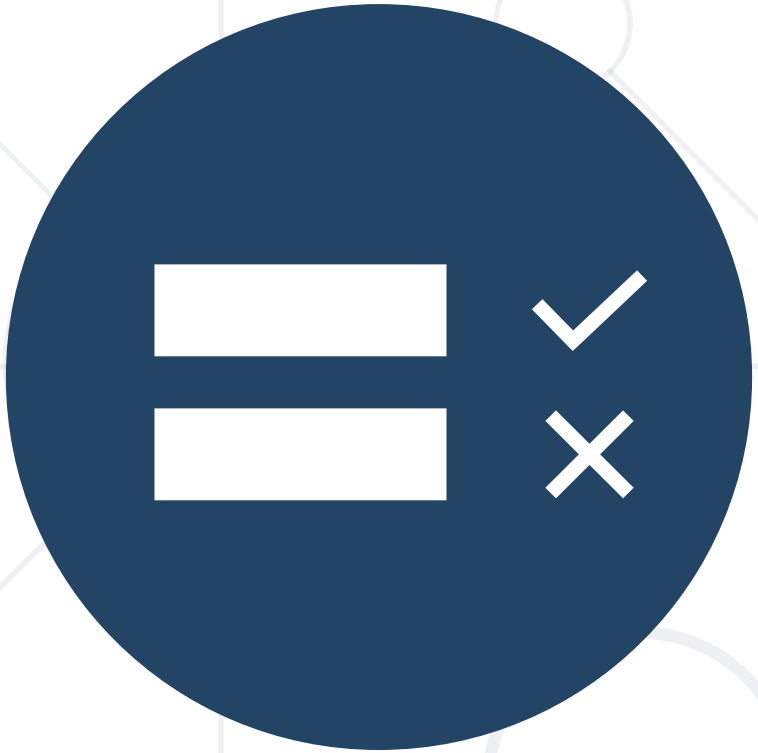
```
[ModelBinder(BinderType = typeof(StudentEntityBinder))]
public class Student
{
    public int Id { get; set; }
    public string Name { get; set; }
    public int Age { get; set; }
}
```

```
public class StudentEntityBinder : IModelBinder
{
    public Task BindModelAsync
         (ModelBindingContext bindingContext)
    {
        // TODO: Do Magic ...
        bindingContext.Result
            = ModelBindingResult.Success(model);
        return Task.CompletedTask;
    }
}
```

Custom Model Binder (2)

```
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 Overview

- 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

Custom Model Validation (1)

- **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;
    }
}
```

Custom Model Validation (2)

- Then you can use it in your model

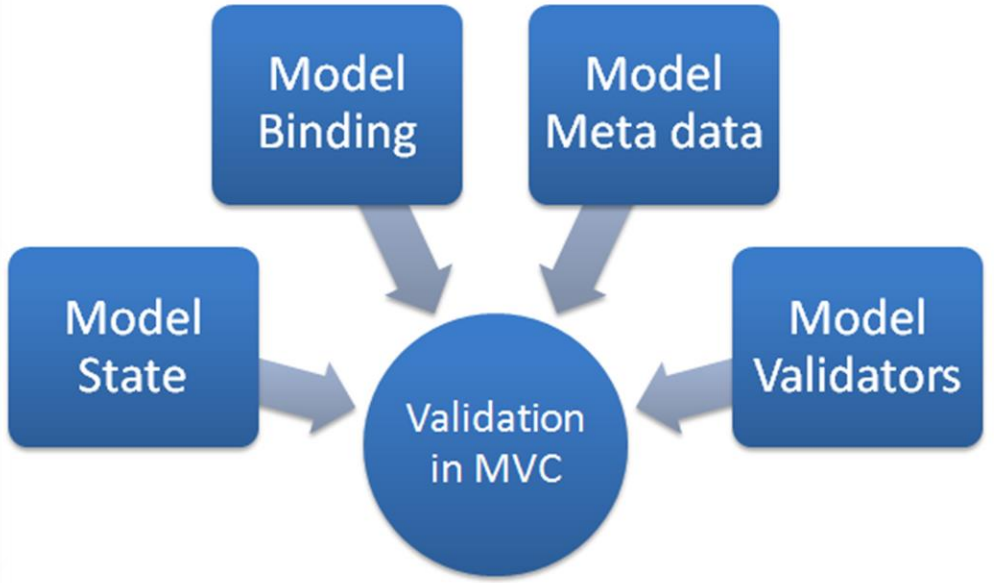
```
public class RegisterUserModel
{
    [Required]
    public string Username { get; set; }

    [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; }
}
```

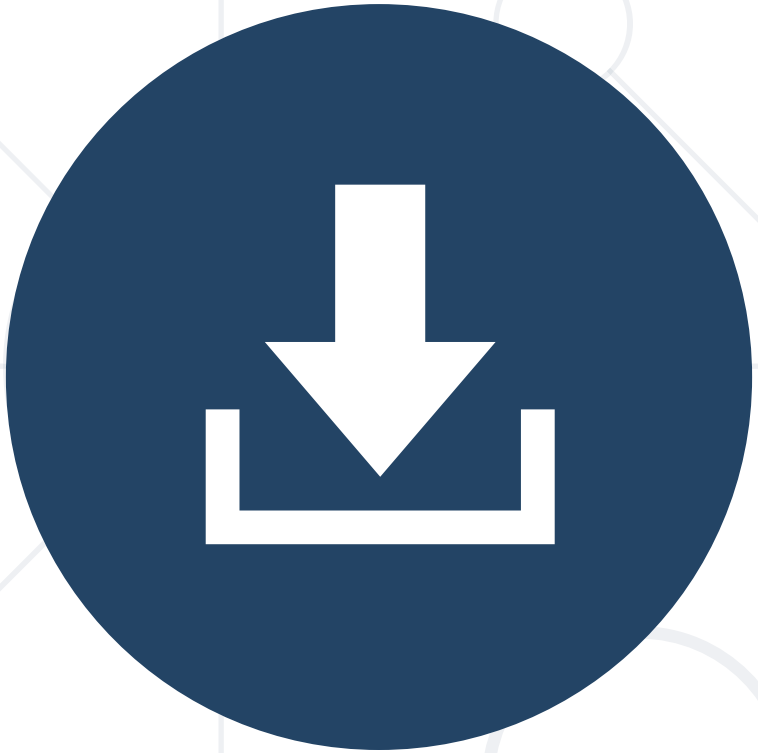


Custom Model Validation (3)

- 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

Uploading Files (1)

- **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>
```

Uploading Files (2)

- 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});
}
```

Downloading Files (1)

- **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

Downloading Files (2)

- 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
    IFileInfo fileInfo = provider.GetFileInfo(fileName); // Extract the FileInfo

    var readStream = fileInfo.CreateReadStream(); // Extact 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?

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- 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>
```

Razor Syntax (1)

- @ – 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>
```

Razor Syntax (2)

- `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>
```

Razor Syntax (3)

- 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>
```

Razor Syntax (4)

- `@(…)` – 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`**

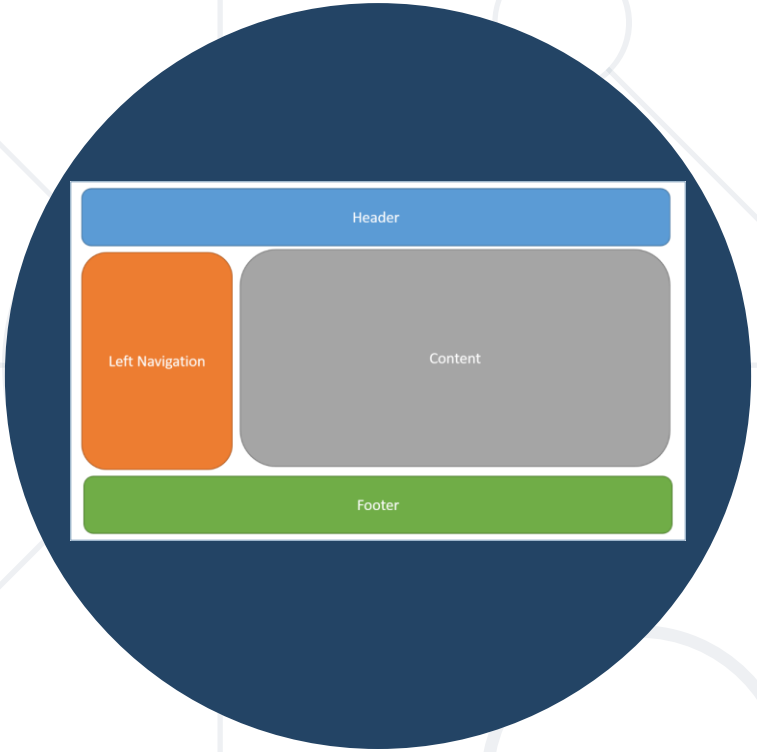
```
public class DataService
{
    1 reference
    public IEnumerable<string> GetData()
    {
        return new[] { "David", "John", "Max", "George" };
    }
}
```

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

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

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

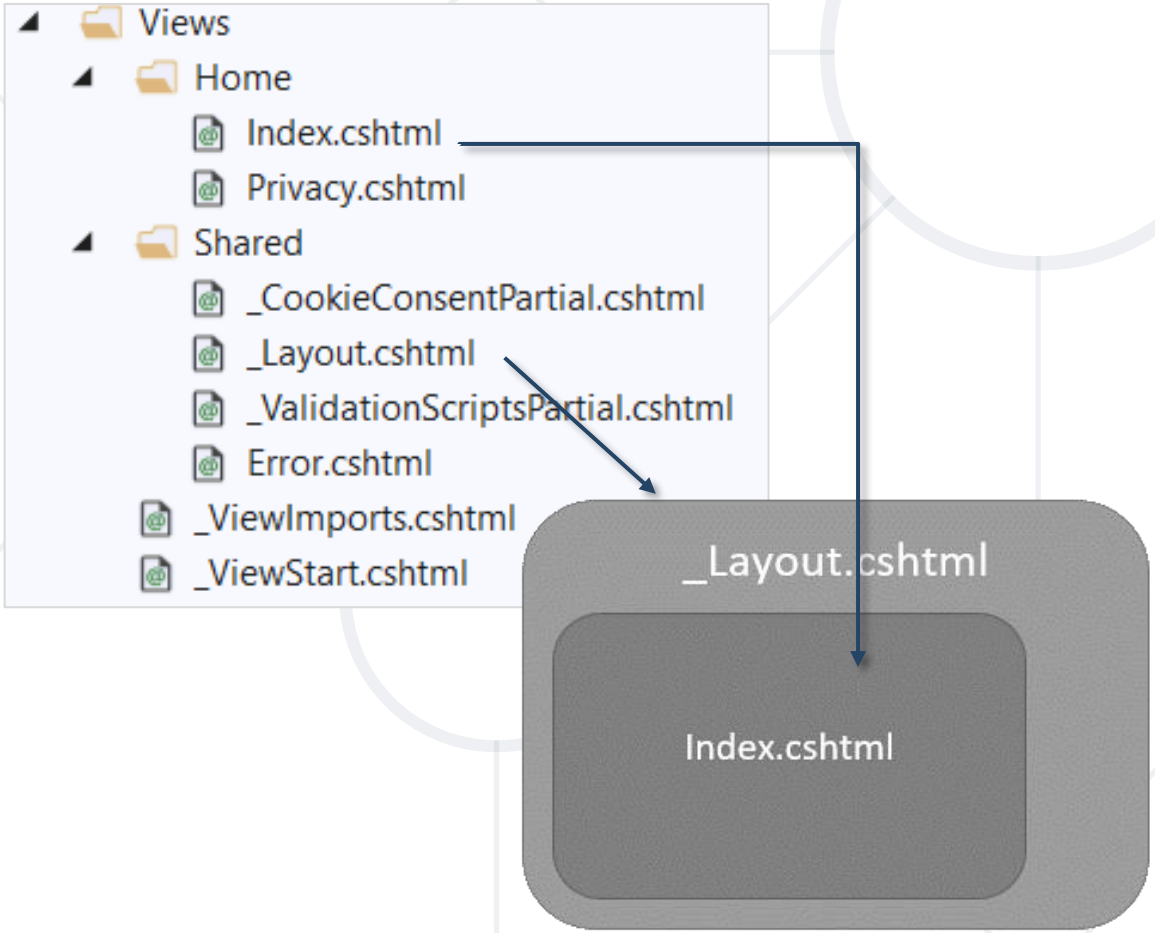
David
John
Max
George

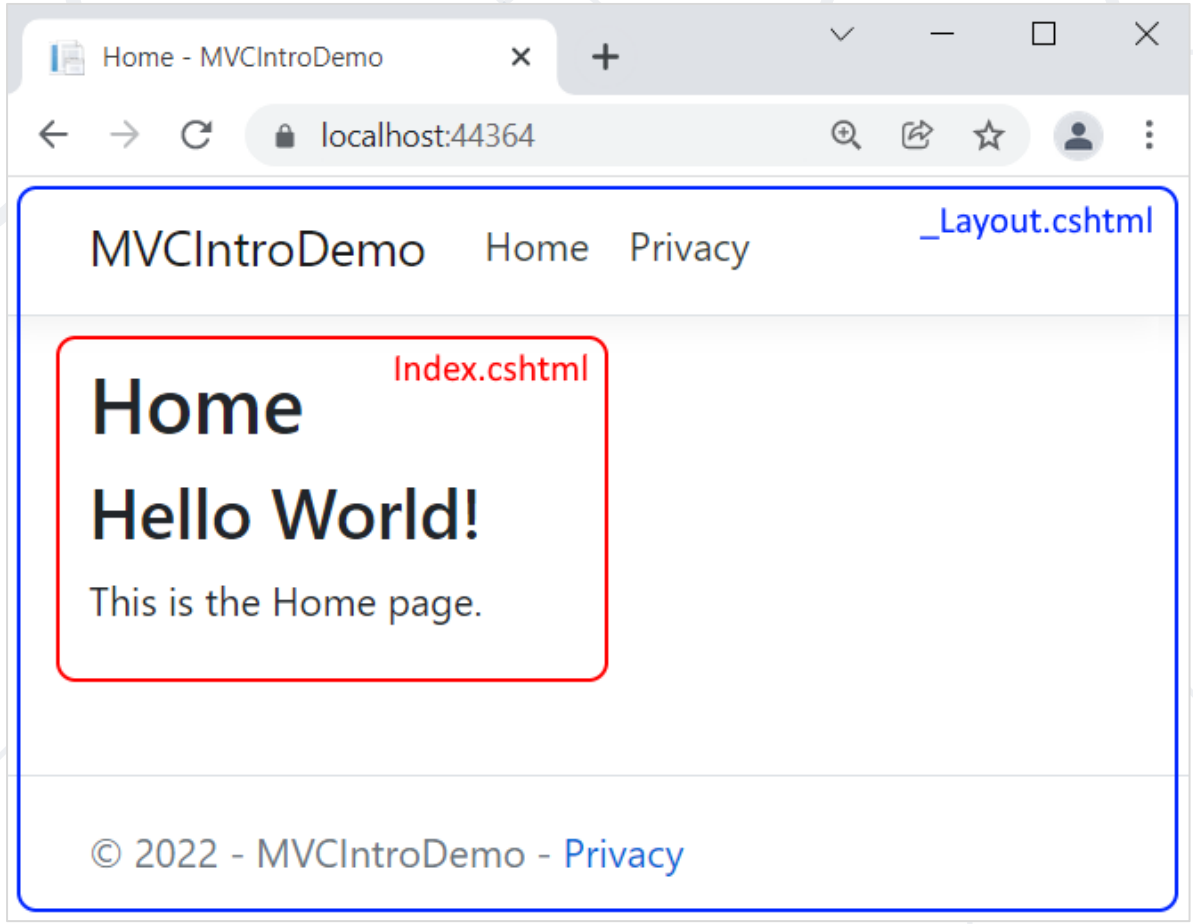


Layout and Special View Files

_Layout.cshtml (1)

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





_Layout.cshtml (2)

- 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>
```

Sections

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

Index.cshtml

```
@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>
```

Scheme

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Index.cshtml

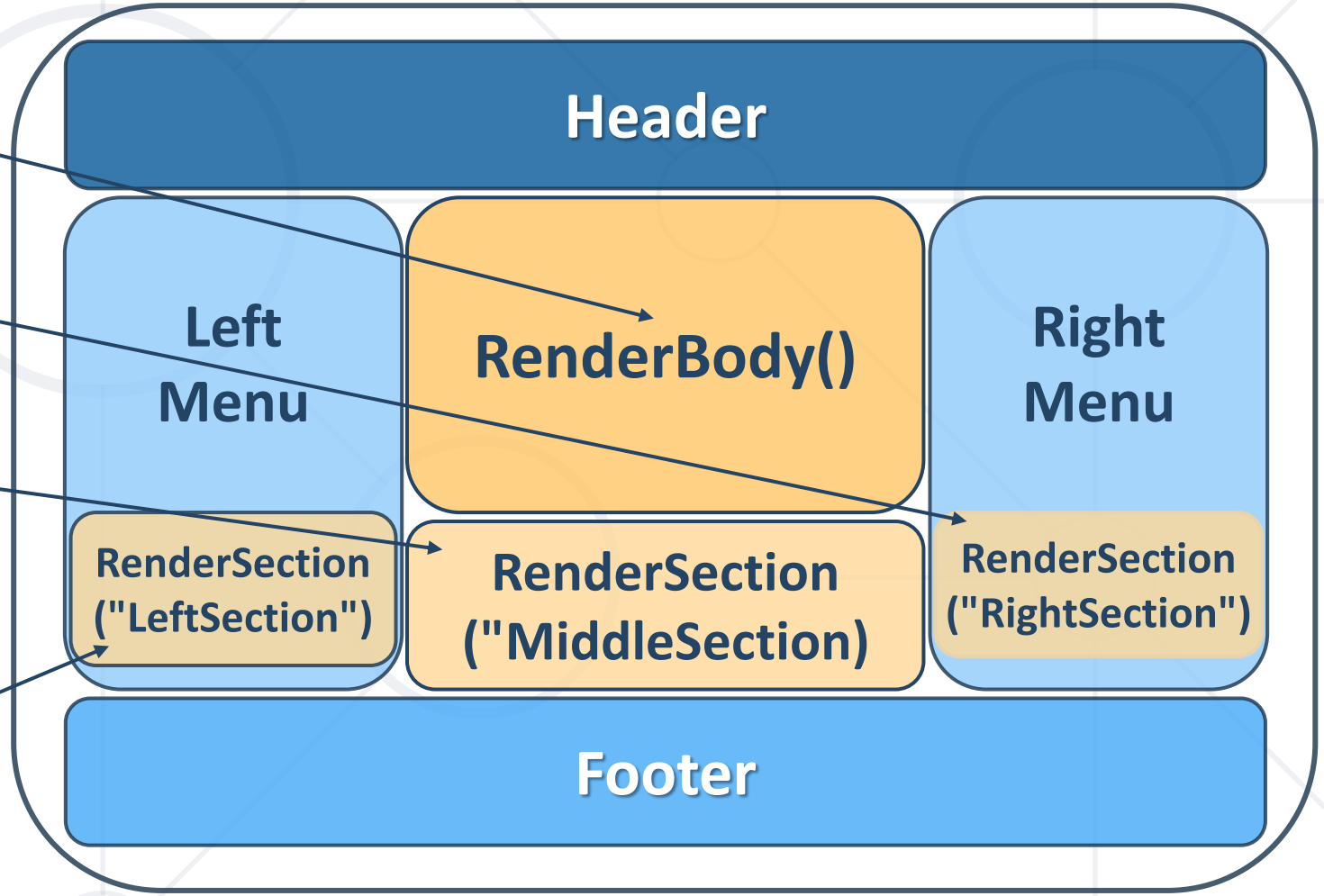
```
<div>
    This is the main content
</div>

@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



_ViewStart.cshtml

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- 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;
}
```

_ViewImports.cshtml

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- 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

_ValidationScriptsPartial.cshtml

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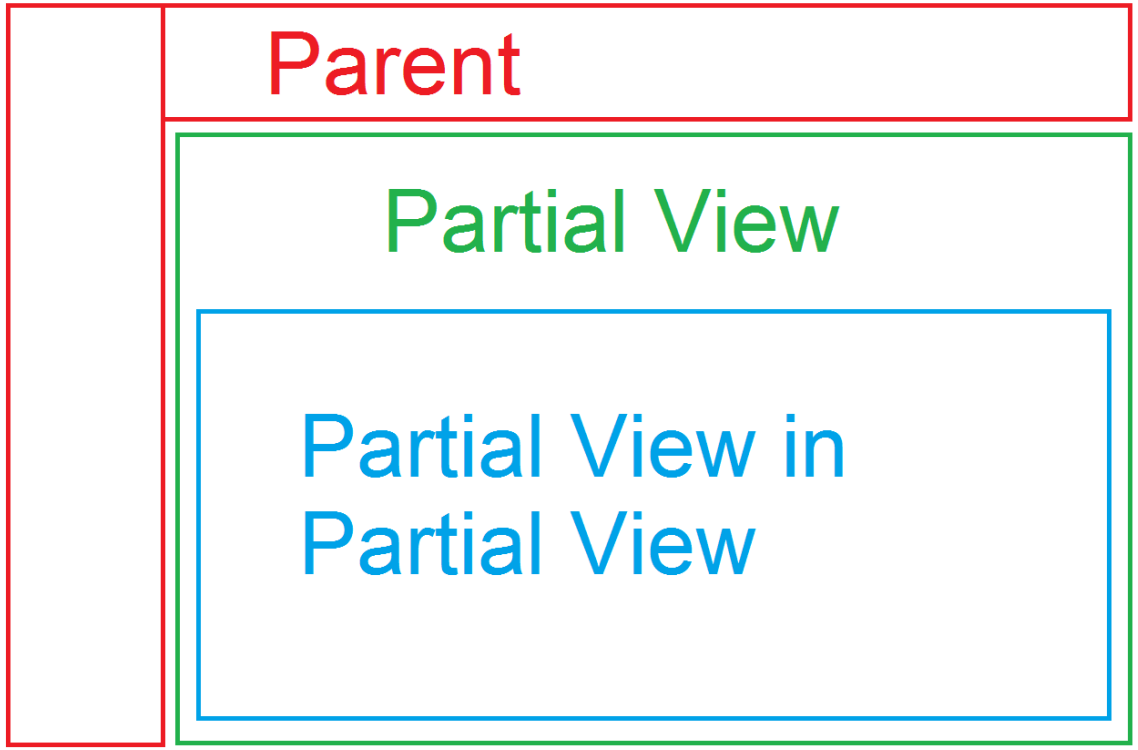
- This file contains **validation scripts** in the form of a partial view
  - **~/Views/Shared/_ValidationScriptsPartial.cshtml**

```
<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

- **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

Use of Partial Views

- HTML Helper for Partial Views

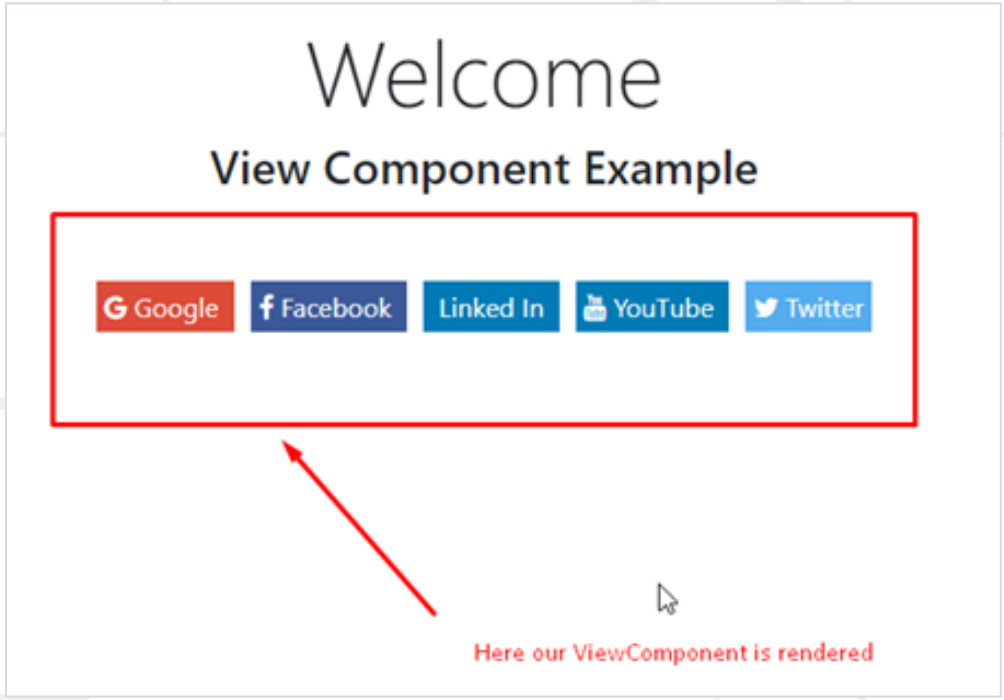
```
@using WebApplication.Models;
@model ProductsListViewModel

@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" />
}
```

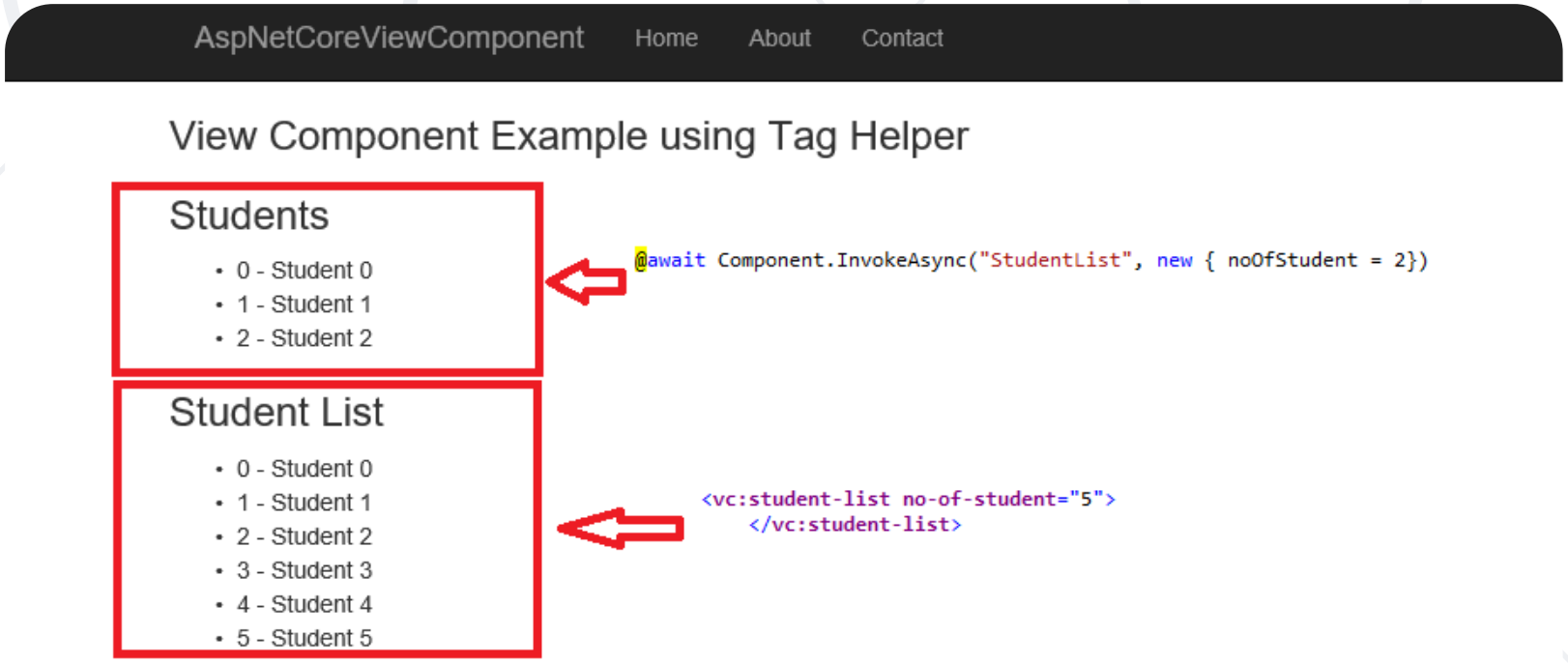
View Components (1)

- **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 (2)

- **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



View Components (3)

- **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 (1)

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\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

They often initialize a model which is passed to the view

Typically return a view

Defining Your Own ViewComponent (2)

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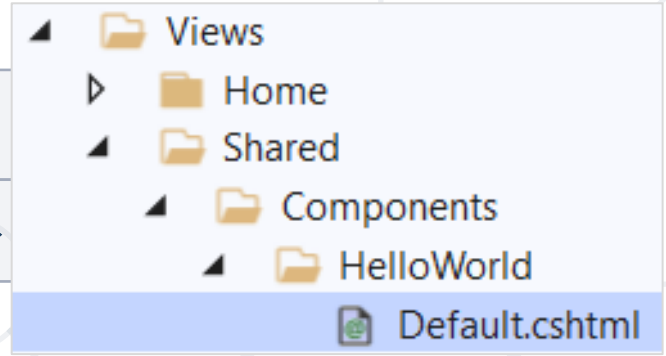
\Views\Shared\Components\HelloWorld\Default.cshtml

```
<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

HTML 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

- **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**

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

- **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

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

Creating Your Own Tag Helper

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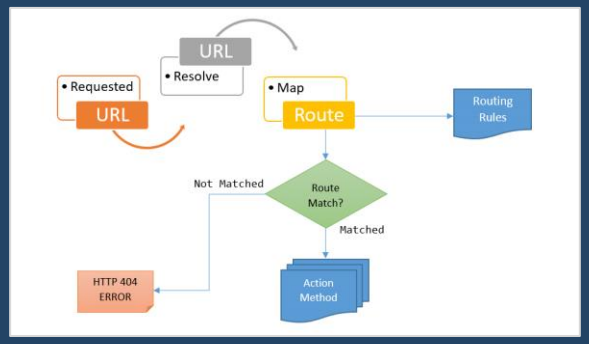
```
[HtmlTargetElement("h1")]
public class HelloTagHelper : TagHelper
{
    private const string MessageFormat = "Hello, {0}";
    public string TargetName { get; set; }

    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>
```


URL
• Resolve
• Requested
URL
• Map
Route
Routing Rules
Not Matched
Route Match?
Matched
HTTP 404 ERROR
Action Method

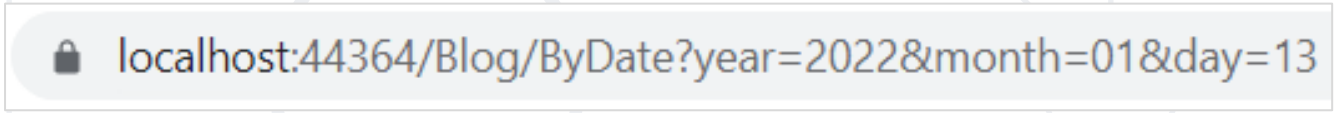
Routing

Route Constraints

- **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)
    { … }
}
```

Attribute Routing (1)

- 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 (2)

- **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();
    }
}
```

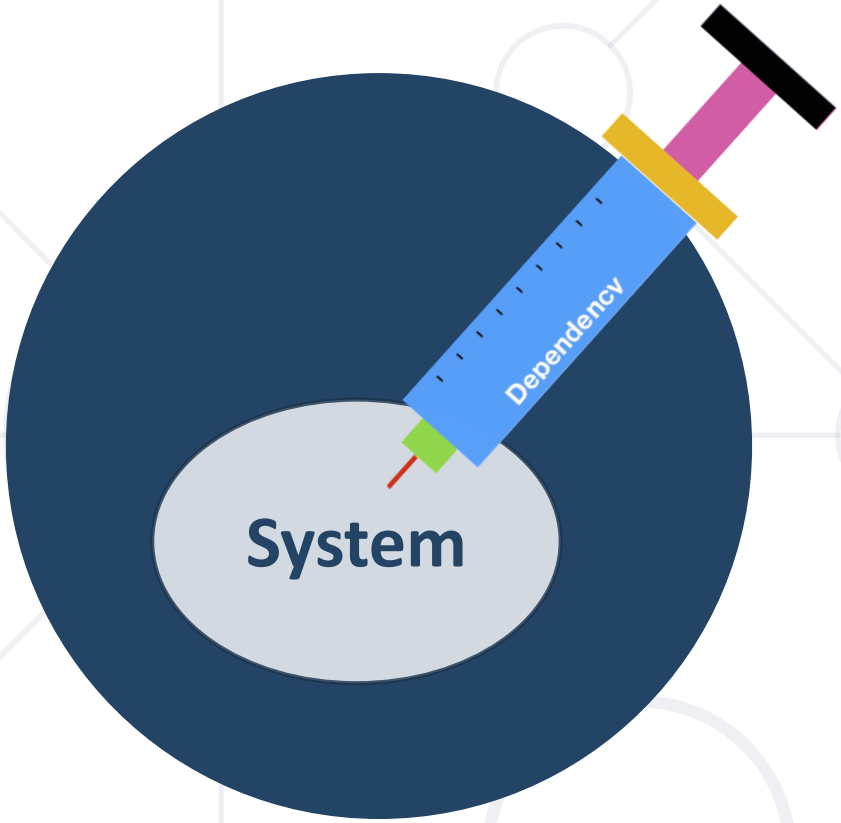
```
[Route("Home")]
public class HomeController : Controller
{
    // …

    [Route("/")] // Does not combine, Route – /
    [Route("Index")] // Route - /Home/Index
    [Route("")] // Route - /Home
    public IActionResult Index()
    {
        return View();
    }
}
```

Static Files Routing

- 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

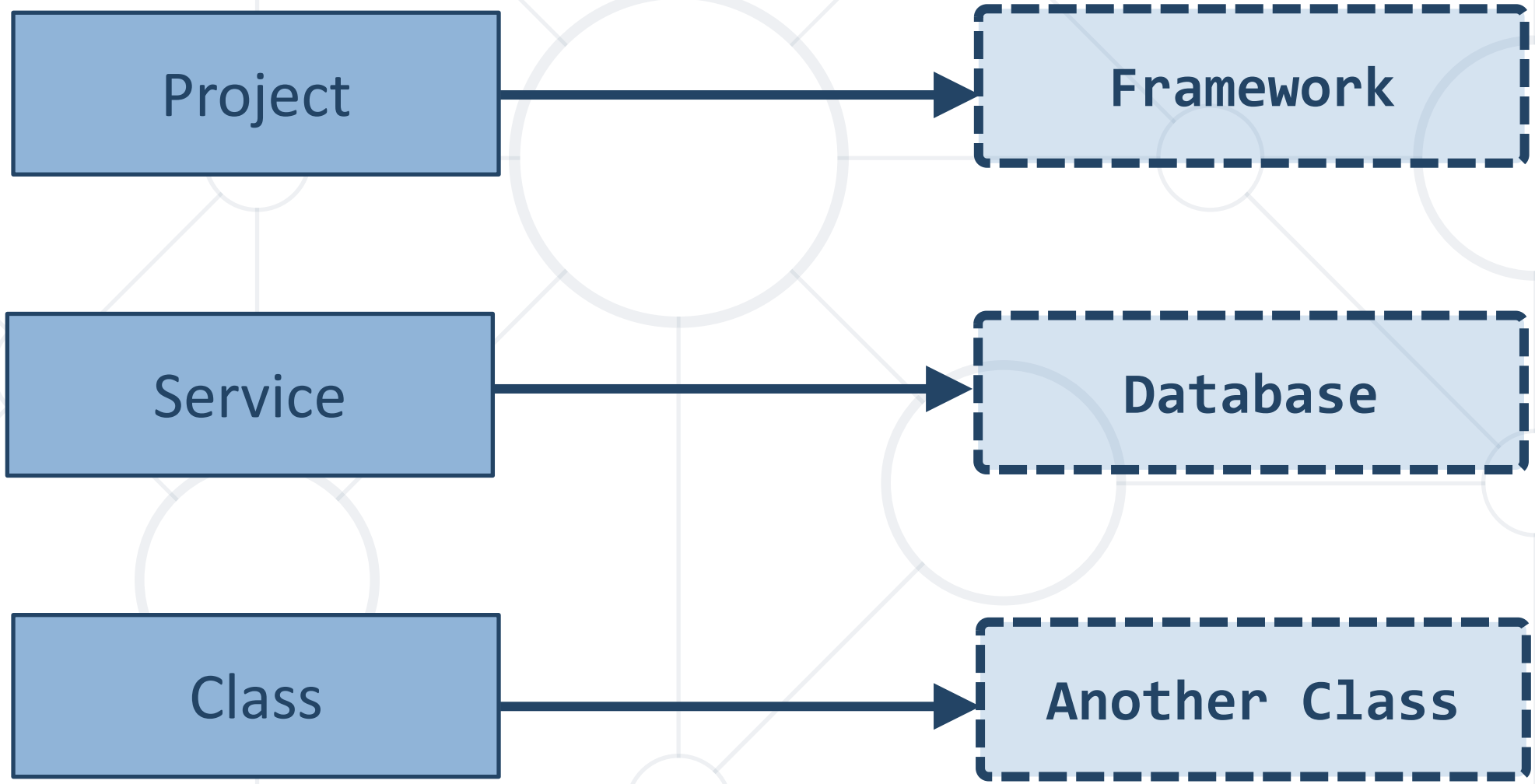
What is a Dependency?

- 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');
}
```

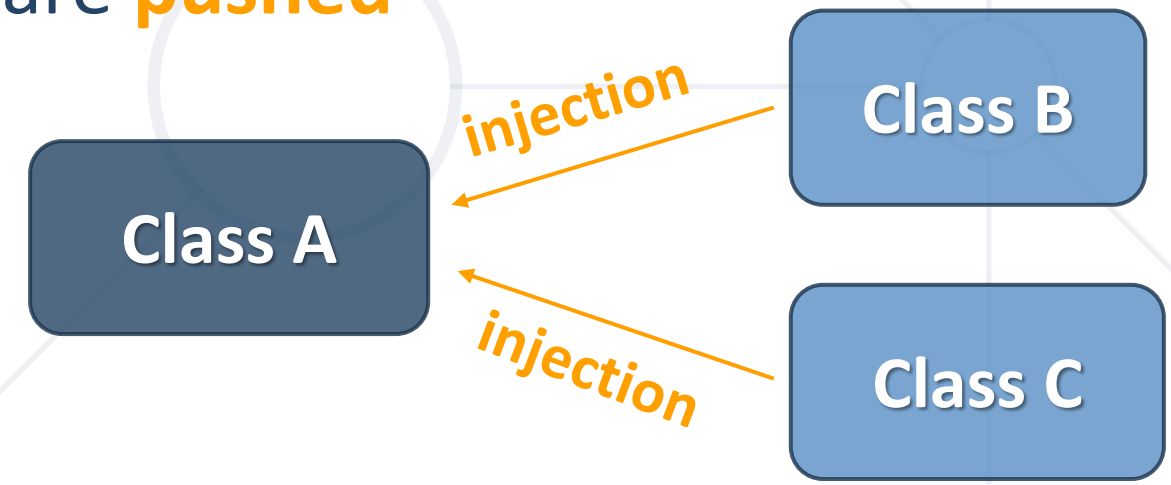
Customer class is **dependent** on **concrete** service

Dependency Examples

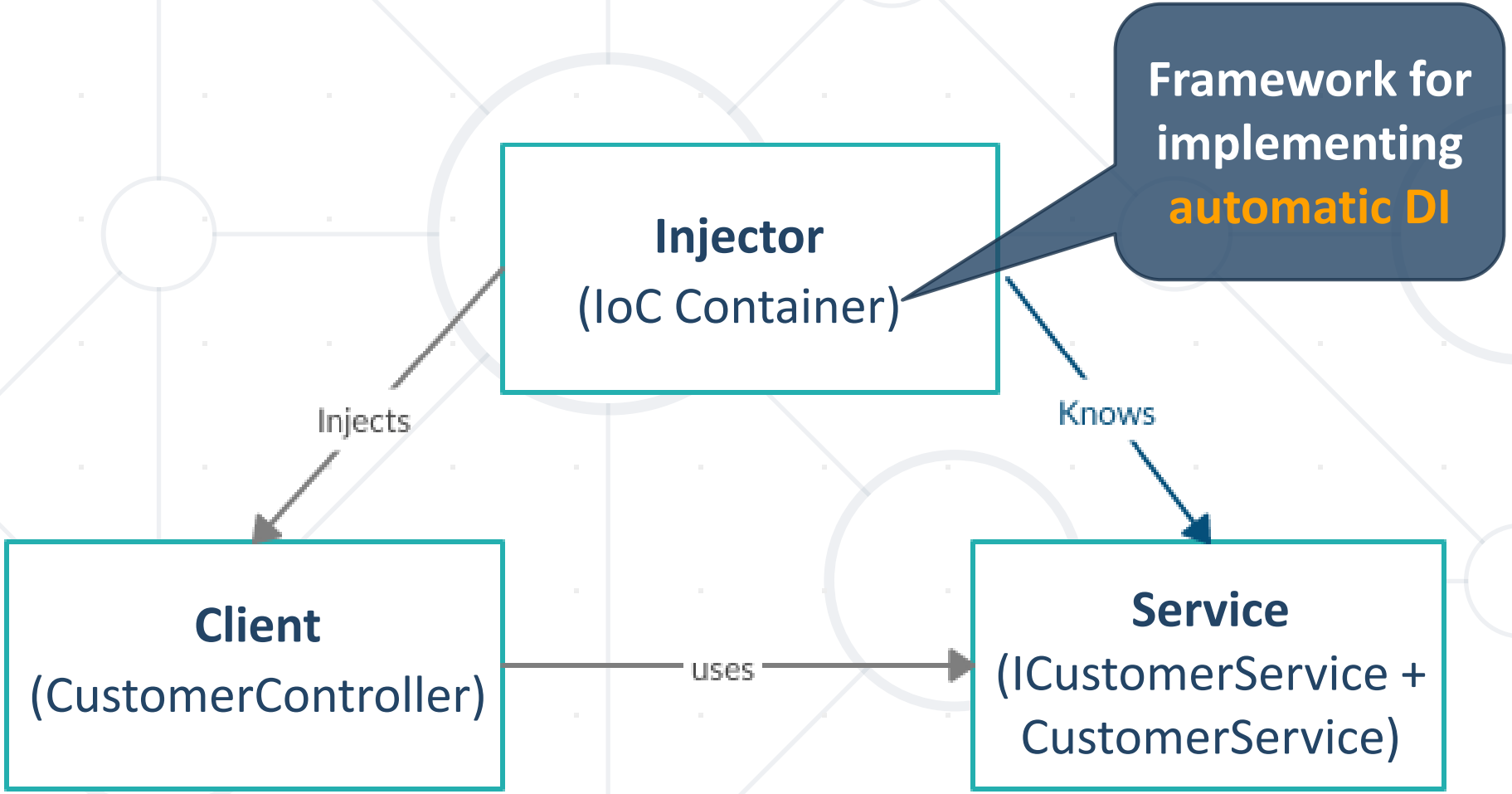


What is Dependency Injection?

- **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

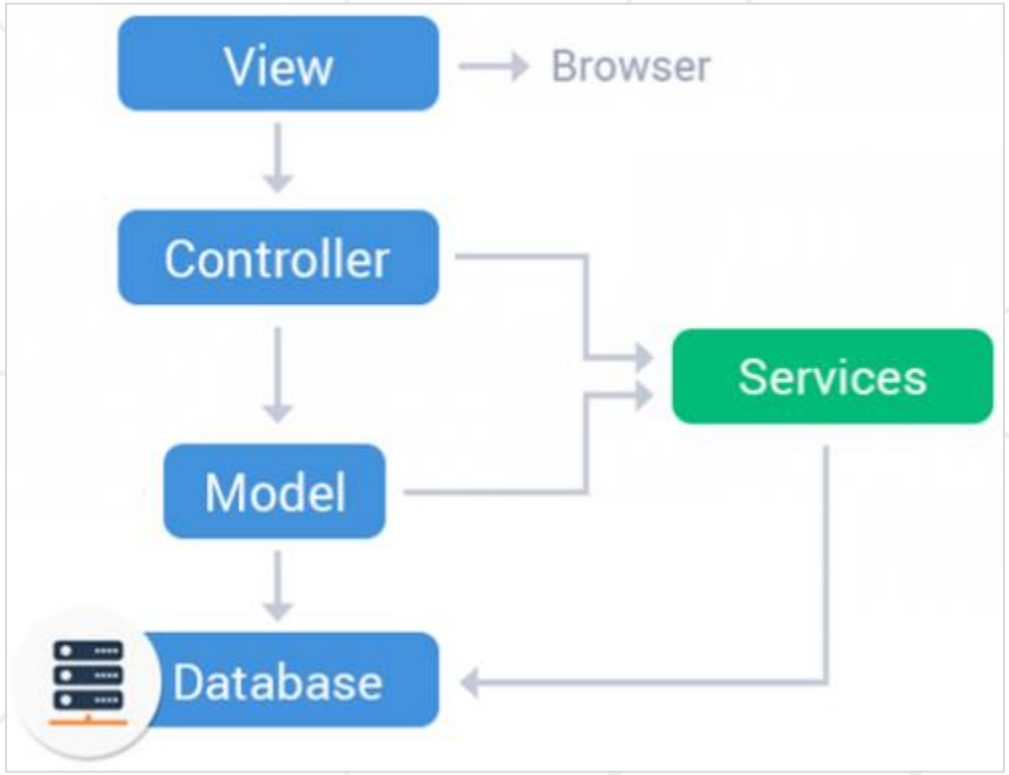


Constructor Injection

- 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**

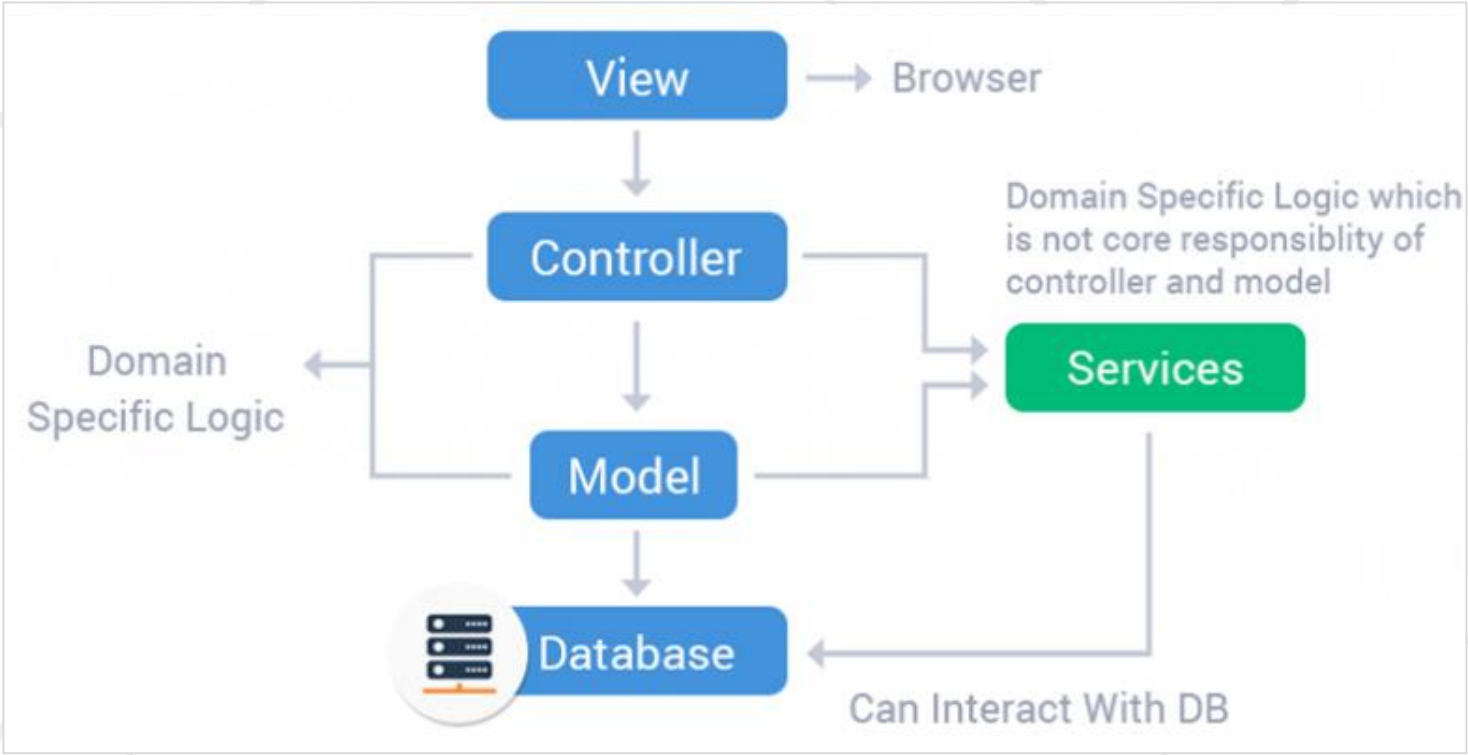


Services

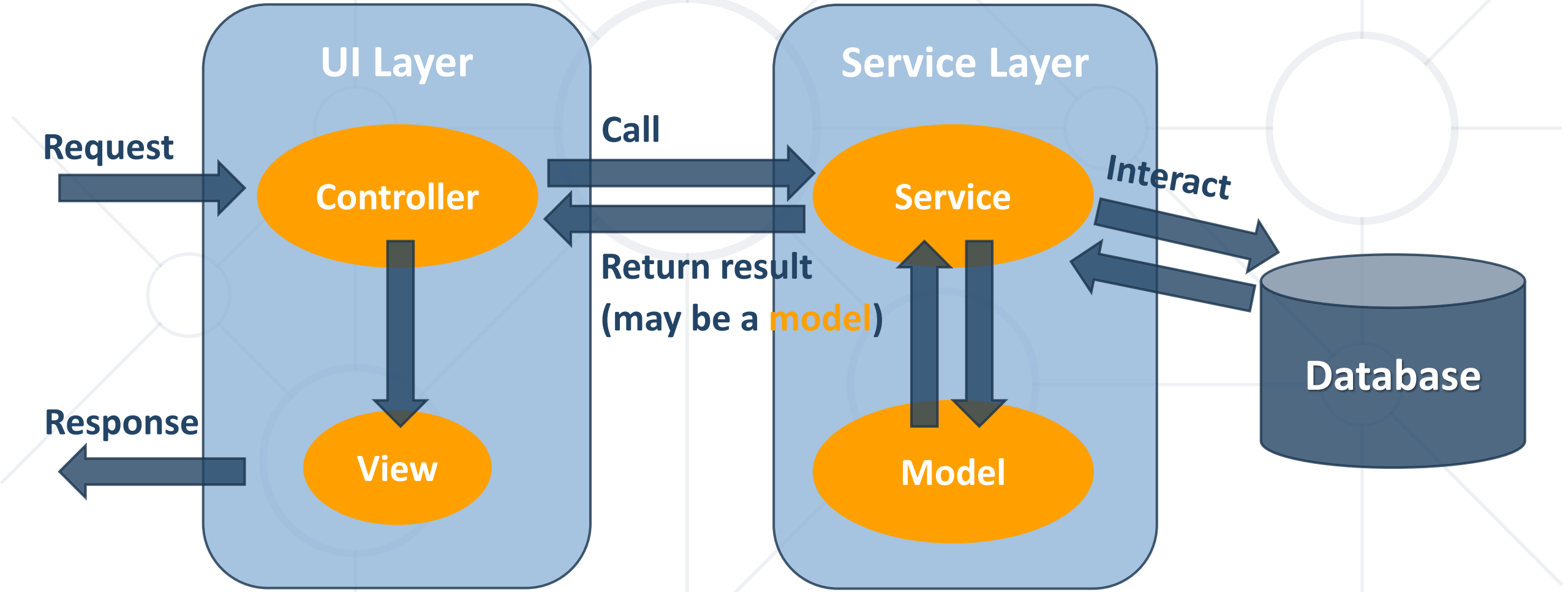
Service Layer in MVC

Service Layer

- **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



Application Services Configuration

- **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**

Service

- 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

Controller

- 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

Special model for the service

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

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

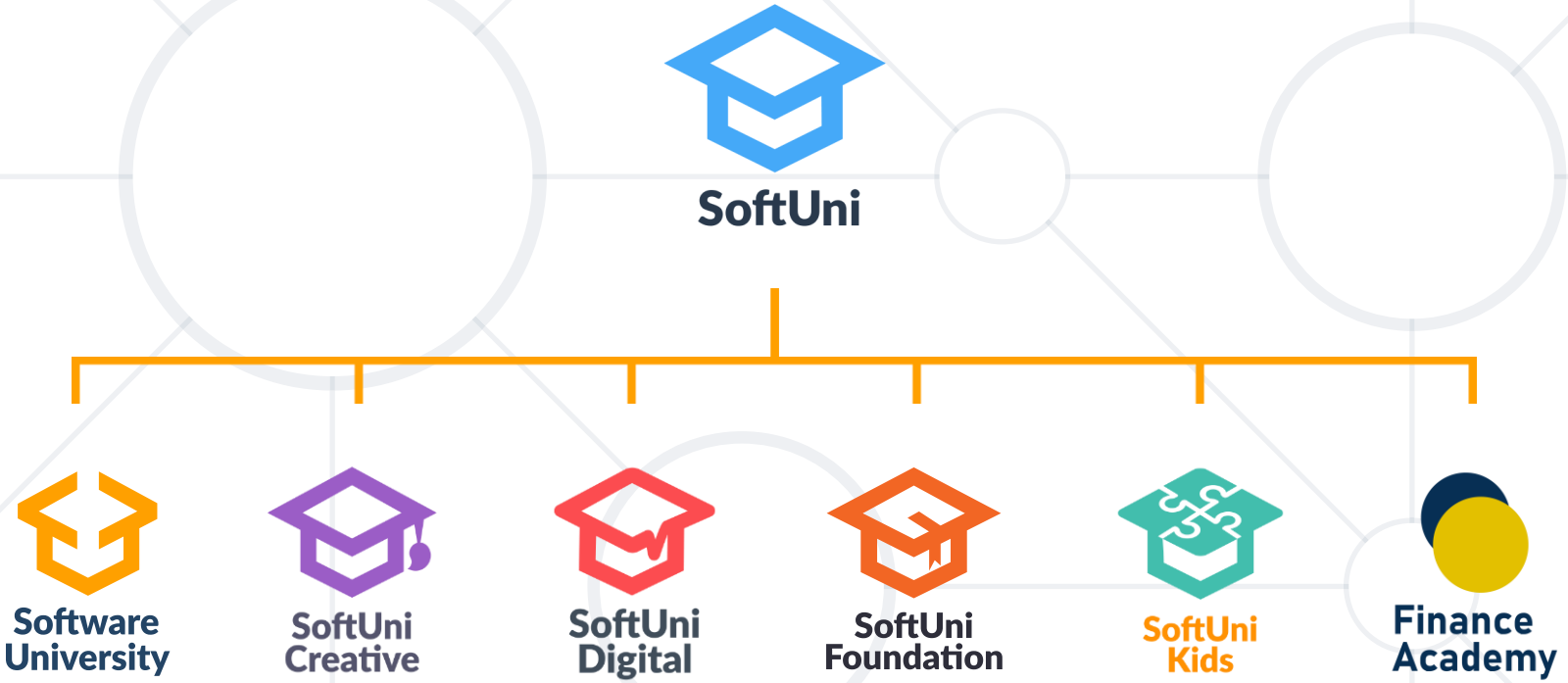
```
public class ProductController : Controller
{
    private IProductService _productService;

    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;
    }
}
```

Summary

- 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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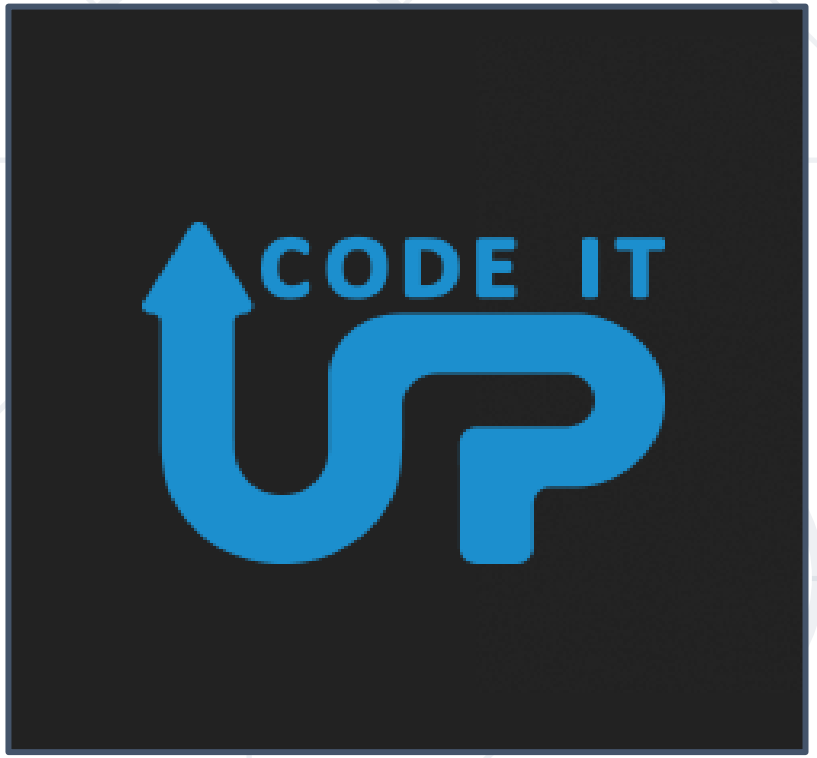

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