Routing and Layouts in ASP.NET Blazor

What is Routing in Blazor?

- Routing in Blazor enables navigation between different Razor components based on the URL.
- When a user navigates to a URL, Blazor finds the component with the matching `@page` directive and renders it.
- Blazor supports client-side routing, which means the page doesn't reload, rather the navigation is handled within the browser using the `Router` component.

@page Directive

- Each routable component (like a Razor page) must begin with an `@page` directive, defining the route it responds to.

```
@page "/about"
```

- This means that the About component will be displayed when the user navigates to `/about`.

App.razor and the <Router> Component

- App.razor acts as the root component for the Blazor app.
- It contains the `<Routes />` component.
- Routes.razor has `<Router>` element which:
  - Matches the current URL to a route.
  - Displays the appropriate component.
  - If you want to customize the fallback behavior, you can use the `NotFound`.

```
<Router AppAssembly="@typeof(App).Assembly">
    <Found Context="routeData">
        <RouteView RouteData="@routeData" DefaultLayout="@typeof(MainLayout)" />
    </Found>
    <NotFound>
        <LayoutView Layout="@typeof(MainLayout)">
            <p>Sorry, there's nothing at this address.</p>
        </LayoutView>
    </NotFound>
</Router>
```

Routes.razor

```
<Router AppAssembly="@typeof(App).Assembly">
    <Found Context="routeData">
        <RouteView RouteData="@routeData" DefaultLayout="@typeof(MainLayout)" />
    </Found>
    <NotFound>
        <LayoutView Layout="@typeof(MainLayout)">
            <p>Sorry, there's nothing at this address.</p>
        </LayoutView>
    </NotFound>
</Router>
```

- Routes.razor:
  - Uses `<Router>` to match routes.
  - Displays pages using `<RouteView>`.
  - Shows a custom 404 message when no route matches using `<NotFound>`.

Exercise - Routing Basics

- Create a Blazor app that will have 3 pages:
  - Home (`/`)
  - About (`/about`)
  - Contact (`/contact`)

- The Home.razor already has the `@page` directive.

```
@page "/"

<PageTitle>Home</PageTitle>

<h1>Hello, world!</h1>

Welcome to your new app.
```

Exercise - Routing Basics

- Add a new razor component About.razor.
- Add the @page directive at the top.
- Add some HTML tags.

```
@page "/about"

<h1>About Us</h1>

<p>This is a sample Blazor application for learning routing.</p>
```

Exercise - Routing Basics

- Open Layout/NavMenu.razor.
- Add navigation using `NavLink`.
- Blazor's `NavLink` automatically adds the active class when the link matches the current route.

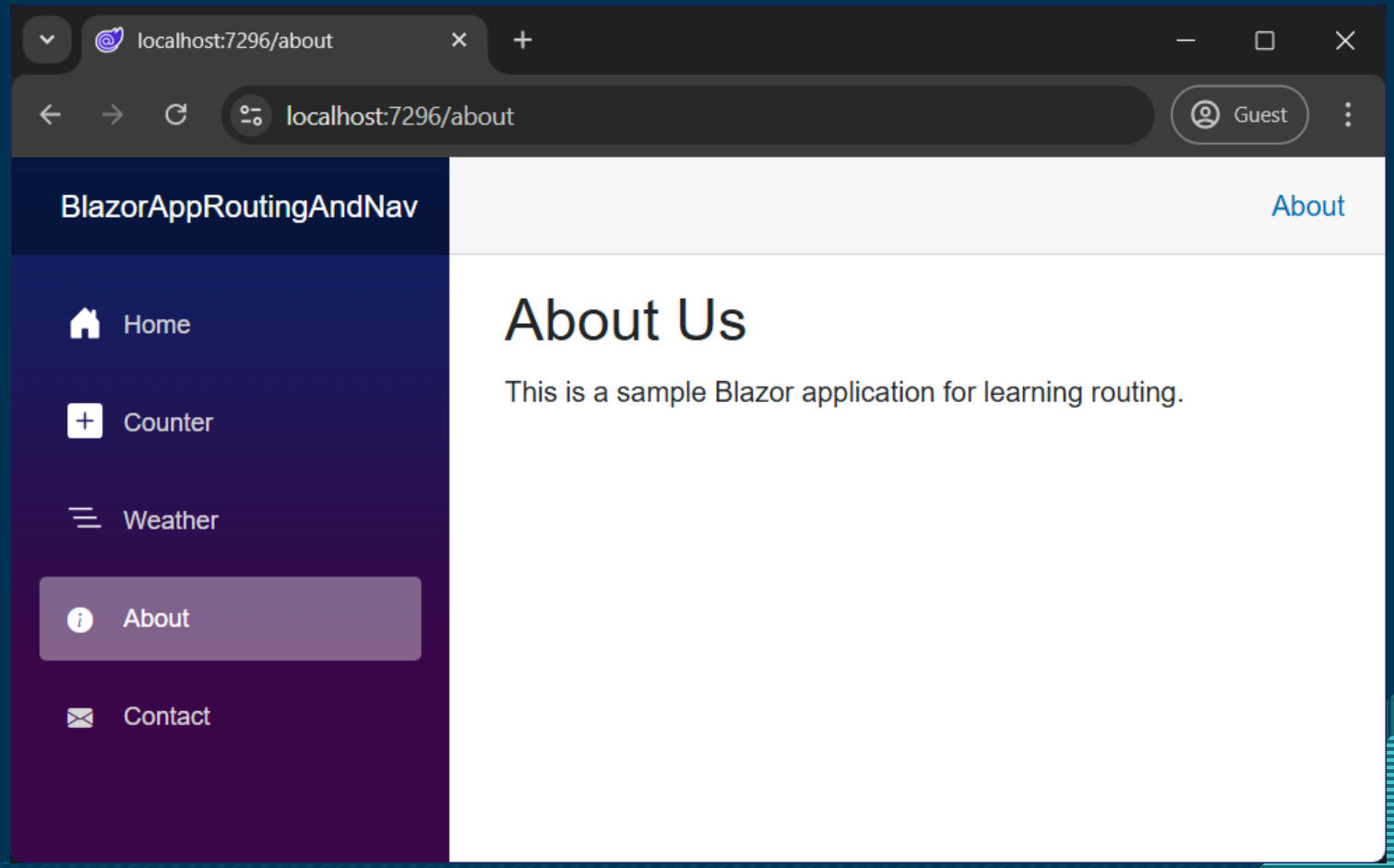
```
    <div class="nav-item px-3">
        <NavLink class="nav-link" href="weather">
            <span class="bi bi-list-nested-nav-menu" aria-hidden="true"></span> Weather
        </NavLink>
    </div>

    <div class="nav-item px-3">
        <NavLink class="nav-link" href="about">
            <span class="bi bi-info-circle-fill mb-4" aria-hidden="true"></span> About
        </NavLink>
    </div>

    <div class="nav-item px-3">
        <NavLink class="nav-link" href="contact">
            <span class="bi bi-envelope-fill mb-4" aria-hidden="true"></span> Contact
        </NavLink>
    </div>
</nav>
```

- Add the following CSS to the App.razor's `<head>` element.

```
<link href="https://cdn.jsdelivr.net/npm/bootstrap-icons@1.13.1/font/bootstrap-icons.css" rel="stylesheet">
```

Exercise - Routing Basics

- Run the app.
- Click the navigation links.
- Enter URLs directly (e.g., `/about`, `/contact`).



Route Parameters in Blazor

- Route parameters allow a Blazor component to accept values from the URL.
- For example, if you navigate to:

```
/product/123
```

- You can have a Blazor component (like Product.razor) that reads 123 as a parameter (`id`).
- This enables dynamic routing, where a single component can handle multiple data entries, like user profiles, orders, blog posts, etc.

Basic Route Parameter

- Example: User.razor:

```
@page "/user/{id}"

<h3>User ID: @Id</h3>

@code {
    [Parameter]
    public string? Id { get; set; }
}
```

- The `@page "/user/{id}"` tells Blazor to match any route like `/user/123`, `/user/abc` etc.
- The `id` value in the URL is passed to the `Id` property decorated with `[Parameter]`.
- You can use any variable name inside `{}`, just make sure it matches the `[Parameter]` property name.
  - It is case-insensitive, but spellings must match.

Typed Route Parameters

- Blazor supports type constraints like `int`, `guid`, `bool`, etc.
- Example: Order.razor:

```
@page "/order/{orderId:int}"

<h3>Order ID: @OrderId</h3>

@code {
    [Parameter]
    public int OrderId { get; set; }
}
```

- Works for:
  - `/order/100`
  - `/order/9999`
- Fails for:
  - `/order/abc` → Won't match.

Multiple Parameters

- You can pass multiple route parameters.
- Example: Invoice.razor:

```
@page "/invoice/{year:int}/{month:int}"

<h3>Invoice for @Year/@Month</h3>

@code {
    [Parameter]
    public int Year { get; set; }

    [Parameter]
    public int Month { get; set; }
}
```

- Works for:
  - `/invoice/2024/12`

Optional Parameters (Workaround)

- Blazor doesn't support optional route parameters directly in the `@page` directive.
- But you can define multiple routes for the same component.
- Example: Search.razor:

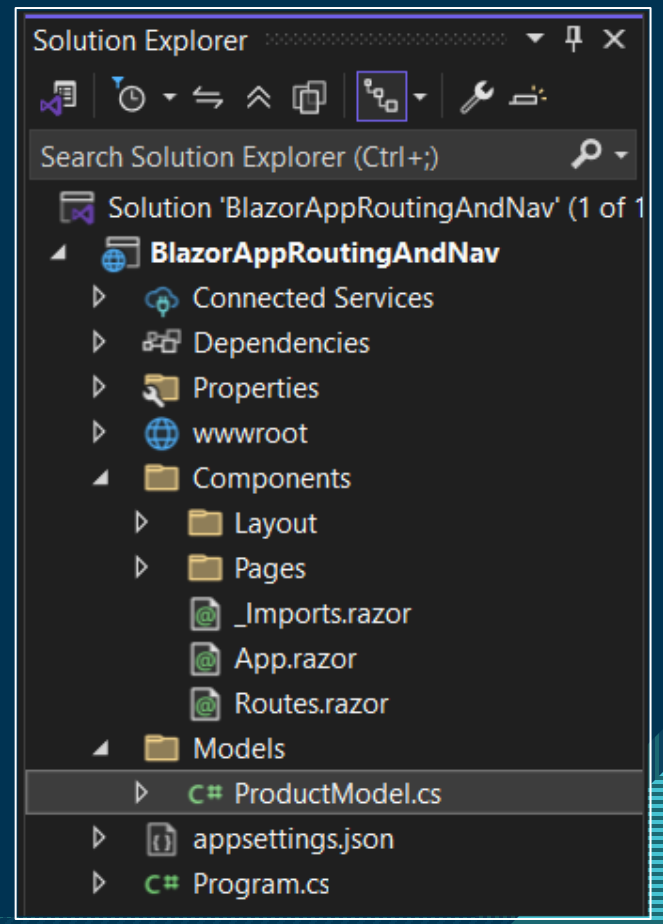
```
@page "/search"
@page "/search/{term}"

<h3>Search Results</h3>
@if (Term != null)
{
    <p>Results for: <strong>@Term</strong></p>
}
else
{
    <p>Please enter a search term.</p>
}

@code {
    [Parameter]
    public string? Term { get; set; }
}
```

- Works for:
  - `/search`
  - `/search/books`

Exercise - Route Parameter

- Create a new folder Models at the root of your project.
- Create a new class ProductModel.cs inside the Models folder.

```
public class ProductModel
{
    public int Id { get; set; }
    public string Name { get; set; }
    public double Price { get; set; }
}
```



Exercise - Route Parameter

- Open _Imports.razor and add the path to the Models folder.
- Please change the project name "BlazorAppRoutingAndNav" to your own project name.

_Imports.razor

```
@using System.Net.Http
@using System.Net.Http.Json
@using Microsoft.AspNetCore.Components.Forms
@using Microsoft.AspNetCore.Components.Routing
@using Microsoft.AspNetCore.Components.Web
@using static Microsoft.AspNetCore.Components.Web.RenderMode
@using Microsoft.AspNetCore.Components.Web.Virtualization
@using Microsoft.JSInterop
@using BlazorAppRoutingAndNav
@using BlazorAppRoutingAndNav.Components
@using BlazorAppRoutingAndNav.Models
```

Exercise - Route Parameter

- Create a new component, Product.razor:
  - You can copy the sample code from here:

```
@page "/product/{id:int}"
<h1>Product Details</h1>
@if (product != null) {
    <div class="card p-3 m-2 shadow">
        <h4>@product.Name</h4>
        <p><strong>ID:</strong>
@product.Id</p>
        <p><strong>Price:</strong>
@product.Price.ToString("C")</p>
    </div>          }
Else {
    <div class="alert alert-warning">
Product not found.<NavLink href="/">Go
back to home</NavLink> </div>
}
```

```
@code {
    [Parameter]
    public int Id { get; set; }
    private ProductModel? product;
    private List<ProductModel>
products = new() {
        new ProductModel(1, "Gaming
Laptop", 1499.99M),
        new ProductModel(2, "Wireless
Mouse", 29.99M),
        new ProductModel(3,
"Mechanical Keyboard", 79.50M),
        new ProductModel(4, "27-inch
Monitor", 299.00M),
        new ProductModel(5, "USB-C
Dock", 59.95M)     };
```

Exercise - Route Parameter

- Create a new component, Product.razor:
  - You can copy the sample code from here:

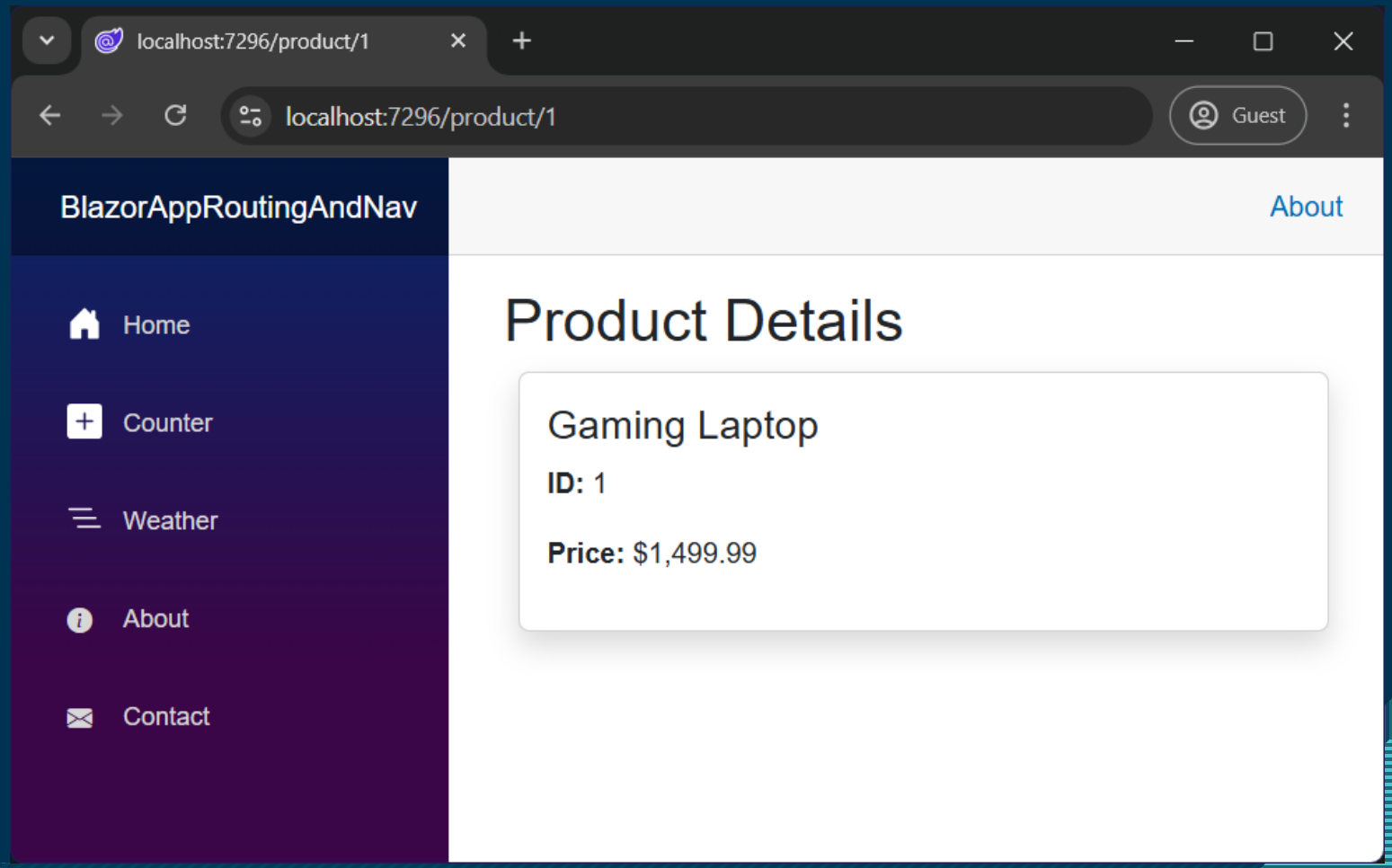
```
Continue …
    protected override void OnInitialized()
{
        product = products.Find(p => p.Id
== Id); }
}
```

```
protected override void OnInitialized()
{
    product = products.Find(p => p.Id == Id);
}
```

- The `OnInitialized` method is a component lifecycle method that runs once when the component is first initialized (before rendering for the first time).
- This method is called when the `Product` component is created.
- It tries to find a `product` in the `products` list whose `Id` matches the `Id` parameter.
- The result is stored in the `product` variable, which is then used to display product details.

Exercise - Route Parameter

- Run the app and try navigating to:
  - `/product/1`
  - `/product/4`
  - `/product/99` (not found)



Layout Components

What Are Layout Components?

- Layout Components are like master pages or templates in traditional web apps.
- They define a common structure for your pages, such as headers, footers, nav menus, and sidebars.
- And then insert page-specific content inside that layout.

- Why Use Layouts?
  - Reuse consistent UI structure (e.g., navigation and footer).
  - Keep pages clean and focused only on their content.
  - Centralized styling and branding.
  - Easy to change layout globally (e.g., update nav for all pages).

Anatomy of a Layout Component

- A layout is a Razor component with a special directive `@inherits LayoutComponentBase`.
- It must contain a placeholder for the content of child pages using `@Body`.

- Have a look at the Layout/MainLayout.razor.

- `@inherits LayoutComponentBase` tells the Razor component to inherit behavior from the built-in class `LayoutComponentBase`, which is part of the Blazor framework.
- This is required when creating a layout component because it provides the special Blazor layout functionality, specifically, access to the `@Body` property.

MainLayout.razor

BlazorAppRoutingAndNav

```
1   @inherits LayoutComponentBase
2
3   <div class="page">
4       <div class="sidebar">
5           <NavMenu />
6       </div>
7
8       <main>
9           <div class="top-row px-4">
10              <a href="https://learn.microsoft.com/aspnet/core/" target="_blank">About</a>
11          </div>
12
13          <article class="content px-4">
14              @Body
15          </article>
16      </main>
17  </div>
18
19  <div id="blazor-error-ui" data-nosnippet>
20      An unhandled error has occurred.
21      <a href="." class="reload">Reload</a>
22      <span class="dismiss">✕</span>
23  </div>
```

Register Layout in the Router (Routes.razor)

- In Routes.razor, `<RouteView>` defines the default layout.
- This applies `MainLayout` to all routed components unless they override it with `@layout`.

```
<Router AppAssembly="typeof(Program).Assembly">
    <Found Context="routeData">
        <RouteView RouteData="routeData" DefaultLayout="typeof(Layout.MainLayout)" />
        <FocusOnNavigate RouteData="routeData" Selector="h1" />
    </Found>
</Router>
```

Exercise - Layout Component

- Create a new Razor component file: Layout/MyLayout.razor.
  - You can copy-paste the code from here:

```
@inherits LayoutComponentBase

<div class="container-fluid">
    <header class="bg-primary text-white p-3">
        <h1>My Blazor App</h1>
    </header>

    <div class="row">
        <div class="col-4 bg-dark p-2">
            <NavMenu />
        </div>

Continue …
```

```
Continue …

        <div class="col-8 p-3">
            @Body
        </div>
    </div>

    <footer class="mt-4 p-3 text-center text-muted">
        © 2025 My Company
    </footer>
</div>
```

Exercise - Layout Component

- Create a new Razor component file: Layout/MyLayout.razor.

- @Body is where the content of the current page will be rendered.
- You can style it however you like using Bootstrap or custom CSS.

MyLayout.razor

```
@inherits LayoutComponentBase

<div class="container-fluid">
    <header class="bg-primary text-white p-3">
        <h1>My Blazor App</h1>
    </header>

    <div class="row">
        <div class="col-4 bg-dark p-2">
            <NavMenu />
        </div>

        <div class="col-8 p-3">
            @Body
        </div>
    </div>

    <footer class="mt-4 p-3 text-center text-muted">
        © 2025 My Company
    </footer>
</div>
```

Exercise - Layout Component

- Add the path to the Layout folder in the _Imports.razor.
- Change the project name "BlazorAppRoutingAndNav" to your own project name.

_Imports.razor

```
gAndNav
@using System.Net.Http
@using System.Net.Http.Json
@using Microsoft.AspNetCore.Components.Forms
@using Microsoft.AspNetCore.Components.Routing
@using Microsoft.AspNetCore.Components.Web
@using static Microsoft.AspNetCore.Components.Web.RenderMode
@using Microsoft.AspNetCore.Components.Web.Virtualization
@using Microsoft.JSInterop
@using BlazorAppRoutingAndNav
@using BlazorAppRoutingAndNav.Components
@using BlazorAppRoutingAndNav.Components.Layout
@using BlazorAppRoutingAndNav.Models
```

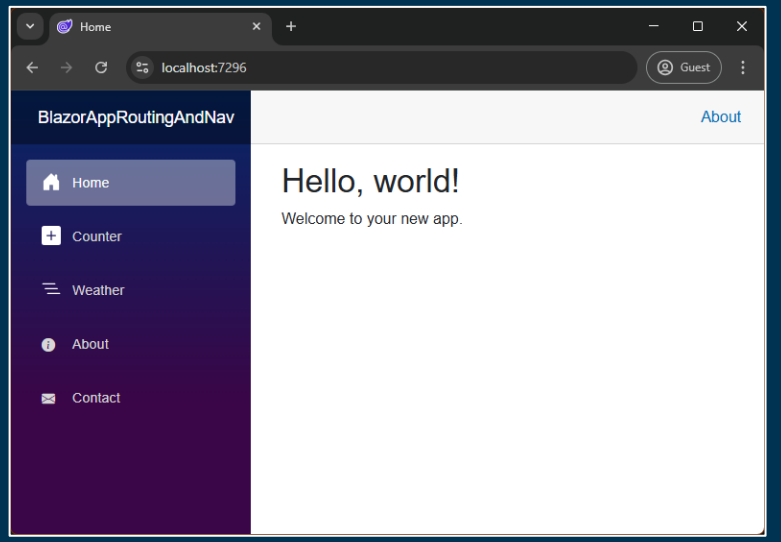
Exercise - Layout Component

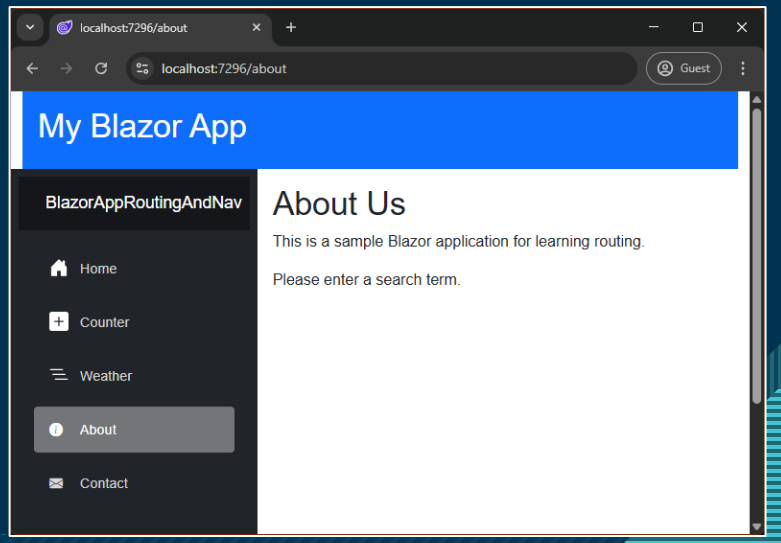
- Apply `MyLayout` to the `About.razor`.

About.razor | MyLayout.razor

ndNav | BlazorAppRoutingAndNav.Components.Pages.About | Id

```
@page "/about"
@page "/about/{id:int}"

@layout MyLayout

<h1>About Us</h1>

<p>This is a sample Blazor application for learning routing.</p>
```





Nested Layouts

- A nested layout is when one layout component is wrapped inside another layout.
- Blazor allows components to use another layout as their layout using: `@layout BaseLayout`.

- So, a layout (like `AdminLayout`) can:
  - Act as a layout for pages.
  - Also be wrapped inside another layout (like `BaseLayout`).
- This creates a layout hierarchy, where each level adds structure.

- Think of `BaseLayout` as the outer HTML frame (like the `<html>` and `<body>`), and `MainLayout` or `AdminLayout` as sections inside it (like sidebar + top row).

```
BaseLayout
├── MainLayout
│    └── Home.razor, About.razor, Product.razor
├── AdminLayout
     └── AdminProduct.razor, AdminDashboard.razor
```

Why Use Nested Layouts?

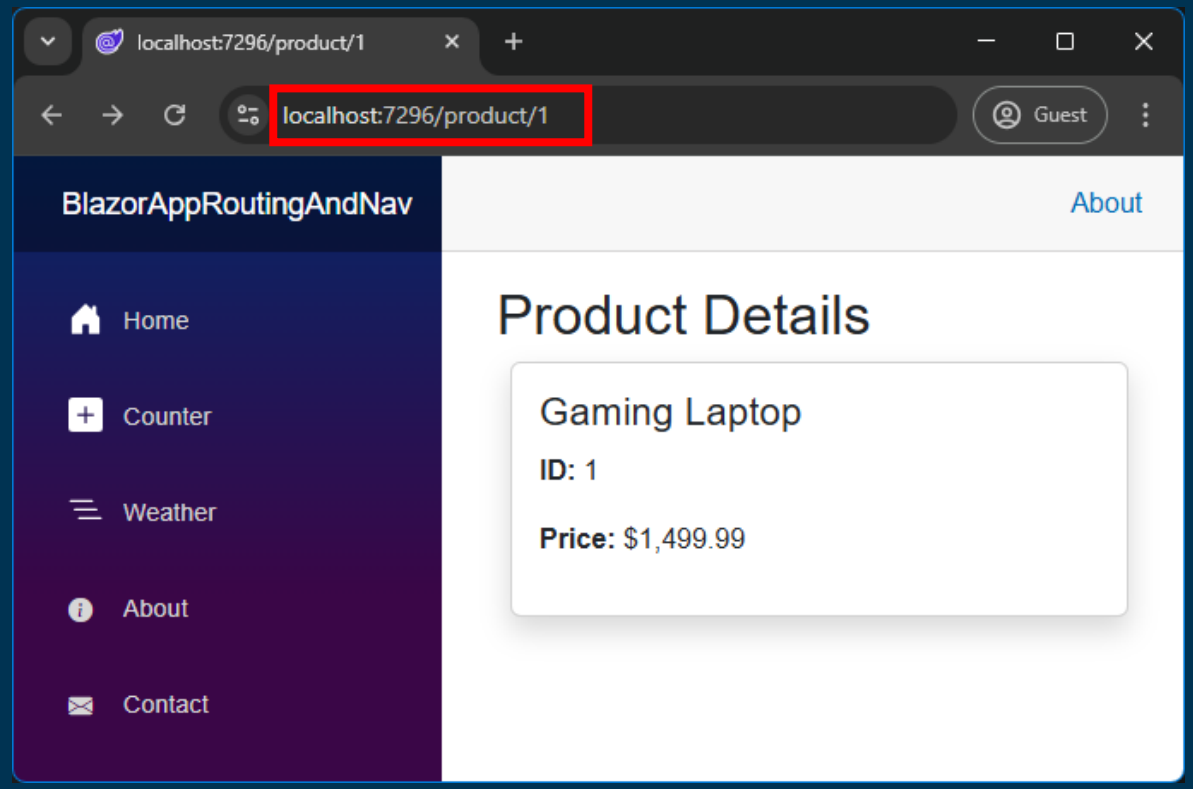
- **Avoids Code Duplication**:
  - Without nesting: MainLayout and AdminLayout would both define the same , error UI, etc.
  - With nesting, you put shared UI (like the error banner) in BaseLayout, and both layouts inherit it.

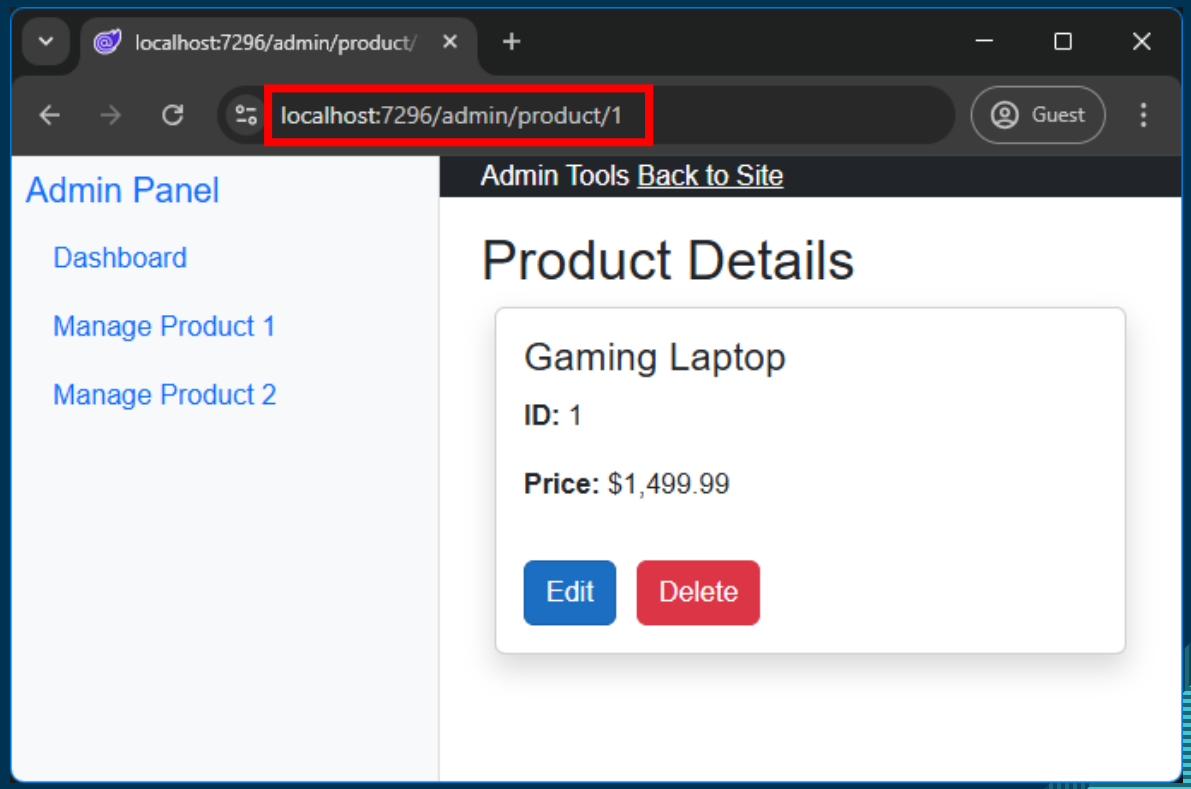
- **Improves Maintainability**:
  - Need to change a wrapper , layout style, or error UI?
  - Do it once in BaseLayout, and all nested layouts benefit.
  - Keeps each layout's job focused and clean.

- **Enforces Consistency**:
  - All pages use the same top-level structure automatically.
  - Nested layouts only handle role-specific or feature-specific layouts.

Exercise - Nested Layouts

- Use nested layouts to create separate UI for standard user and admin.
- User can only view product details whereas, admin can Edit or Delete as well.





Exercise - Nested Layouts

- Create a new Razor component file: Layout/BaseLayout.razor.
- Copy the `<div class="page">` and `<div id="blazor-error-ui">` from the `MainLayout` to `BaseLayout`.
- Add `@Body` to the `<div class="page">`.

```
@inherits LayoutComponentBase

<div class="page">
    @Body
</div>

<div id="blazor-error-ui" data-nosnippet>
    An unhandled error has occurred.
    <a href="." class="reload">Reload</a>
    <span class="dismiss">✕</span>
</div>
```

Exercise - Nested Layouts

- Go to MainLayout: Layout/MainLayout.razor.
- Change the class of `<div class="page">` to `<div class="layout-container">`.
- Delete `<div id="blazor-error-ui">`.

```
@inherits LayoutComponentBase
@layout BaseLayout

<div class="layout-container">
    <div class="sidebar">
        <NavMenu />
    </div>

Continue …
```

```
Continue …

    <main>
        <div class="top-row px-4">
            <a
href="https://learn.microsoft.com/aspnet/core/"
target="_blank">About</a>
        </div>

        <article class="content px-4">
            @Body
        </article>
    </main>
</div>
```

Exercise - Nested Layouts

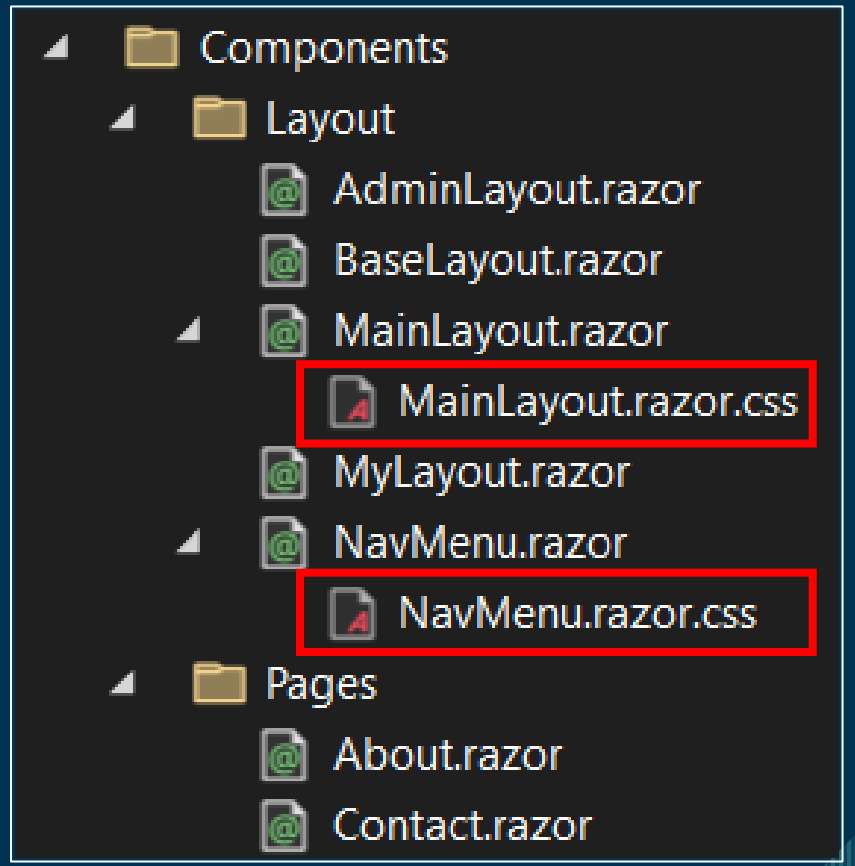
- Create a new Razor component file: Layout/AdminLayout.razor.
- You can copy-paste the code from here:

```
@layout BaseLayout
@inherits LayoutComponentBase

<div class="layout-container">
    <div class="sidebar bg-light">
        <nav class="nav flex-column p-2">
            <h5 class="text-primary">Admin Panel</h5>
            <NavLink href="/admin/dashboard"
class="nav-link">Dashboard</NavLink>
            <NavLink href="/admin/product/1"
class="nav-link">Manage Product 1</NavLink>
            <NavLink href="/admin/product/2"
class="nav-link">Manage Product 2</NavLink>
        </nav>
    </div>
Continue…
```

```
Continue…
  <main>
        <div class="top-row bg-dark text-white px-4">
            <span>Admin Tools</span>
            <a href="/" class="ms-auto text-white text-
decoration-underline">Back to Site</a>
        </div>

        <article class="content px-4">
            @Body
        </article>
    </main>
</div>
```

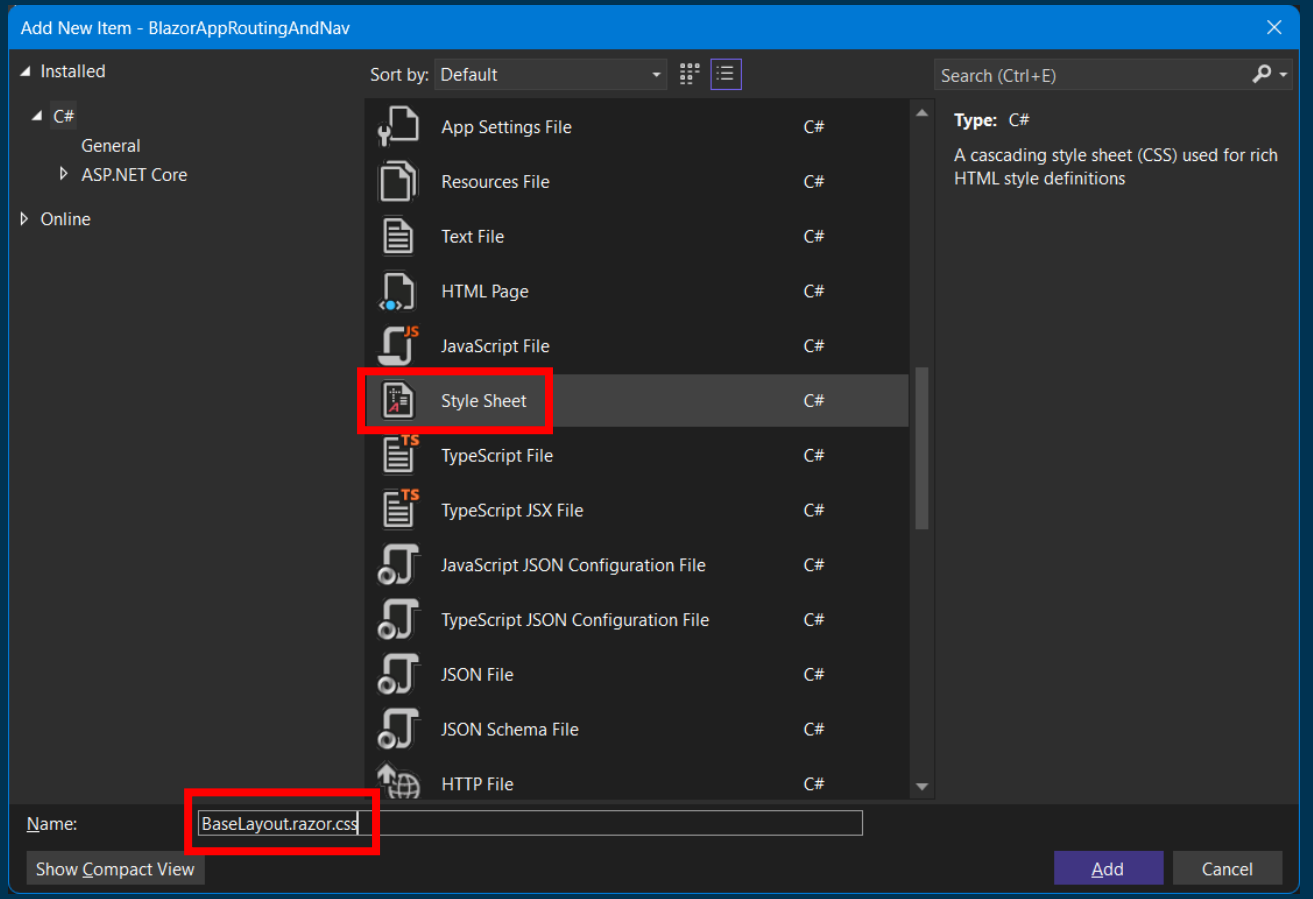
Exercise - Nested Layouts

- Now we need to fix some CSS of these Layouts.
- Notice how the built-in layouts, `MainLayout` and `NavMenu` have CSS files under their names.
- These are called Scoped CSS files.
- When you add a file named ComponentName.razor.css in the same folder as the .razor file, Blazor will:
  - Automatically scope the CSS to that component.
  - Apply styles only within that component's rendered markup.
  - Add it under the .razor file in Solution Explorer (like a linked file).



Exercise - Nested Layouts

- To create a CSS File for BaseLayout.razor, right-click on Layout folder.
- Select Add → New Item.
- Choose Style Sheet.
- Name it BaseLayout.razor.css.
- Visual Studio will automatically link it under BaseLayout.razor.



Exercise - Nested Layouts

- Once BaseLayout.razor.css created, copy-paste the CSS code from here:

```
.page {
    position: relative;
    display: flex;
    flex-direction: column;
}
#blazor-error-ui {
    color-scheme: light only;
    background: lightyellow;
    bottom: 0;
    box-shadow: 0 -1px 2px rgba(0, 0, 0, 0.2);
    box-sizing: border-box;
    display: none;
    left: 0;
    padding: 0.6rem 1.25rem 0.7rem 1.25rem;
    position: fixed;
    width: 100%;
    z-index: 1000;
}
```

```
#blazor-error-ui .dismiss {
        cursor: pointer;
        position: absolute;
        right: 0.75rem;
        top: 0.5rem;
    }
```

Exercise - Nested Layouts

- Go to MainLayout.razor.css.
- Delete the CSS code under `.page`.

MainLayout.razor.css | BaseLayout.razor.css

```
.page {
    position: relative;
    display: flex;
    flex-direction: column;
}

main {
    flex: 1;
}
```

- And delete `#blazor-error-ui` and `#blazor-error-ui .dismiss`.

MainLayout.razor.css | BaseLayout.razor.css | AdminLayout.razor | BaseLayo

```
#blazor-error-ui {
    color-scheme: light only;
    background: lightyellow;
    bottom: 0;
    box-shadow: 0 -1px 2px rgba(0, 0, 0, 0.2);
    box-sizing: border-box;
    display: none;
    left: 0;
    padding: 0.6rem 1.25rem 0.7rem 1.25rem;
    position: fixed;
    width: 100%;
    z-index: 1000;
}

    #blazor-error-ui .dismiss {
        cursor: pointer;
        position: absolute;
        right: 0.75rem;
        top: 0.5rem;
    }
```

Exercise - Nested Layouts

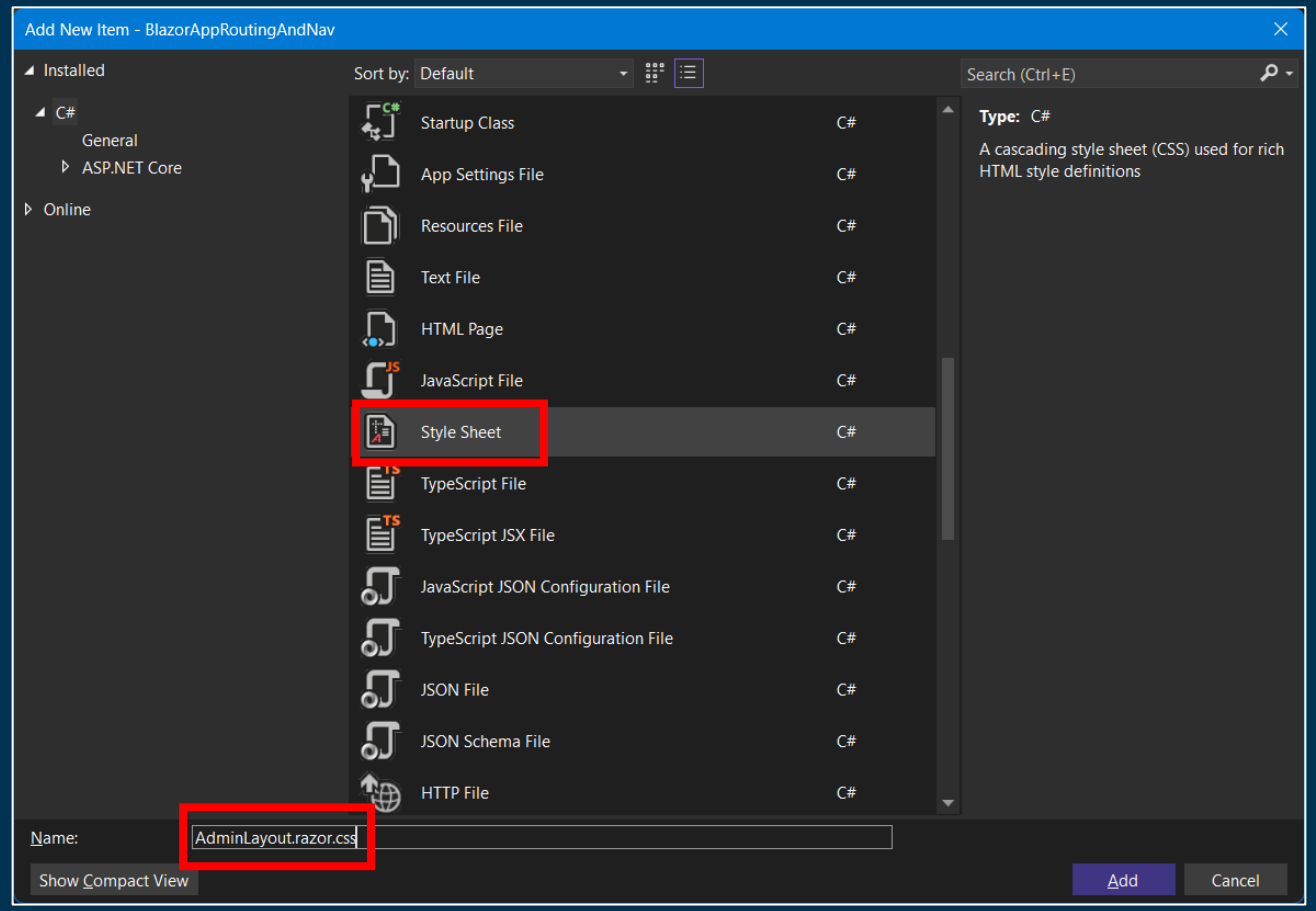
- Add CSS code for `.layout-container` to the MainLayout.razor.css.

MainLayout.razor.css | BaseLayout.razor.css

```
.layout-container {
    display: flex;
    flex: 1;
}

main {
    flex: 1;
}
```

Exercise - Nested Layouts

- Create another CSS File for AdminLayout.razor by right-clicking on Layout folder.
- Select Add → New Item.
- Choose Style Sheet.
- Name it AdminLayout.razor.css.



Exercise - Nested Layouts

- Once AdminLayout.razor.css created, copy-paste the CSS code from here:

```
.sidebar {
    width: 250px;
    height: 100vh;
    position: sticky;
    top: 0;
    border-right: 1px solid #ddd;
    background-color: #f8f9fa;
}
main {
    flex: 1;
    display: flex;
    flex-direction: column;
}
.layout-container {
    display: flex;
    flex: 1;
}
```

Exercise - Nested Layouts

- Go to Product.razor and provide the `MainLayout` as its layout.

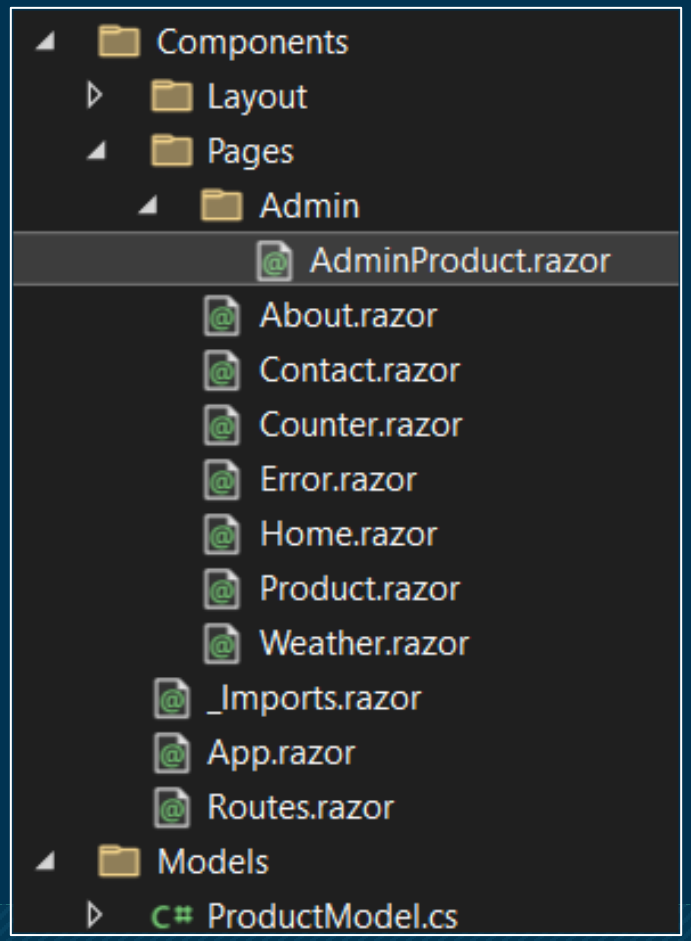
Product.razor

ndNav BlazorAppRoutingAndNav.C

```
@page "/product/{id:int}"

@layout MainLayout

<h1>Product Details</h1>

@if (product != null)
{
    <div class="card p-3 m-2 shadow">
```

Exercise - Nested Layouts

- Add a new folder Admin to the Pages folder.
- Then, add a new razor component AdminProduct.razor inside the Admin folder.



Exercise - Nested Layouts

- For AdminProduct.razor page you can copy-paste the code from here:

```
@page "/admin/product/{id:int}"
@layout AdminLayout
<h1>Product Details</h1>
@if (product != null)
{
    <div class="card p-3 m-2 shadow">
        <h4>@product.Name</h4>
        <p><strong>ID:</strong> @product.Id</p>
        <p><strong>Price:</strong>
@product.Price.ToString("C")</p>
        <!-- Dummy admin actions -->
        <div class="mt-3">
            <button class="btn btn-
primary">Edit</button>
            <button class="btn btn-danger ms-
2">Delete</button>
        </div>
    </div>
}
```

```
else
{
    <div class="alert alert-warning">
        Product not found. <NavLink href="/">Go back
to home</NavLink>
    </div>
}

Continue …
```

Exercise - Nested Layouts

- For AdminProduct.razor page you can copy-paste the code from here:

```
@code {
    [Parameter]
    public int Id { get; set; }

    private ProductModel? product;

    private List<ProductModel> products = new()
    {
        new ProductModel(1, "Gaming Laptop",
1499.99M),
        new ProductModel(2, "Wireless Mouse",
29.99M),
        new ProductModel(3, "Mechanical Keyboard",
79.50M),
        new ProductModel(4, "27-inch Monitor",
299.00M),
        new ProductModel(5, "USB-C Dock", 59.95M)
    };
Continue …
```

```
Continue …

    protected override void OnInitialized()
    {
        product = products.Find(p => p.Id == Id);
    }
}
```

Exercise - Nested Layouts

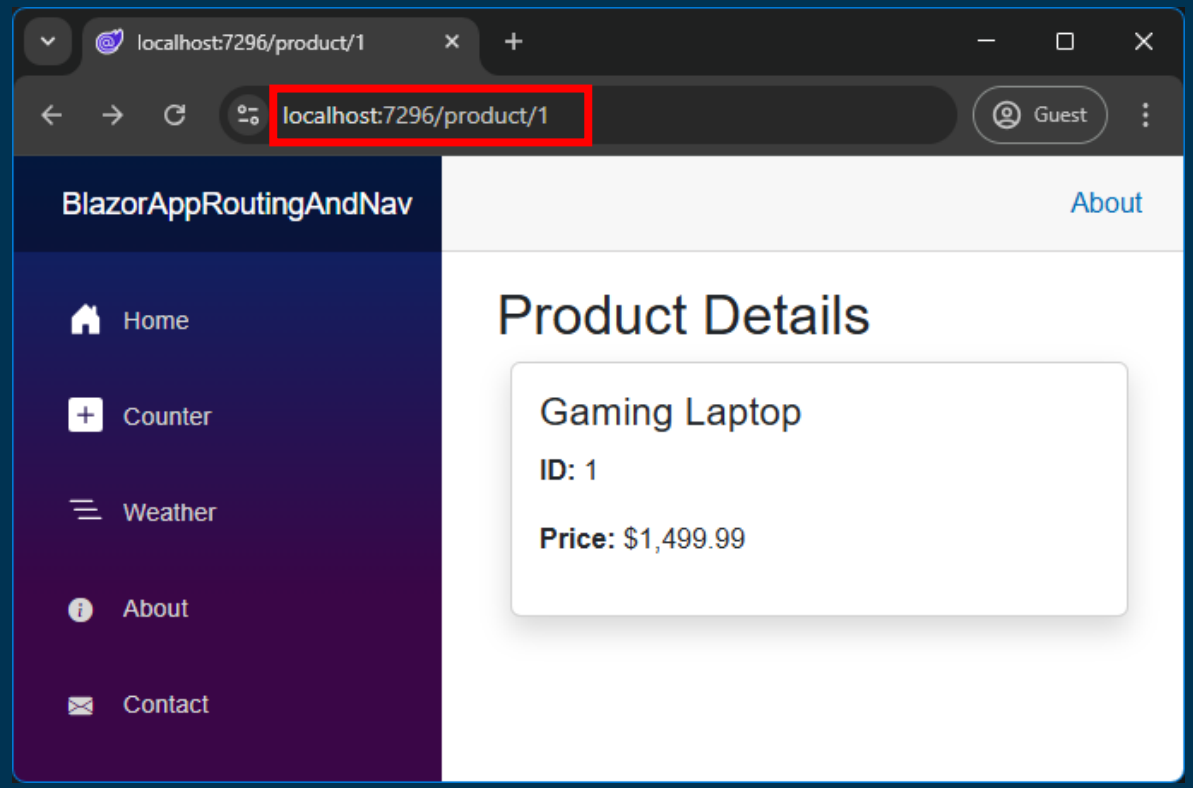
- The `@page` directive points to the route `/admin/product/{id}`.
- It uses `AdminLayout` as its layout.
- There are some dummy buttons to simulate Edit and Delete functionality.
  - *The buttons don't work in this example.*
- The remainder code is like the one in Product.razor component.

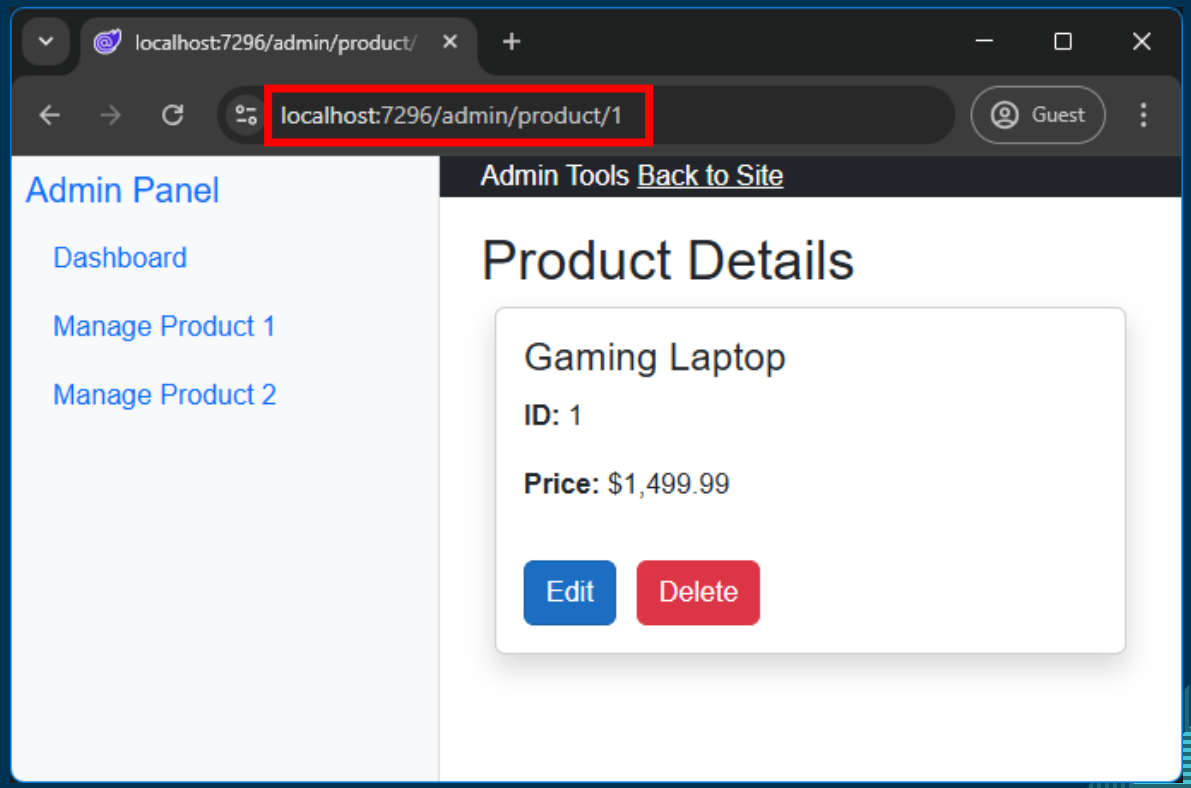
AdminProduct.razor | Product.razor

```
@page "/admin/product/{id:int}"

@layout AdminLayout

<h1>Product Details</h1>

@if (product != null)
{
    <div class="card p-3 m-2 shadow">
        <h4>@product.Name</h4>
        <p><strong>ID:</strong> @product.Id</p>
        <p><strong>Price:</strong> @product.Price.ToString("C")</p>

        <!-- Dummy admin actions -->
        <div class="mt-3">
            <button class="btn btn-primary">Edit</button>
            <button class="btn btn-danger ms-2">Delete</button>
        </div>
    </div>
}
```

Exercise - Nested Layouts

- Run the app and try navigating to:
  - `/product/1`
  - `/admin/product/1`





Do It Yourself!

- **Show User Profile by ID**:
  - Create a new Razor component: UserProfile.razor.
  - Accept a route parameter for `id`:

```
@page "/user/{id:int}"
```

  - Display a fake user profile based on the `id`.
  - Use a list like:

```
private List<User> Users = new()
{
    new User { Id = 1, Name = "Alice" },
    new User { Id = 2, Name = "Bob" }
};
```

  - Test with `/user/1`, `/user/2`, etc.

Do It Yourself!

- **Optional Route Parameter with Fallback**:
  - Create a page: Welcome.razor.
  - Define a route like:

```
@page "/welcome"
@page "/welcome/{name}"
```

  - If name is supplied, show “Welcome, [name]”.
  - If not, show a default message: “Welcome, Guest”.

Do It Yourself!

- **Admin vs. User Layout (UI Only)**:
  - Create two layouts:
    - UserLayout.razor: Regular sidebar and top bar.
    - AdminLayout.razor: Sidebar includes links to “Dashboard”, “Manage Users”, etc.
  - Create two pages:
    - UserHome.razor using UserLayout.
    - AdminHome.razor using AdminLayout.
  - Add fake links like:
    - `/user/home` → standard view.
    - `/admin/home` → admin view.

Thank You

References

Some material has been taken from:

- Use pages, routing, and layouts to improve Blazor navigation:
  - https://learn.microsoft.com/en-us/training/modules/use-pages-routing-layouts-control-blazor-navigation/1-introduction

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