

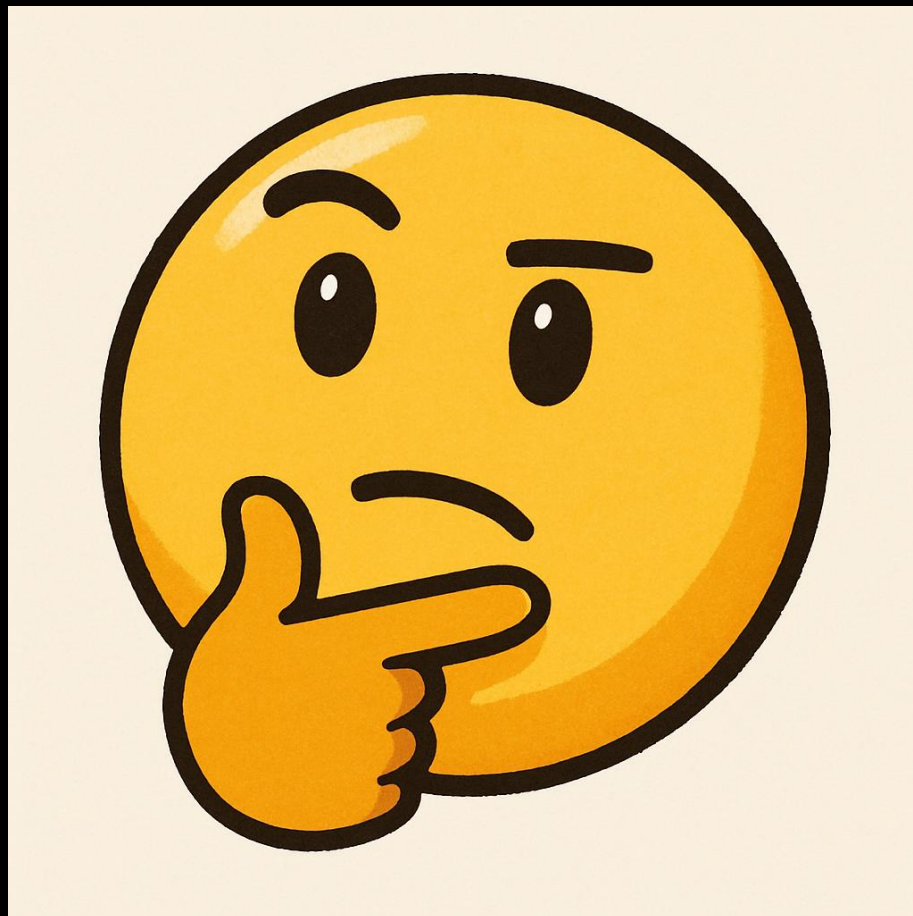


Blazor for JavaScript Developers

Tim Purdum
DevUp Conf
August, 2025



Why Did You Come to This Session?





Goals of the Session

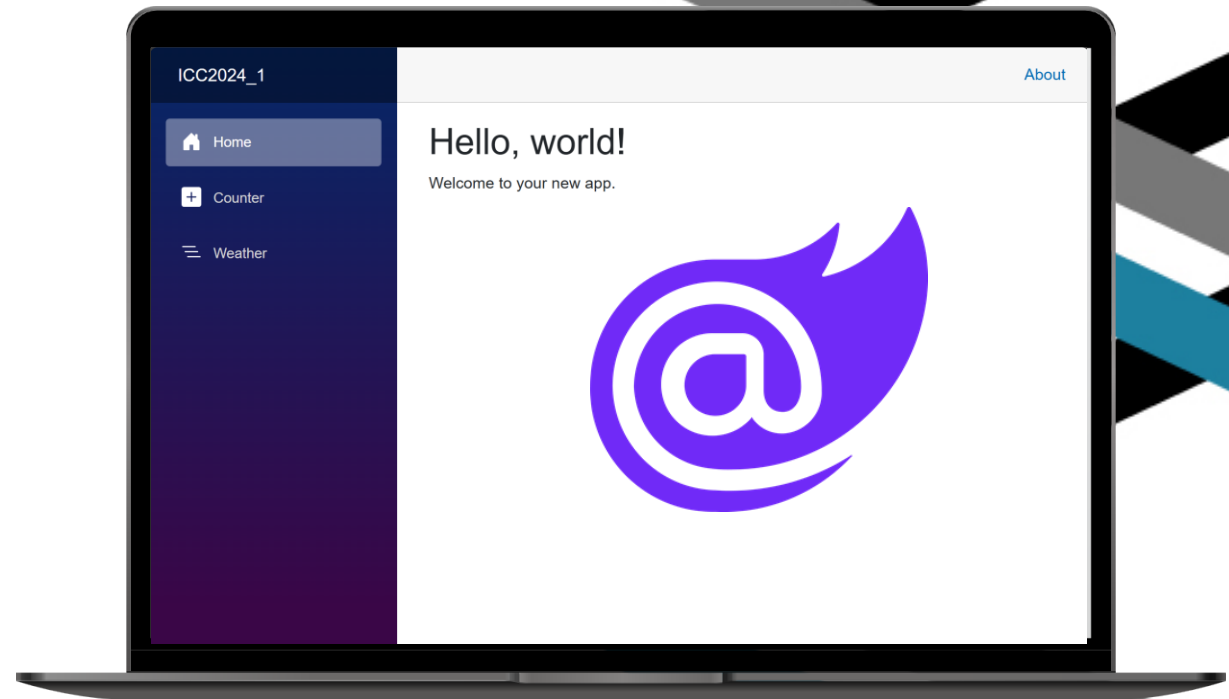
- *Why* use Blazor
- Getting started
- Unique features and functionality
- Compare & contrast to JavaScript frameworks
- Pitfalls and drawbacks
- How it ties into the Asp.NET Core back-end Ecosystem
- How you can write interop code between Blazor and JS

Why Use Blazor?

- Single language, full stack
- Shared data models
- Strongly-typed language
- Utilize existing developer skillsets
- Expanding an existing Asp.NET Core application
- Unique, server-first rendering modes unavailable in JS
- Shared code with .NET MAUI for desktop/mobile

What is Blazor?

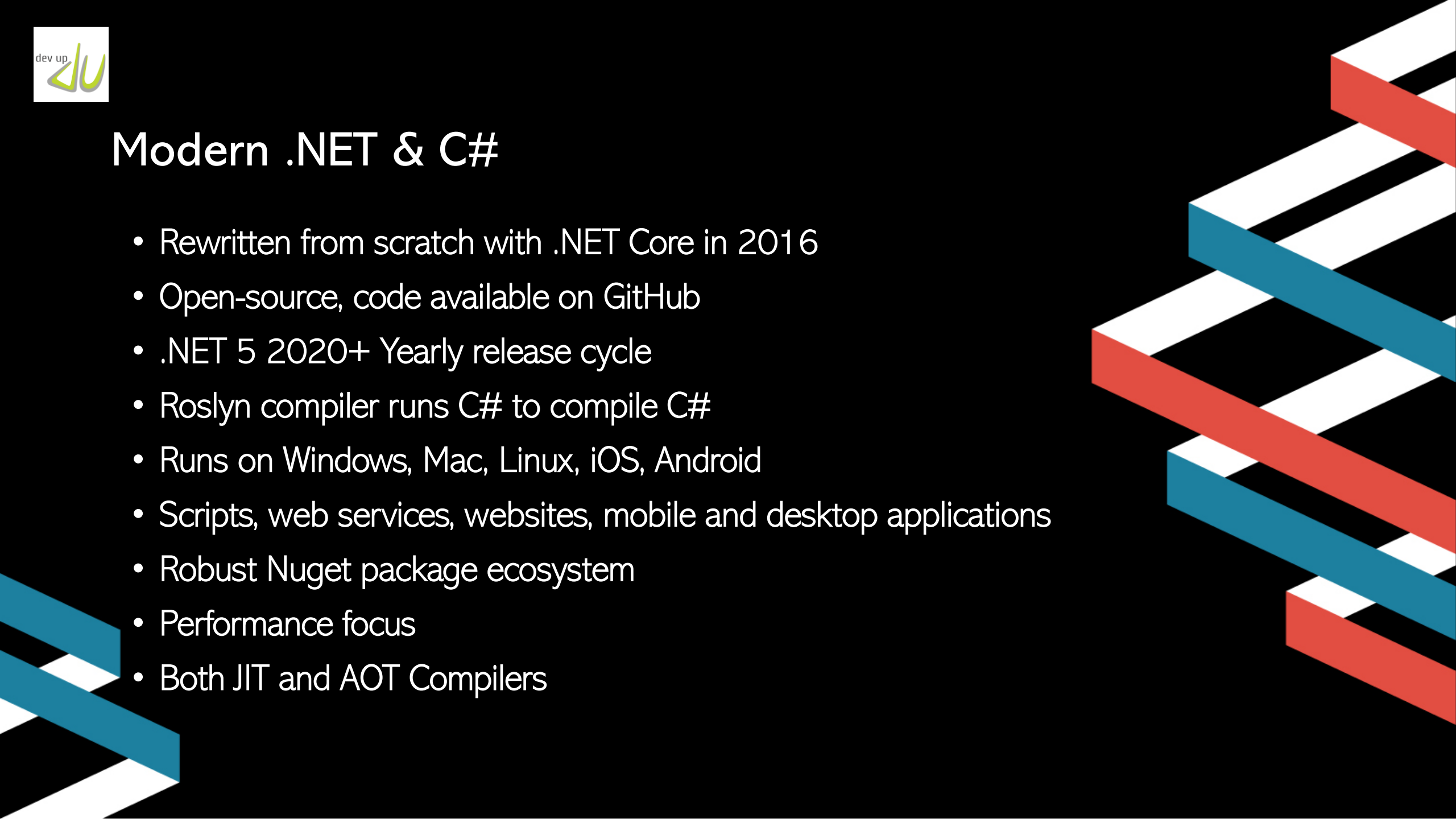
- Modern full-stack web framework
- Built on Asp.NET Core and Modern .NET
- Released with .NET Core 3.1 in 2018
- Static and dynamic Server-Side rendering
- Client WebAssembly SPA applications or individual components
- High productivity with a single unifying language and framework
- Hot-reload == rapid development with robust dev tools





Modern .NET & C#




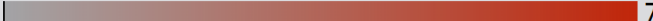









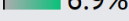

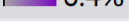

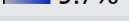

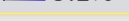
- Rewritten from scratch with .NET Core in 2016
- Open-source, code available on GitHub
- .NET 5 2020+ Yearly release cycle
- Roslyn compiler runs C# to compile C#
- Runs on Windows, Mac, Linux, iOS, Android
- Scripts, web services, websites, mobile and desktop applications
- Robust Nuget package ecosystem
- Performance focus
- Both JIT and AOT Compilers



Asp.NET Core Performance

Composite Framework Scores

Each framework's peak performance in each test type (shown in the colored columns below) is multiplied by the weights shown above. The results are then summed to yield a weighted score. Only frameworks that implement all test types are included. 159 total frameworks ranked, 10 visible, 149 hidden by filters. See filter panel above.

Rnk	Framework	JSON	1-query	20-query	Fortunes	Updates	Plaintext	Weighted score
13	 actix	1,194,185	429,376	22,538	405,144	15,658	6,970,300	6,288  77.8%
15	 asp.net core	1,042,029	392,709	25,329	363,344	18,197	7,014,298	6,143  76.0%
27	 fiber	955,738	348,092	18,374	328,620	11,543	4,868,585	4,882  60.4%
88	 spring	236,259	147,907	15,932	24,082	7,131	506,087	1,507  18.6%
106	 nestjs	270,076	76,938	5,975	61,081	3,641	419,035	1,099  13.6%
117	 koa	215,740	54,531	5,094	43,896	1,800	365,806	782  9.7%
130	 express	92,604	37,488	4,806	33,868	2,005	113,117	555  6.9%
134	 rails	85,460	21,382	5,578	14,804	2,869	93,140	515  6.4%
138	 laravel	77,648	37,275	4,656	22,501	1,666	81,052	462  5.7%
143	 django	177,099	19,032	1,623	14,707	871	300,170	413  5.1%

Round 22 results

TechEmpower Framework Benchmarks Oct. 2023



Getting Started

- **Get .NET**
 - Download from <https://dotnet.microsoft.com>
 - `winget install Microsoft.DotNet.SDK.9`
- **Get Language Support**
 - VS Code + VS License – C# Dev Kit Extension
 - Visual Studio - Community Edition (free), Professional, Enterprise
 - JetBrains Rider – Free Community License, Paid Prof. License



Getting Started (2)

- `dotnet new list` – shows all the available templates
- `dotnet new blazor -h` – displays help for completions
- `dotnet new blazor -int Auto -au Individual -o HelloWorld`
 - `-int Auto` – auto interactive mode
 - `-au Individual` – adds individual authentication user accounts
 - `-o HelloWorld` – sets the name and output folder of the project
- `cd HelloWorld` – navigate
- `code .` – open the folder for editing
- `dotnet run -lp https` – run the application!

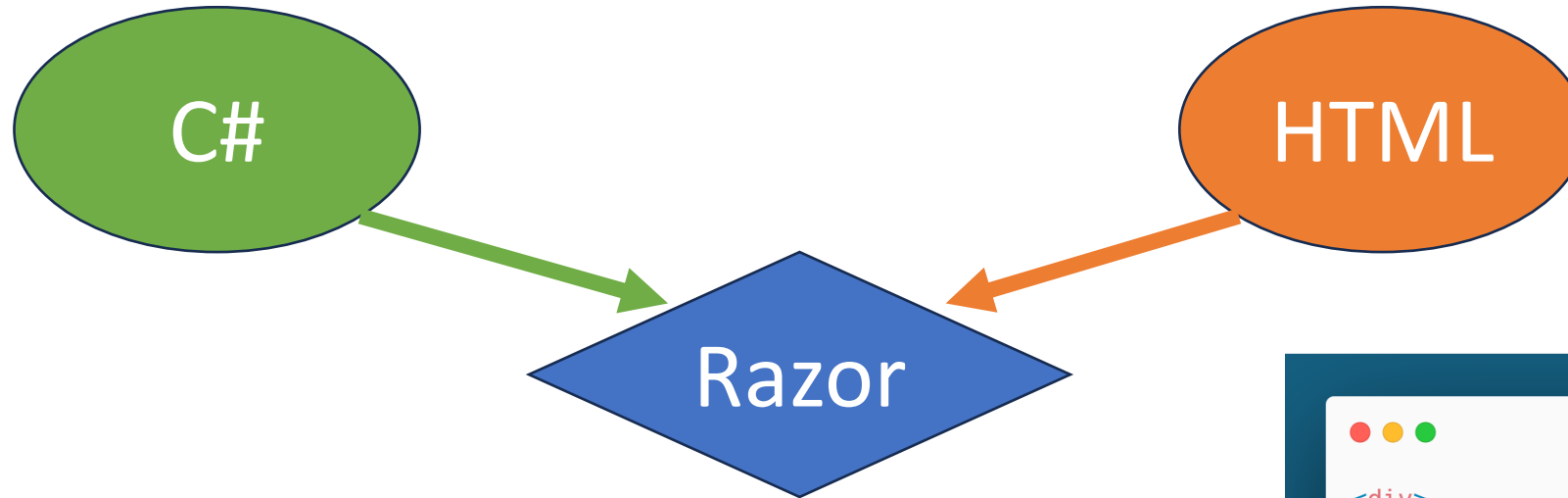


DON'T PANIC

Blazor Supports Modern Web Standards

- HTML
 - Full support, only changes would be to escape @ text characters
 - Can create nested components primarily out of HTML simply for organizational structure, even if not using other functionality
 - Declarative head tags, links, scripts, and component-level injection of extra head content, links, and scripts
- CSS
 - Inline support
 - `/wwwroot` files imported with link tags
 - *Scoped* CSS files per component: e.g., `Component1.razor => Component1.razor.css`
- W {
 - {
 - L / IJSRuntime L w

Razor (the Syntax and Components behind Blazor)



- `.razor` file extension
- Encapsulate UI and functionality
- Reusable and composable
- Each one can run client-side or server-side
- `@` symbol identifies start of C# code
- Parentheses and Braces define code scopes
- Markup tags can be nested inside conditional logic on new lines

```
<div>
  <h1>Sample</h1>
  <p>This is a sample component.</p>
  <button @onclick="CSharpMethod">@CSharpVariable</button>
  <p>Current count: @CSharpCount</p>
  <AnotherRazorComponent Count="CSharpCount" />
</div>

@code {
    private int CSharpCount = 0;
    private string CSharpVariable = "Click me";

    private void CSharpMethod()
    {
        CSharpCount++;
    }
}
```

Razor Component Structure

Razor Markup

```


<h1>Sample</h1>
  <p>This is a sample component.</p>
  <button @onclick="CSharpMethod">
    @CSharpVariable
  </button>
  <p>Current count: @CSharpCount</p>
</div>


```

Code Block

```

@code {
    private int CSharpCount = 0;
    private string CSharpVariable = "Click me";

    private void CSharpMethod()
    {
        CSharpCount++;
    }
}

```


Razor Partial Class ("Code-Behind" Pattern)

MyComponent.razor

```


<div>
    <h1>Sample</h1>
    <p>This is a sample component.</p>
    <button @onclick="CSharpMethod">
      @CSharpVariable
    </button>
    <p>Current count: @CSharpCount</p>
  </div>


```

MyComponent.razor.cs

```

namespace MyBlazorProject;

public partial class MyComponent
{
    private int CSharpCount = 0;
    private string CSharpVariable = "Click me";

    private void CSharpMethod()
    {
        CSharpCount++;
    }
}

```

Dependency Injection



```
// Program.cs  
builder.Services.AddScoped<IRepository, MyRepository>();
```



```
// Code Block or MyComponent.razor.cs  
[Inject]  
public required IRepository Repository { get; set; }
```



```
// MyComponent.razor  
@inject IRepository Repository  
  
<div>  
    ...  
</div>
```



Comparing Blazor to JavaScript Frameworks

Feature / Aspect	Angular	React	Vue	Blazor
Created By	Google	Meta	Evan You (ex-Google)	Microsoft
First Release	2010	2013	2014	2018
Language	TypeScript	JavaScript / Typescript	JavaScript / TypeScript	C#/WebAssembly
Architectural Patterns	MVC, MVVM, Modules, Templates, Components, Dependency Injection, Hexagonal, Onion, Vertical Slice	SPA, Flux, Redux, Components, HOC, SSR, Code Splitting, Reactive	MVVM, Components, Templates, Flat Structure, Modules, Micro Front Ends, Reactive	Reactive, Components, Dependency Injection, SSR, InteractiveServer



Comparing Blazor to JavaScript Frameworks

Feature / Aspect

Angular

React

Vue

Blazor

Project
Structure

```

  hello-angular-world
  > .angular
  > .vscode
  > node_modules
  > public
  > src
    > app
      # app.component.css
      <> app.component.html
      TS app.component.spec.ts
      TS app.component.ts
      TS app.config.server.ts
      TS app.config.ts
      TS app.routes.server.ts
      TS app.routes.ts
      <> index.html
      TS main.server.ts
      TS main.ts
      TS server.ts
      # styles.css
      .editorconfig
      .gitignore
      {} angular.json
      {} package-lock.json
      {} package.json
      {} README.md
      {} tsconfig.app.json
      TS tsconfig.json
      {} tsconfig.spec.json

```

```

  HELLO-REACT-WORLD
  > node_modules
  > public
  > src\app
    ★ favicon.ico
    # globals.css
    ⚙ layout.tsx
    # page.module.css
    ⚙ page.tsx
    .gitignore
    JS eslint.config.mjs
    TS next-env.d.ts
    TS next.config.ts
    {} package-lock.json
    {} package.json
    ⓘ README.md
    TS tsconfig.json

```

```

  hello-vue-world
  > .vscode
  > node_modules
  > public
  > src
    > assets
    > components
    > router
    > stores
    > views
    ▼ App.vue
    TS main.ts
    .gitignore
    TS env.d.ts
    <> index.html
    {} package-lock.json
    {} package.json
    ⓘ README.md
    {} tsconfig.app.json
    TS tsconfig.json
    {} tsconfig.node.json
    ⚡ vite.config.ts

```

```

  Hello.Blazor.World
  > Hello.Blazor.World
    > bin
    > Components
    > obj
    > Properties
    > wwwroot
    {} appsettings.Development.json
    {} appsettings.json
    ⚡ Hello.Blazor.World.csproj
    C# Program.cs
  > Hello.Blazor.World.Client
    > bin
    > obj
    > Pages
    > wwwroot
    .Imports.razor
    ⚡ Hello.Blazor.World.Client.csproj
    C# Program.cs
    .Hello.Blazor.World.sln

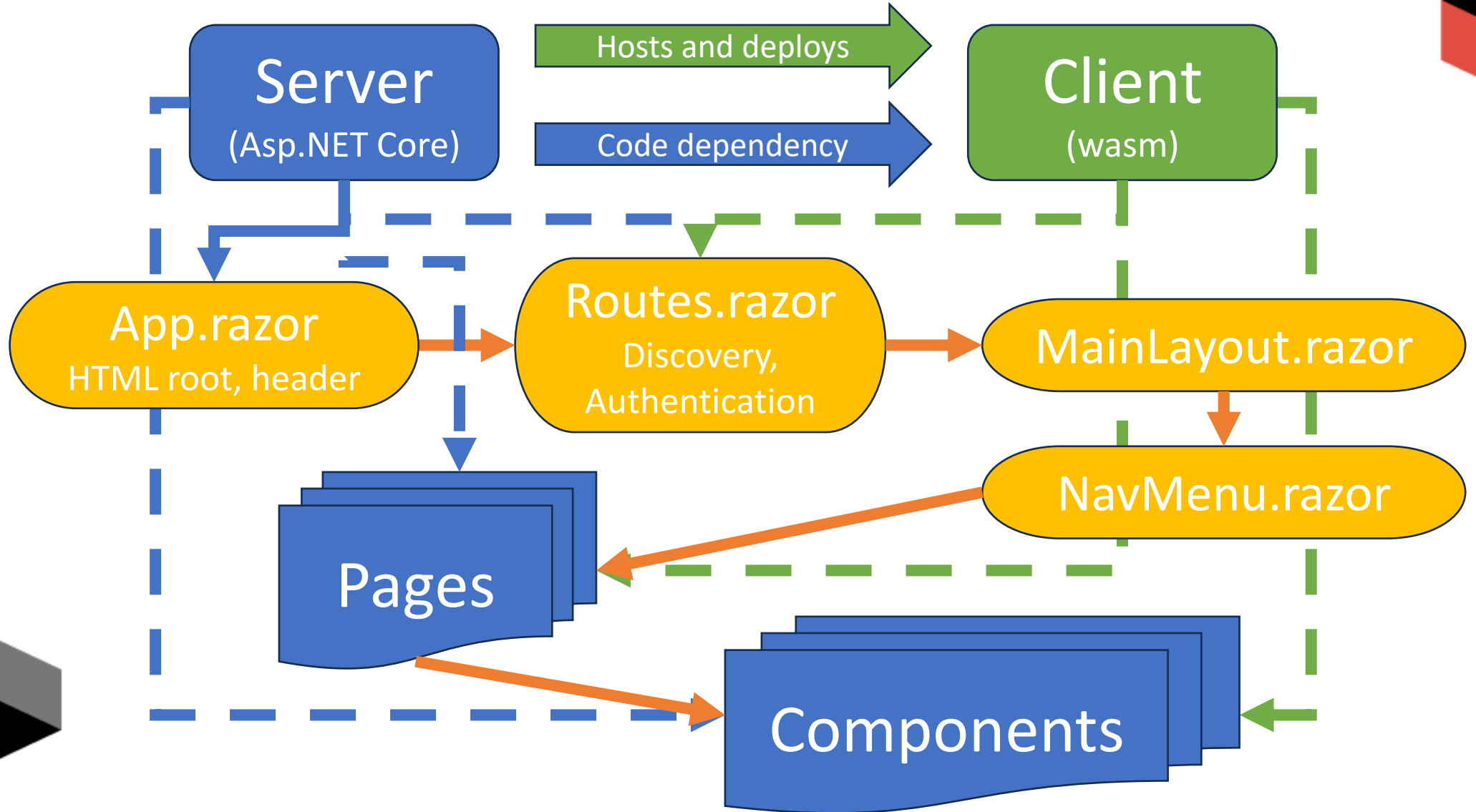
```



Comparing Blazor to JavaScript Frameworks

Feature / Aspect	Angular	React	Vue	Blazor
Markup Syntax	HTML Templates	JSX	SFC	Razor
File Structures	app.component.html app.component.css app.component.ts	page.tsx page.module.css	App.vue	Home.razor Home.razor.cs Home.razor.css Home.razor.js
Field/Property Injection	 {{ propVal }} 	 { propVal } 	 {{ propVal }} 	 @propVal
Property Binding	[src]="variableUrl"	src={variableUrl}	:src="variableUrl"	src="@variableUrl"
Click Handler	(click)="jsFunction()"	onClick={jsFunction}	@click="jsFunction"	@onclick="CsharpMethod"
Two-way Form Binding	@angular/forms [(ngModel)]="model.item"	value={item} onChange={setItem}	v-model="item"	@bind="item" OR @bind:get="item" & @bind:set="method"

Project Structure



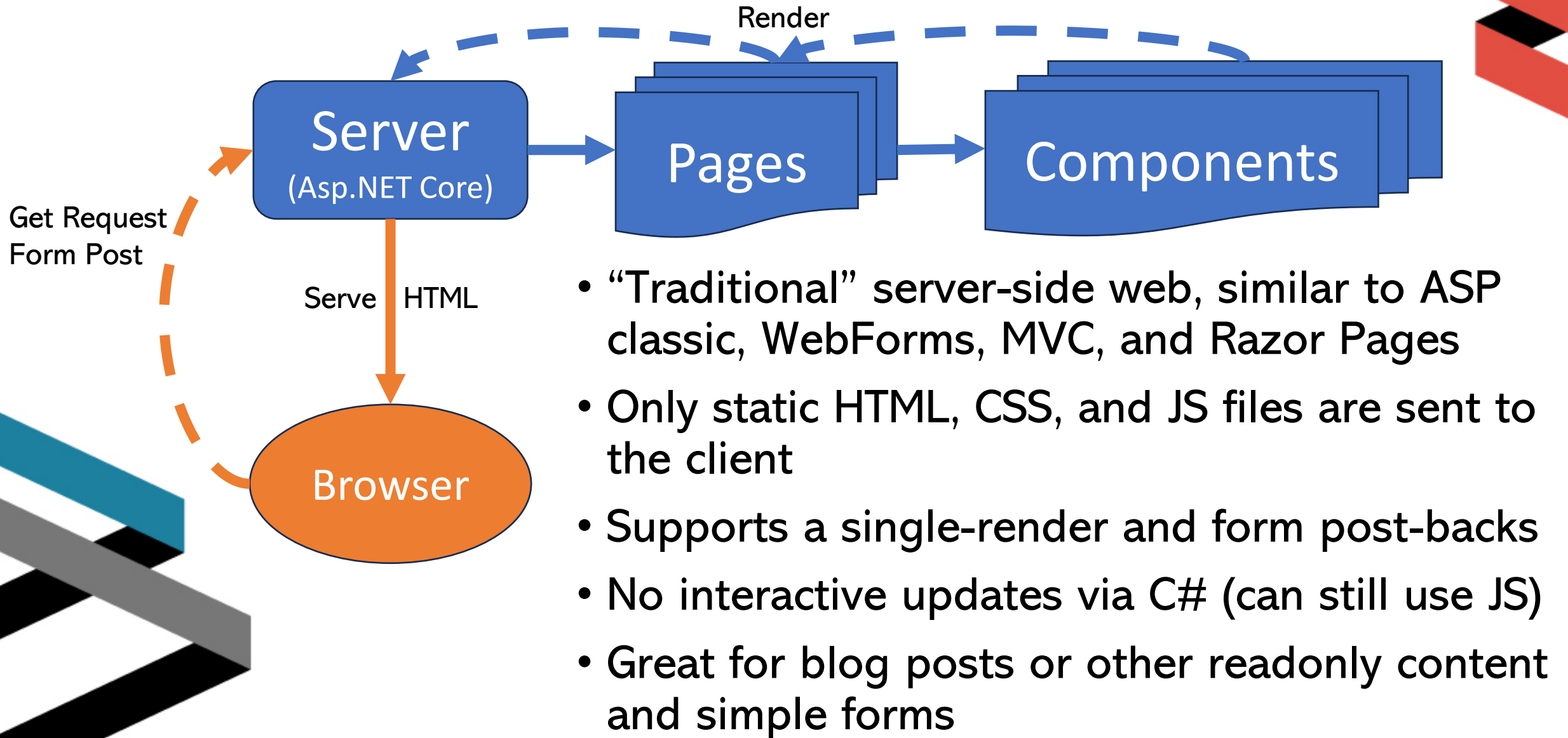
Blazor Component Render Modes



- **Static Server Mode**
- **Interactive Server Mode**
- **Interactive WebAssembly Mode**
- **Interactive Auto Mode**
- **Blazor Hybrid (MAUI)**

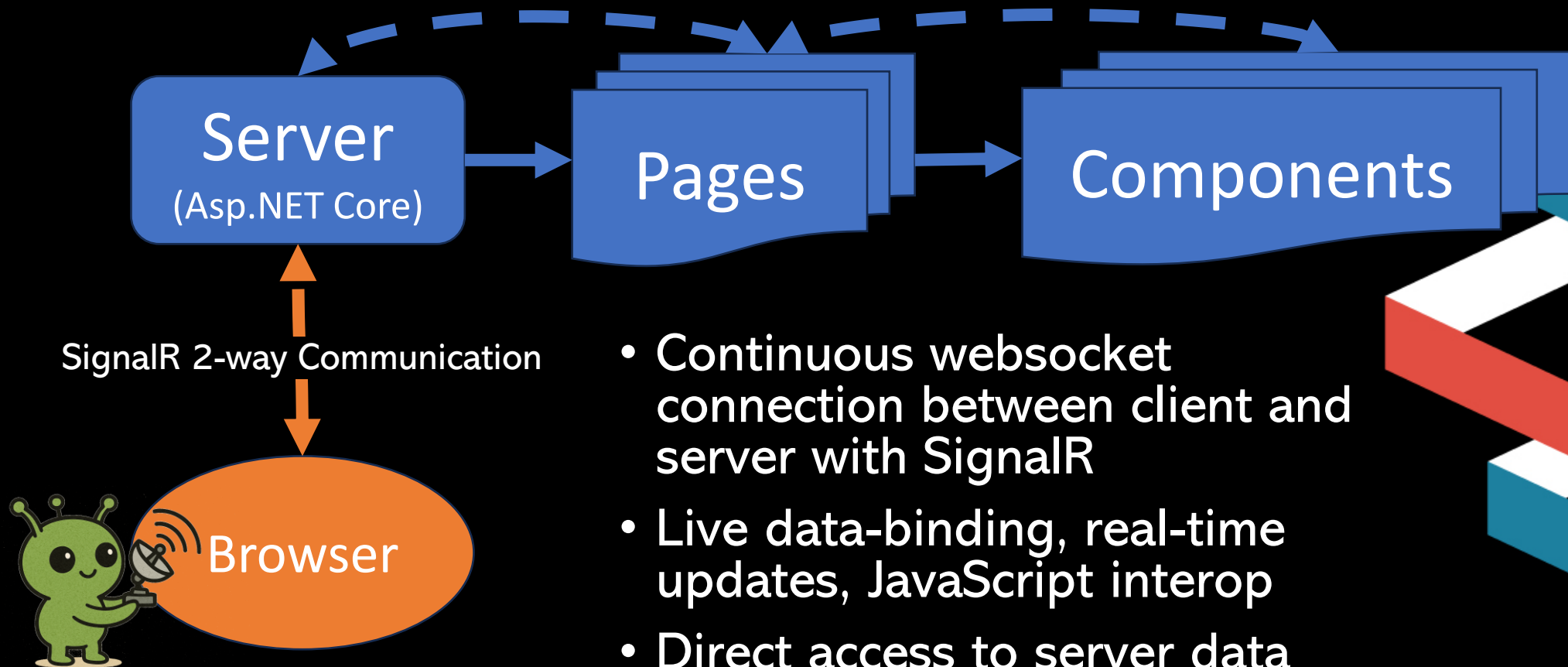


Blazor Render Modes: Static Server





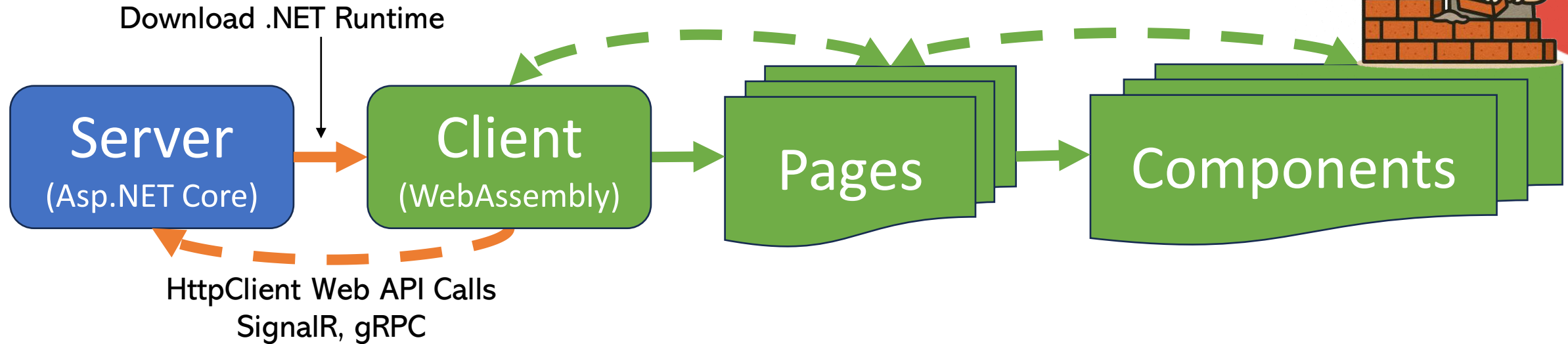
Blazor Render Modes: Interactive Server



- Continuous websocket connection between client and server with SignalR
- Live data-binding, real-time updates, JavaScript interop
- Direct access to server data store
- Fast on first load
- Leaving browser tabs open can cause disconnection issues



Blazor Render Modes: Interactive WebAssembly



- Runs in the client browser
- Live data-binding, real-time updates, JavaScript interop
- HttpClient calls to communicate with server web API

- Single-threaded
- Large/slow first load
- Fast interactions after load
- Closest in approach to most JS SPA frameworks



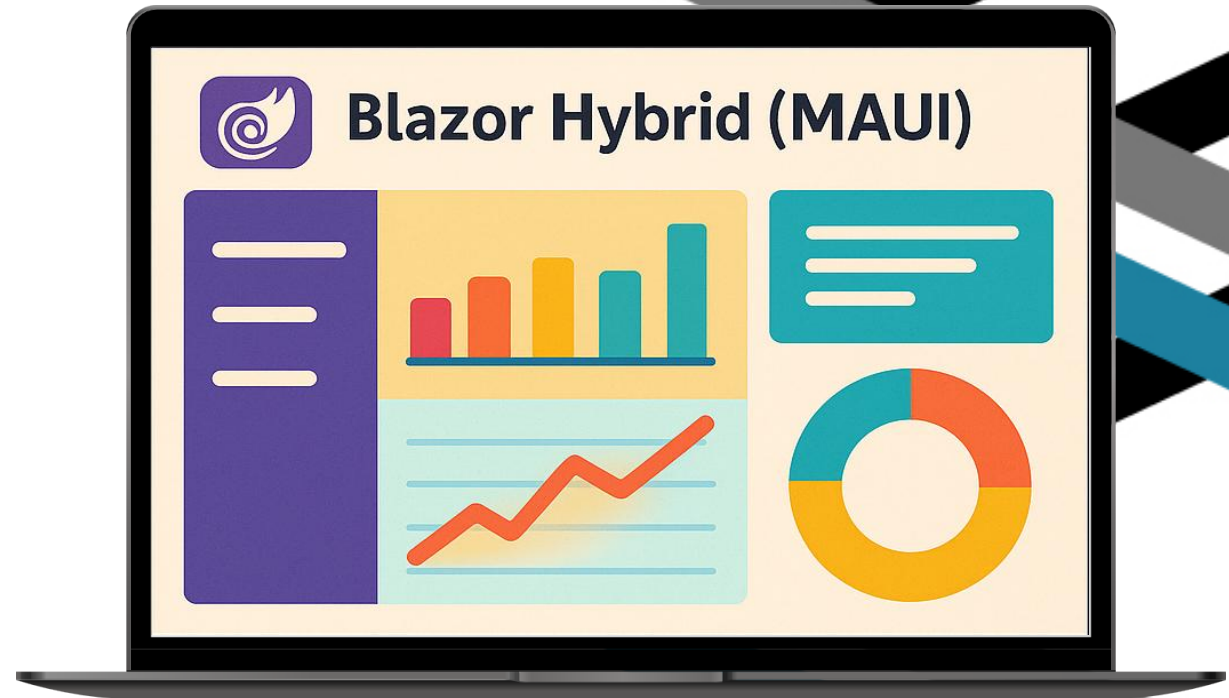
Blazor Render Modes: Interactive Auto



- On first load, runs from server, creating SignalR connection
- In the background, downloads .NET runtime and client code
- On next load, switches to running from WebAssembly
- “Best of both worlds”
 - Fast start on first load (server)
 - More responsive and robust interactions (client)
- Requires flexible data handling/abstraction to handle both client and server modes

Blazor Hybrid (MAUI)

- Runs in a WebView in .NET MAUI (iOS, Android, Mac, Windows)
- Native .NET multi-threaded code execution (not WebAssembly)
- Access to device APIs (GPS, Bluetooth, photos, etc.)
- Can reuse components or entire UI applications between web, desktop, and mobile



Escaping Back into JavaScript...



```
<script>
  window.getWindowWidth = () => {
    return window.innerWidth;
  };
</script>
```



```
[Inject]
public required IJSRuntime JSRuntime { get; set; }

protected async Task OnAfterRenderAsync(bool firstRender)
{
  double width = await JSRuntime.InvokeAsync<double>("getWindowWidth");
}
```

Escaping Back into JavaScript...



module.js

```
export async function printDomElement(elementId) {  
    let canvas = await html2canvas(document.getElementById(elementId));  
    return base64ToArrayBuffer(canvas.toDataURL("image/png").split(",")[1]);  
}  
  
function base64ToArrayBuffer(base64): Uint8Array {  
    const binaryString = atob(base64);  
    const bytes = new Uint8Array(binaryString.length);  
    for (let i = 0; i < binaryString.length; i++) {  
        bytes[i] = binaryString.charCodeAt(i);  
    }  
    return bytes;  
}
```

Escaping Back into JavaScript...



Importing a JavaScript module



```
[Inject]
public required IJSRuntime JSRuntime { get; set; }

protected async Task OnAfterRenderAsync(bool firstRender)
{
    var module = await JSRuntime.InvokeAsync<IJSObjectReference>("import", "./js/module.js");
    var jsStreamRef = await JsModule!.InvokeAsync<IJSStreamReference>("printDomElement",
        MapView!.Id);
}
```



Escaping Back into JavaScript...

Calling .NET from JavaScript

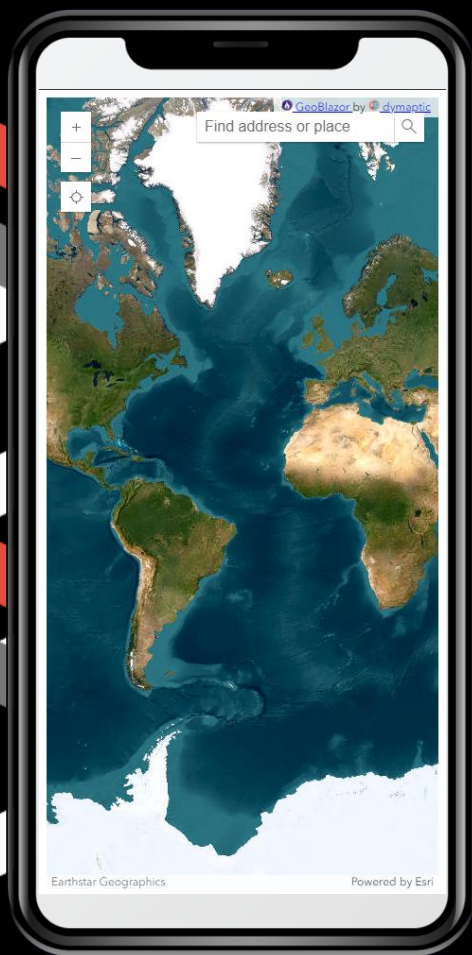
```
window.initialize = (dotNetRef) => {  
  window.addEventListener('resize', async () => {  
    const width = window.innerWidth;  
    const height = window.innerHeight;  
    await dotNetRef?.invokeMethodAsync('OnViewSizeChanged', width, height);  
  });  
}
```

```
[JSInvokable]  
public async Task OnViewSizeChanged(double width, double height)  
{  
    // update C# code  
}
```



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