

Developing Cross-Platform Web Apps With Blazor

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v1.0

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- Take the presentation files home with you

Module 2: Overview

Module Overview

Why Do We Need a .Net Single Page App (SPA) Framework?

- The evolution of JavaScript in the recent years resulted in an ever more complex build process and byzantine build systems
- With JavaScript it seems the simpler the programming model gets, the more complex the build system and tooling becomes
- This isn't just about 'language' either. JavaScript's insane build systems required for all major frameworks these days is a house of cards that seems to break anytime you step away for more than a few days. Other platforms have skinned that cat in other and potentially more efficient ways that are easier and more integrated without the brittleness that seems to come part and parcel for JavaScript development

“Rick Strahl”

Module 2: Overview

Section 1: WebAssembly

Lesson: WebAssembly
Fundamentals

What Is Webassembly?

WebAssembly is a new type of code that can be run in modern web browsers — it is a low-level assembly-like language with a compact binary format that runs with near-native performance and provides languages such as C/C++ and Rust with a compilation target so that they can run on the web. It is also designed to run alongside JavaScript, allowing both to work together

“MDN”

What Is Webassembly?

A Virtual Machine For The
Web
Again.

How Is It Different Than Java?

Separate VM

Clunky

No Dom
Integration

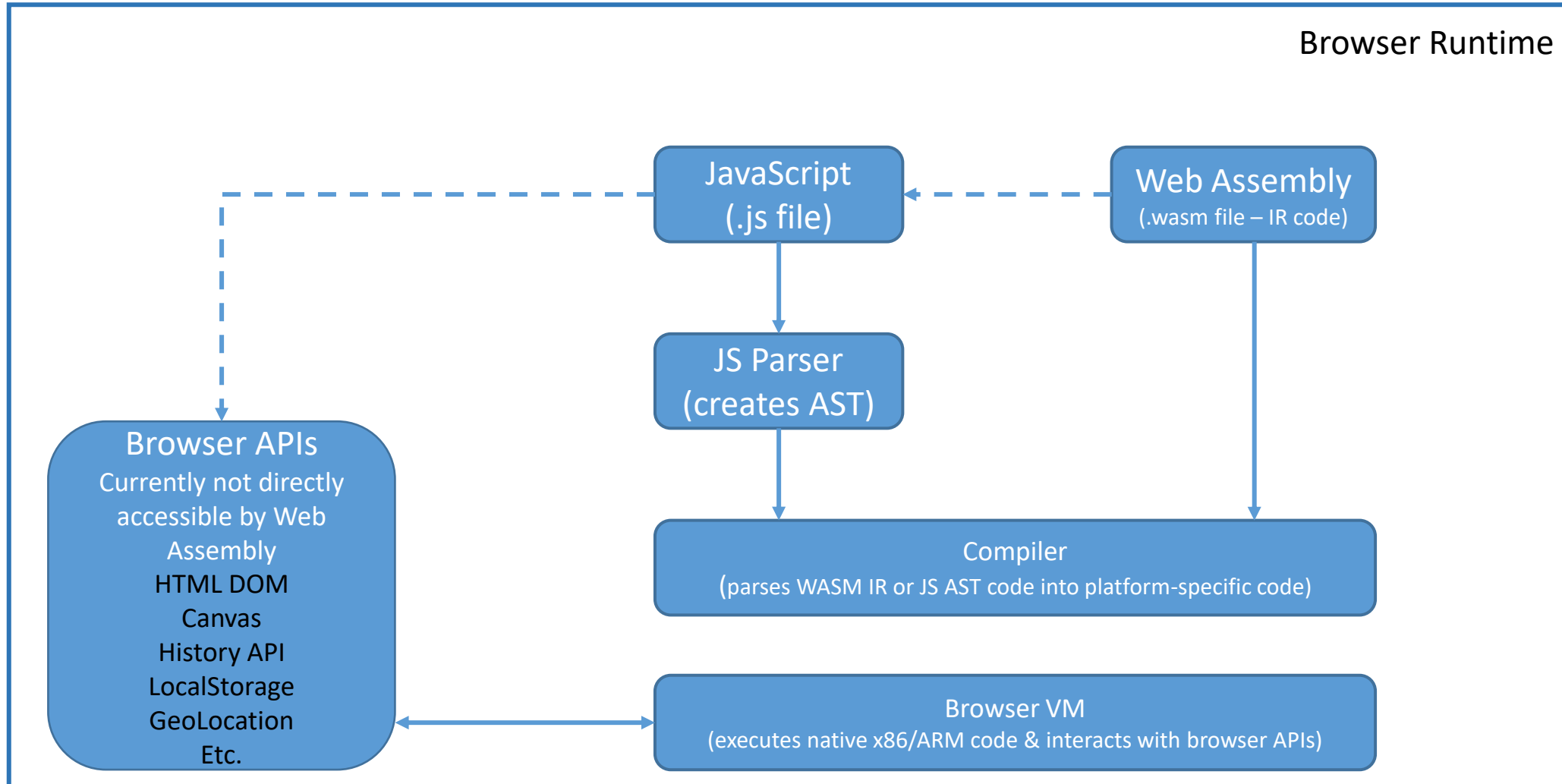
What Is Different This Time?

Exposes Internal
Browser VM

Cross-Browser
Support

JS Bindings

Re-Assembling The Web



Let's Break That Down...

Low-level
Assembly-like
Language

Compact Binary
Format

Near-native
Performance

Web Assembly Goals

Fast, Efficient, Portable

Readable, Debuggable

Keep Secure

Don't Break The Web

Demo: Unity3D

Module 2: Overview

Section 2: Blazor

Lesson: Getting Started

WebAssembly and Mono

- Mono is an open source implementation of the .NET CLI specification, meaning that Mono is a platform for running .NET assemblies
- Mono is written in C++. This is important because you can compile C++ to WebAssembly
- The Mono team decided to try to compile Mono to WebAssembly, which they did successfully which in turn gave the birth to Blazor

Approaches For Compiling Mono To WebAssembly

- .Net team considered two approaches:
 - Take the .NET code and compile it together with the Mono runtime into one big WASM application. This approach takes a lot of time because you need to take several steps to compile everything into WASM, which is not so practical for day-to-day development
 - The second approach takes the Mono runtime, compiles it into WASM, and this runs in the browser where it will execute .NET Intermediate Language just like normal .NET does. This has a big advantage as you can simply run .NET assemblies without having to compile them first into WASM. **This is the approach currently taken by Blazor.** The **disadvantage of this is that it needs to download a lot of .NET assemblies.** This **can be solved by using Tree Shaking algorithms**, which removes all unused code from assemblies

Blazor History



NDC Demo In 2017



Lots Of Interest...



Moved To ASP.Net's Github As Official Experiment
Jan 2018

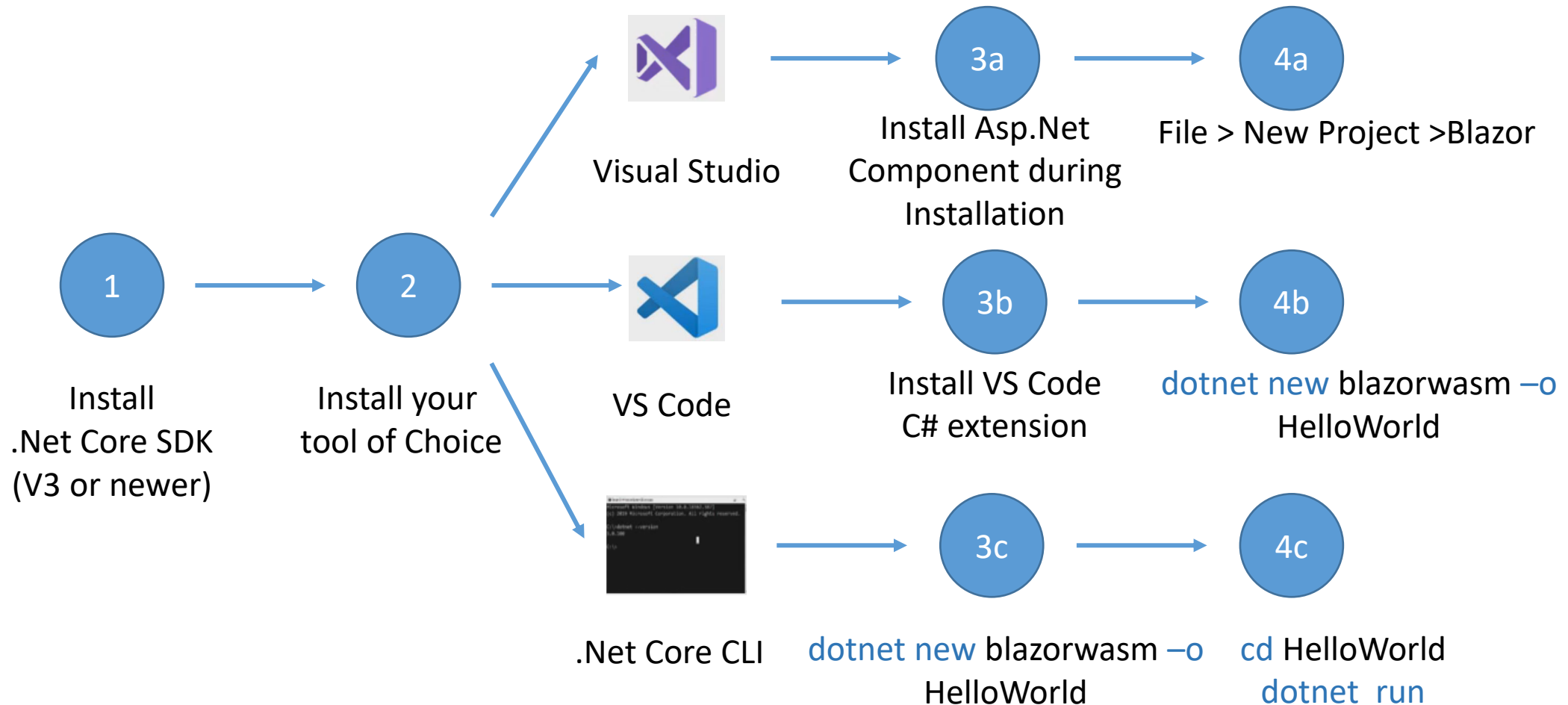


Server Side Blazor Components Shipped With .NET
3.0

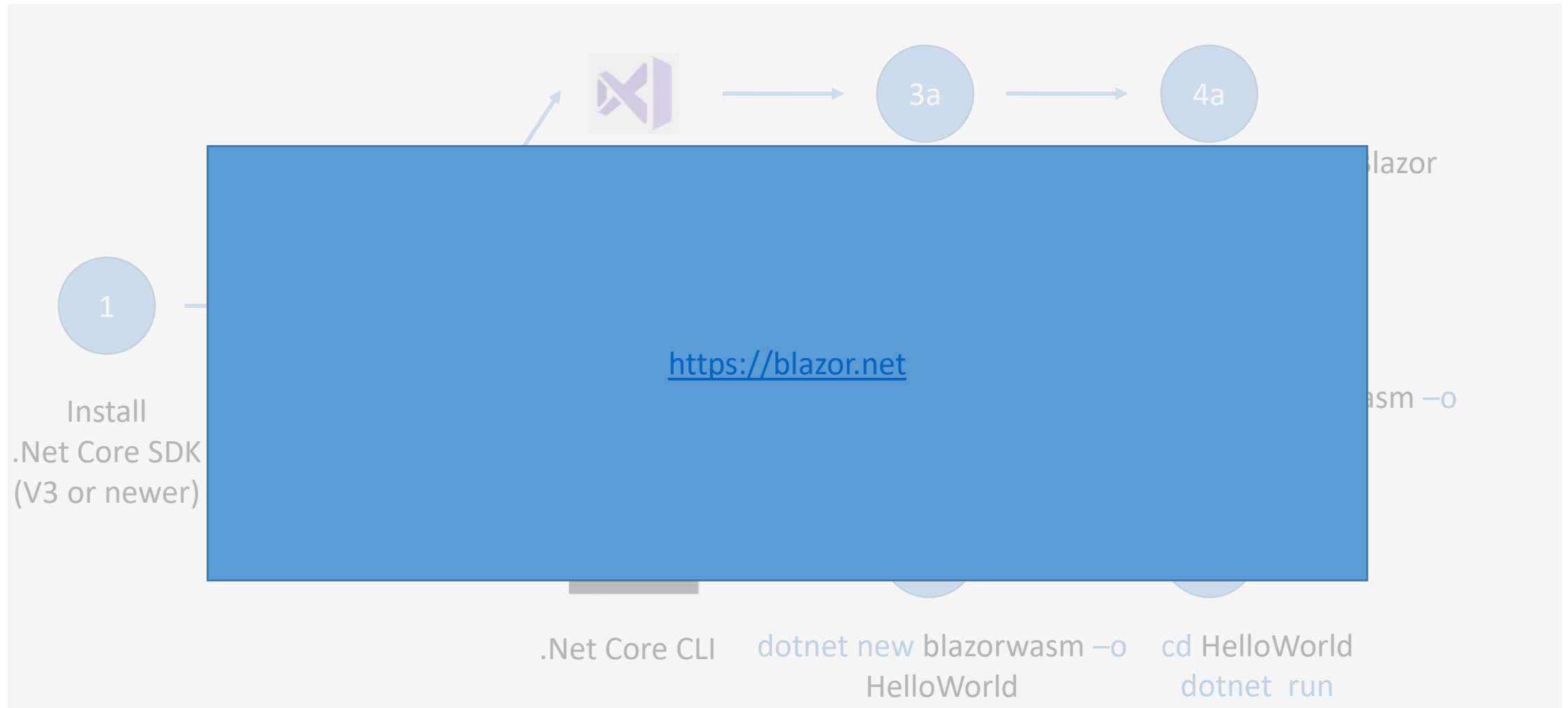


Client Side Blazor Shipping After .NET 3.0

Blazor Development Environment Options



Blazor Development Environment Options



Why Use Blazor?

WebAssembly is supported by all major browsers



Use C# For Interactive Web Applications



Reuse Existing Libraries



Performance Is Near Native



Tooling And Debugging



What Is Blazor?

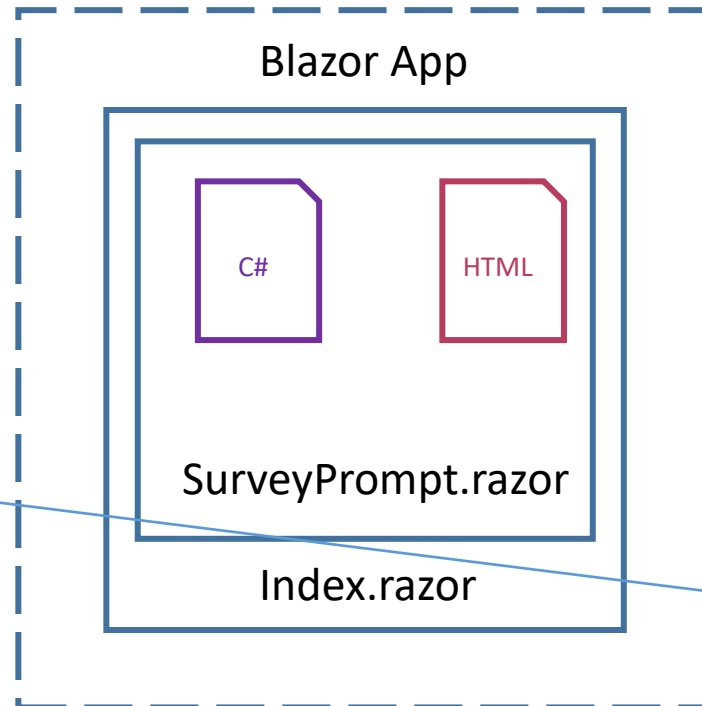
Index.razor

```
@page "/"
```

```
<h1>Hello, world!</h1>
```

Welcome to your new app.

```
<SurveyPrompt Title="How is Blazor working for you?" />
```



SurveyPrompt.razor

```
<div class="alert alert-secondary mt-4" role="alert">
  <span class="oi oi-pencil mr-2" aria-hidden="true"></span>
  <strong>@Title</strong>

  <span class="text-nowrap">
    Please take our
    <a target="_blank" class="font-weight-bold"
      href="https://go.microsoft.com/fwlink/?linkid=2109206">
      brief survey
    </a>
  </span>
  and tell us what you think.
</div>
```

```
@code {
```

```
// Demonstrates how a parent component can supply parameters
```

```
[Parameter]
```

```
public string Title { get; set; }
```

```
}
```

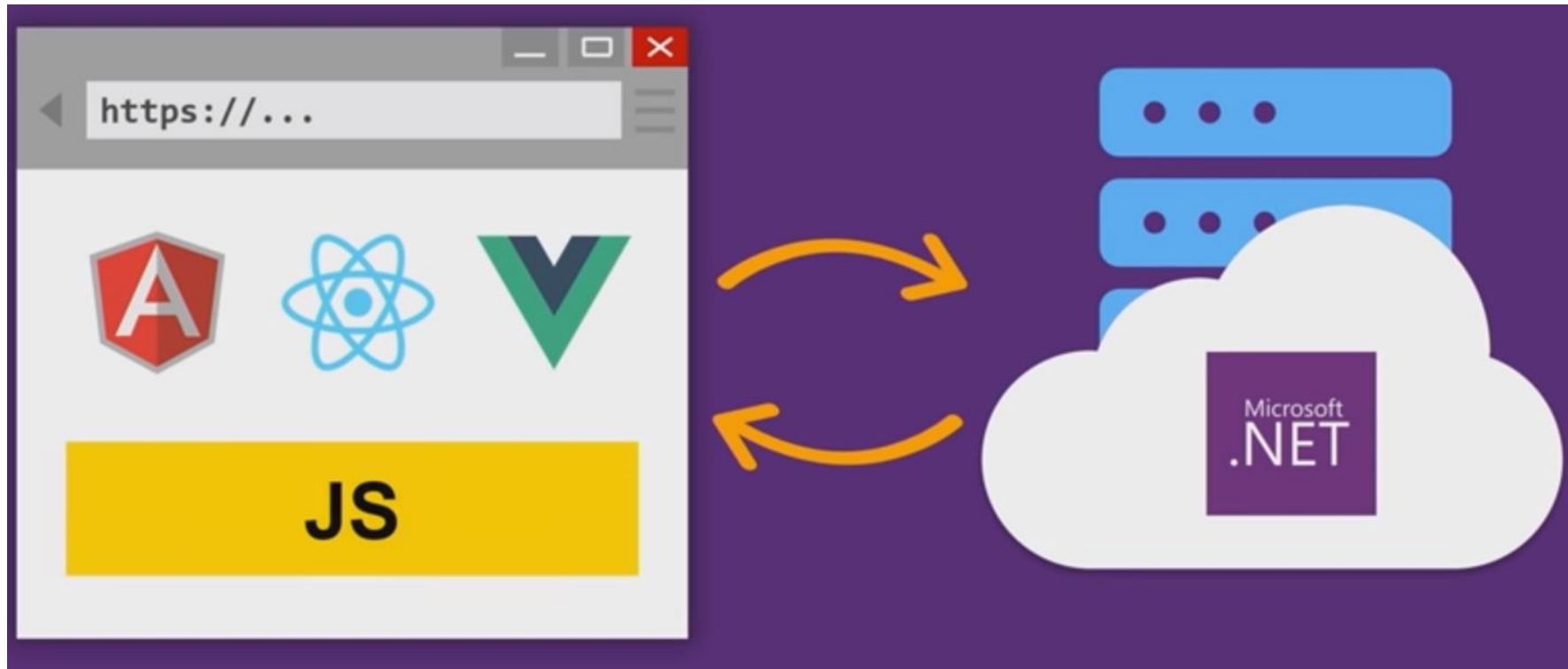
Demo: A Quick Hello World

Module 2: Overview

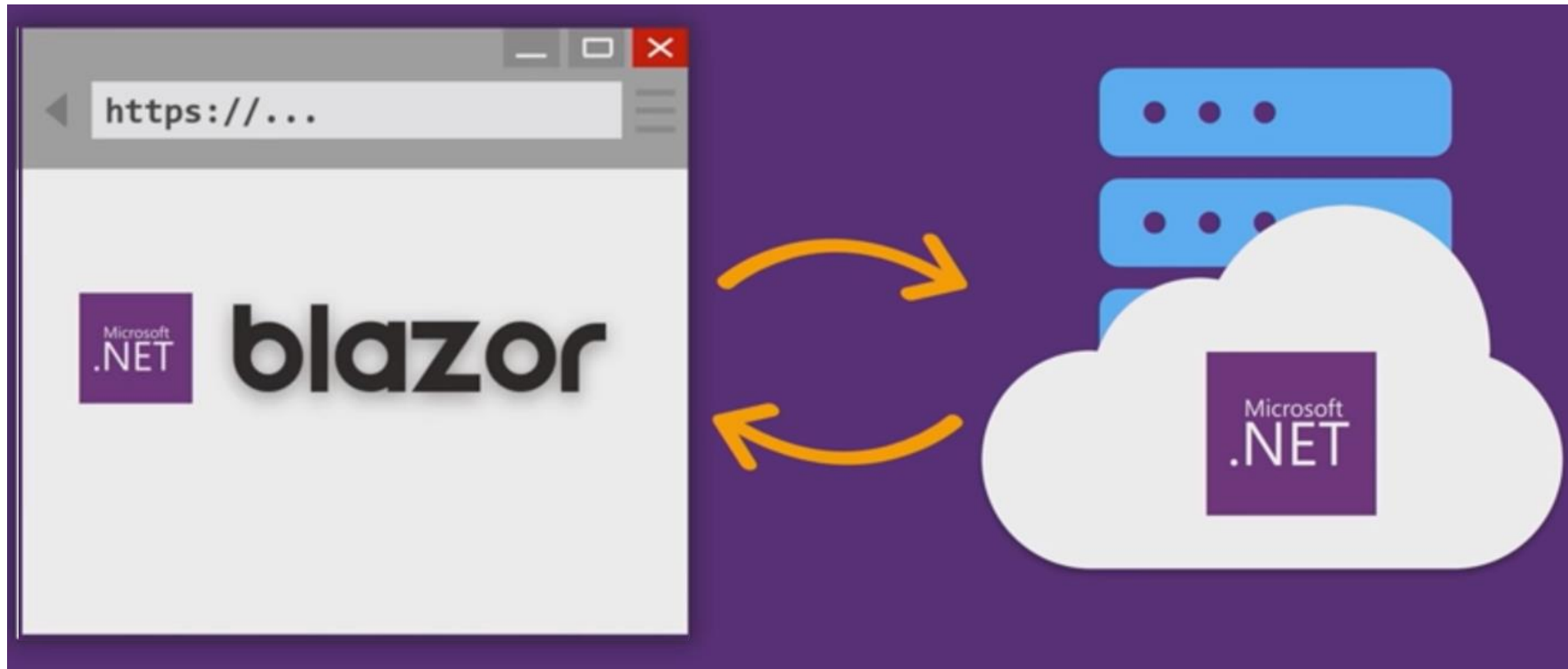
Section 2: Blazor

Lesson: Hosting Models

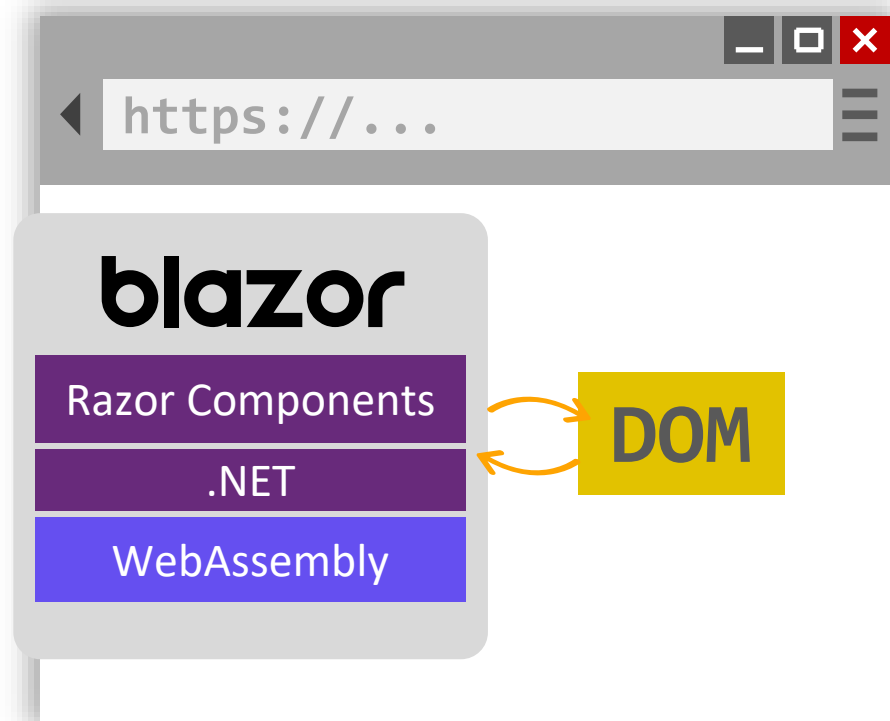
Blazor WebAssembly



Blazor WebAssembly



Blazor WebAssembly



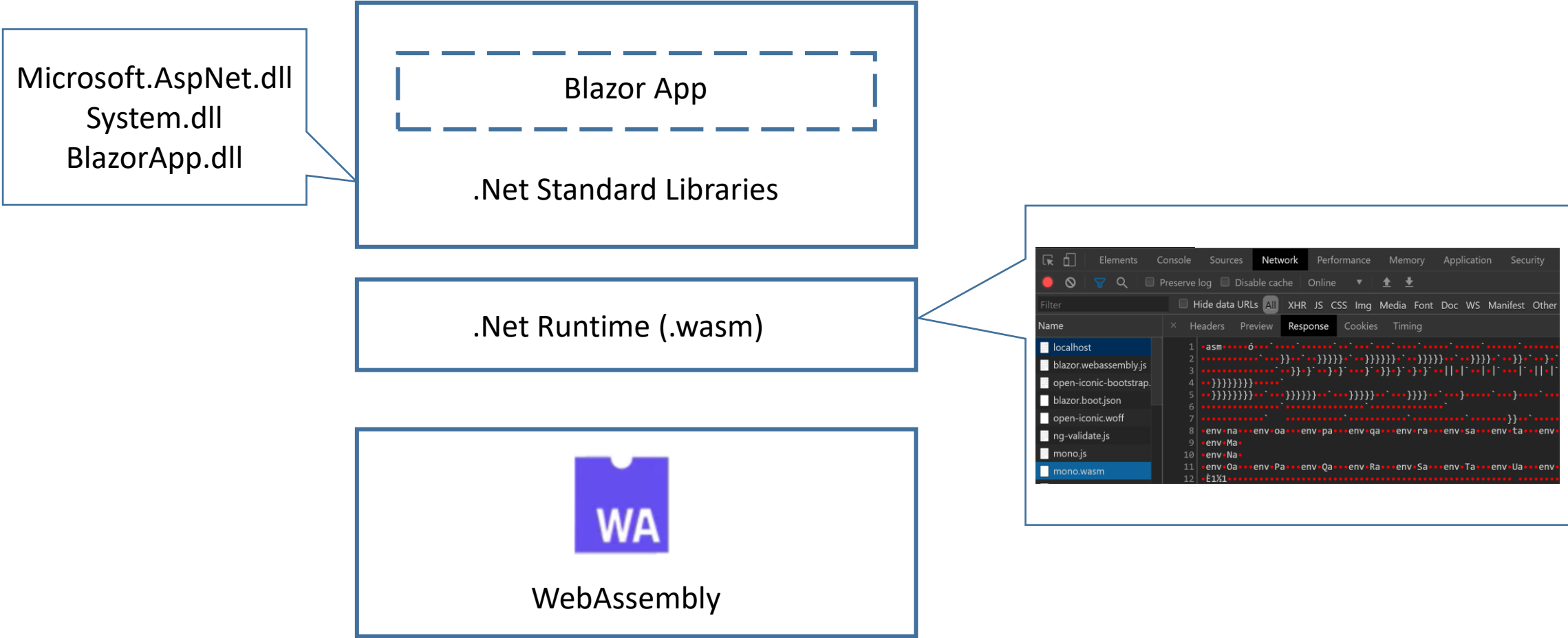
Browser
provides the
core
WebAssembly
support

.Net
WebAssembly
runtime runs
on top of
WebAssembly

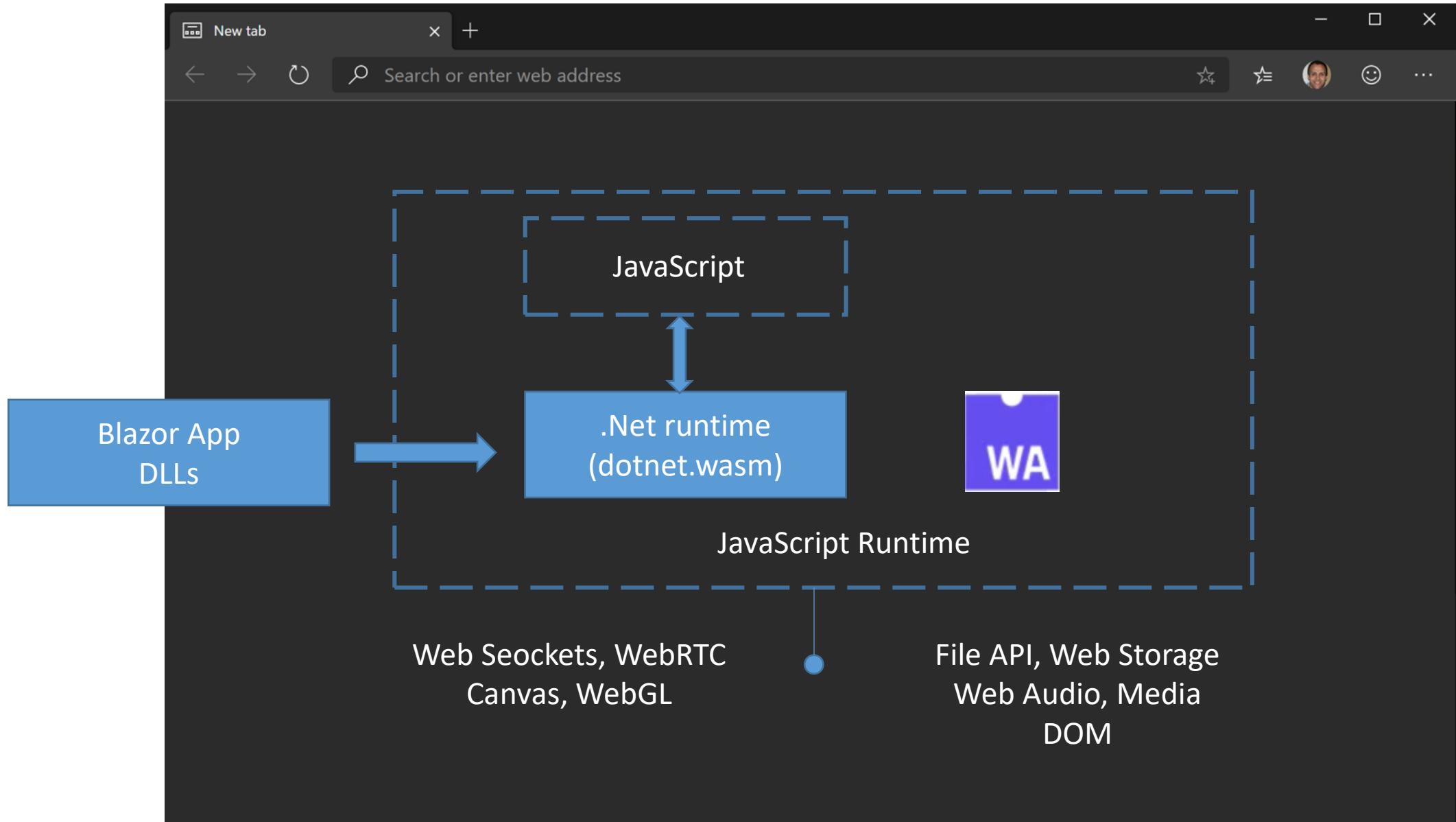
Razor
Components
run in the
browser on
top of the .Net
runtime

Blazor receives
UI events from
the DOM and
later sends
back DOM
diffs to be
applied to the
DOM

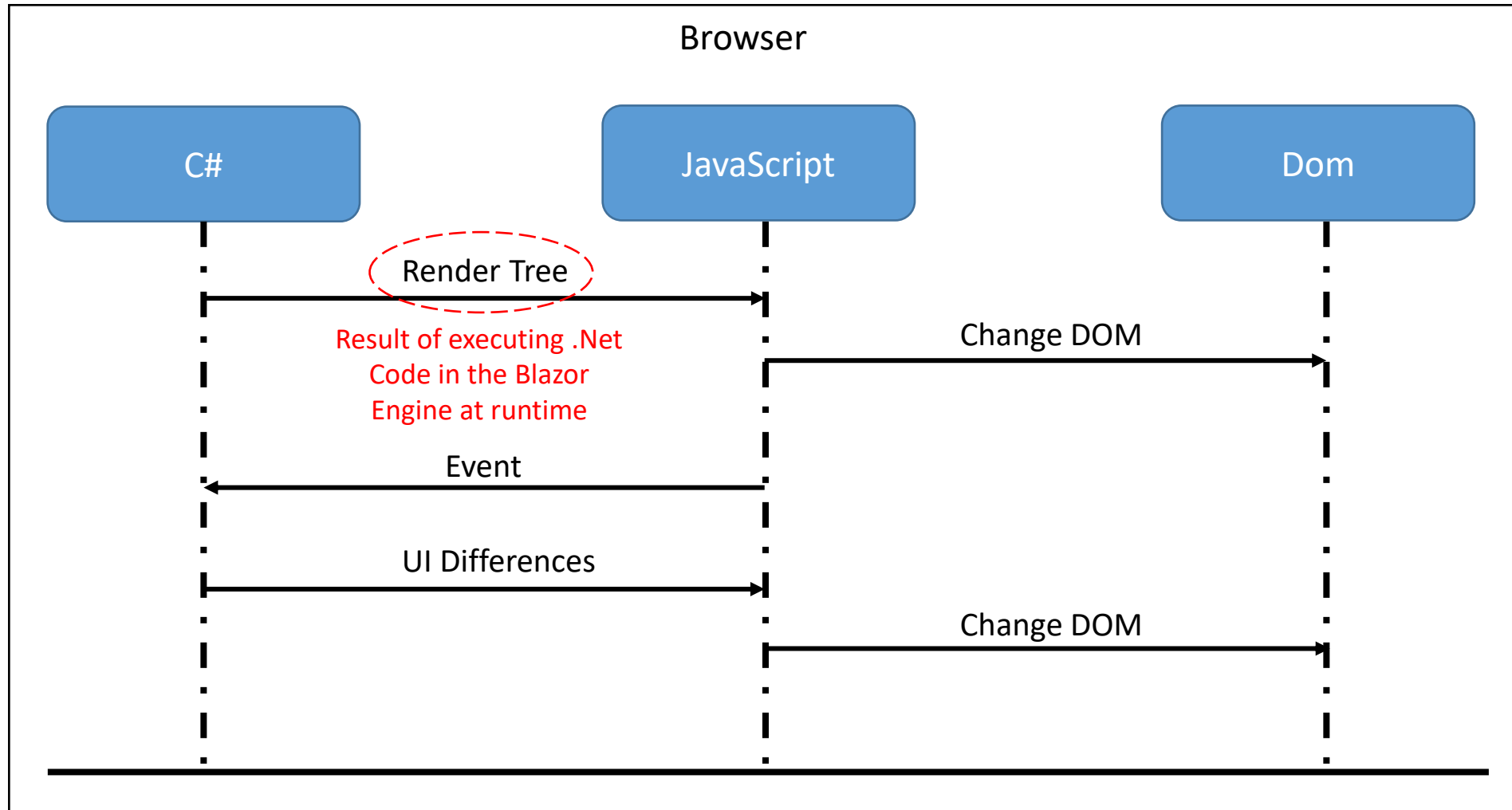
Blazor WebAssembly



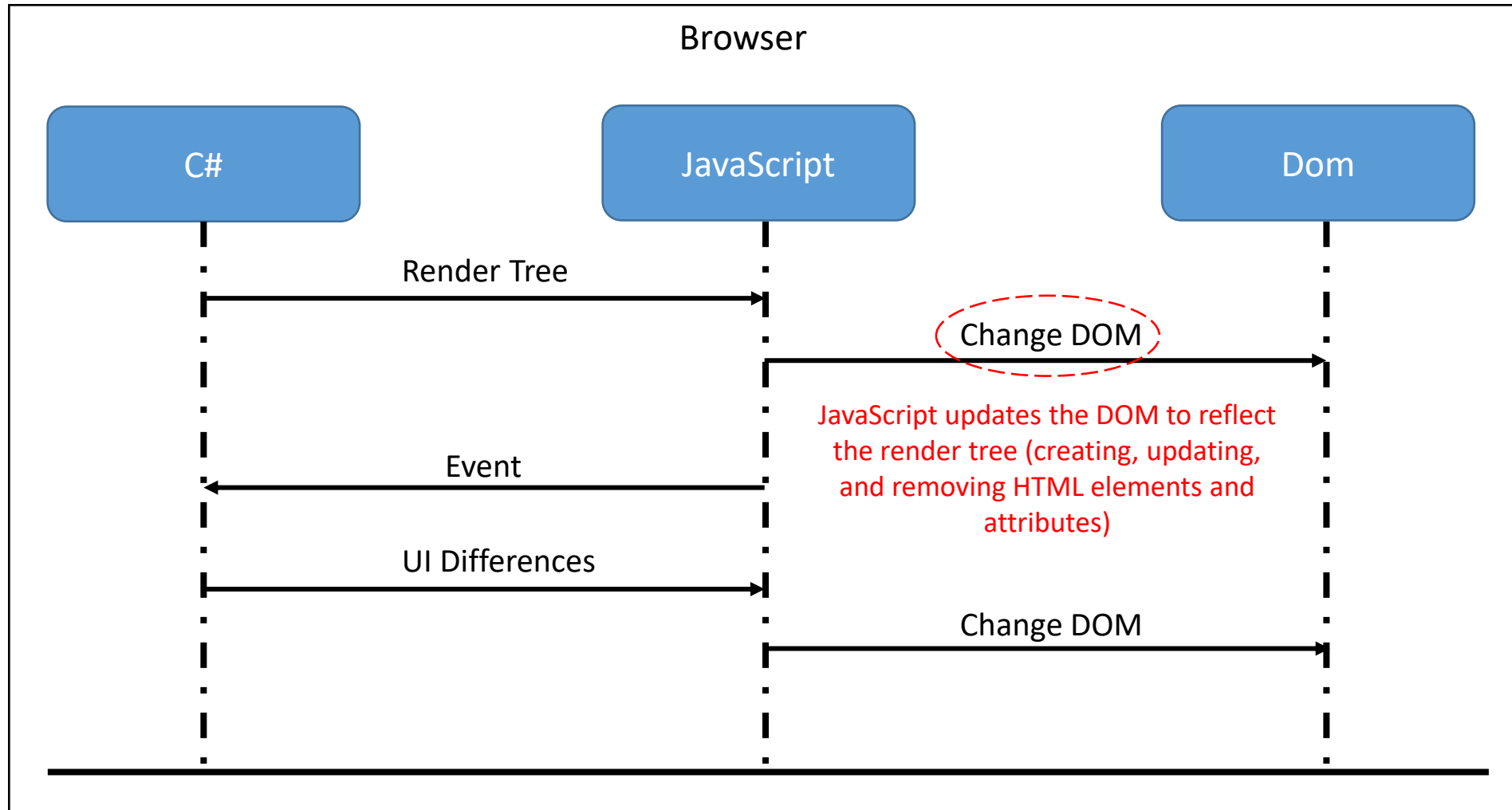
Blazor WebAssembly SandBox



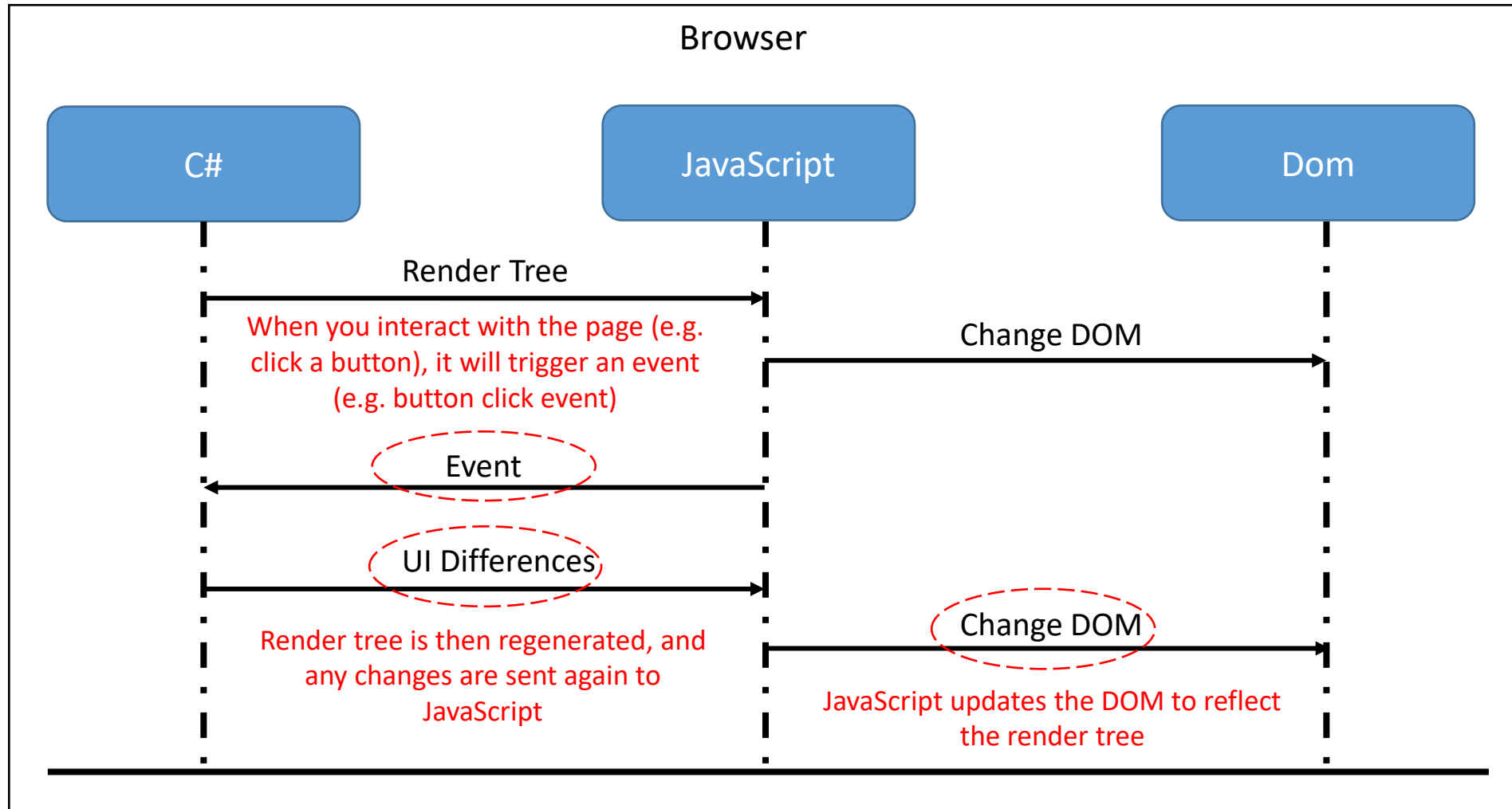
Blazor WebAssembly DOM Generation Process



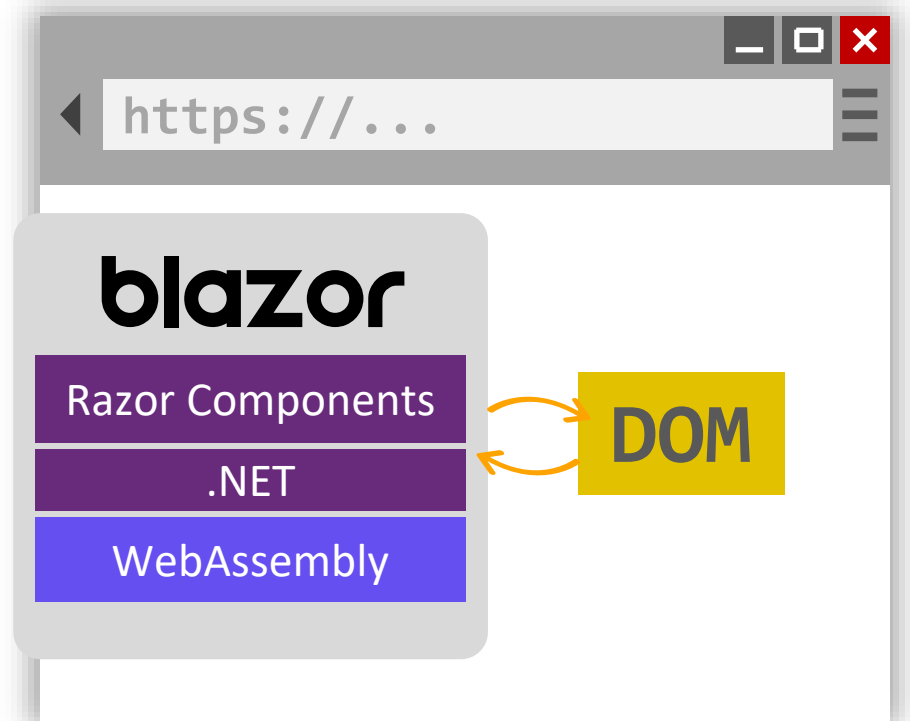
Blazor WebAssembly DOM Generation Process



Blazor WebAssembly DOM Generation Process



Hosting Blazor WebAssembly



Azure
CDN

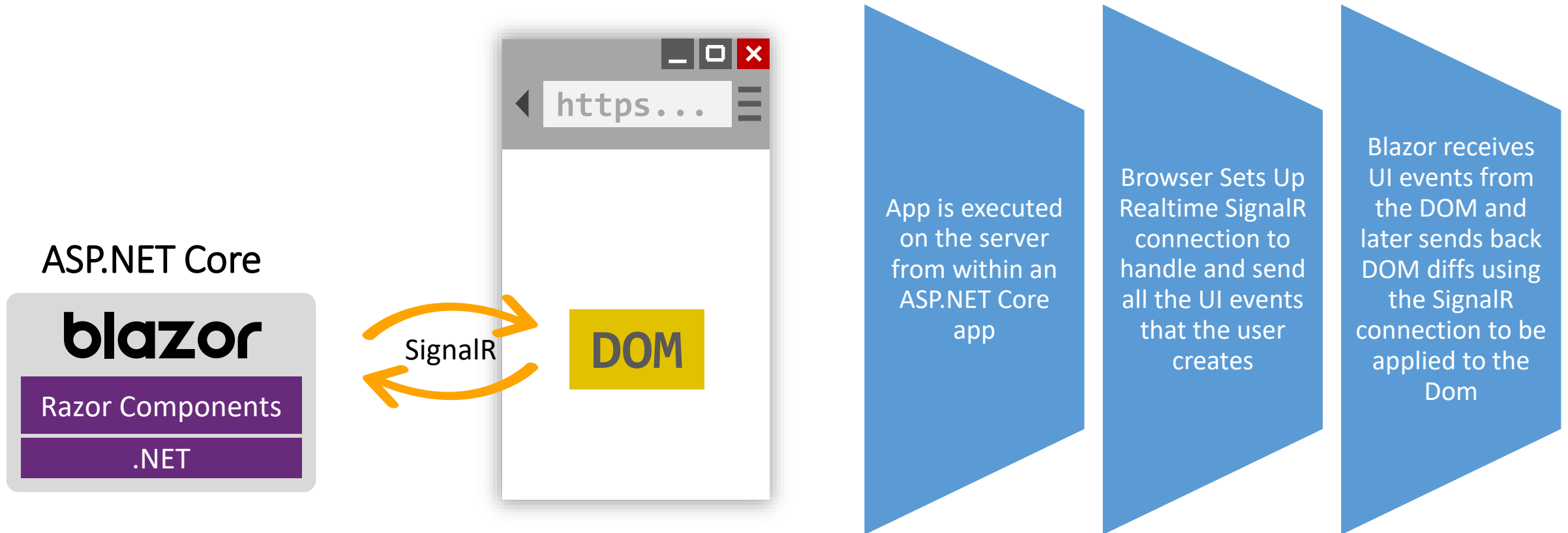


Azure
App
Service

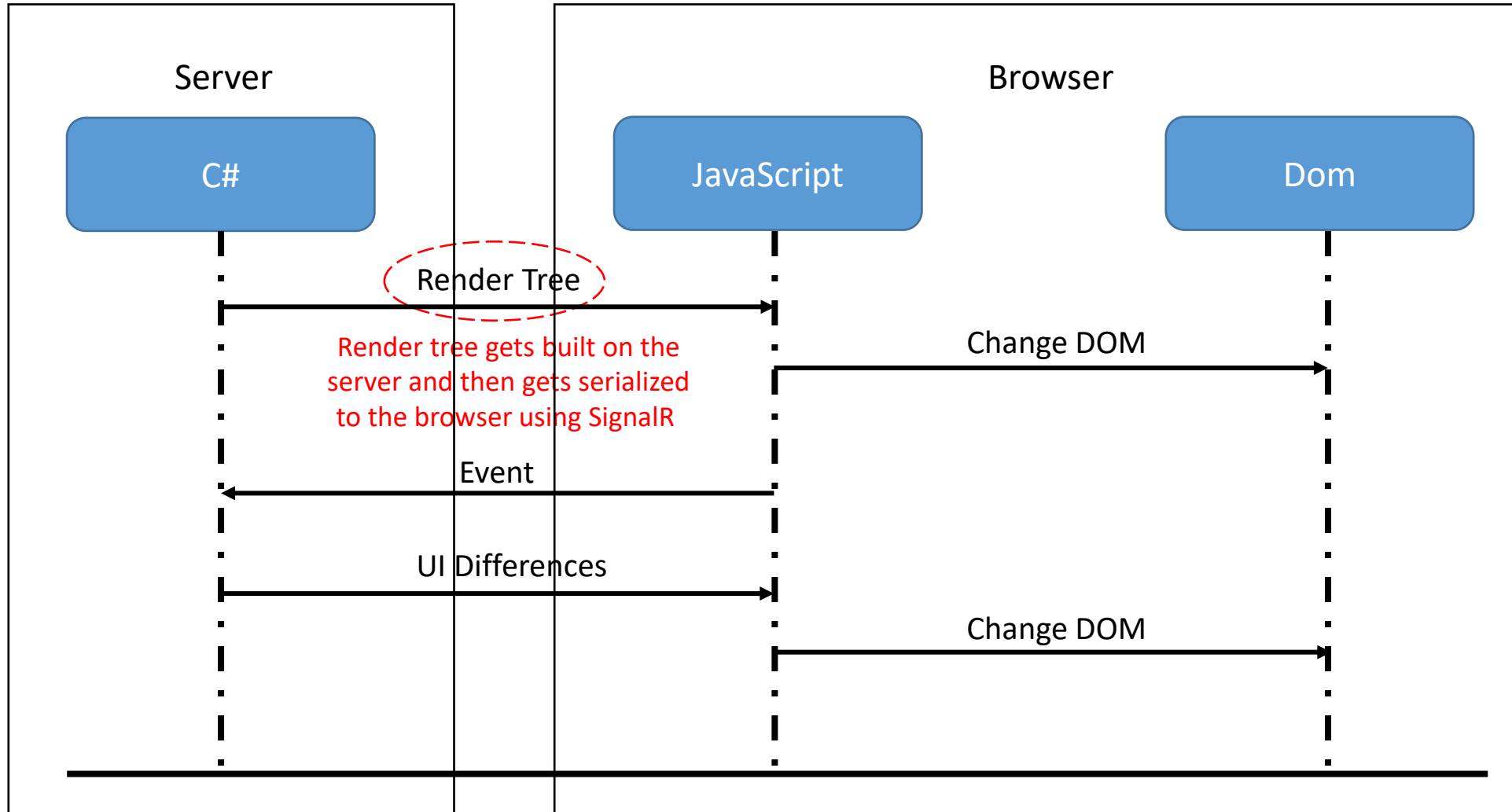


Azure Storage
Static Website

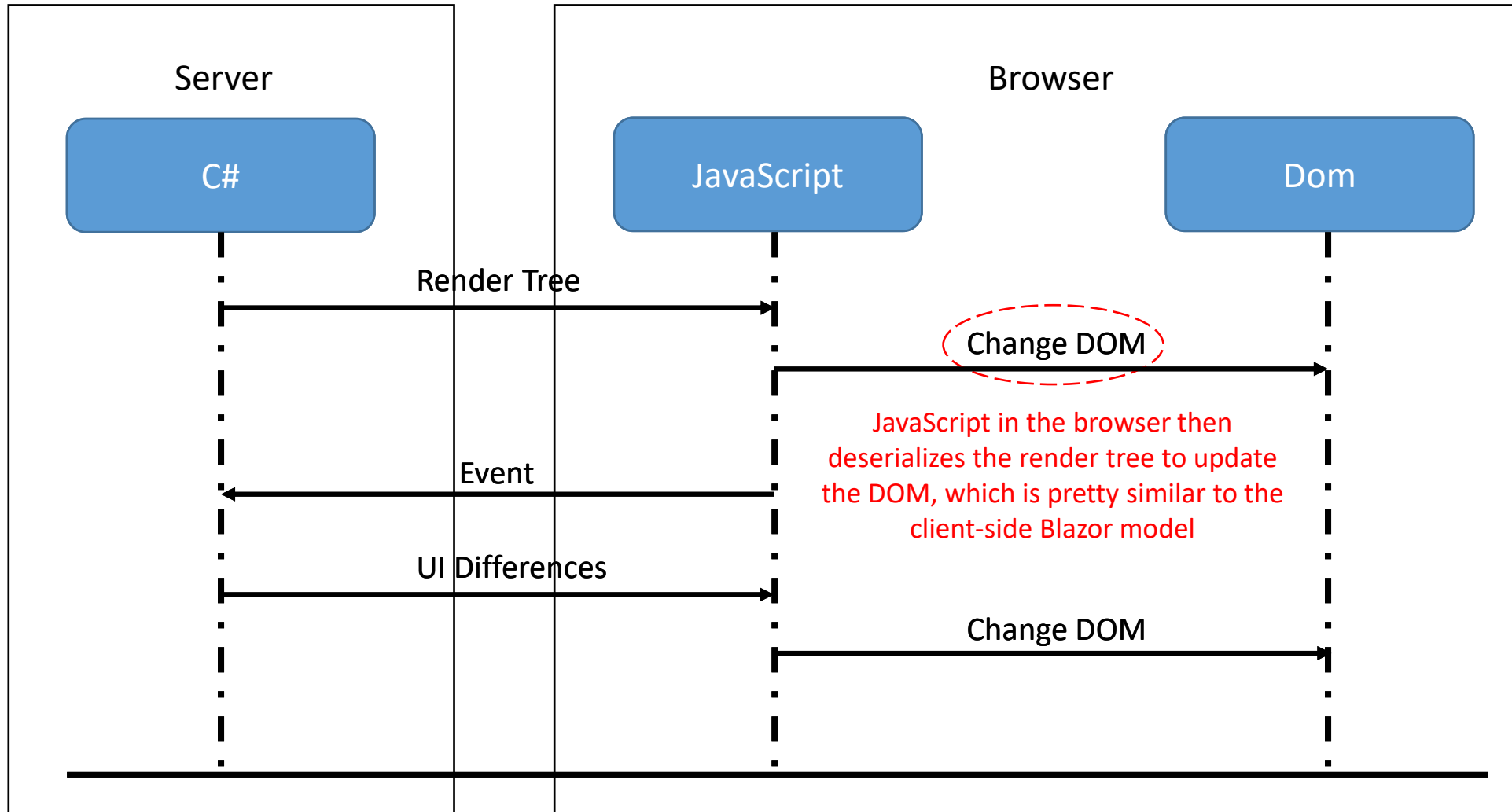
Server-Side Blazor – Released With .Net Core 3



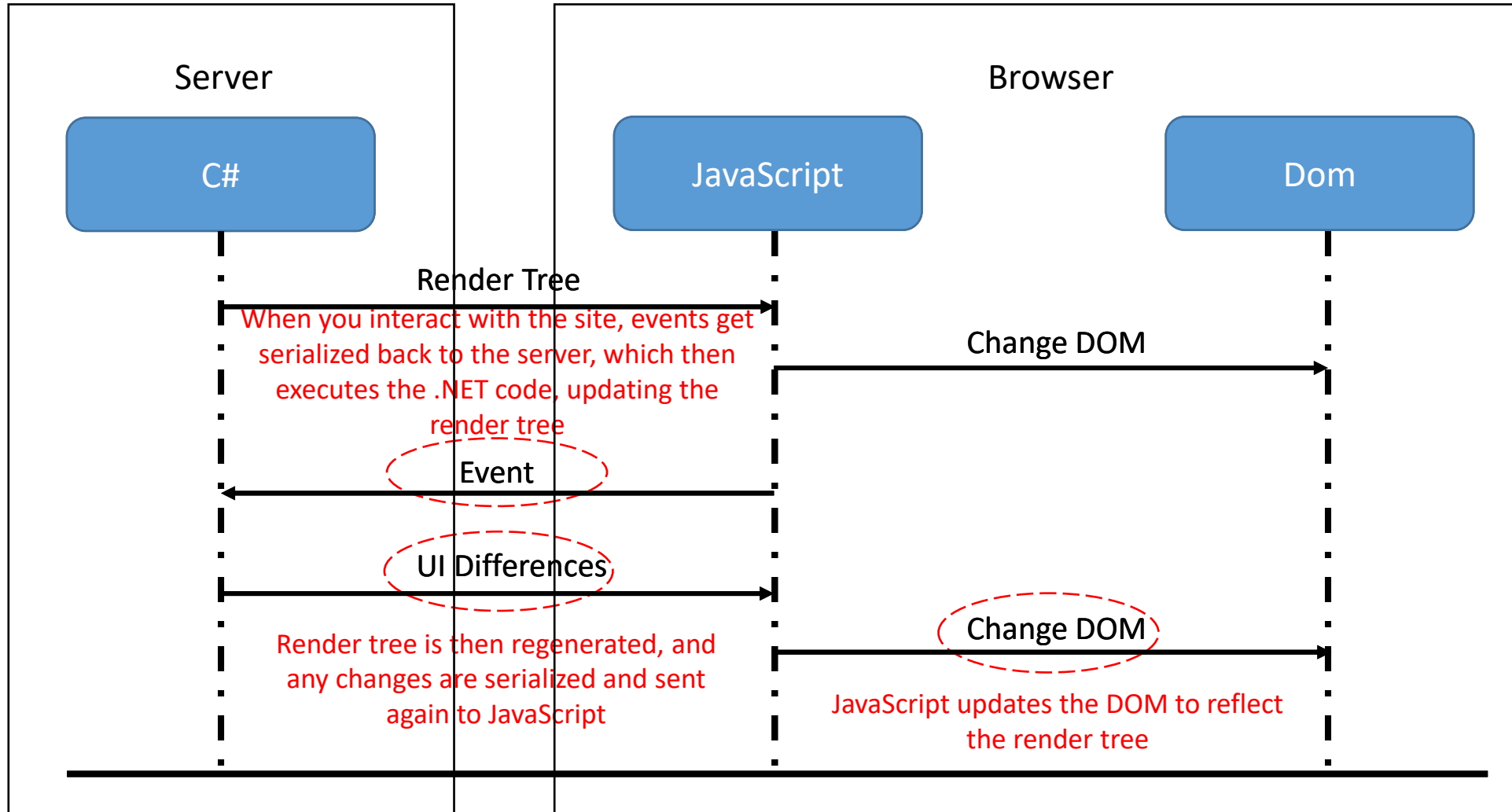
Server-Side Blazor DOM Generation Process



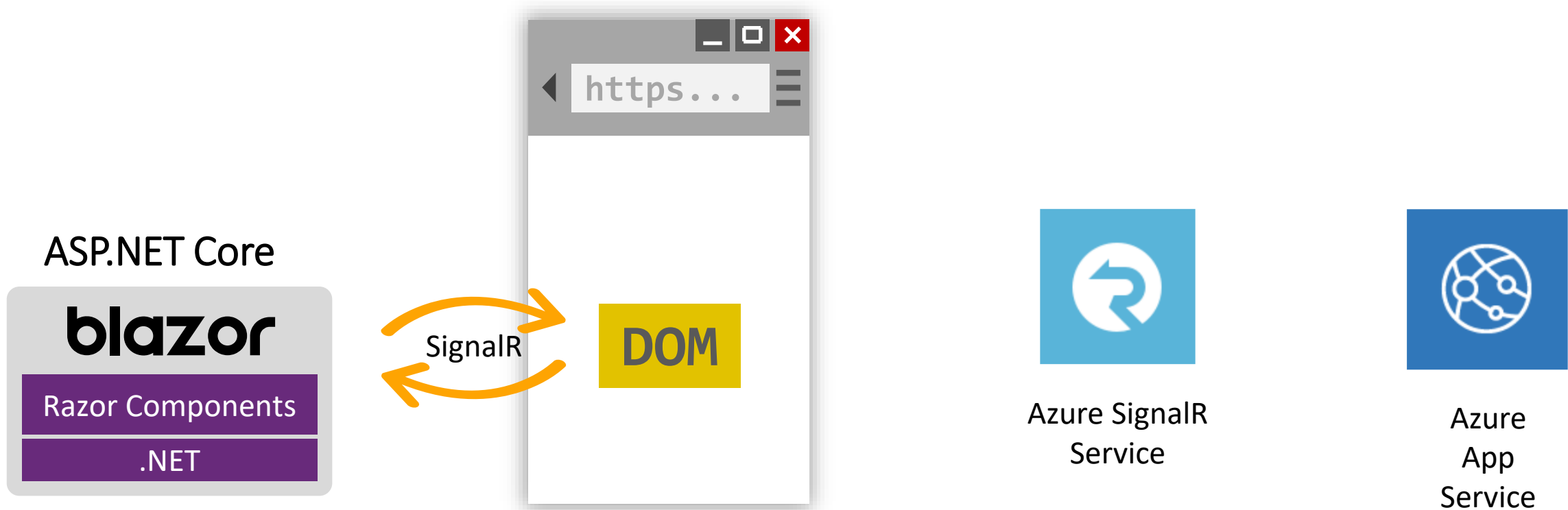
Server-Side Blazor DOM Generation Process



Server-Side Blazor DOM Generation Process



Hosting Server-Side Blazor



Blazor WebAssembly Vs Blazor Server








Blazor WebAssembly

- Pros:
 - True SPA, full interactivity
 - Near Native Performance
 - Utilize client resources
 - No server needed
 - Can work offline
- Cons:
 - Restricted to the capabilities of the browser
 - Larger download size
 - Requires WebAssembly
 - Client-side secrets

Blazor Server

- Pros:
 - Smaller download size, faster load time
 - Running on fully featured .NET runtime
 - Code never leaves the server, Server side secrets
- Cons:
 - Latency
 - No offline support
 - Consumes more server resources

Which Hosting Model To Use When?

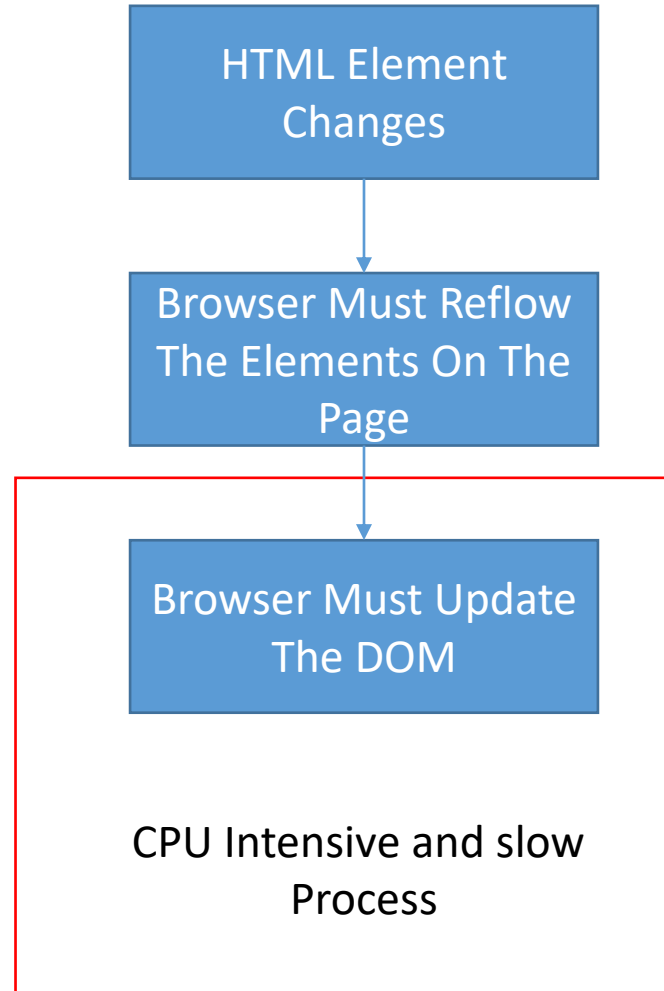
	Blazor WebAssembly	Blazor Server
Need near native experience		
Need to connect to Server-Side resources		
Using Older Browsers		
Offline Support		
You don't want to run an Asp.Net Core Server		
You want to create a fast, interactive web app with C#		

Demo: Hosting Models

Manipulating DOM Elements From Blazor

- Blazor is specifically designed to provide a convenient and efficient way to update the UI without having to issue individual calls to mutate individual DOM elements
- **Blazor runs a diffing algorithm to work out the minimal set of changes to apply and runs them in a batch.** This will be far more performant than crossing the interop boundary separately for each element update, and potentially interleaving DOM mutations with repaints, etc. Most modern SPA frameworks are built around an architecture similar to this
- Blazor still does allow you to directly reach DOM elements if you want via its JS interop APIs, but you should only do that for exceptional custom things, not for routine UI rendering

Rendering Without Virtual DOM and Incremental DOM



Rendering With Virtual DOM and Incremental DOM

- **Virtual DOM**

- An in-memory representation of the elements that will make up the HTML page. This data creates a tree of HTML elements as if they had been specified by an HTML mark-up page. Blazor components create this Virtual DOM in its Razor views via a virtual method named `BuildRenderTree`. For example, the `BuildRenderTree` for the standard `Pages/Index.razor` page looks like this

```
protected override void BuildRenderTree(Microsoft.AspNetCore.Components.Rendering.RenderTreeBuilder builder)
{
    builder.AddMarkupContent(0, "<h1>Hello, world!</h1>\r\n\r\nWelcome to your new app.\r\n\r\n");
    builder.OpenComponent<MyFirstBlazorApp.Client.Shared.SurveyPrompt>(1);
    builder.AddAttribute(2, "Title", "How is Blazor working for you?");
    builder.CloseComponent();
}
```

Rendering With Virtual DOM and Incremental DOM

- **Virtual DOM**

- Building a data tree that represents the view to be rendered has two significant benefits:
 - Attribute values of those virtual HTML elements can be updated many times in code during a complex update process without the browser having to re-render and reflow its view until after the process has finished
 - Render trees can be created by comparing two trees and building a new tree that is the difference between the two. **This allows us to utilize an Incremental DOM approach**

Rendering With Virtual DOM and Incremental DOM

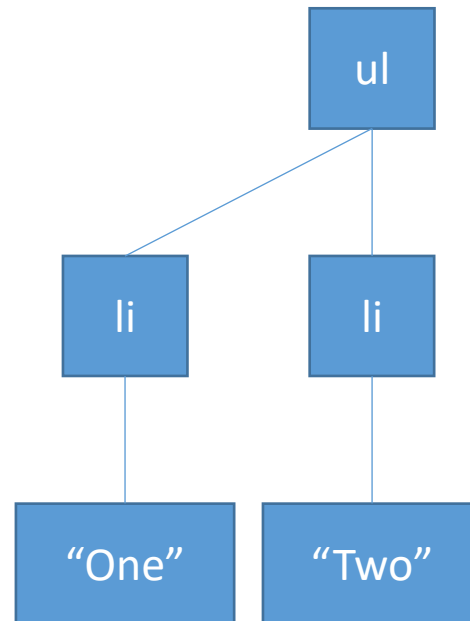
- **Incremental DOM**

- Incremental DOM is a technique that minimizes the amount of work needed to update the elements in a browser's view
- **Being able to create a diff tree gives us the ability to represent changes to the view using the smallest number of changes possible required to update the DOM.** This saves time when changing the display (so the user-experience is better), and in Server-Side Blazor apps it means fewer bytes over the network – making a Blazor app more useable on slow networks or very remote locations

Rendering With Virtual DOM and Incremental DOM

Example – Adding a new list item

Virtual DOM 1



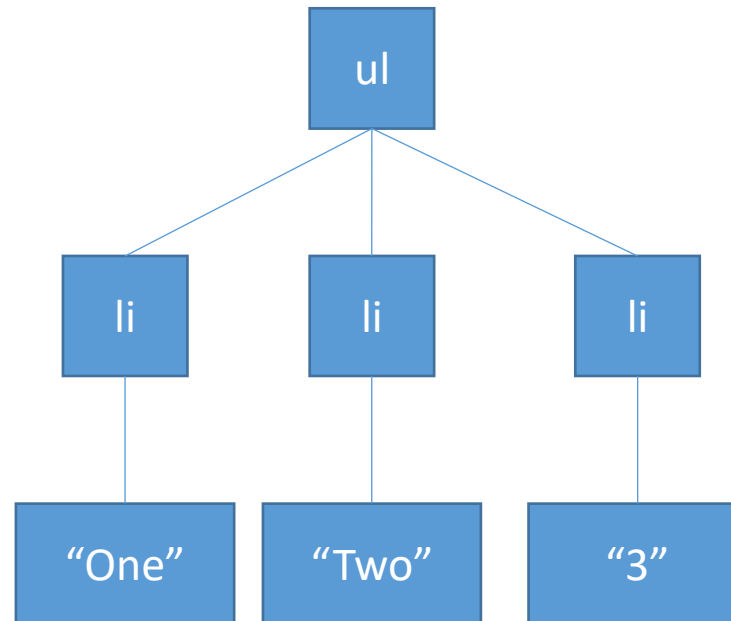
The current Virtual DOM for the view in the browser consists of a list with two items

Rendering With Virtual DOM and Incremental DOM

Example – Adding a new list item

Virtual DOM 2

The app adds a new item to the list. Blazor represents this in a new Virtual DOM

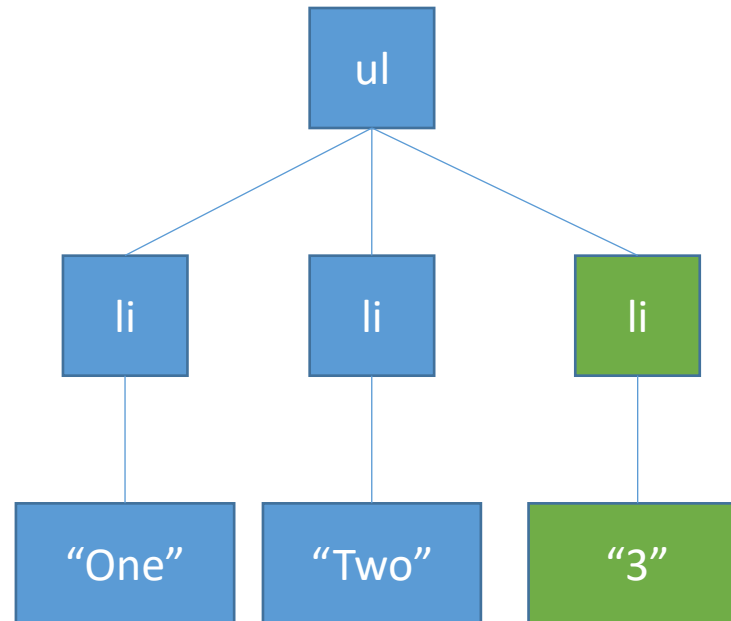


Rendering With Virtual DOM and Incremental DOM

Example – Adding a new list item

Differential Tree

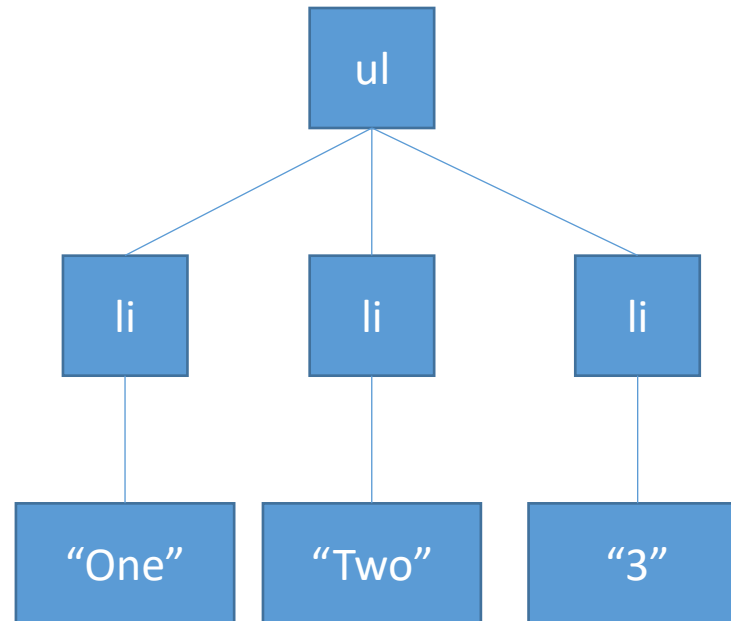
The following differential tree is determined to be the fewest number of changes required. In this case, one new `` and one new text element "3"



Rendering With Virtual DOM and Incremental DOM

Example – Adding a new list item

Actual DOM



The differential render tree is then used to update the actual HTML DOM in the browser

Demo: Rendering With Virtual DOM and Incremental DOM

Module 2: Overview

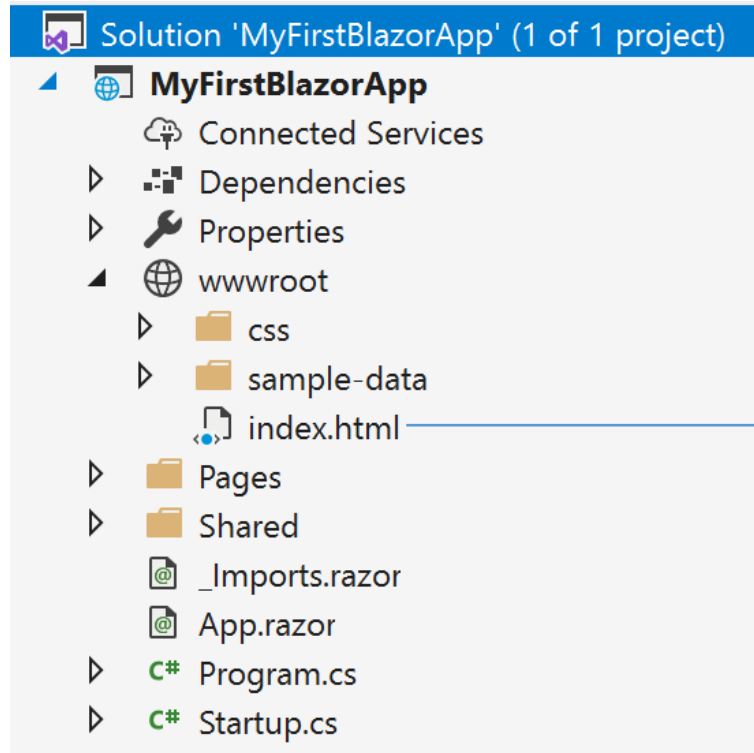
Section 2: Blazor

Lesson: Bootstrap Process

Blazor WebAssembly Bootstrap Process

- This script will install Blazor by downloading the compiled .net runtime (.wasm file) and your assemblies

<script src="_framework/blazor.webassembly.js"> </script>

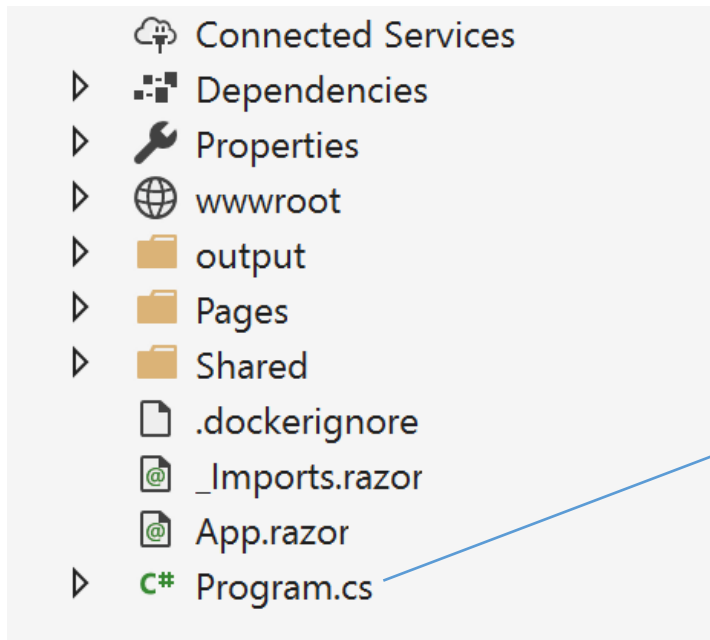


```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0, maximum-scale=1.0, user-scalable=no" />
    <title>BlazorApp1</title>
    <base href="/" />
    <link href="css/bootstrap/bootstrap.min.css" rel="stylesheet" />
    <link href="css/app.css" rel="stylesheet" />
    <link href="BlazorApp1.styles.css" rel="stylesheet" />
  </head>
  <body>
    <div id="app">Loading...</div>

    <div id="blazor-error-ui">
      An unhandled error has occurred.
      <a href="" class="reload">Reload</a>
      <a class="dismiss">✕</a>
    </div>
    <script src="_framework/blazor.webassembly.js"></script>
  </body>
</html>
```

Blazor WebAssembly Bootstrap Process

- The bootstrapping happens in the main method in the Program.cs file which loads the root component (App)
- It also associates App component with the div element with id #app inside index.html
- Blazor runtime places the component's markup, which is normal HTML recognized by the browser, inside the aforementioned div element



```
public class Program
{
    0 references
    public static async Task Main(string[] args)
    {
        var builder = WebAssemblyHostBuilder.CreateDefault(args);
        builder.RootComponents.Add<App>("#app");

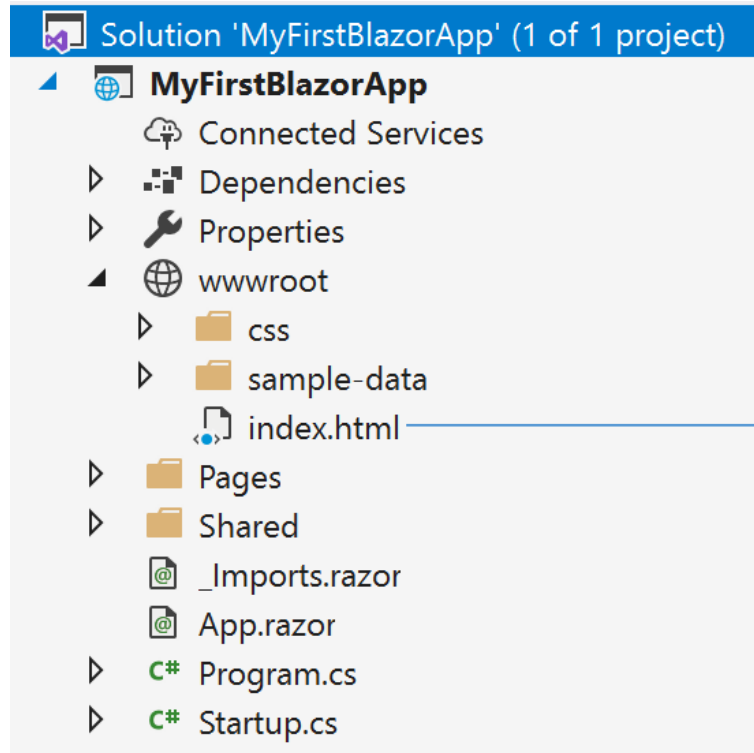
        builder.Services.AddScoped(sp => new HttpClient {
            BaseAddress = new Uri(builder.HostEnvironment.BaseAddress)
        });

        await builder.Build().RunAsync();
    }
}
```

Blazor WebAssembly Bootstrap Process

- This script will install Blazor by downloading the compiled .net runtime (.wasm file) and your assemblies

<script src="_framework/blazor.webassembly.js"> </script>



```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0, maximum-scale=1.0, user-scalable=no" />
    <title>BlazorApp1</title>
    <base href="/" />
    <link href="css/bootstrap/bootstrap.min.css" rel="stylesheet" />
    <link href="css/app.css" rel="stylesheet" />
    <link href="BlazorApp1.styles.css" rel="stylesheet" />
  </head>
  <body>
    <div id="app">Loading...</div>

    <div id="blazor-error-ui">
      An unhandled error has occurred.
      <a href="" class="reload">Reload</a>
      <a class="dismiss">✕</a>
    </div>
    <script src="_framework/blazor.webassembly.js"></script>
  </body>
</html>
```

Blazor WebAssembly Bootstrap Process

- The app component is responsible for installing the router
- The router is responsible for loading a Blazor component depending on the URI in the browser
 - For example, if you browse to the / URI, the router will look for a component with a matching @page directive

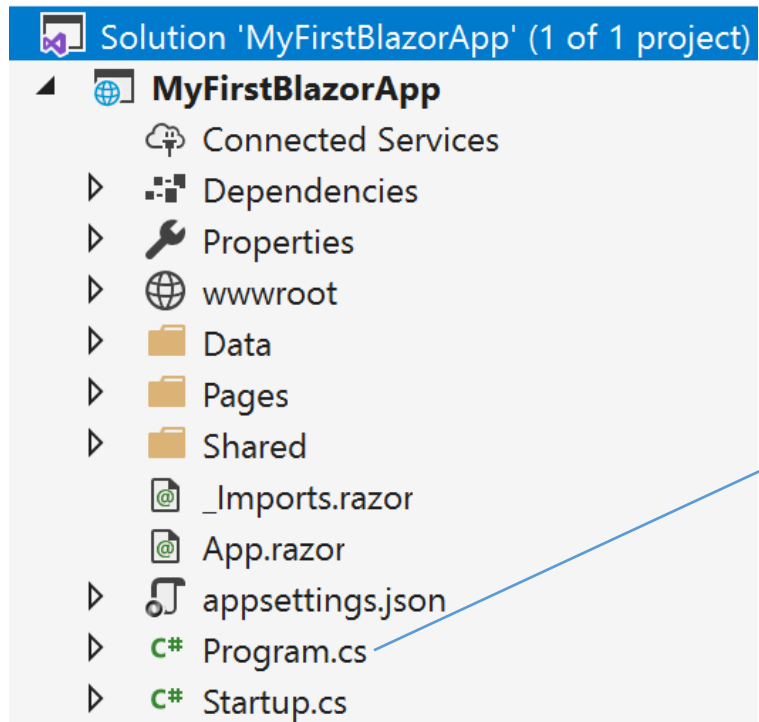
```
<Router AppAssembly="@typeof(Program).Assembly">
  <Found Context="routeData">
    <RouteView RouteData="@routeData" DefaultLayout="@typeof(MainLayout)" />
  </Found>
  <NotFound>
    <LayoutView Layout="@typeof(MainLayout)">
      <p>Sorry, there's nothing at this address.</p>
    </LayoutView>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


Blazor WebAssembly Bootstrap Process

Network			
Filter Hide data URLs All XHR JS CSS Img Media Font Doc WS Manifest Other Has blocked cookies Blocked Requests			
50 ms 100 ms 150 ms 200 ms 250 ms 300 ms 350 ms 400 ms 450 ms 500 ms 550 ms 600 ms 650 ms 700 ms 750 ms			
Name	Status	Type	Initiator
<input type="checkbox"/> blazor.boot.json	304	fetch	blazor.webassembly.js:1
<input checked="" type="checkbox"/> blazor.webassembly.js	304	script	(index)
<input checked="" type="checkbox"/> BlazorApp1.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> BlazorApp1.pdb	304	fetch	blazor.webassembly.js:1
<input checked="" type="checkbox"/> dotnet.5.0.0-rc.2.20475.5.js	304	script	blazor.webassembly.js:1
<input type="checkbox"/> dotnet.timezones.blat	304	fetch	blazor.webassembly.js:1
<input checked="" type="checkbox"/> dotnet.wasm	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> favicon.ico	200	x-icon	Other
<input type="checkbox"/> icudt_EFIGS.dat	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> localhost	304	document	Other
<input type="checkbox"/> Microsoft.AspNetCore.Authorization.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.AspNetCore.Components.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.AspNetCore.Components.Forms.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.AspNetCore.Components.Web.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.AspNetCore.Components.WebAssembly.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.AspNetCore.Metadata.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.CSharp.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.Configuration.Abstractions.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.Configuration.Binder.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.Configuration.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.Configuration.FileExtensions.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.Configuration.Json.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.DependencyInjection.Abstractions.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.DependencyInjection.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.FileProviders.Abstractions.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.FileProviders.Physical.dll	304	fetch	blazor.webassembly.js:1
<input type="checkbox"/> Microsoft.Extensions.FileSystemGlobbing.dll	304	fetch	blazor.webassembly.js:1

Server Side Blazor Bootstrap Process

- With the Blazor Server Side hosting model, the app is executed on the server from within an ASP.NET Core app

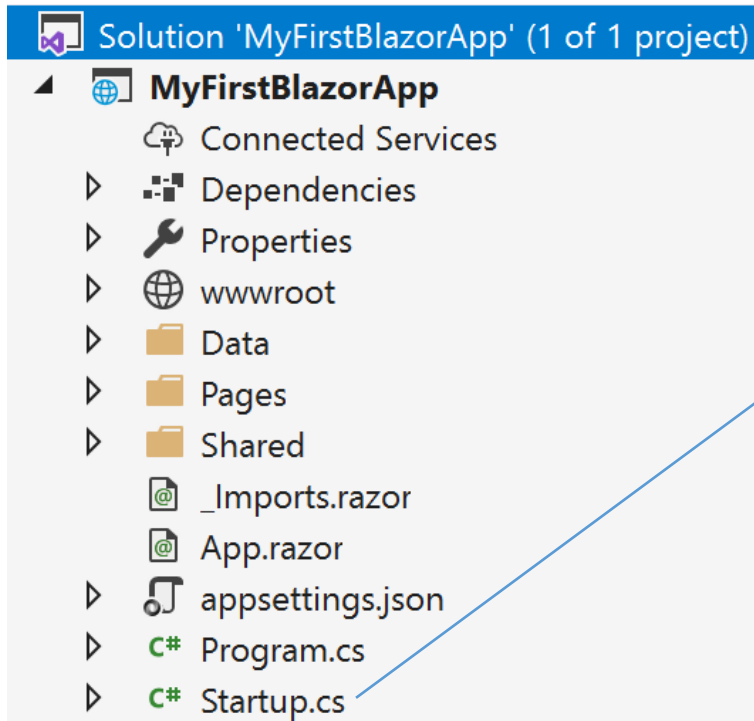


```
namespace MyFirstBlazorApp
{
    - references
    public class Program
    {
        - references
        public static void Main(string[] args)
        {
            CreateHostBuilder(args).Build().Run();
        }

        - references
        public static IHostBuilder CreateHostBuilder(string[] args) =>
            Host.CreateDefaultBuilder(args)
                .ConfigureWebHostDefaults(webBuilder =>
                {
                    webBuilder.UseStartup<Startup>();
                })
            ;
    }
}
```

Server Side Blazor Bootstrap Process

- The ASP.NET Core app references the app's Startup class to add:
 - Server-side services
 - The app to the request handling pipeline



```
public class Startup
{
    0 references
    public Startup(IConfiguration configuration)
    {
        Configuration = configuration;
    }

    1 reference
    public IConfiguration Configuration { get; }

    // This method gets called by the runtime. Use this method to add services to the container.
    // For more information on how to configure your application, visit https://go.microsoft.com/fwlink/?LinkID=398940
    0 references
    public void ConfigureServices(IServiceCollection services)
    {
        services.AddRazorPages();
        services.AddServerSideBlazor();
        services.AddSingleton<WeatherForecastService>();
    }

    // This method gets called by the runtime. Use this method to configure the HTTP request pipeline.
    0 references
    public void Configure(IApplicationBuilder app, IWebHostEnvironment env)
    {
        if (env.IsDevelopment())
        {
            app.UseDeveloperExceptionPage();
        }
        else
        {
            app.UseExceptionHandler("/Error");
            // The default HSTS value is 30 days. You may want to change this for production scenarios, see https://aka.ms/aspnetcore-hsts.
            app.UseHsts();
        }

        app.UseHttpsRedirection();
        app.UseStaticFiles();

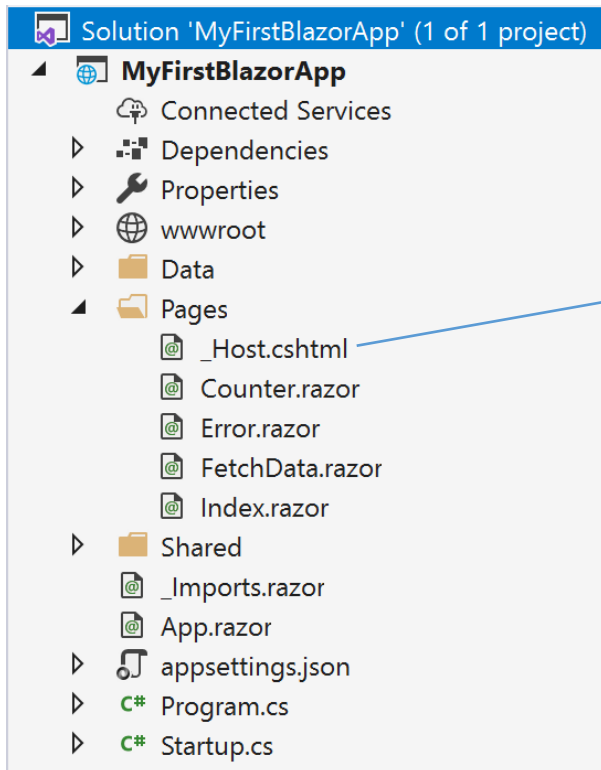
        app.UseRouting();

        app.UseEndpoints(endpoints =>
        {
            endpoints.MapBlazorHub();
            endpoints.MapFallbackToPage("/_Host");
        });
    }
}
```

Server Side Blazor Bootstrap Process

- The **blazor.server.js** script establishes the client connection

- It's the app's responsibility to **persist and restore app state** as required (for example, in the event of a lost network connection)
- Its **served from** an embedded resource in the **ASP.NET Core shared framework**



```
<body>
  <component type="typeof(App)" render-mode="ServerPrerendered" />

  <div id="blazor-error-ui">
    <environment include="Staging,Production">
      An error has occurred. This application may no longer respond until reloaded.
    </environment>
    <environment include="Development">
      An unhandled exception has occurred. See browser dev tools for details.
    </environment>
    <a href="" class="reload">Reload</a>
    <a class="dismiss">✕</a>
  </div>

  <script src="_framework/blazor.server.js"></script>
</body>
```

Server-Side Blazor Bootstrap Process

Name	Status	Type	Initiator
■ _blazor?id=YnCsREhSf6KsB10zQFE3KA	101	websocket	<u>blazor.server.js:1</u>
■ localhost	200	document	Other
■ blazor.server.js	304	script	<u>(index)</u>
■ open-iconic-bootstrap.min.css	304	stylesheet	<u>(index)</u>
■ negotiate	200	xhr	<u>blazor.server.js:1</u>
■ open-iconic.woff	304	font	<u>(index)</u>
■ ng-validate.js	200	script	<u>content-script.js:24</u>
■ favicon.ico	200	x-icon	Other
■ _blazor?id=okjLrGzL-287yDDpN1t-UQ	101	websocket	<u>blazor.server.js:1</u>
■ negotiate	200	xhr	<u>blazor.server.js:1</u>

Establishes the client connection

No runtime or dlls get sent to the browser

Demo: Blazor WebAssembly Bootstrap Process

Blazor WebAssembly Framework Caching

- Initial Blazor WebAssembly app size is large as it has to download the application and framework dlls to the browser

The image shows a Blazor WebAssembly application running in a browser. The application has a dark blue sidebar with navigation links: Home, Counter, and Fetch data. The main content area displays "Hello, world!" and a welcome message. Below the application, the Chrome DevTools Network tab is open, showing a list of requests. A red circle highlights the bottom of the network list, which includes the text "56 requests 6.1 MB transferred 16.6 MB resources".

Name	Status	Type	Initiator
bootstrap.min.css	200	stylesheet	(index)
site.css	200	stylesheet	(index)
blazor.webassembly.js	200	script	(index)
open-iconic-bootstrap.min.css	200	stylesheet	(index)
blazor.boot.json	200	fetch	blazor.webassembly.js:1
ng-validate.js	200	script	content-script.js:1
dotnet.3.2.0-preview2.20159.2.js	200	script	blazor.webassembly.js:1
dotnet.wasm	200	fetch	blazor.webassembly.js:1
favicon.ico	200	x-icon	Other
BlazorApp1.dll	200	fetch	blazor.webassembly.js:1
Microsoft.AspNetCore.Blazor.HttpClient.dll	200	fetch	blazor.webassembly.js:1
System.Text.Json.dll	200	fetch	blazor.webassembly.js:1

56 requests 6.1 MB transferred 16.6 MB resources

Blazor WebAssembly Framework Caching

- If you look at the network trace of what's being downloaded for a Blazor WebAssembly app after it's initially loaded you will notice that the size is extremely smaller

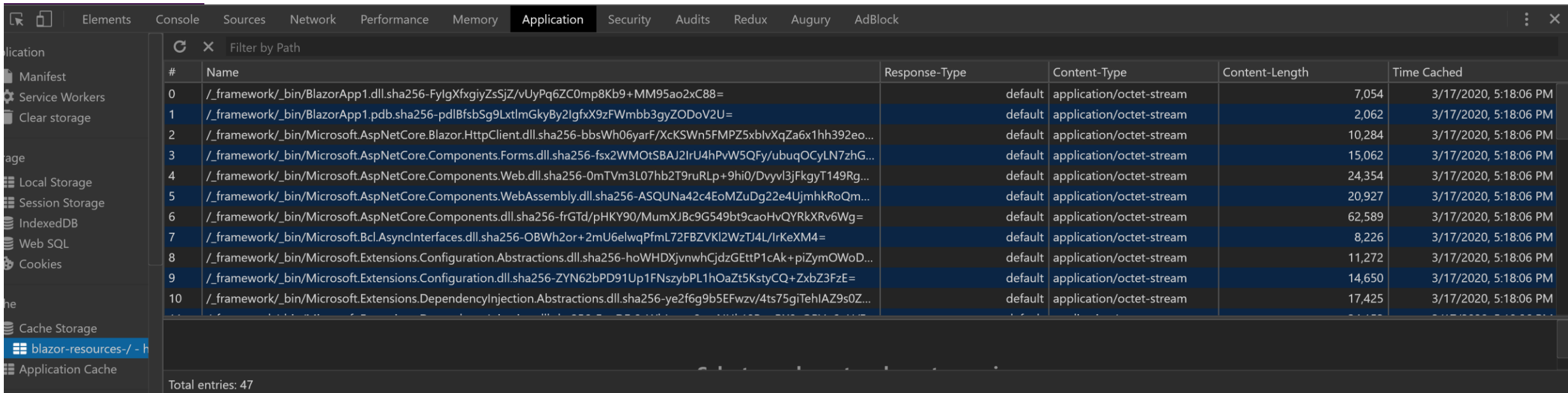
The image shows a Blazor WebAssembly application running in a browser. The application has a sidebar with links to Home, Counter, and Fetch data. The main content area displays "Hello, world!" and a welcome message. Below the application, the Chrome DevTools Network tab is open, showing a list of requests. A red circle highlights the summary at the bottom of the network trace.

Name	Status	Type	Initiator
localhost	304	document	Other
bootstrap.min.css	200	stylesheet	(index)
site.css	200	stylesheet	(index)
blazor.webassembly.js	304	script	(index)
open-iconic-bootstrap.min.css	304	stylesheet	(index)
blazor.boot.json	200	fetch	blazor.webassembly.js:1
ng-validate.js	200	script	content-script.js:1
dotnet.3.2.0-preview2.20159.2.js	200	script	blazor.webassembly.js:1
favicon.ico	200	x-icon	Other
open-iconic.woff	304	font	Other

10 requests 156 KB transferred 597 KB resources Finish: 2.85 s DOMContentLoaded: 545 ms Load: 858 ms

Blazor WebAssembly Framework Caching

- When a Blazor WebAssembly app is initially loaded, the runtime and framework files are now stored in the browser cache storage
- When the app loads, it first uses the contents of the *blazor.boot.json* to check if it already has all of the runtime and framework files it needs in the cache. If it does, then no additional network requests are necessary

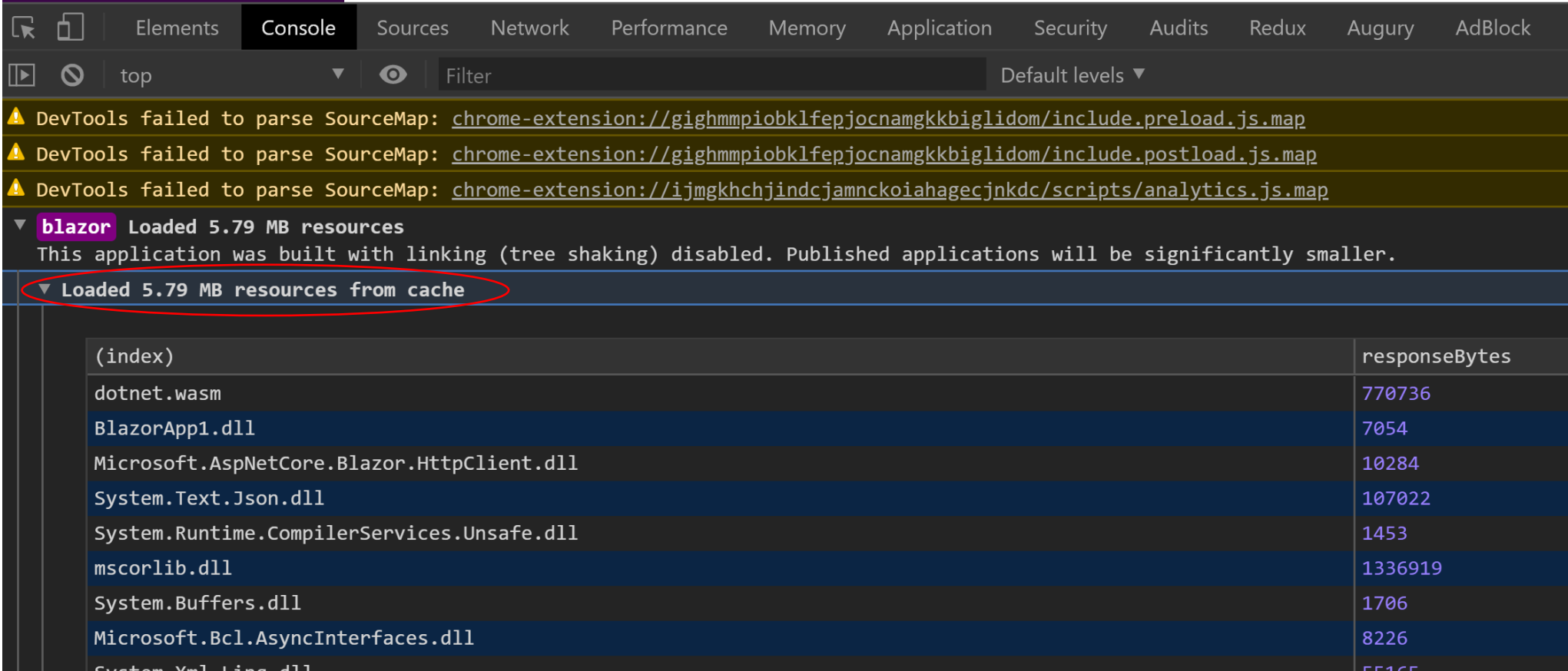


#	Name	Response-Type	Content-Type	Content-Length	Time Cached
0	/_framework/_bin/BlazorApp1.dll.sha256-FyIgXfxgiyZsSjZ/vUyPq6ZC0mp8Kb9+MM95ao2xC88=	default	application/octet-stream	7,054	3/17/2020, 5:18:06 PM
1	/_framework/_bin/BlazorApp1.pdb.sha256-pdlBfsbSg9LxtlmGkyBy2lgfX9zFWmbb3gyZODoV2U=	default	application/octet-stream	2,062	3/17/2020, 5:18:06 PM
2	/_framework/_bin/Microsoft.AspNetCore.Blazor.HttpClient.dll.sha256-bbsWh06yarF/XcKSWn5FMPZ5xbIvXqZa6x1hh392eo...	default	application/octet-stream	10,284	3/17/2020, 5:18:06 PM
3	/_framework/_bin/Microsoft.AspNetCore.Components.Forms.dll.sha256-fsx2WMOtSBAJ2IrU4hPvW5QFy/ubuqOCyLN7zhG...	default	application/octet-stream	15,062	3/17/2020, 5:18:06 PM
4	/_framework/_bin/Microsoft.AspNetCore.Components.Web.dll.sha256-0mTVm3L07hb2T9ruRLp+9hi0/Dvyv13jFkgyT149Rg...	default	application/octet-stream	24,354	3/17/2020, 5:18:06 PM
5	/_framework/_bin/Microsoft.AspNetCore.Components.WebAssembly.dll.sha256-ASQUNa42c4EoMZuDG22e4UjmhkRoQm...	default	application/octet-stream	20,927	3/17/2020, 5:18:06 PM
6	/_framework/_bin/Microsoft.AspNetCore.Components.dll.sha256-frGTd/pHKY90/MumXJBc9G549bt9caoHvQYRkXRv6Wg=	default	application/octet-stream	62,589	3/17/2020, 5:18:06 PM
7	/_framework/_bin/Microsoft.Bcl.AsyncInterfaces.dll.sha256-OBWh2or+2mU6elwqPfmL72FBZVKI2WzTJ4L/IrKeXM4=	default	application/octet-stream	8,226	3/17/2020, 5:18:06 PM
8	/_framework/_bin/Microsoft.Extensions.Configuration.Abstractions.dll.sha256-hoWHDXjvnwhCjdzG EttP1cAk+piZymOWoD...	default	application/octet-stream	11,272	3/17/2020, 5:18:06 PM
9	/_framework/_bin/Microsoft.Extensions.Configuration.dll.sha256-ZYN62bPD91Up1FNszybPL1hOaZt5KstyCQ+ZxbZ3FzE=	default	application/octet-stream	14,650	3/17/2020, 5:18:06 PM
10	/_framework/_bin/Microsoft.Extensions.DependencyInjection.Abstractions.dll.sha256-ye2f6g9b5EFwzv/4ts75giTehIAZ9s0Z...	default	application/octet-stream	17,425	3/17/2020, 5:18:06 PM

Total entries: 47

Blazor WebAssembly Framework Caching

- You can still see what the true size of the app is during development by checking the browser console



The screenshot shows the Chrome DevTools Console with the 'Console' tab selected. It displays three yellow warning messages about SourceMap parsing failures. Below these, a message indicates that Blazor loaded 5.79 MB of resources, noting that tree shaking is disabled. A red circle highlights the message 'Loaded 5.79 MB resources from cache'. Below this, a table lists the loaded resources and their response sizes in bytes.

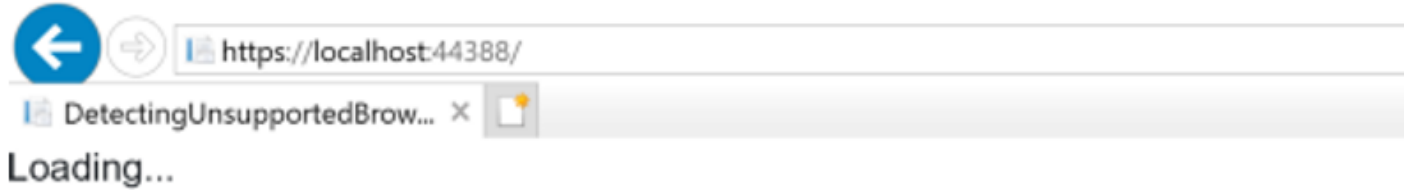
(index)	responseBytes
dotnet.wasm	770736
BlazorApp1.dll	7054
Microsoft.AspNetCore.Blazor.HttpClient.dll	10284
System.Text.Json.dll	107022
System.Runtime.CompilerServices.Unsafe.dll	1453
mscorlib.dll	1336919
System Buffers.dll	1706
Microsoft.Bcl.AsyncInterfaces.dll	8226
System.Xml.Linq.dll	55165

Blazor WebAssembly Framework Caching

- What about invalidating the cache?
 - The cache is based on hashes of all of the files, which are then recorded in the blazor.boot.json file when the app is built. If any of the files change, the hashes should change and the cache will get invalidated

Detecting Unsupported Browsers

- What happens when you load a Blazor WebAssembly application Under older browsers?



Demo: Detecting Unsupported Browsers

Blazor Roadmap

- [Roadmap](#)

Module Summary

- In this module, you learned about:
 - WebAssembly
 - Blazor Hosting Models
 - Blazor Bootstrap Process
 - Blazor WebAssembly Framework Caching



Lab 2: Overview



References

- [Microsoft Docs](#)

