



# Single Page Architectures with Vue.JS and ASP.NET Core

Kevin Griffin

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## Hello, I'm Kevin!



**Kevin Griffin**  
Owner, Swift Kick

11-time Microsoft MVP  
Focused on ASP.NET / ASP.NET Core / Azure

[twitter.com/1kevgriff](https://twitter.com/1kevgriff)  
[kevin@consultwithgriff.com](mailto:kevin@consultwithgriff.com)

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## Get the Resources

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<https://consultwithgriff.com/spas-with-vuejs-aspnetcore>

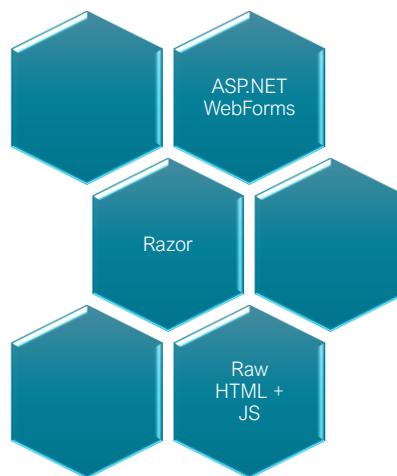
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## Client-Side Applications of the Past (for .NET)

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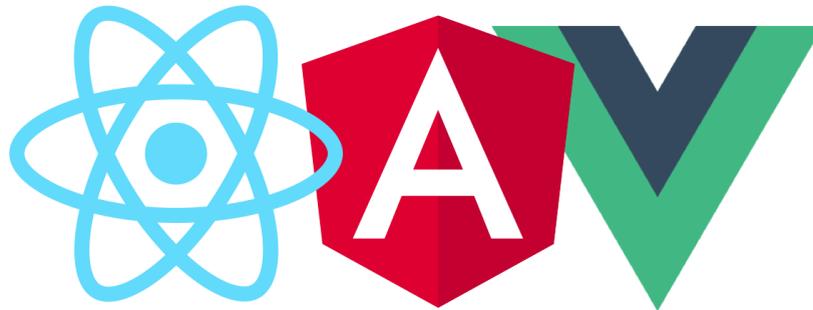


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## New Ways To Develop Client-Side Applications



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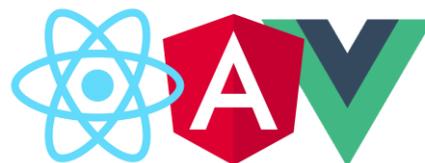
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## New Ways To Develop Client-Side Applications



- CLI-based
- Development and Deployment happens outside of the backend application
- Front end doesn't care where it is served from.
- Front end doesn't care where it gets data from.



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# In an ASP.NET Core world, how can we better support these types of applications?

## Goals of this talk

---



- Discuss my approach for building SPAs with VueJS and ASP.NET Core
- Ask and answer the logical questions I've asked myself while learning this process.
- Explain WHY certain libraries are used, instead of just saying "use this and that"

## Things you will NOT learn



- Everything about VueJS
- Everything about ASP.NET (Core)
- But – the examples should give you an idea of what's going on.

## Architecture of a Single Page Application

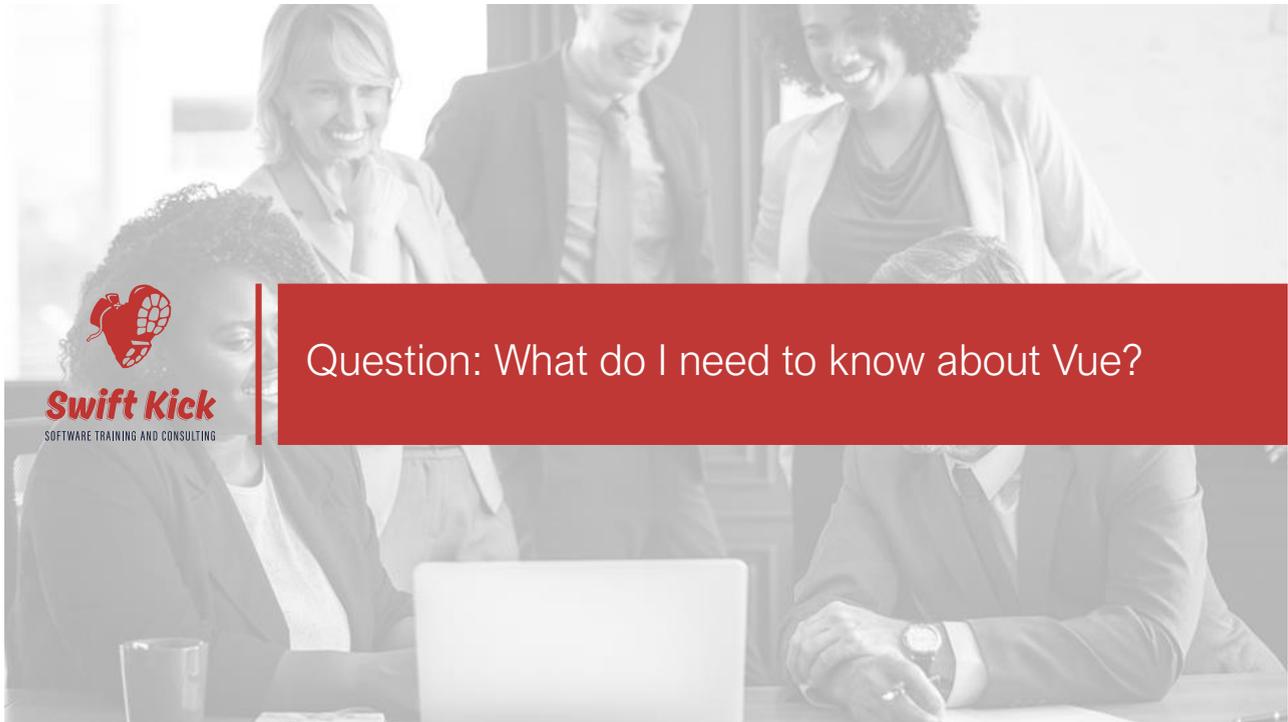


### ASP.NET Core Application (Back-end)

- Data Access
- Authentication
- Authorization

### Vue.JS Application (Front-end)

- Routing
- State Management (Vuex)
- Data fetching (Axios)



Question: What do I need to know about Vue?

## Question: What do I need to know about Vue?

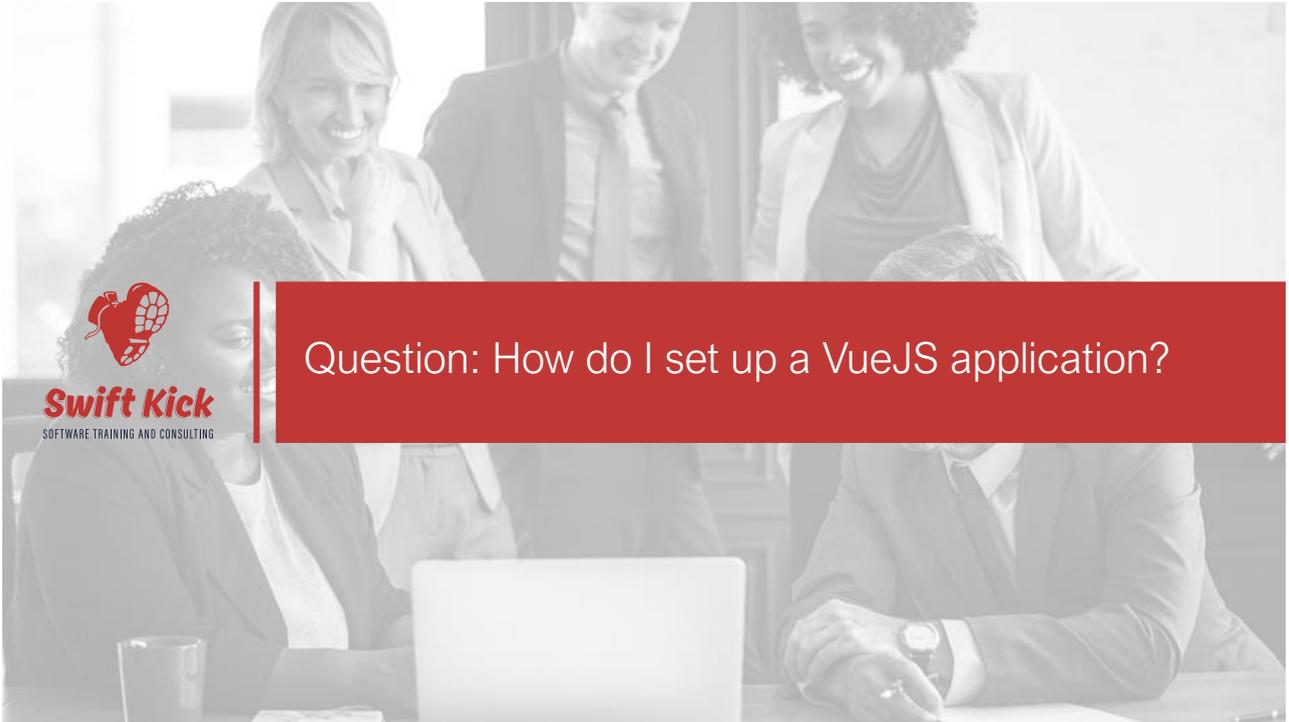


- VueJS is a client-side framework for building web applications.
- It is component-based.
- Each component can maintain its own:
  - Template
  - Styles
  - State
  - Properties
  - Events
- Limited opinion

```

1 <template>
2   <div class="home">
3     
4     <HelloWorld msg="Welcome to Your Vue.js App"/>
5   </div>
6 </template>
7
8 <style scoped>
9
10 </style>
11
12 <script>
13 import HelloWorld from '@components/HelloWorld.vue'
14
15 export default {
16   name: 'home',
17   components: {
18     HelloWorld
19   }
20 }
21 </script>

```



Question: How do I set up a VueJS application?



## Step 1: Installing Vue CLI



```
npm install -g @vue/cli  
# OR  
yarn global add @vue/cli
```

sh



## Question: Why use the Vue CLI?



### Why use the Vue CLI?



- Vue applications don't require the Vue CLI to be built.
- The CLI helps tremendously in scaffolding the base application.
- Hot reload ensures you are always looking at the current code
- Version upgrades are easier because dependencies are hidden from you.

## Step 2: Create a Vue.js Application



```
C:\spa> vue create frontend
```

```
Vue CLI v4.0.5
? Please pick a preset: (Use arrow keys)
> default (babel, eslint)
  Manually select features
```

## Step 2: Create a Vue.js Application



```
Vue CLI v4.0.5
? Please pick a preset: Manually select features
? Check the features needed for your project: (Press <space> to select, <a> to toggle all, <i> to
  invert selection)
> (*) Babel
  ( ) TypeScript
  ( ) Progressive Web App (PWA) Support
  ( ) Router
  ( ) Vuex
  ( ) CSS Pre-processors
  (*) Linter / Formatter
  ( ) Unit Testing
  ( ) E2E Testing
```

## Step 2: Create a Vue.js Application



```
Vue CLI v4.0.5
? Please pick a preset: Manually select features
? Check the features needed for your project: (Press <space> to select, <a> to toggle all, <i> to
o invert selection)Babel, Linter
? Pick a linter / formatter config: (Use arrow keys)
> ESLint with error prevention only
  ESLint + Airbnb config
  ESLint + Standard config
  ESLint + Prettier
```

## Step 2: Create a Vue.js Application



```
Vue CLI v4.0.5
? Please pick a preset: Manually select features
? Check the features needed for your project: (Press <space> to select, <a> to toggle all, <i> to
o invert selection)Babel, Linter
? Pick a linter / formatter config: Basic
? Pick additional lint features: (Press <space> to select, <a> to toggle all, <i> to invert sele
ction)
> (*) Lint on save
  ( ) Lint and fix on commit
```

## Step 2: Create a Vue.js Application



```
Vue CLI v4.0.5
? Please pick a preset: Manually select features
? Check the features needed for your project: (Press <space> to select, <a> to toggle all, <i> to
invert selection)Babel, Linter
? Pick a linter / formatter config: Basic
? Pick additional lint features: (Press <space> to select, <a> to toggle all, <i> to invert selec
tion)Lint on save
? Where do you prefer placing config for Babel, PostCSS, ESLint, etc.? (Use arrow keys)
> In dedicated config files
  In package.json
```

## Step 2: Create a Vue.js Application



```
Vue CLI v4.0.5
🔗 Creating project in C:\spa\frontend.
📦 Initializing git repository...
🌀 Installing CLI plugins. This might take a while...

[.....] - fetchMetadata: sill pacote range manifest for wrap-ansi@^5.1.0 fetched i
```

## Step 2: Create a Vue.js Application



```

Installing additional dependencies...
added 56 packages from 44 contributors and audited 24408 packages in 16.333s
found 0 vulnerabilities

Running completion hooks...

Generating README.md...

Successfully created project frontend.
Get started with the following commands:

$ cd frontend
$ npm run serve

C:\spa>

```

## Step 3: npm run serve



- Generates a “development” build of the application
- All JavaScript, HTML, CSS, and Images are built and combined – but for development
- Source maps allow for easy debugging
- Enables development server – which handles hot reload responsibilities and real-time rebuilding of the application.

```

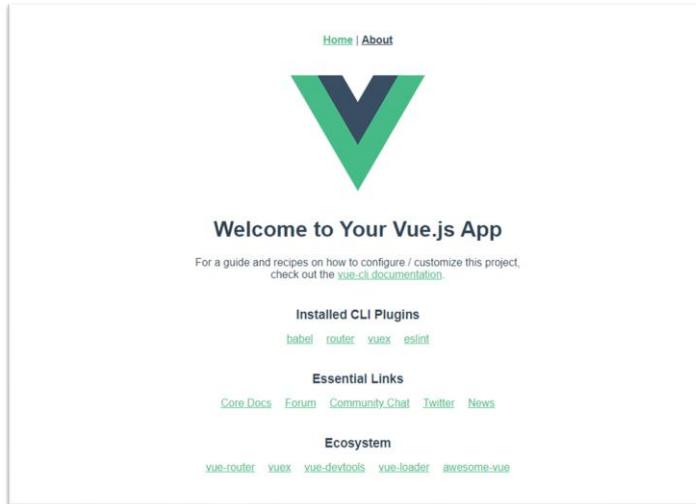
npm
DONE Compiled successfully in 2133ms 10:39:50 AM

App running at:
- Local: http://localhost:8081/
- Network: http://10.13.0.147:8081/

Note that the development build is not optimized.
To create a production build, run npm run build.

```

Tada!



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## Setting your ASP.NET Core Application

## Create an ASP.NET Core Application



```
C:\spa> dotnet new web -o backend
The template "ASP.NET Core Empty" was created successfully.

Processing post-creation actions...
Running 'dotnet restore' on backend\backend.csproj...
  Restore completed in 80.01 ms for C:\spa\backend\backend.csproj.

Restore succeeded.

C:\spa> |
```

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## When you're done...



```
C:\spa> ls

Directory: C:\spa

Mode                LastWriteTime         Length Name
----                -
d-----            11/6/2019   2:58 PM      backend
d-----            11/6/2019   3:30 PM      frontend
```

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Question: How does a VueJS SPA work?

Question: How does a VueJS SPA work?



```

1 <!DOCTYPE html>
2 <html lang="en">
3
4 <head>
5   <meta charset="utf-8">
6   <meta http-equiv="X-UA-Compatible" content="IE=edge">
7   <meta name="viewport" content="width=device-width,initial-scale=1.0">
8   <link rel="icon" href="<%= BASE_URL %>favicon.ico">
9   <title>frontend</title>
10 </head>
11
12 <body>
13   <noscript>
14     <strong>We're sorry but frontend doesn't work
15       properly without JavaScript enabled.
16       Please enable it to continue.</strong>
17   </noscript>
18   <div id="app"></div>
19   <!-- built files will be auto injected -->
20 </body>
21
22 </html>

```

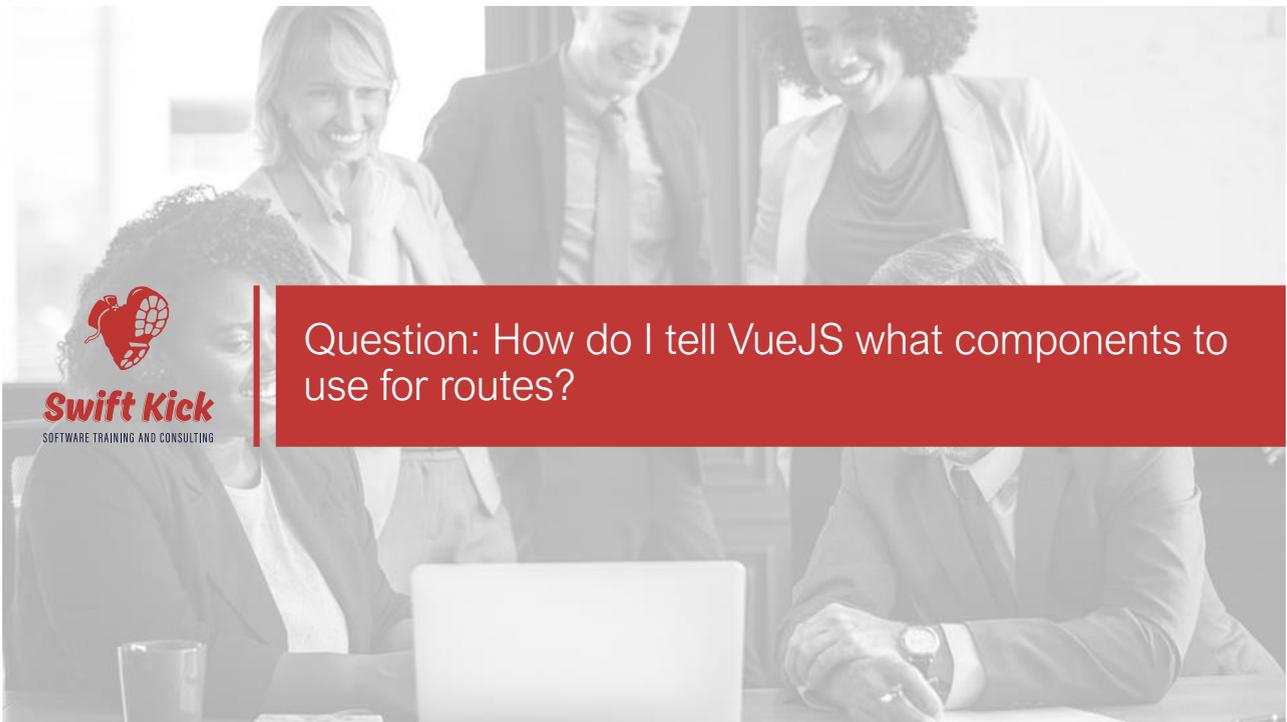
## Question: How does a VueJS SPA work?



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## Question: How do I tell VueJS what components to use for routes?



vuejs / vue-router

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Code Issues 134 Pull requests 61 Actions Projects 2 Security Insights

The official router for Vue.js. <http://router.vuejs.org/>

vue javascript router

1,059 commits 13 branches 0 packages 67 releases 204 contributors MIT

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## Question: How do I tell VueJS what components to use?



```

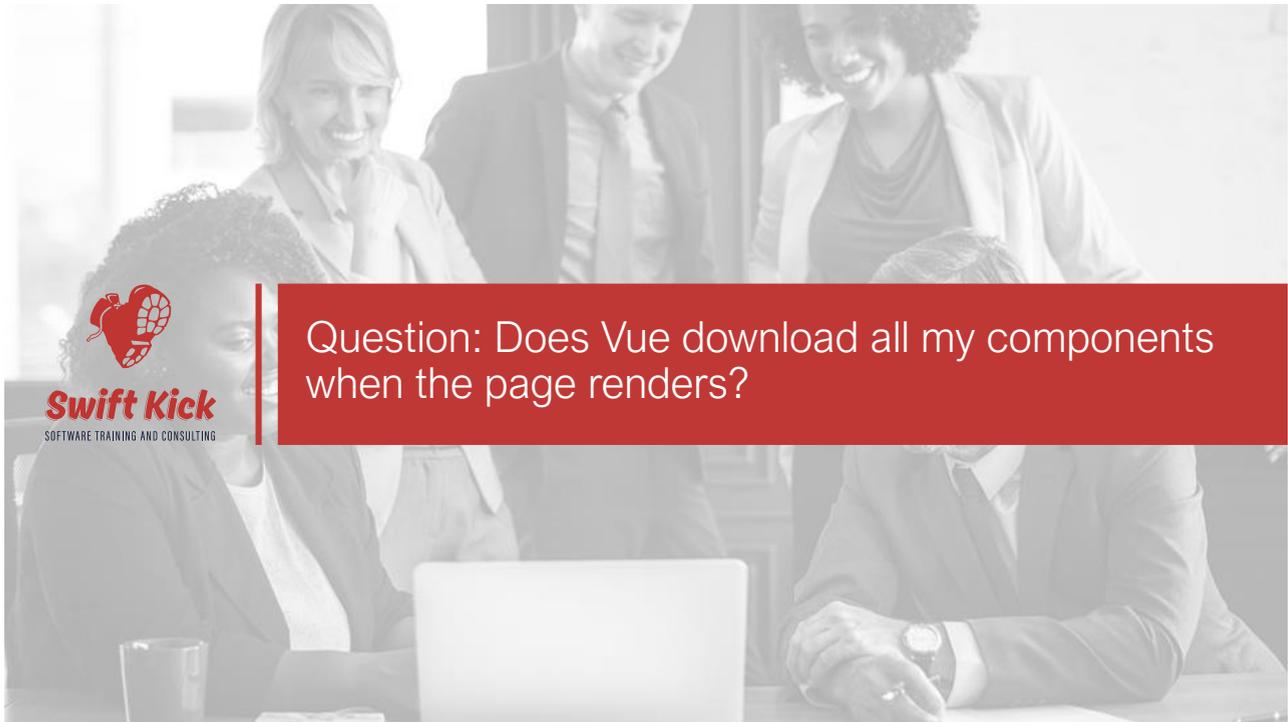
1 import Vue from 'vue' 68.1K (gzipped: 24.3K)
2 import VueRouter from 'vue-router' 26.4K (gzipped: 9.2K)
3 import Home from '../views/Home.vue'
4
5 Vue.use(VueRouter)
6
7 const routes = [
8   {
9     path: '/',
10    name: 'home',
11    component: Home
12  },
13  {
14    path: '/about',
15    name: 'about',
16    component: () => import(/* webpackChunkName: "about" */ '../views/About.vue')
17  }
18 ]
19
20 const router = new VueRouter({
21   mode: 'history',
22   base: process.env.BASE_URL,
23   routes
24 })

```

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Question: Does Vue download all my components when the page renders?

Question: Does Vue download all my components when the page renders?



- Yes!
- Lazy loading is available *\*if\** you don't want that to happen.

```
{  
  path: '/about',  
  name: 'about',  
  component: () => import(/* webpackChunkName: "about" */ '../views/About.vue')  
}
```



Question: What makes up a Vue component?

## Question: What makes up a Vue component?



- There are several ways to build Vue components – and we cannot cover all them.
- In this architecture, we use Vue with “Single File Components”
- Three distinct sections:
  - HTML template
  - CSS styles
  - Script

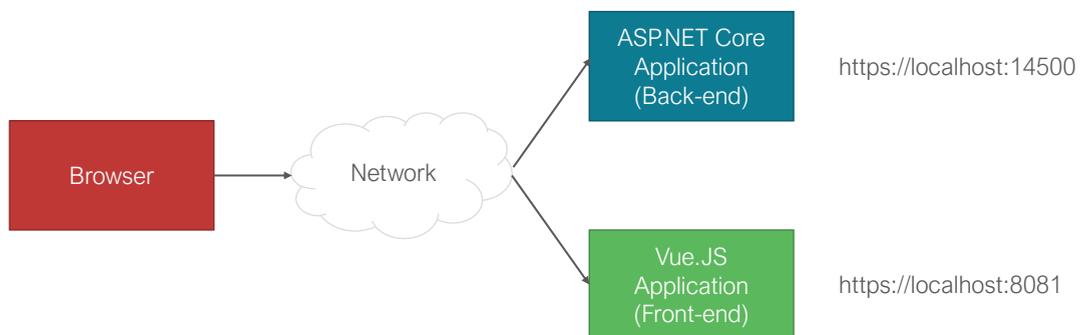
```

1 <template>
2   <div class="home">
3     
4     <HelloWorld msg="Welcome to Your Vue.js App"/>
5   </div>
6 </template>
7
8 <style scoped>
9
10 </style>
11
12 <script>
13 import HelloWorld from '@components/HelloWorld.vue'
14
15 export default {
16   name: 'home',
17   components: {
18     HelloWorld
19   }
20 }
21 </script>

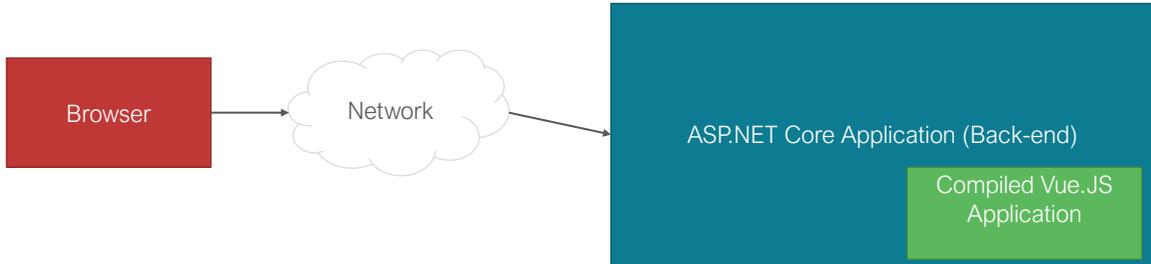
```



## Architecture of a Single Page Application (Dev)



# Architecture of a Single Page Application (Prod)



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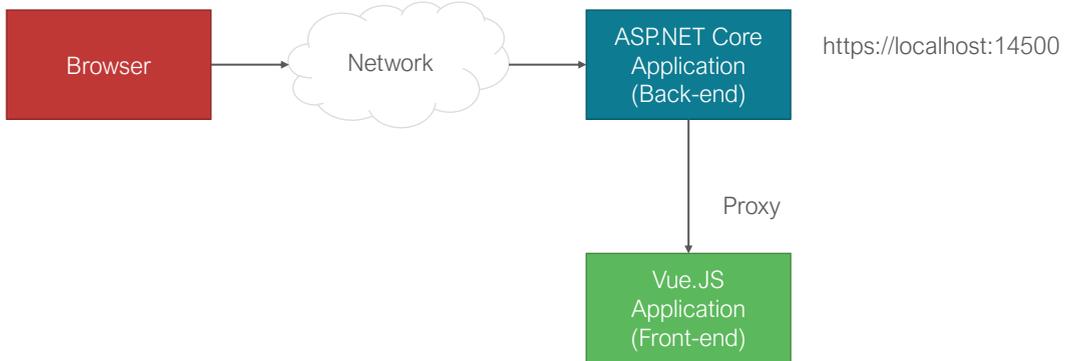
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Question: What if I want \*one\* url during development?

# Architecture of a Single Page Application (Dev)



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# Set up the proxy



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**Microsoft.AspNetCore.SpaServices.Extensions** 3.0.0

Helpers for building single-page applications on ASP.NET MVC Core.

This package was built from the source code at <https://github.com/aspnet/AspNetCore/tree/ae5e4080331553ea9dfb7fb388b6d72f715bf6a>

ⓘ There is a newer prerelease version of this package available. See the version list below for details.

Package Manager **.NET CLI** PackageReference Paket CLI

```
> dotnet add package Microsoft.AspNetCore.SpaServices.Extensions --version 3.0.0
```

Info

- last updated a month ago
- <https://asp.net/>
- Source repository
- Dependent repositories (13+)
- License: Apache-2.0
- Contact owners
- Report
- Download package (50.5 KB)

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## Set up the proxy



```
public void ConfigureServices(IServiceCollection services)
{
    services.AddSpaStaticFiles(configuration: options => { options.RootPath = "wwwroot"; });
    services.AddControllers();
}
```

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## Set up the proxy



```
public void Configure(IApplicationBuilder app, IWebHostEnvironment env)
{
    if (env.IsDevelopment())
    {
        app.UseDeveloperExceptionPage();
    }

    app.UseRouting();

    app.UseEndpoints(endpoints => { endpoints.MapControllers(); });

    app.UseSpaStaticFiles();
    app.UseSpa(configuration: builder =>
    {
        if (env.IsDevelopment())
        {
            builder.UseProxyToSpaDevelopmentServer(baseUri: "http://localhost:8081");
        }
    });
}
```

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## Run Vue Development Server



```
C:\spa\frontend [master]> npm run serve
> frontend@0.1.0 serve C:\spa\frontend
> vue-cli-service serve

[INFO] Starting development server...

[DONE] Compiled successfully in 4461ms 3:18:11 PM

App running at:
- Local: http://localhost:8080/
- Network: http://10.102.13.127:8080/

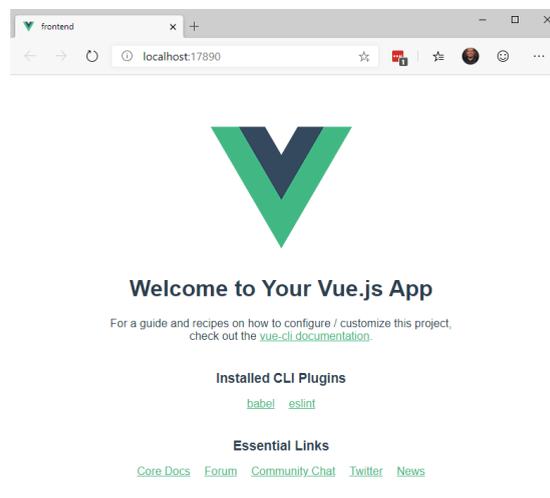
Note that the development build is not optimized.
To create a production build, run npm run build.
```

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## Run ASP.NET Core Application



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Question: How do I deploy?



## Deployment



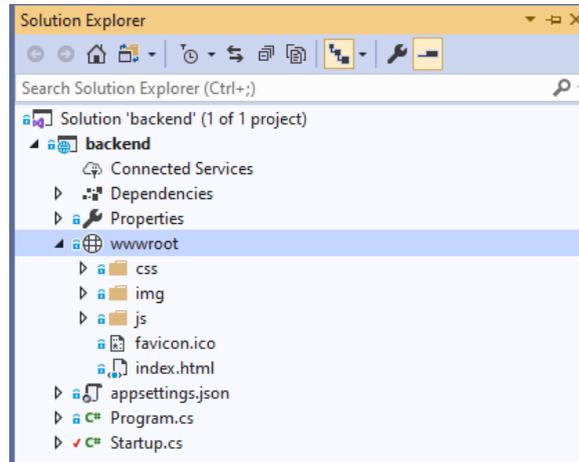
```
C:\spa\frontend [master]> npm run build
> frontend@0.1.0 build C:\spa\frontend
> vue-cli-service build

  Building for production...
DONE | Compiled successfully in 7839ms                               3:29:29 PM

File                               Size           Gzipped
dist\js\chunk-vendors.e4831489.js  88.32 KiB      31.63 KiB
dist\js\app.3c1527e6.js            4.62 KiB       1.64 KiB
dist\css\app.e2713bb0.css          0.33 KiB       0.23 KiB

Images and other types of assets omitted.
DONE | Build complete. The dist directory is ready to be deployed.
INFO | Check out deployment instructions at https://cli.vuejs.org/guide/deployment.html
```

## Deployment



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## Deployment



```

public void Configure(IApplicationBuilder app, IWebHostEnvironment env)
{
    if (env.IsDevelopment())
    {
        app.UseDeveloperExceptionPage();
    }

    app.UseRouting();

    app.UseEndpoints(endpoints => { endpoints.MapControllers(); });

    app.UseSpaStaticFiles();
    app.UseSpa(configuration: builder =>
    {
        if (env.IsDevelopment())
        {
            builder.UseProxyToSpaDevelopmentServer(baseUrl: "http://localhost:8081");
        }
    });
}

```

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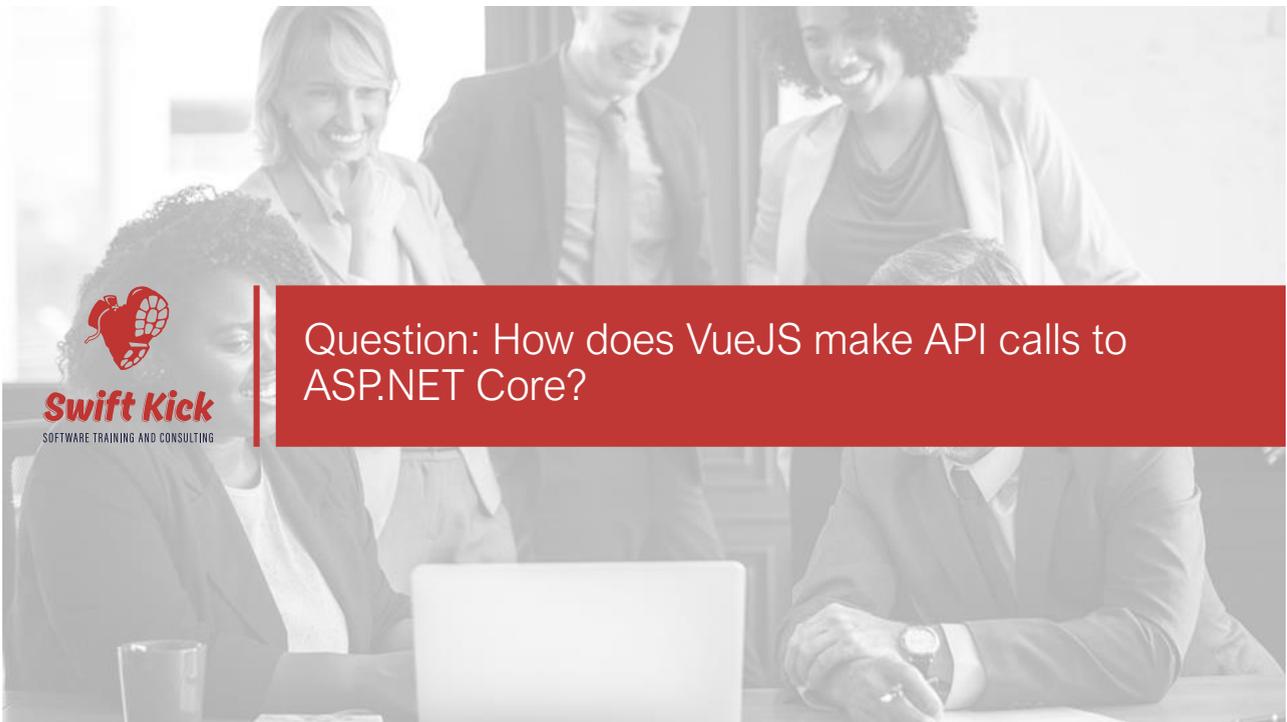
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## Griff's Tip



- Use the "outputDir" option in the vue.config.js file to set where **npm run build** will deploy its built files too.

```
JS vue.config.js ×
JS vue.config.js > ...
1  module.exports = {
2    configureWebpack: {
3      optimization: {
4        splitChunks: {
5          minSize: 10000,
6          maxSize: 250000,
7        }
8      }
9    },
10
11    outputDir: '[PATH TO WWWROOT]'
12  }
```



## Question: How does VueJS make API calls to ASP.NET Core?



- VueJS does not have a built-in AJAX or HTTP client.
- I recommend Axios – but \*any\* JavaScript fetch-based client will work.
- In newer browsers, fetch will work just fine.

### axios

npm v0.19.2 build passing coverage 94% install size 419 kB downloads 239/month chat on github code helpers 132

Promise based HTTP client for the browser and node.js

#### Features

- Make XMLHttpRequests from the browser
- Make http requests from node.js
- Supports the Promise API
- Intercept request and response
- Transform request and response data
- Cancel requests
- Automatic transforms for JSON data
- Client side support for protecting against XSRF

#### Browser Support

Latest ✓	11 ✓				

## Question: How does VueJS make API calls to ASP.NET Core?



### axios

```
.get("https://localhost:14500/api/users")
.then(
  (response) => commit("loadUsersSuccess", response.data),
  (error) => commit("loadUsersError", error));
```



Question: How do I share state between components?

## Question: How do I share state between components?



- Manage state in a higher level component
- Great for downstream data
- Horrible for upstream data
- Difficult to keep state in sync

```

<template>
  <div class="home">
    
    <HelloWorld users="users" msg="Welcome to Your Vue.js App" />
  </div>
</template>

<style scoped>
</style>

<script>
import HelloWorld from "@/components/HelloWorld.vue";

export default {
  name: "home",
  data() {
    return {
      users: [{ firstName: "Kevin", lastName: "Griffin" }]
    };
  },
  components: {
    HelloWorld
  }
};
</script>

```

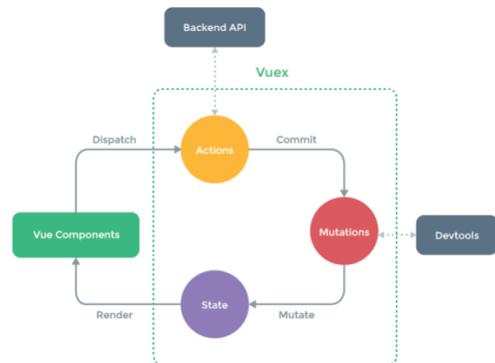
## Question: How do I share state between components?



- Use a global state management library, such as Vuex

**Vuex** circled passing

Centralized State Management for Vue.js.

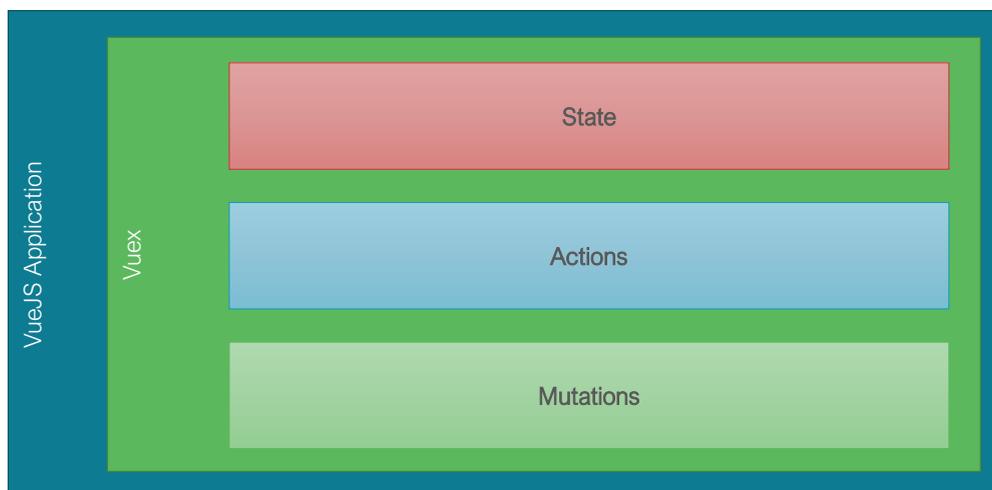


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## Vuex in a Nutshell



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## Vuex in a Nutshell



- “State” is an object that is available to any Vue components that request it.
- Objects in state must be pre-defined for change tracking.

```
state: {
  globalNumber: 42,
  error: {
    loadUsers: ""
  },
  users: [],
  products: [{ name: "Default Product", price: 3.50 }],
},
```

## Vuex in a Nutshell



- “Mutations” are processes that change state.
- Change will bubble out to any components that need to know about them.
- How do you call a mutation?

```
mutations: {
  loadUsersSuccess(state, data) {
    state.users = data;
  },
  loadUsersError(state, error) {
    state.error.loadUsers = error;
    state.globalNumber = -42;
  }
},
```

## Vuex in a Nutshell



- “Actions” are methods that trigger one or multiple mutations.

```
actions: {
  loadUsers({ commit }) {
    axios
      .get("https://localhost:14500/api/users")
      .then(
        (response) => commit("loadUsersSuccess", response.data),
        (error) => commit("loadUsersError", error));
  }
}
```

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## Vuex in a Nutshell



- State can be unloaded into a component via the “mapState” helper.

```
1 <template>
2   <div class="hello">
3     <p>Global Number is {{someNumber}}</p>
4     <ul>
5       <li v-for="u in users" :key="u.id">{{u}}</li>
6     </ul>
7   </div>
8 </template>
9
10 <script>
11 import {mapActions, mapState} from "vuex";
12
13 export default {
14   name: 'HelloWorld',
15   computed: {
16     ...mapState({
17       users: state => state.users,
18       someNumber: state => state.globalNumber
19     })
20   },
21   props: {
22     msg: String
23   }
24 }
25 </script>
```

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## Vuex in a Nutshell



- Actions can be called via the "mapActions" helper.

```
<script>
import { mapState, mapActions } from "vuex";

export default {
  name: "HelloWorld",
  computed: {
    ..mapState({
      users: state => state.users,
      someNumber: state => state.globalNumber
    })
  },
  methods: {
    ..mapActions(["loadUsers"]), // via Vuex actions
    localLoad() { // local method
      this.loadUsers();
    }
  },
  props: {
    msg: String
  }
};
</script>
```



Question: Authentication?

## Question: Authentication?



- Cookie Authentication
  - Works well in same-domain systems
  - Very well supported in ASP.NET Core
  - Automatically sent to the server on a request
  - Easy to revoke
- JWTs (JSON Web Tokens)
  - New “hotness”
  - Not necessarily more or less secure than Cookies.
  - JSON-based, so you can add metadata to the token
  - Not sent to the server by default.
  - In ASP.NET Core, you need to write your own refresh and revoking processes.

## Question: Authentication



- Do not confuse “authentication” with “authorization”
- Never trust \*anything\* on the client
- Server will always be the single point of truth – and this is for your protection!
- Handle your errors!

```
[Route(template:"api/user")]
[ApiController]
[Authorize]
public class UserController : ControllerBase
{
    public async Task<IActionResult> Get()
    {
        // TODO: write code
        return Ok();
    }
}
```

## Sample Code

---



[github.com/1kevgriff/  
sample-spa-vuejs-aspnetcore](https://github.com/1kevgriff/sample-spa-vuejs-aspnetcore)



Thanks for joining me!

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**Kevin Griffin**  
Owner, Swift Kick

[twitter.com/1kevgriff](https://twitter.com/1kevgriff)  
[kevin@swiftkick.in](mailto:kevin@swiftkick.in)

[kevgriffin.com](http://kevgriffin.com)  
[swiftkick.in](http://swiftkick.in)