

# Next.js on Module Federation Starter Project

This is a detailed outline of the step by step results of following the Next.js & Module Federation integration guide located at: <https://module-federation.io/practice/frameworks/next/index.html>

## Step 0: Prerequisites AKA “Setup Environment”

I ensured the prereqs are matched. Here’s my node environment:

```
~/projects/web/micro-frontends (0.042s)
node -v
v20.15.0
```

## Step 1: Setup Next Applications

### 1a) App Creation

I created both mfe1 and mfe2 next apps via create-next-app@latest with the following options; namely, with the inclusion of Typescript, ESLint, Tailwind; however, I opted out of option to: (a) use of the “App” router, (b) the creation of the “. /src” directory, and (c) customization of the “import alias” options. Here are screenshots with the summary for each of the app creation options.

MFE1	MFE2
<pre>~/projects/web/micro-frontends (1s 26.66s) npx create-next-app@latest Need to install the following packages: create-next-app@14.2.4 Ok to proceed? (y) y  ? What is your project named? .. mfe1 ✓ Would you like to use TypeScript? .. No / Yes ✓ Would you like to use ESLint? .. No / Yes ✓ Would you like to use Tailwind CSS? .. No / Yes ✓ Would you like to use 'src/' directory? .. No / Yes ✓ Would you like to use App Router? (recommended) .. No / Yes ✓ Would you like to customize the default import alias (@/*)? .. No / Yes Creating a new Next.js app in /Users/calvingnuyen/projects/web/micro-frontends/mfe1.  Using npm.  Initializing project with template: default-tw</pre>	<pre>npx create-next-app@latest ✓ What is your project named? .. mfe2 ✓ Would you like to use TypeScript? .. No / Yes ✓ Would you like to use ESLint? .. No / Yes ✓ Would you like to use Tailwind CSS? .. No / Yes ✓ Would you like to use 'src/' directory? .. No / Yes ✓ Would you like to use App Router? (recommended) .. No / Yes ✓ Would you like to customize the default import alias (@/*)? .. No / Yes Creating a new Next.js app in /Users/calvingnuyen/projects/web/micro-frontends/mfe2.  Using npm.  Initializing project with template: default-tw</pre>

### 1b) Installing dependencies

Upon executing my batch ‘make install’ which just runs `pnpm i` on each of the MFE apps, I encounter my first error that appears to be remediated by downgrading to node version 19 LTS. Here’s the pnpm installation error.

Note: I have a Makefile that automates installing dependencies and starting up the dev server. You may see references to `make install` and `make dev` which are just aliases for changing directories and running `pnpm i` and `pnpm dev` within each MFE subdirectory.

```
~/projects/web/micro-frontends/mfe-on-nextjs-and-modifed (1m 11.41s)
make install
make install-mfe1 install-mfe2
cd mfe1; pnpm i
ERR_PNPM_META_FETCH_FAIL GET https://registry.npmjs.org/pnpm: Value of "this" must be of type URLSearchParams
```

I am able to run pnpm i with warnings but no error after switching to node v19.9.0. Here's a readout.

```
~/projects/web/micro-frontends/mfe-on-nextjs-and-modifed (5.025s)
nvm install 19 --lts

Downloading and installing node v19.9.0...
Downloading https://nodejs.org/dist/v19.9.0/node-v19.9.0-darwin-arm64.tar.xz...
#####
Computing checksum with sha256sum
Checksums matched!
Now using node v19.9.0 (npm v9.6.3)

~/projects/web/micro-frontends/mfe-on-nextjs-and-modifed (13.569s)
make install
make install-mfe1 install-mfe2
cd mfe1; pnpm i
WARN deprecated @humanwhocodes/config-array@0.11.14: Use @eslint/config-array instead
WARN deprecated rimraf@3.0.2: Rimraf versions prior to v4 are no longer supported
WARN deprecated @humanwhocodes/object-schema@2.0.3: Use @eslint/object-schema instead
WARN deprecated glob@7.2.3: Glob versions prior to v9 are no longer supported
WARN deprecated inflight@1.0.6: This module is not supported, and leaks memory. Do not use it. Check out lru-cache
much more comprehensive and powerful.
Packages: +353
+++++
Packages are hard linked from the content-addressable store to the virtual store.
Content-addressable store is at: /Users/calvingnuy/Library/pnpm/store/v3
Virtual store is at: node_modules/.pnpm

dependencies:
+ next 14.2.4
+ react 18.3.1
+ react-dom 18.3.1

devDependencies:
+ @types/node 20.14.8
+ @types/react 18.3.3
+ @types/react-dom 18.3.0
+ eslint 8.57.0 (9.5.0 is available)
+ eslint-config-next 14.2.4
+ postcss 8.4.38
+ tailwindcss 3.4.4
+ typescript 5.5.2

The integrity of 2620 files was checked. This might have caused installation to take longer.
Progress: resolved 361, reused 220, downloaded 133, added 353, done
Done in 7.5s
```

```

cd mfe2; pnpm i
WARN Moving typescript that was installed by a different package manager to "node_modules/.ignored
WARN Moving @types/node that was installed by a different package manager to "node_modules/.ignored
WARN Moving @types/react that was installed by a different package manager to "node_modules/.ignored
WARN Moving @types/react-dom that was installed by a different package manager to "node_modules/.ignored
WARN Moving postcss that was installed by a different package manager to "node_modules/.ignored
WARN 6 other warnings
WARN deprecated @humanwhocodes/config-array@0.11.14: Use @eslint/config-array instead
WARN deprecated @humanwhocodes/object-schema@2.0.3: Use @eslint/object-schema instead
WARN deprecated rimraf@3.0.2: Rimraf versions prior to v4 are no longer supported
WARN deprecated glob@7.2.3: Glob versions prior to v9 are no longer supported
WARN deprecated inflight@1.0.6: This module is not supported, and leaks memory. Do not use it. Check out
much more comprehensive and powerful.
Packages: +353
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Packages are hard linked from the content-addressable store to the virtual store.
Content-addressable store is at: /Users/calvinnguyen/Library/pnpm/store/v3
Virtual store is at: node_modules/.pnpm
Progress: resolved 361, reused 353, downloaded 0, added 353, done

dependencies:
+ next 14.2.4
+ react 18.3.1
+ react-dom 18.3.1

devDependencies:
+ @types/node 20.14.8
+ @types/react 18.3.3
+ @types/react-dom 18.3.0
+ eslint 8.57.0 (9.5.0 is available)
+ eslint-config-next 14.2.4
+ postcss 8.4.38
+ tailwindcss 3.4.4
+ typescript 5.5.2

Done in 5.8s

~/projects/web/micro-frontends/mfe-on-nextjs-and-modfed (0.039s)
node -v
v19.9.0

```

Just a cursory check, at this point, both mfe1 and mfe2 next apps without any modification are able to start up without error as evident by this console readout.

```
> mfe1@0.1.0 dev /Users/calvinnguyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe1
> next dev

▲ Next.js 14.2.4
- Local:      http://localhost:3000

✓ Starting...
Error: process.env.NEXT_PRIVATE_LOCAL_WEBPACK is not set to true, please set it to true, and "npm install webpack"
    at NextFederationPlugin.validateOptions (/Users/calvinnguyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe1/node_modules/next/dist/compiled/webpack/next.js:100:11)

~/projects/web/micro-frontends/mfe-on-nextjs-and-modfed
make dev

make -j 2 dev-mfe2 dev-mfe1
cd mfe2; pnpm run dev
cd mfe1; pnpm run dev

> mfe2@0.1.0 dev /Users/calvinnguyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2
> next dev

> mfe1@0.1.0 dev /Users/calvinnguyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe1
> next dev

▲ Port 3000 is in use, trying 3001 instead.
▲ Next.js 14.2.4
- Local:      http://localhost:3001

✓ Starting...
▲ Next.js 14.2.4
- Local:      http://localhost:3000

✓ Starting...
✓ Ready in 2.1s
○ Compiling / ...
✓ Ready in 3s
✓ Compiled / in 1024ms (290 modules)
✓ Compiled in 66ms (290 modules)
GET / 200 in 1154ms
○ Compiling / ...
✓ Compiled / in 1126ms (290 modules)
✓ Compiled in 74ms (290 modules)
GET / 200 in 1267ms
```

## Step 2: Configuring “NextFederationPlugin” on the Host via next.config.mjs

## 2a) Configuring Host side Module Federation Plugin

=> **Documentation Opportunity**: While it's implied by the guide, it would be more clear to highlight that this step pertains to configuring the "mfe1" host app to ensure the right configuration is applied. And additionally, it may be best to have this step after we configure and expose the button component from mfe2, acting as the remote.

I've copied the guide's code for `next.config.mjs` verbatim here. Perhaps expected; if stop here and run ``make dev``, I do get a terminal console error indicating that the version of NEXT is not

the expected Private; i.e. it finds the version bootstrapped by Nexts but needs to be the full version that is bundled with Node. I will remedy that in the next step, by following the guide using an .env.local.

## 2b) Ensure Webpack is installed manually

This step is where I first encounter an error that I don't quite know how to work around. Here is my readout from the console that shows I successfully "manually" installed webpack but still get a "module not found" error.

=> Will you clarify what it means to have webpack "installed manually?" Does webpack normally just get implicitly bundled through some other means with Next but is not complete enough and therefore fails? And why does this step switch to using just `npm` whereas; all the preceding steps reference `pnpm` instead?

```
~/projects/web/micro-frontends/mfe-on-nextjs-and-modfed (1.961s)
(cd mfe2; npm i webpack -D)

added 3 packages, changed 13 packages, and audited 522 packages in 2s

145 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities

~/projects/web/micro-frontends/mfe-on-nextjs-and-modfed (1.531s)
make dev-mfe2
(cd mfe2; pnpm run dev)

> mfe2@0.1.0 dev /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2
> next dev -p 3001

  ▲ Next.js 14.2.4
  - Local:      http://localhost:3001
  - Environments: .env

✓ Starting...
Error: Cannot find module '/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/next/dist/compiled/lib/util/makeSerializable'
Require stack:
- /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/lib/container/ContainerExposedDependency.js
- /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/lib/container/ContainerEntryModule.js
- /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/lib/container/HoistContainerReferencesPlugin.js
- /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/wrapper/HoistContainerReferencesPlugin.js
- /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/index.js
- /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/nextjs-mf/dist/src/plugins/NextFederationPlugin/apply-server-plugins.js
- /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/nextjs-mf/dist/src/plugins/NextFederationPlugin/index.js
- /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/nextjs-mf/dist/src/index.js
    at Module._resolveFilename (node:internal/modules/cjs/loader:1090:15)
    at /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/next/dist/server/require-hook.js:55:36
    at Module._load (node:internal/modules/cjs/loader:934:27)
    at Module.require (node:internal/modules/cjs/loader:1157:19)
    at mod.require (/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/next/dist/server/require-hook.js:65:28)
    at require (node:internal/modules/helpers:119:18)
    at Object.<anonymous> (/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/lib/container/ContainerExposedDependency.js:14:14)
    at Module._compile (node:internal/modules/cjs/loader:1275:14)
    at Module._extensions..js (node:internal/modules/cjs/loader:1329:10)
    at Module.load (node:internal/modules/cjs/loader:1133:32) {
  code: 'MODULE_NOT_FOUND',
  requireStack: [
    '/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/lib/container/ContainerExposedDependency.js',
    '/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/lib/container/ContainerEntryModule.js',
    '/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/lib/container/HoistContainerReferencesPlugin.js',
    '/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/wrapper/HoistContainerReferencesPlugin.js',
    '/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/enhanced/dist/src/index.js',
    '/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/nextjs-mf/dist/src/plugins/NextFederationPlugin/apply-server-plugins.js',
    '/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/nextjs-mf/dist/src/plugins/NextFederationPlugin/index.js',
    '/Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe2/node_modules/@module-federation/nextjs-mf/dist/src/index.js'
  ]
}
```

Workaround: I leveraged the pattern in the nextjs-ssr example that overrides the "dev" script with one that explicitly deletes the Next cache resident at .next and added the "NEXT\_PRIVATE\_LOCAL\_WEBPACK=true" as follows. To avoid overwriting, I am using the "dev-lwp" for local webpack override.

```
"scripts": {
  "dev": "next dev -p 3000",
```

```
"dev-lwp": "rm -rf .next; NEXT_PRIVATE_LOCAL_WEBPACK=true next dev -p 3000",
```

## Step 3: Implementing SSR

=> **Documentation Opportunity:** I would recommend if this step applies to both mfe1 and mfe2 or one or the other? I inferred they are required for both but wanted to check each step and started with mfe2 and ran into errors detailed below.

### 3a) Add Server Lifecycle

I replaced `_document.tsx` with what is shown in the guide for `document.js`. Note my projects are typescript based. At this stage, I am taking this step by step, and have only applied the change to “mfe2” however, upon execution of ``pnpm run dev-lwp`` I get the following **Error: The default export is not a React Component in page: “/\_document” error.**

I’ve tried all three variants of the code snippets; including those with Revalidation and the Chunk Flushing but get the same server. **As likely side effect:** I believe the error above with mfe2 as a remote results in mfe1 failing with this error as it tries to resolve the Remote button.

```
> mfe1@0.1.0 dev-lwp /Users/calvingnuyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe1
> rm -rf .next; NEXT_PRIVATE_LOCAL_WEBPACK=true next dev -p 3000

▲ Next.js 14.2.4
- Local:      http://localhost:3001
- Environments: .env

✓ Starting...
▲ Next.js 14.2.4
- Local:      http://localhost:3000
- Environments: .env

✓ Starting...
[ Module Federation Manifest Plugin ]: Manifest will use absolute path resolution via its host at runtime, reason: publicPath='auto'
No ModuleFederationPlugin(s) found.
[ Module Federation Manifest Plugin ]: Manifest will use absolute path resolution via its host at runtime, reason: publicPath='auto'
[ Module Federation Manifest Plugin ] Manifest Link: {auto}/static/chunks/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: /_next/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: {auto}/static/chunks/mf-manifest.json
✓ Ready in 2.6s
[ Module Federation Manifest Plugin ] Manifest Link: {auto}/static/chunks/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: /_next/mf-manifest.json
✗ external "http://localhost:3001/static/chunks/remoteEntry.js"
Invalid request "http://localhost:3001/static/chunks/remoteEntry.js"
```

=> **Documentation Opportunity:**

Adding the “default export `MyDocument`” to the end of the `_document.tsx` fixes the aforementioned error.

```
class MyDocument extends Document {...
...
}

export default MyDocument;
```

---

## Step 4: Create and Expose

Steps 4a) of creating a button and 4b) with exposing the remote endpoint were straight forward. Nothing else to note.

## Step 5: Consume Remote Module

### 5b) Add Server Lifecycle Method to Page

=> **Documentation Opportunity**

Perhaps this is intuitive for those with experience with React and Next; however, I think it may help others if we clarify if this lifecycle hook method is to be placed in every Page component within the /pages directory or whether it is a special instance that goes into a “root level” Index.tsx somewhere? Just some additional context may help here. In comparison, the example within the nextjs-ssr, [seen here](#) has App.getInitialProps and it seems to be required just on the App instance within \_app.js.

#### Current Status:

Having interpreted errors and employing some workarounds, I arrive at this current error that is emitted into the terminal console that indicates the “mfe1” host is not able to resolve the “mfe2” remoteEntry metadata and bundle. Here is the console error from mfe1.

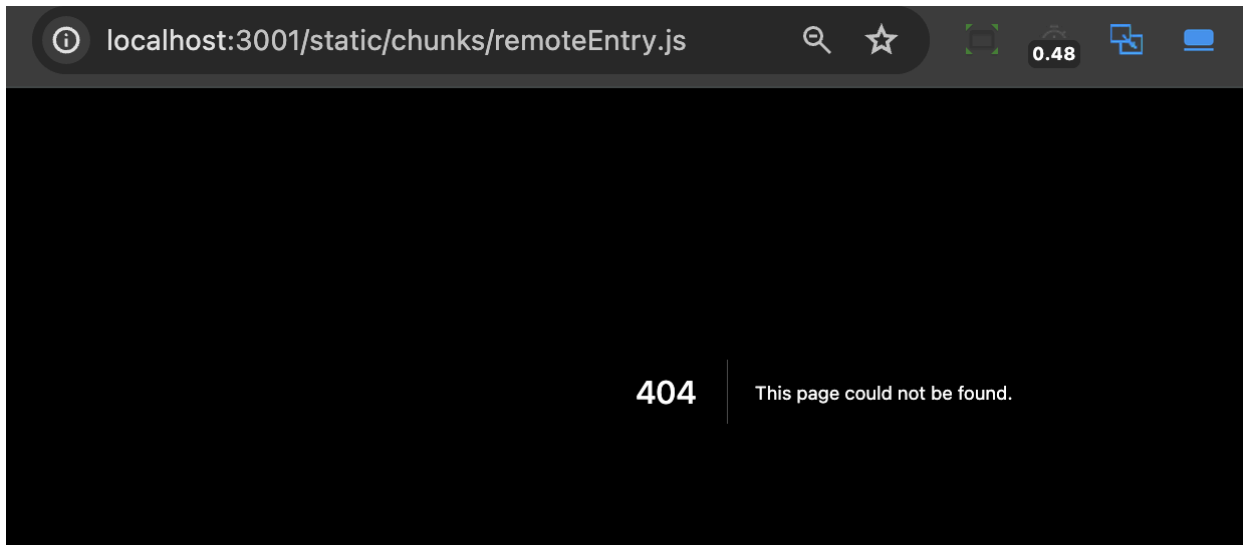
```
~/projects/web/micro-frontends/mfe-on-nextjs-and-modfed git:(main)±3
make dev-mfe1
(cd mfe1; pnpm run dev-lwp)

> mfe1@0.1.0 dev-lwp /Users/calvinnguyen/projects/web/micro-frontends/mfe-on-nextjs-and-modfed/mfe1
> rm -rf .next; NEXT_PRIVATE_LOCAL_WEBPACK=true next dev -p 3000

  ▲ Next.js 14.2.4
  - Local:      http://localhost:3000
  - Environments: .env

✓ Starting...
No ModuleFederationPlugin(s) found.
[ Module Federation Manifest Plugin ]: Manifest will use absolute path resolution via its host at runtime, reason: publicPath='auto'
[ Module Federation Manifest Plugin ] Manifest Link: {auto}/static/chunks/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: /_next/mf-manifest.json
✖ external "http://localhost:3001/static/chunks/remoteEntry.js"
Invalid request "http://localhost:3001/static/chunks/remoteEntry.js"
```

If I attempt to navigate the remote endpoint expected to be at: <http://localhost:3001/static/chunks/remoteEntry.js> I get an HTTP 404 error rather than the expected JS bundle from the “mfe1” remote as seen below.



When I inspect the “mfe1” console, I see the following that references /static/chunks/mf-manifest.json as follows.

```
~/projects/web/micro-frontends/mfe-on-nextjs-and-modfed git:(main)✚
make dev-mfe2

▲ Next.js 14.2.4
- Local:    http://localhost:3001
- Environments: .env

✓ Starting...
[ Module Federation Manifest Plugin ] Manifest will use absolute path resolution via its host at runtime, reason: publicPath='auto'
[ Module Federation Manifest Plugin ] Manifest Link: {auto}/static/chunks/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: /_next/mf-manifest.json
✓ Ready in 2.4s
[ Module Federation Manifest Plugin ] Manifest Link: {auto}/static/chunks/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: /_next/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: {auto}/static/chunks/mf-manifest.json
o Compiling /_error ...
[ Module Federation Manifest Plugin ] Manifest Link: /_next/mf-manifest.json
✓ Compiled /_error in 711ms (568 modules)
GET /_next/static/webpack/49e4904e32fe1de5.webpack.hot-update.json 404 in 726ms
▲ Fast Refresh had to perform a full reload. Read more: https://nextjs.org/docs/messages/fast-refresh-reload
[ Module Federation Manifest Plugin ] Manifest Link: {auto}/static/chunks/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: /_next/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: {auto}/static/chunks/mf-manifest.json
[ Module Federation Manifest Plugin ] Manifest Link: /_next/mf-manifest.json
✓ Compiled / in 350ms (570 modules)
GET /_next/static/webpack/49e4904e32fe1de5.webpack.hot-update.json 404 in 317ms
GET /static/chunks/remoteEntry.js 404 in 88ms
GET /static/chunks/mf-manifest.json 404 in 87ms
▲ Fast Refresh had to perform a full reload. Read more: https://nextjs.org/docs/messages/fast-refresh-reload
▲ Fast Refresh had to perform a full reload. Read more: https://nextjs.org/docs/messages/fast-refresh-reload
Home returned an empty object from 'getInitialProps'. This de-optimizes and prevents automatic static optimization. https://nextjs.org/docs/messages/empty-object-getInitialProps
GET / 200 in 366ms
▲ Fast Refresh had to perform a full reload. Read more: https://nextjs.org/docs/messages/fast-refresh-reload
GET /static/chunks/remoteEntry.js 404 in 9ms
GET /static/chunks/mf-manifest.json 404 in 9ms
Home returned an empty object from 'getInitialProps'. This de-optimizes and prevents automatic static optimization. https://nextjs.org/docs/messages/empty-object-getInitialProps
▲ Fast Refresh had to perform a full reload. Read more: https://nextjs.org/docs/messages/fast-refresh-reload
▲ Fast Refresh had to perform a full reload. Read more: https://nextjs.org/docs/messages/fast-refresh-reload
GET / 200 in 8ms
▲ Fast Refresh had to perform a full reload. Read more: https://nextjs.org/docs/messages/fast-refresh-reload
```

**Question:** I suspect that I need to reconfigure the URL and have tried this other setting instead but still failed. Are my packages for module federation expected to work with a JSON bundle and require a different set of configuration to be applied on both mfe1 and mfe2 next.config.mjs files?

```
import { NextFederationPlugin } from '@module-federation/nextjs-mf';

/** @type {import('next').NextConfig} */
```



```
const nextConfig = {
  reactStrictMode: true,
  webpack(config, options) {
    config.plugins.push(
      new NextFederationPlugin({
        name: 'mfe1',
        filename: 'static/chunks/remoteEntry.js',
        remotes: {
          // mfe2: `http://localhost:3001/static/${options.isServer ? 'ssr' :
'chunks'}/remoteEntry.js`,
          mfe2: `http://localhost:3001/static/${options.isServer ? 'ssr' :
'chunks'}/mf-manifest.json`,
        },
        shared: {},
        extraOptions: {
          exposePages: true,
          enableImageLoaderFix: true,
          enableUrlLoaderFix: true,
        },
      })
    )
    return config
  }
};

export default nextConfig;
```