

Using JS

Only experience can teach

- All the options available
- How to break down a problem

But...

- Some best practices can save you a lot of time

State

An application has "state"

- Frontend/backend different + separate states
- The current values for all things that can change

A chat application

- Are you logged in?
- As who?
- Are there messages?
- What are they?
- Are you typing a message?

Server State and Client State NOT the same!

Example of Chat app:

- Server knows all users data
 - Client only knows THIS user
- Server knows all messages
 - Client only knows what is on page
- Server has data in format to help server
 - Client has data in format to help client

These states are often similar, but not identical!

How to store state

Store your state in variables/object

- These live only until a new page load
- Use these to update the screen as needed

DO NOT read the HTML (DOM) to recapture the state

- Industry did that
- Apps worked great...until they got big enough
- Then changes got too complex (too coupled)
- Literal years of JS Hate followed

How NOT to store state

Example: You show a list of users on the screen.

To get the list of users, should you read the DOM?

No. Why?

- The screen is the visual output
- Alter the display = change how to read DOM for list
- As display gets complex , so does state interaction
 - Does not "scale"
 - New changes = increasingly difficult

Model-View-Controller (MVC)

We do this frontend as well as backend!

- Frameworks exist, but we look at concepts

MVC is common best-practice pattern:

- Something manages your data (model)
- Something the flow of the application (controller)
- Something translates the data to output (view)

We will change a lot, but that breakdown will remain

Client side storage

Sometimes you want to store information outside of the page *on the browser*

- Cookies
- localStorage
- IndexedDB

BE CAREFUL

- Limited security
- Users will change browsers/machines
- Can get changed/deleted by user/browser
- Not all clients are browsers

Cookies

"Cookies" are just an HTTP header

- Special is how browsers treat them
- Browser sends cookies along with each request

Cookies are text-based key/values pairs

- limited to a URL and descendant paths
- might have expiration date
- might (should) require HTTPS
- might not be accessible to JS
- shared between tabs

When to use cookies

Most Common:

- Store a random key that is IS also server-side
 - a "session" identifier
- request with key lets server read extra data
- Depends on that random number staying secret
- Cookie/session should NOT hold **application** state
 - because user might be using multiple tabs
 - each page/tab has its own application state
 - session data is useful regardless of state

When not to use cookies

DO NOT use cookies to store:

- Sensitive data (CC numbers, passwords)
- Personal data (addresses, etc)
- Application state
- Big data
- Data hard to represent in short bits of text

Local Storage

localStorage and sessionStorage

- key/value
- client-side only (not sent to server)
- JS only (no JS, no using localStorage)
- Store bigger values than cookies
- localStorage is shared between tabs
 - sessionStorage is NOT
- localStorage does not expire
 - sessionStorage lasts until browser quits
- Still domain-limited
 - Not path limited

When to use localStorage

- Store JS-applicable preferences
- When data too awkward for cookies
- When user switching devices isn't a problem
- To keep tabs in sync with choices

Rarely want sessionStorage

- Lack of tab-sharing causes confusion

When NOT to use localStorage

- Cookie security restrictions still apply
 - Sensitive data (CC numbers, passwords)
 - Personal data (addresses, etc)
- If the data is needed without JS

IndexedDB

Browser-side object-based DB

- NOT relational, NOT table-based

Asynchronous

- Like a click handler: response will happen later

JS-only

Stores larger data, non-expiring

- Browser can limit and/or delete without warning

When to use IndexedDB

Fairly few cases

Transactions

Larger data, but unreliable storage

Non-trivial to use

When NOT to use IndexedDB

- Cookie security restrictions still apply
 - Sensitive data (CC numbers, passwords)
 - Personal data (addresses, etc)
- If the data is needed without JS
- If you don't want the complexity

Client-side Storage for Assignments

- Cookies for session id only
- No localStorage/sessionStorage
- No IndexedDB

JS Tools

JS ecosystem has many tools beyond the engine

- Polyfills
- Linters
 - Prettier
- Minifiers
- Bundlers
- Transpilers

Polyfills

Older browsers may not have latest built-in JS features

- Polyfills are libraries that "add" such a feature
- Usually managed by bundler/transpiler
 - But good to know the term

Linters

Linters (not JS-specific): programs to check syntax

- For purely stylistic preferences
- For patterns that are technically correct
 - But tend to lead to errors

Formatting is long debated

Linters can help find unintended errors

`eslint` is the most common JS linter

- Many IDEs have linting built-in

Prettier

- Auto-formats code to a common style
 - Like a linter that auto-fixes
- Popular among those that don't want to argue

Minifiers

Change JS/CSS/HTML files sent to users

- Not the files you actually edit/code
- Removes unneeded whitespace
- Replaces some variable names with short ones

Reduces file size of JS/CSS/HTML

- This actually matters!
- Faster downloads

Makes them harder to read/debug

- Is NOT security

Bundlers

Frontend struggles to handle multiple JS files well

"Bundlers" convert multiple files into one

- Some use NodeJS `require()` syntax
- Others use the newer standard `import` command

Some common bundlers:

- Webpack
- Rollup
- Snowpack
- Parcel

Browserify - an example bundler

```
// Commands
mkdir b-ify
cd b-ify
npm init -y
npm install browserify
```

```
// foo.js
const bar = require('./bar');
console.log(`The other file says ${ bar() } successfully`);
```

```
// bar.js
module.exports = function() {
  return `"I like cats"`;
};
```

```
// Commands
browserify foo.js -o bundle.js
```



```
// index.html  
<script src="bundle.js"></script>
```

Transpilers

Transpilers are "**trans**forming comp**ilers**"

- Input (something)
- Output browser-ready JS

Examples:

- Input TypeScript, output JS
- Input ClojureScript, output JS
- Input modern JS, output older JS
- Input **future** JS, output modern JS

Example: See Babel at [**https://babeljs.io/**](https://babeljs.io/)

Hot reloading

During Front End development, it is common to have a setup that will reload your changes easily

- Great during development
- Not great for when the product is shipped

In This Course

- We will start without tools
 - Your IDE might have linting
 - We will add some tools over time
- Tools make things easy
 - But understand the concepts without them
 - You aren't lost if they aren't working
 - And many tools aren't noticed
 - Others definitely ARE

BUT: You may think WebDev is annoying