6.1040: Software Design

Reactive Programming

Code Repo: https://github.com/61040-fa24/lec-vue

Screen Recording

6.1040 Software Studio / Fall 2023

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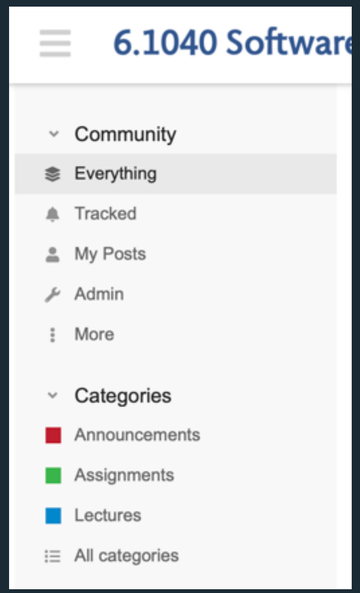
Topic		Replies	Views	Activity
Blog posts: what we're looking for Announcements Seeing lots of interesting blog posts, but wanted to encourage you all going forward to focus your posts more on applying the ideas taught in class. For example, this intriguing post explored how concept structuring coul… read more	D	1	48	4d
Assignment 3: App Synchronizations Assignments	E D	2	42	41m
Full working implementation of concepts for milestone 1 Assignments a4	D	1	9	43m
Global Data Models for Different Types of Concepts Assignments a4	E O D	2	37	1h
Assignment 4: Abstract Data Model Assignments	A D D	2	26	1h
Abstract Data Model Assignments	D D	2	23	1h
Data Modeling Assignments a4	K D	1	12	1h
R5 draft Staff	Z D	1	13	1h
Using Python for Concept Pseudocode Assignments assignments	H	2	18	2h

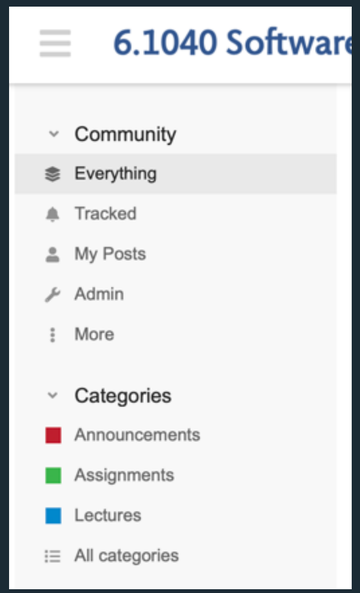
toggle.ts



sidebar.html

The JavaScript *Event Loop*

toggle.ts



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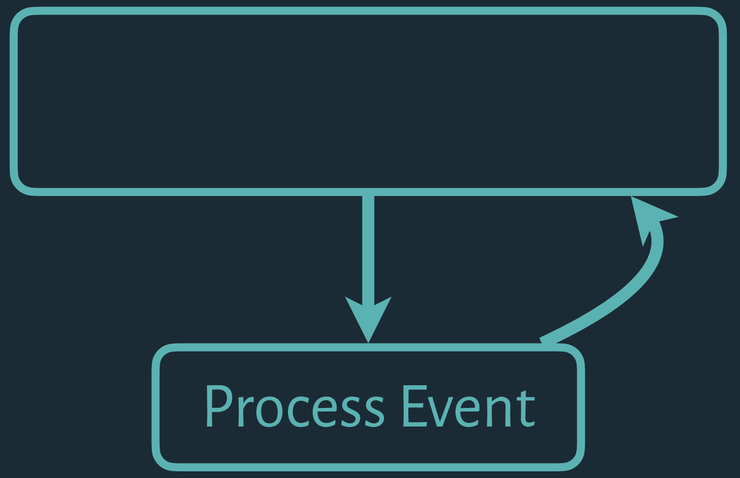
Event Queue



Call Stack

Stack Frame

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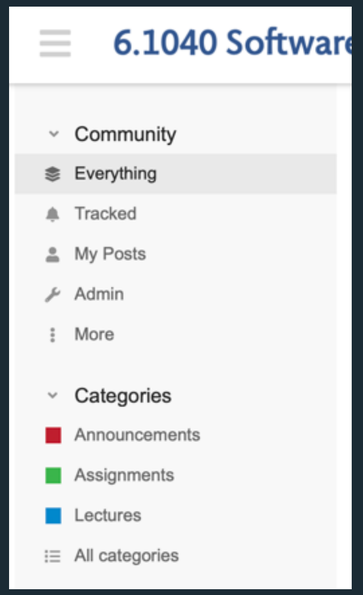
Stack Frame

toggle.ts



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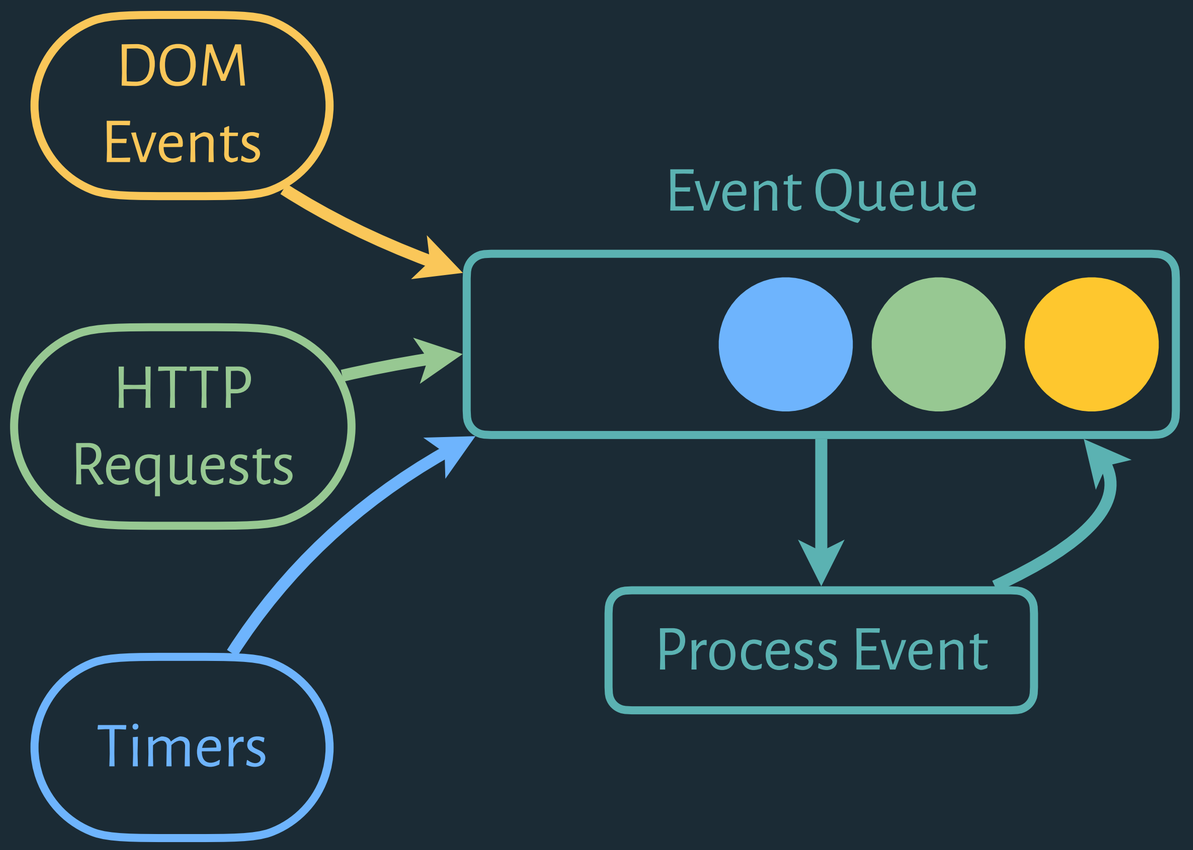

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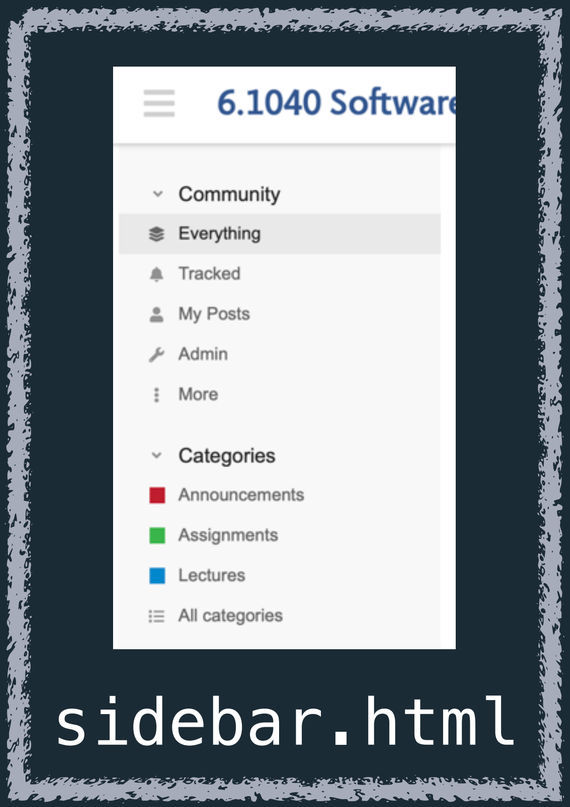

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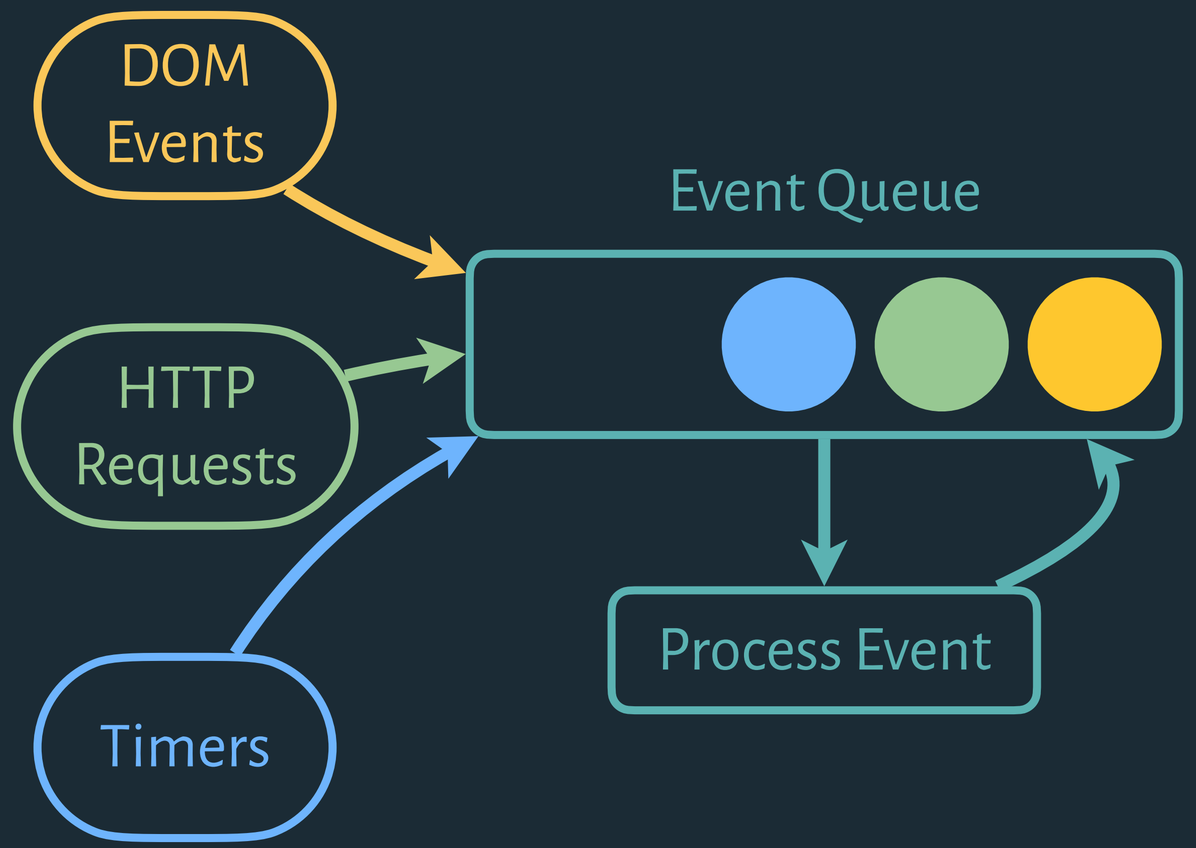

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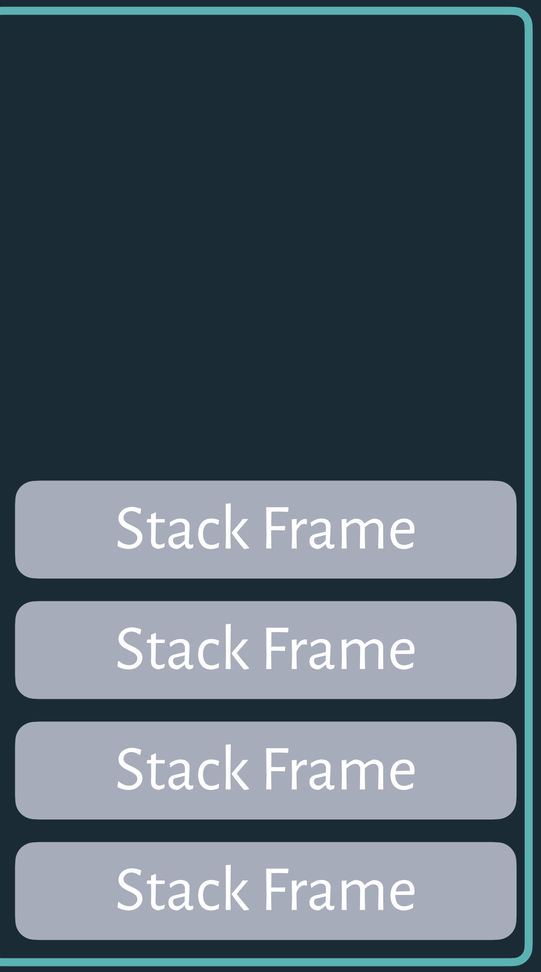

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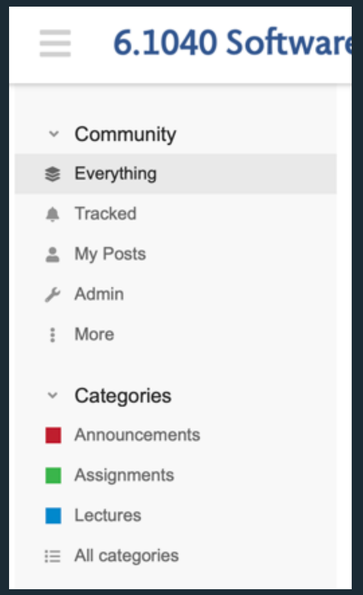

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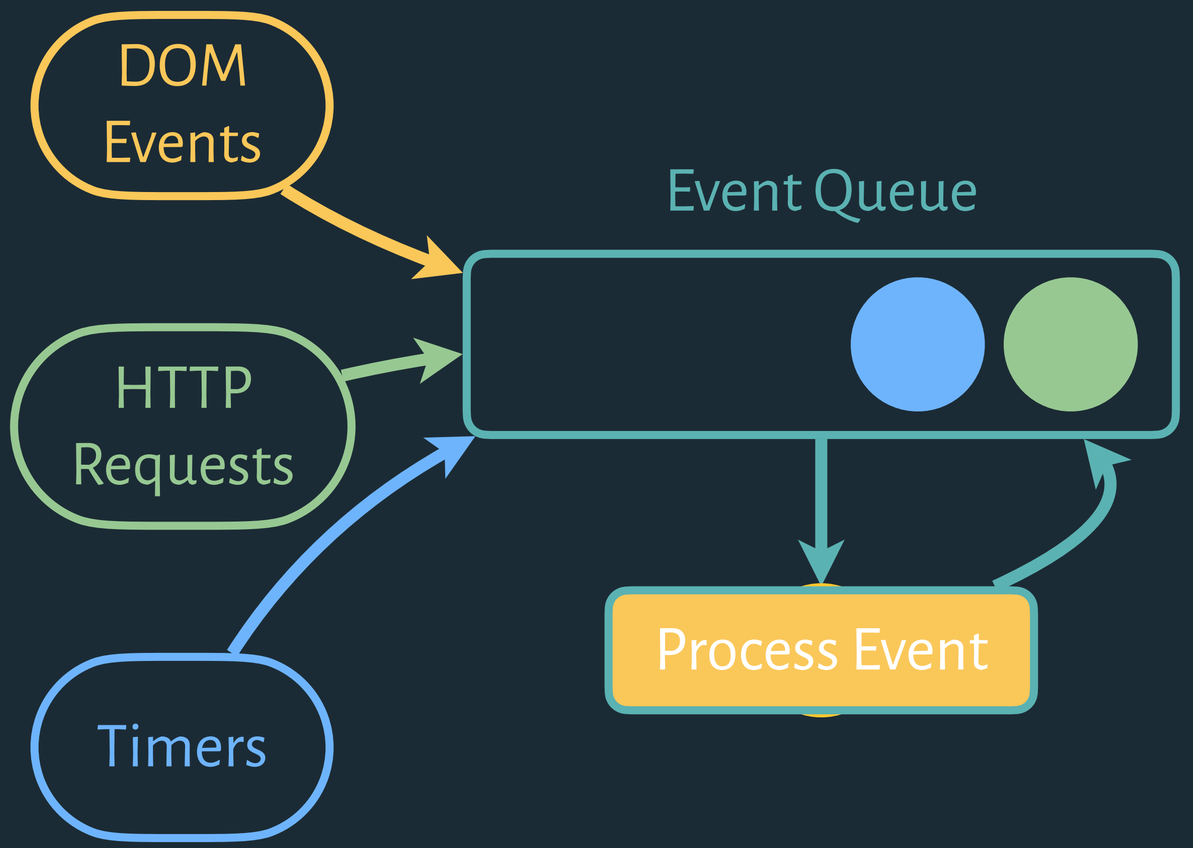

Call Stack

Stack Frame
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Stack Frame
Event Handler

Event Handler
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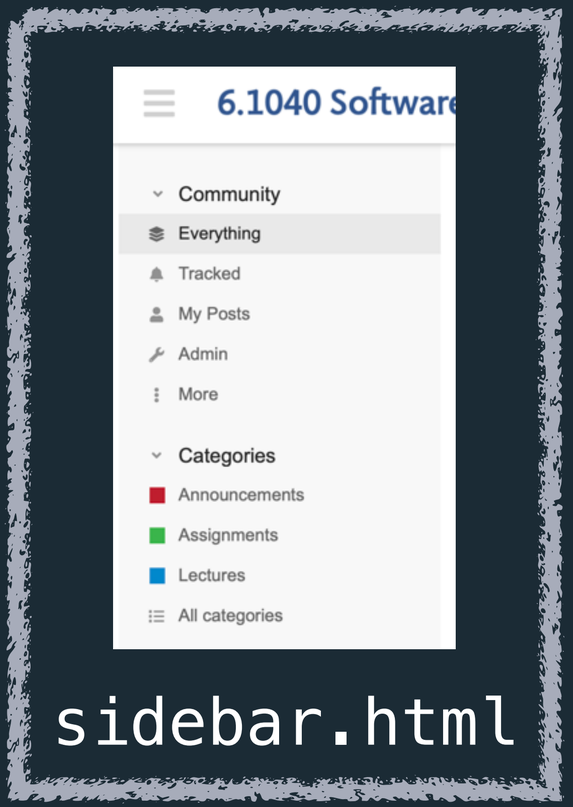
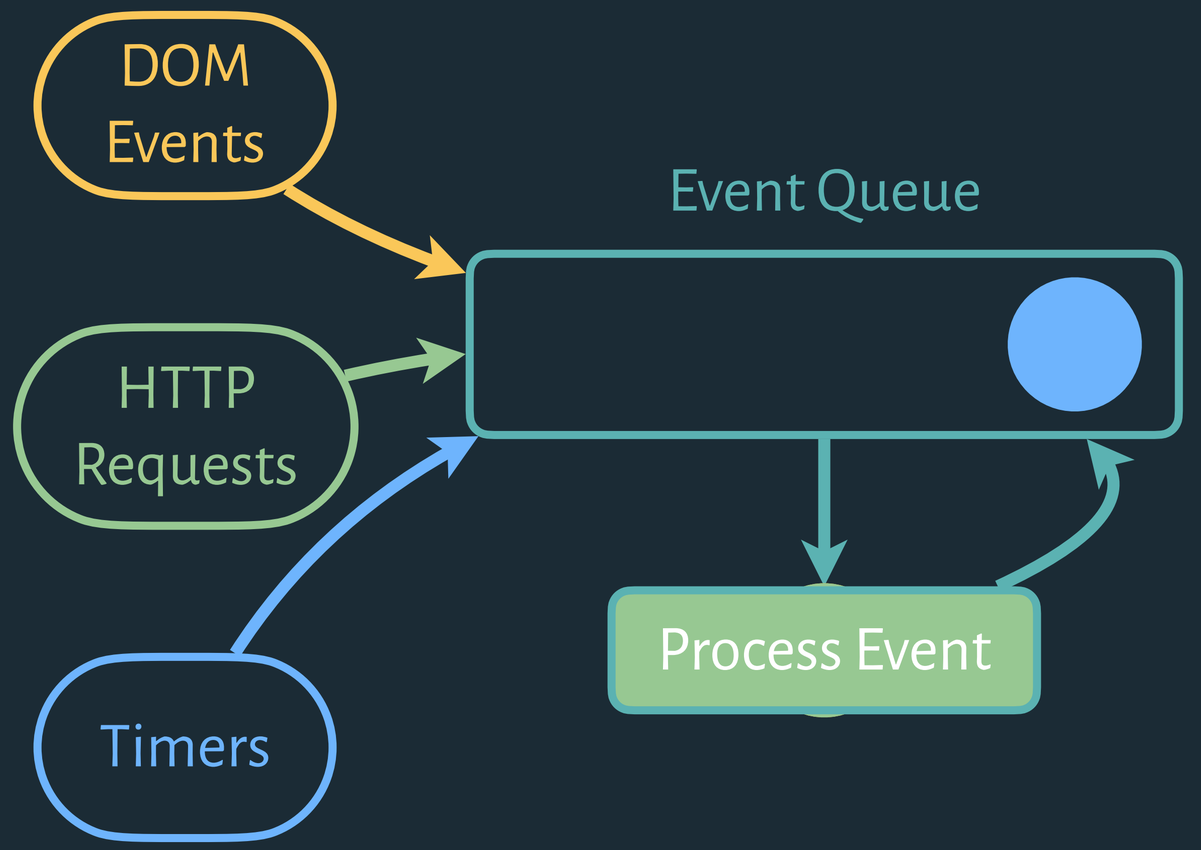
Event Handler

The JavaScript *Event Loop*

toggle.ts



sidebar.html



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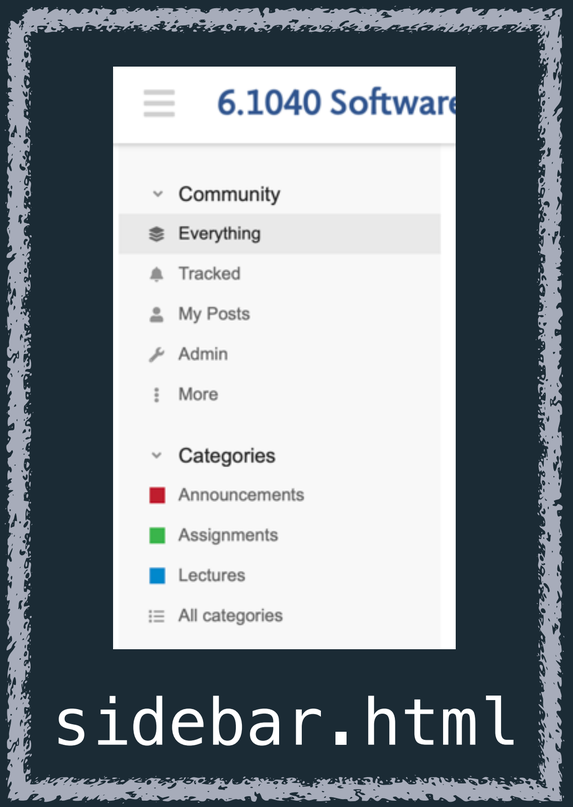

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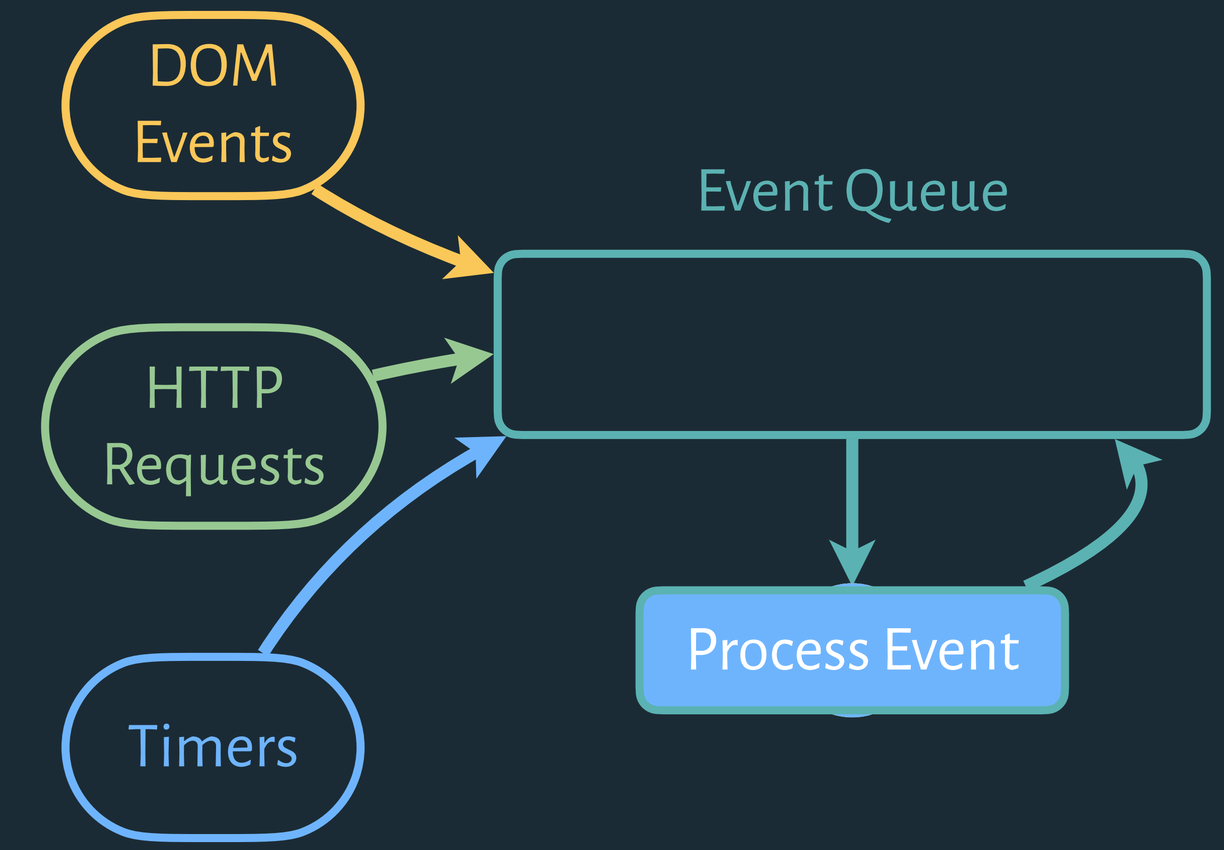

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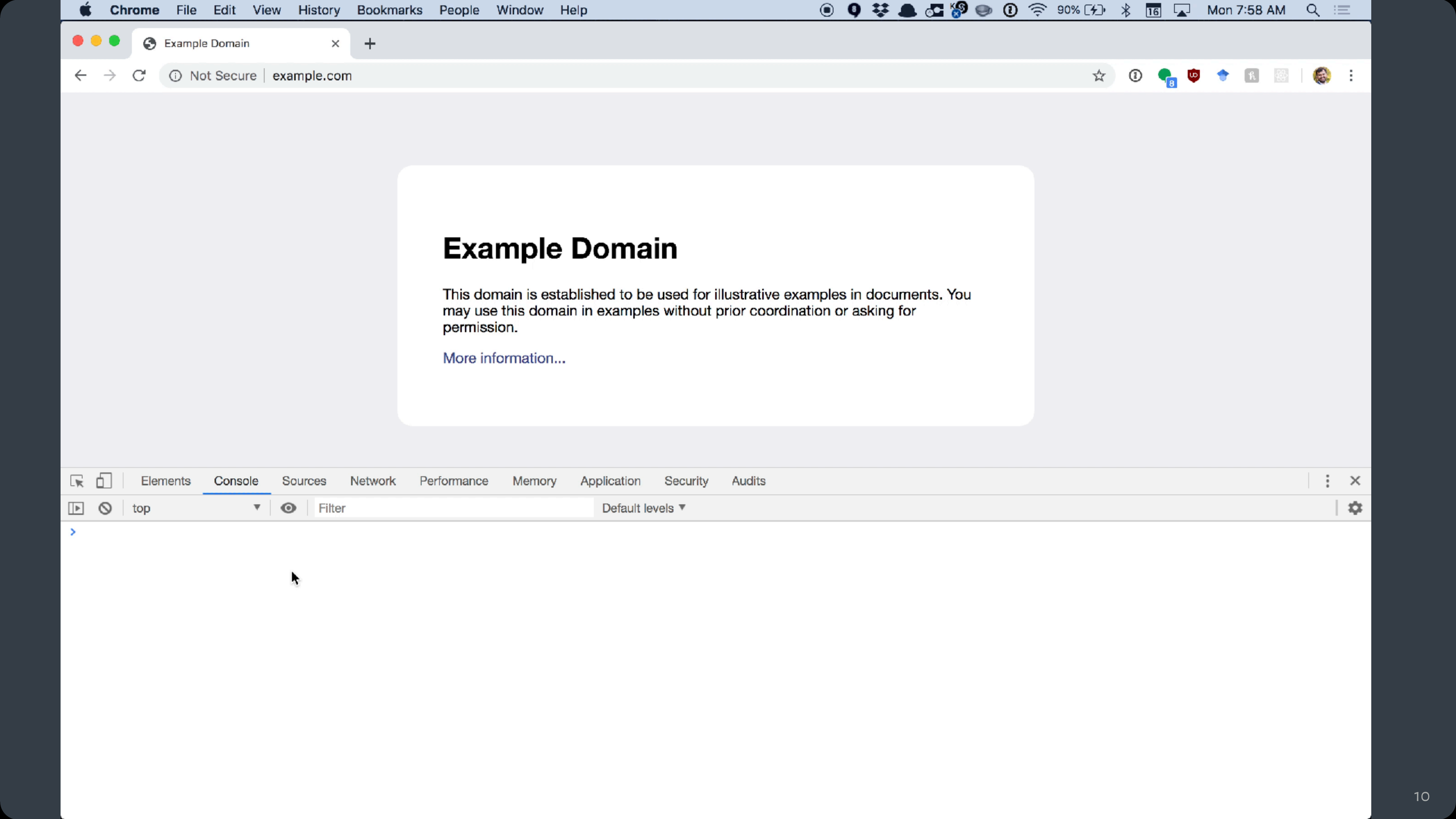
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Elements Console Sources Network Performance Memory Application Security Audits
top
Filter
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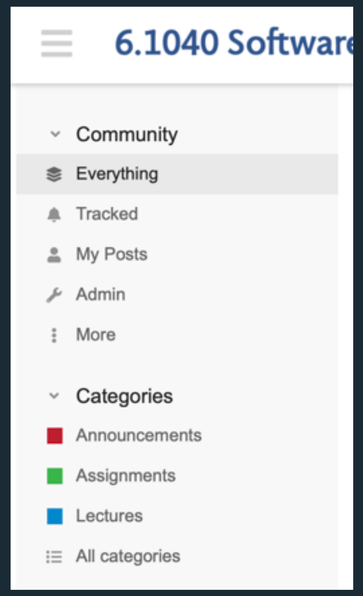
toggle.ts

```
import {Sidebar} from './Sidebar.html';

ToggleBtn.addEventListener('click', (event) => {
  const opacity = Sidebar.style.opacity;
  if (opacity === 0) Sidebar.style.opacity = 1;
  else Sidebar.style.opacity = 0;
});
```

Pseudo Code



sidebar.html

- ✘ Poor separation of concerns.
  Neither toggle nor sidebar state is *well-encapsulated.*
  `Sidebar`'s state is being modified externally, and the `Toggle` button causes external effects (called "*side effects*").
- ✘ State is scattered across the app => hard to maintain, extend, debug.

toggle.ts

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import {Sidebar} from './Sidebar.html';

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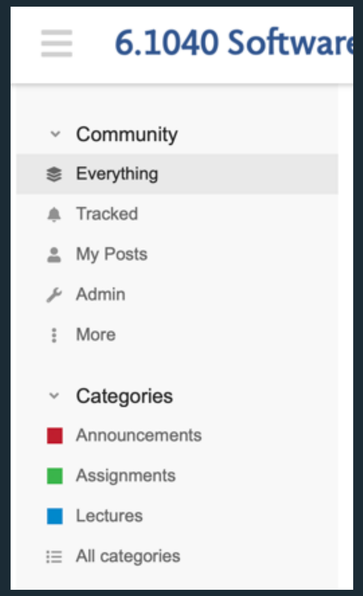


sidebar.html

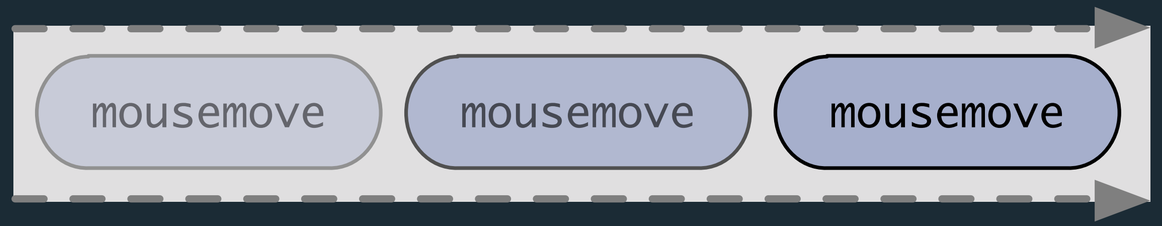
widget.ts

```
import {Sidebar} from './Sidebar.html';

Textbox.addEventListener('change', () => {
  Sidebar.style.opacity = Textbox.value
  Slider.value = Textbox.value;
});

Slider.addEventListener('change', () => {
  Sidebar.style.opacity = Slider.value
  Textbox.value = Slider.value;
});
```

✘ Infinite loop between Textbox and Slider event handlers!

Reactive Programming

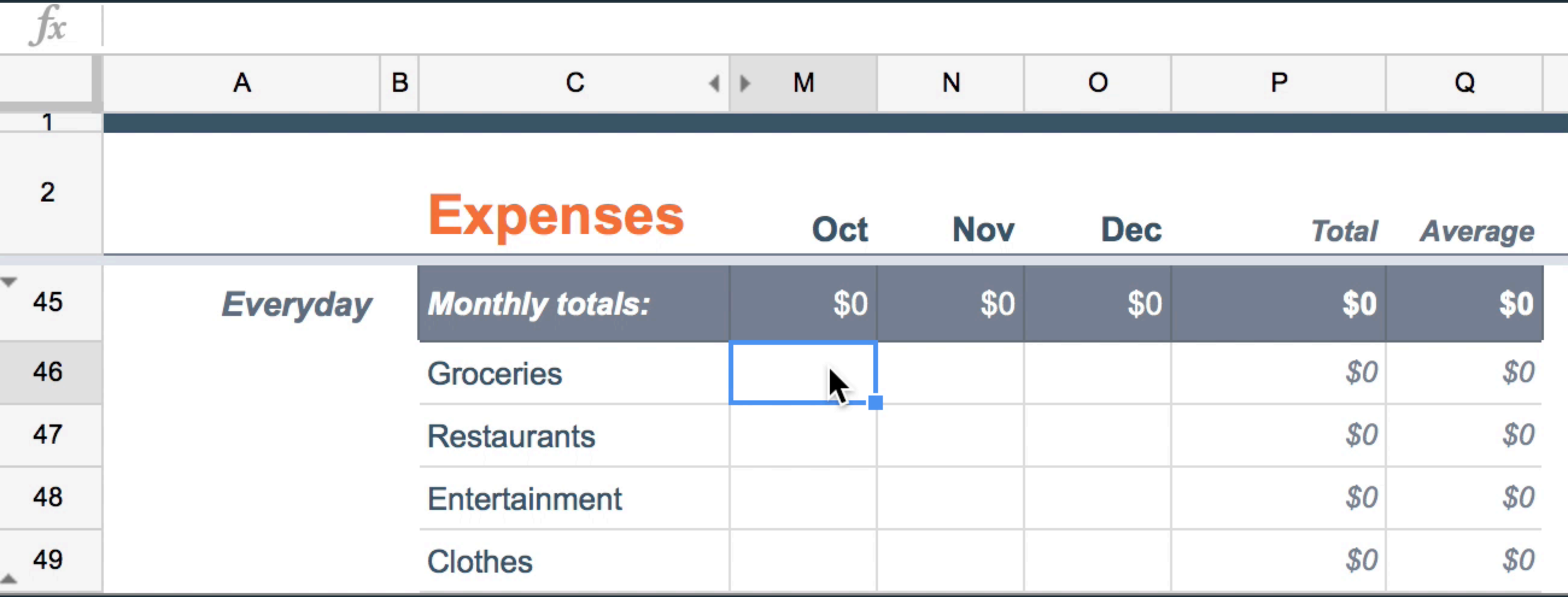
From *Event Listeners* to *Event Streams*



Event *streams*: an abstraction that treats events as a *continuous* data streams (rather than one-off occurrences that must be captured and handled ad hoc).

In practice, few libraries expose event streams directly.

Instead, event streams are constructed in the background, and their most recent values are available as *reactive variables*.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Everyday
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46
Groceries
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47
Restaurants
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$0
48
Entertainment
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$0
49
Clothes
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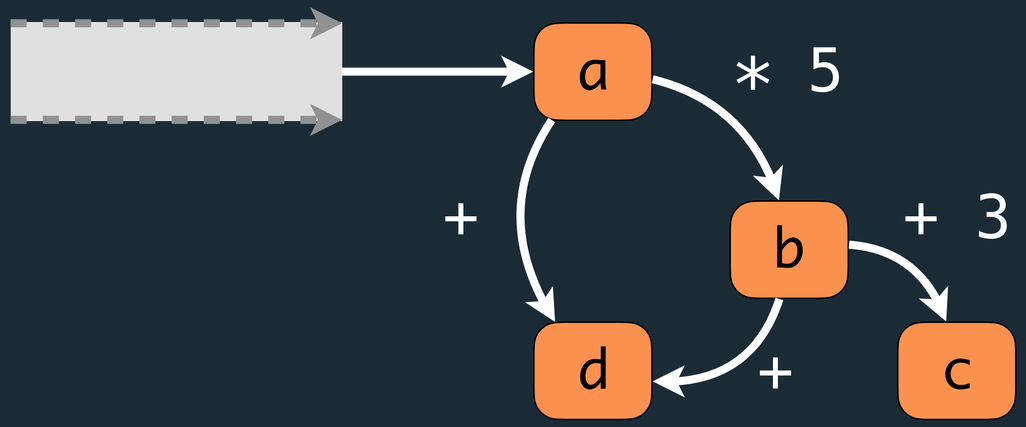
Reactive Programming is *Dataflow Programming*

```
a; <-- data streams in
b = a * 5;
c = b + 3;
d = a + b;
```

pseudo-code



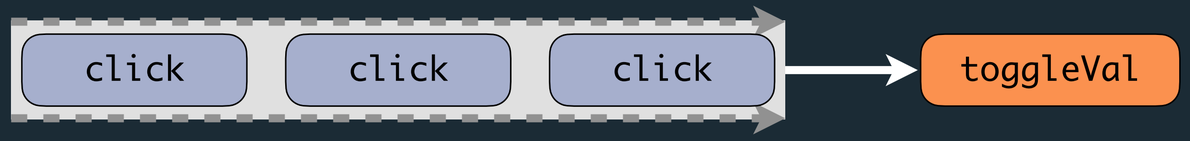
When new data streams in, a is automatically updated, and its new value propagates to variables that depend on it (b, d).

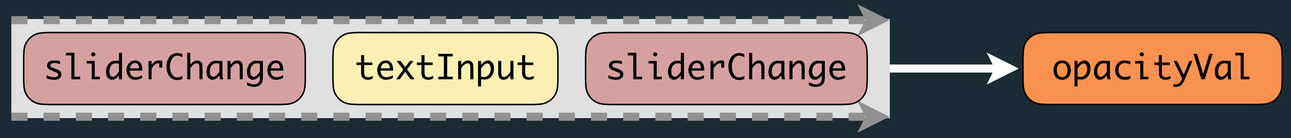
These variables update, and their values continue forwards (b → c).

Updates are *topologically sorted*: a variable is only updated once *all* of its dependencies have been updated.

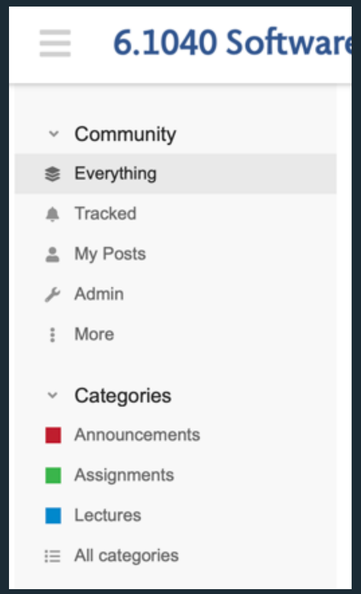
toggle.ts

widget.ts





Pseudo Code



sidebar.html

```
import {toggleVal} from './Toggle.ts'
import {opacityVal} from './Widget.ts'

Sidebar.style.opacity = (toggleVal, opacityVal) => {
  if (toggleVal === 0) return 0;
  else return opacityVal;
}
```

✓ Sidebar state is now well encapsulated.

✓ Much clearer insight into what this state depends on.

https://hackernoon.com/how-it-feels-to-lear...

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Oct 3, 2016 · 13 min read

How it feels to learn JavaScript in 2016

Cool. I need to create a page that displays the latest activity from the users, so I just need to get the data from the REST endpoint and display it in some sort of filterable table, and update it if anything changes in the server. I was thinking maybe using jQuery to fetch and display the data?

-Oh my god no, no one uses jQuery anymore. You should try learning React, it's 2016.

Oh, OK. What's React?

-It's a super cool library made by some guys at Facebook, it really brings control and performance to your application, by allowing you to handle any view changes very easily.

That sounds neat. Can I use React to display data from the server?

-Yeah, but first you need to add React and React DOM as a library in your webpage.

Wait, why two libraries?

-So one is the actual library and the second one is for manipulating the DOM, which now you can describe in JSX.

JSX? What is JSX?

-JSX is just a JavaScript syntax extension that looks pretty much like XML. It's kind of another way to describe the DOM, think of it as a better HTML.

What's wrong with HTML?

-It's 2016. No one codes HTML directly anymore.

vue.js

- ✓ Small surface area (i.e., fewer new things to learn).
- ✓ Thriving ecosystem + community (i.e., easy to find help).
  Note: We are use Vue v3, not v2.

vue.js

- ✓ Small surface area (i.e., fewer new things to learn).
- ✓ Thriving ecosystem + community (i.e., easy to find help).
  Note: We are use Vue v3, not v2.
- ✓ Better modularity + separation of concerns via components.

HTML

```html
<html>
  <head>
    <link rel="stylesheet"
        href="photos.css">
  </head>

  <body>
    <button>Load More!</button>

    <div id="photos">

    </div>
  </body>
</html>
```

Structure + Content

CSS

```css
#photos {
  display: flex;
  background: #ccc;
  padding: 5px;
  border: 1px solid #999;
  border-radius: 5px;
}

.photo {
  flex: 1;
  padding: 5px;
  background: white;
}
```

Presentation

JavaScript

```javascript
const photos =
     document.querySelector('#photos');

document.querySelector('button')
  .addEventListener(function() {
    get('/photos')
      .then(function(data) {
        for (const d of data) {
          const p =
            document.createElement('img');
          photo.src = d.src;
          photos.appendChild(photo);
        }
      });
  });
```

Behavior

HT

```
<html>
  <head>
    <link rel="s
          href="ph
  </head>

  <body>
    <button>Load

    <div id="pho

    </div>
  </body>
</html>
```

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```
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src;
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```

Structure

or

www.nytimes.com/2021/10/03/us/politics/supreme-cour

Back on the Bench, the Supreme Court Faces a Blockbuster Term - The New York Times

The New York Times | POLITICS | Back on the Bench, the Supreme Court Faces a Blockbuster Term

By Adam Liptak

Oct. 3, 2021 Updated 12:30 p.m. ET

WASHINGTON — A transformed Supreme Court returns to the bench on Monday to start a momentous term in which it will consider eliminating the constitutional right to abortion, vastly expanding gun rights and further chipping away at the wall separating church and state.

The abortion case, a challenge to a Mississippi law that bars most abortions after 15 weeks, has attracted the most attention. The court, now dominated by six Republican appointees, seems poised to use it to undermine and perhaps overturn Roe v. Wade, the 1973 decision that established a constitutional right to abortion and barred states from banning the procedure before fetal viability.

The highly charged docket will test the leadership of Chief Justice John G. Roberts Jr., who lost his position at the court's ideological center with the arrival last fall of Justice Amy Coney Barrett. He is now outflanked by five justices to his right, limiting his ability to guide the court toward the consensus and incrementalism he has

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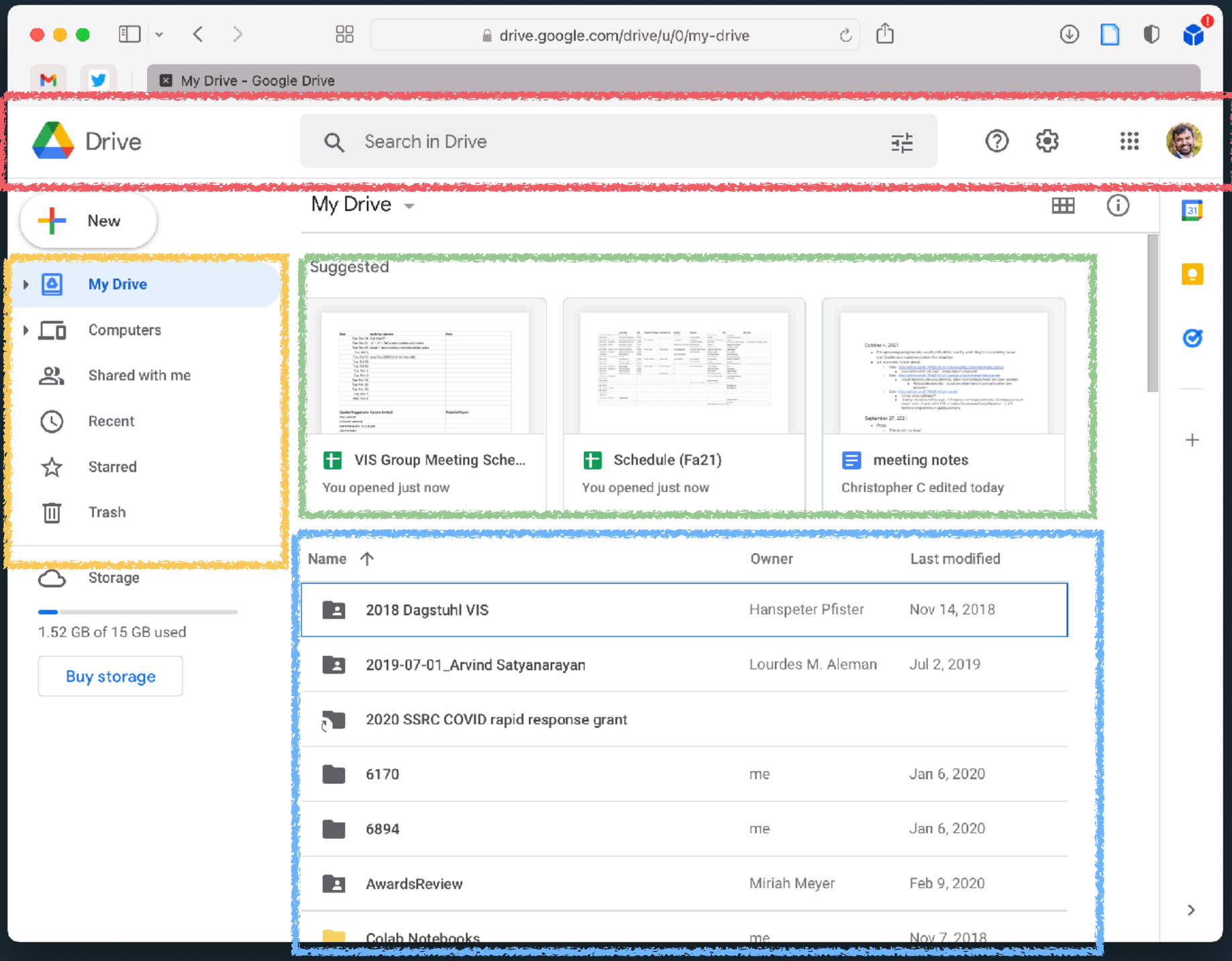
Toolbar

Locations

Suggestions

File Listing