Fast and Precise Type Checking for JavaScript

Avik Chaudhuri

Type Inference

Flow uses type inference to find bugs even without type annotations. It precisely tracks the types of variables as they flow through your program.

Idiomatic JS

Flow is designed for JavaScript programmers. It understands common JavaScript idioms and very dynamic code.

Realtime Feedback

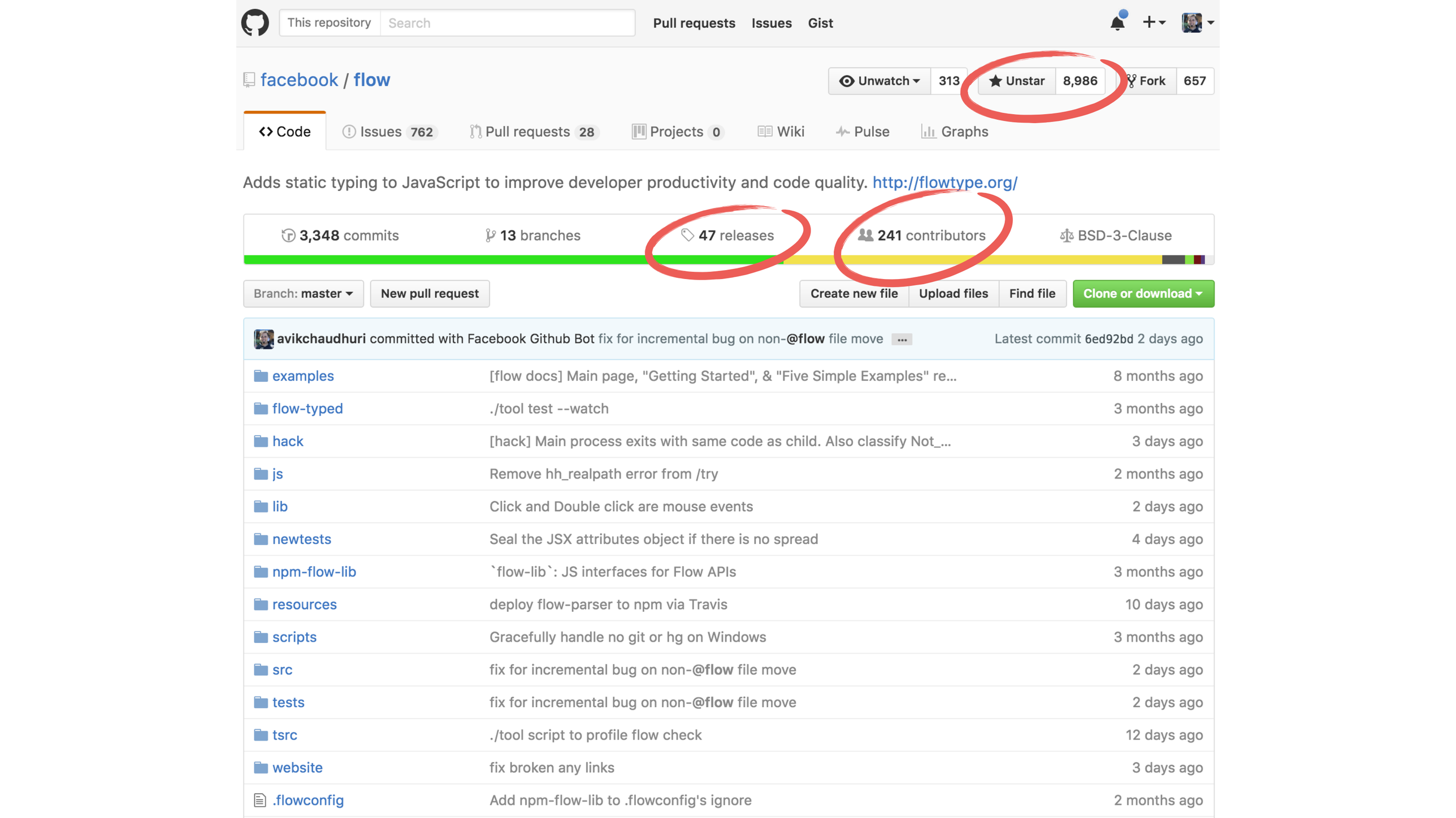
Flow incrementally rechecks your changes as you work, preserving the fast feedback cycle of developing plain JavaScript.

Flow can catch common bugs in JavaScript programs before they run, including:

- silent type conversions,
- `null` dereferences,
- and the dreaded `undefined is not a function`.

```
1  // @flow
2  function foo(x) {
3    return x * 10;
4  }
5  foo('Hello, world!');
```

show Flow output


This repository
Search
Pull requests
Issues
Gist
facebook / flow
Unwatch 313
Unstar 8,986
Fork 657
Code
Issues 762
Pull requests 28
Projects 0
Wiki
Pulse
Graphs
Adds static typing to JavaScript to improve developer productivity and code quality. http://flowtype.org/
3,348 commits
13 branches
47 releases
241 contributors
BSD-3-Clause
Branch: master
New pull request
Create new file
Upload files
Find file
Clone or download
avikchaudhuri committed with Facebook Github Bot fix for incremental bug on non-@flow file move
Latest commit 6ed92bd 2 days ago
examples [flow docs] Main page, "Getting Started", & "Five Simple Examples" re... 8 months ago
flow-typed ./tool test --watch 3 months ago
hack [hack] Main process exits with same code as child. Also classify Not_... 3 days ago
js Remove hh_realpath error from /try 2 months ago
lib Click and Double click are mouse events 2 days ago
newtests Seal the JSX attributes object if there is no spread 4 days ago
npm-flow-lib `flow-lib`: JS interfaces for Flow APIs 3 months ago
resources deploy flow-parser to npm via Travis 10 days ago
scripts Gracefully handle no git or hg on Windows 3 months ago
src fix for incremental bug on non-@flow file move 2 days ago
tests fix for incremental bug on non-@flow file move 2 days ago
tsrc ./tool script to profile flow check 12 days ago
website fix broken any links 3 days ago
.flowconfig Add npm-flow-lib to .flowconfig's ignore 2 months ago

Flow
@flowtype

Following

Flow v0.33 is out! Lots of bugfixes & perf improvements. Stay tuned for news on some new tools+features soon as well

facebook/flow
flow - Adds static typing to JavaScript to improve developer productivity and code quality.
github.com

RETWEETS 60 LIKES 111

7:35 PM - 29 Sep 2016

60 111

Reply to @flowtype

Naman Goel @naman34 · Sep 29
@flowtype so honestly do you literally have hundreds of people working on it or what?

JeffMo @lbljeffmo · Sep 30
@naman34 7 people on the team and some badass users/contributors :)
@flowtype

4

Shane Cavaliere
@shanecav

Follow

The better I get with @flowtype, the less of it I end up having to write. I'm loving how good it is at type inference.

RETWEETS 8 LIKES 19

Brendan
@irvinebroque

Follow

Exact object types in @flowtype are such an amazing refactoring tool for big apps. Worth any pain of upgrading in order to start using them.

RETWEETS 6 LIKES 12

5:38 PM - 4 Oct 2016

6 12

Reply to @irvinebroque @flowtype

philiKON @philikon · 5h
@irvinebroque @Vjeux @flowtype totally my experience as well. If I have to refactor old code, I first flowify it and its tests.

Mark Dalgleish
@markdalgleish

Follow

New team member opened a PR adding @flowtype to our established React + Webpack + Babel app. Really surprised how straightforward it was.

RETWEETS 12 LIKES

9:06 PM - 29 Sep 2016

12 75

Andrey Popp
@andreypopp

Following

Recent @flowtype release adds $ObjMap type constructor—makes it possible to express typesafe deserialisation w/ validation:

```
let schema = s.object({
  name: s.string,
  age: s.number
});

let value = validate(schema, '{name: "Andrey", age: 29}');

value.age
```

```
age                    v number
hasOwnProperty           (prop: any) => boolean
name                   v string
propertyIsEnumerable     (prop: any) => boolean
toLocaleString           () => string
toString                 () => string
valueOf                  () => Object
```

RETWEETS 44 LIKES 101

5:16 AM - 1 Oct 2016

44 101

Flow
@flowtype

Following

New blog post! Introducing flow-typed: Tested, versioned, community-managed libdefs & libdef tooling for Flow. flowtype.org/blog/2016/10/1 …

RETWEETS 73 LIKES 112

Mihaly Csikszentmihalyi:

Flow, the secret to happiness

TED2004 · 18:55 · **Filmed** Feb 2004

32 subtitle languages

View interactive transcript

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3,467,268 Total views

Mihaly Csikszentmihalyi asks, "What makes a life worth living?" Noting that money cannot make us happy, he looks to those who find pleasure and lasting satisfaction in activities that bring about a state of "flow."

Are you in flow?

(*If not, how can Flow help?*)


MOVE
FAST AND
BREAK
THINGS


MOVE
FAST WITH
STABLE
INFRA

At Facebook (and most companies)…

- **Outages are costly** (money, trust)
- **Challenge:** *Enable fast evolution without breaking stuff*
- As # engineers (and LOC) grow quickly…

  How do they **understand** how things fit together?

  How do they **fix** bugs / evolve things?

  How do they **build** new things without being afraid?

Hello, types!

Design goal 1:

Precision

Precise type checking

- *Follow along the code as much as possible*
- **Reduce noise**

  Give useful info about types, reaching definitions, …

  Don’t hide real errors in a sea of spurious errors
- **Soundness is important**

  Types should be trustworthy!

  (… except in a few justifiably difficult cases)

Design goal 2:

Speed

Fast type checking

- **Important not to introduce** any **latency** in workflow

  Preserve illusion of quick edit-refresh cycle

  Work in background, utilize idle time

- **Parallelize** as much as possible!

- **Do** as **little** work as possible!

  Type check incrementally, reusing most of the work

Let’s see some examples!

example1.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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```
1  // @flow
2
3  function length(x) {
4    return x.length;
5  }
6
7  length("");
8
```

4 0 example1.js 7:12 100% LF UTF-8 Babel ES6 JavaScript 5 updates

example2.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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```
1  // @flow
2
3  function length(x) {
4    return x.length;
5  }
6
7  length("");
8  length([1,2,3]);
9
```

4 0 example2.js 8:17 100% LF UTF-8 Babel ES6 JavaScript 5 updates

example3.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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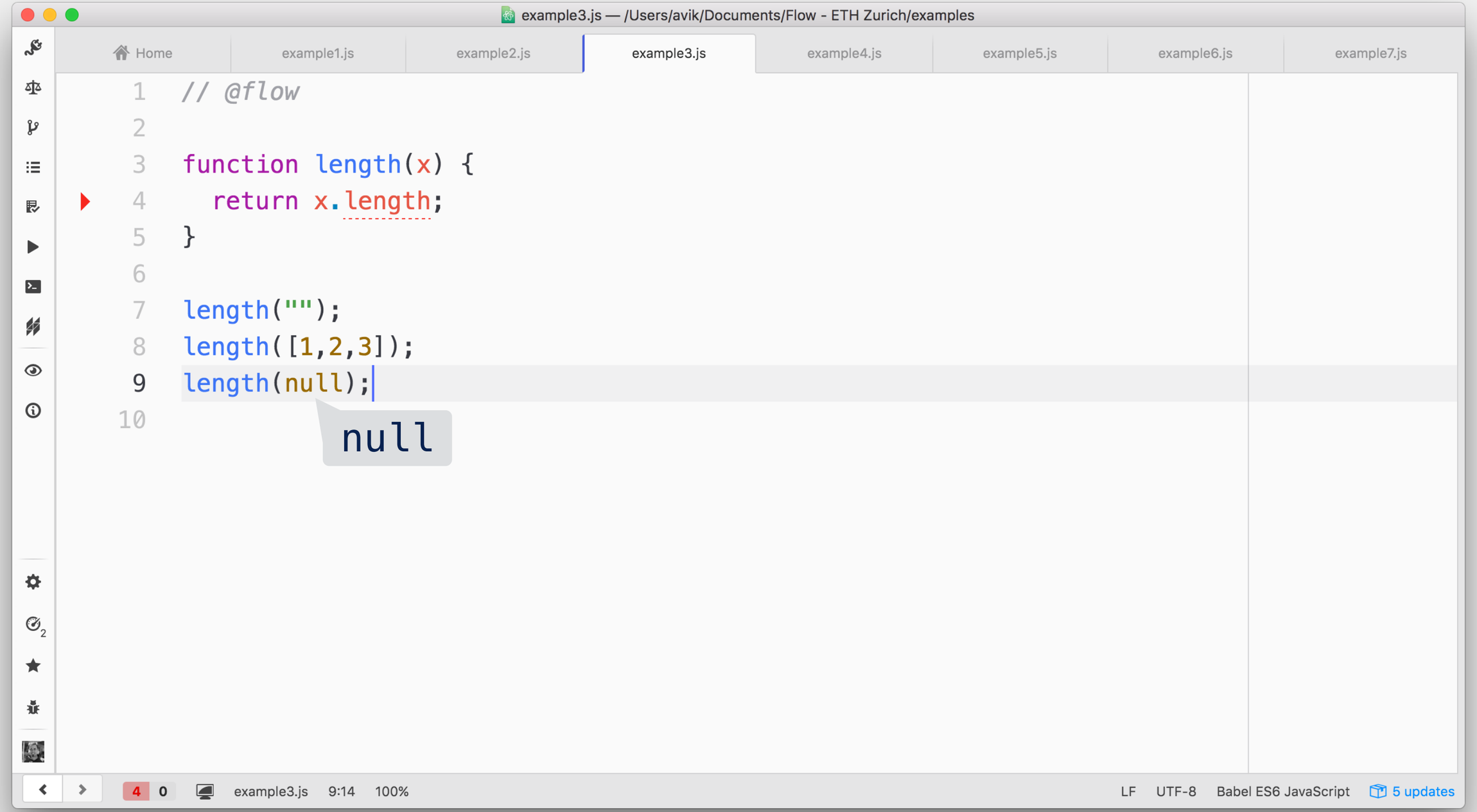
```
1  // @flow
2
3  function length(x) {
4    return x.length;
5  }
6
7  length("");
8  length([1,2,3]);
9  length(null);
10
```

4 0 example3.js 9:14 100% LF UTF-8 Babel ES6 JavaScript 5 updates

What happens at run time?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example7.js
1 // @flow
2
3 function length(x) {
4 return x.length;
5 }
6
7 length("");
8 length([1,2,3]);
9 length(null);
10
null
4 0
example3.js
9:14
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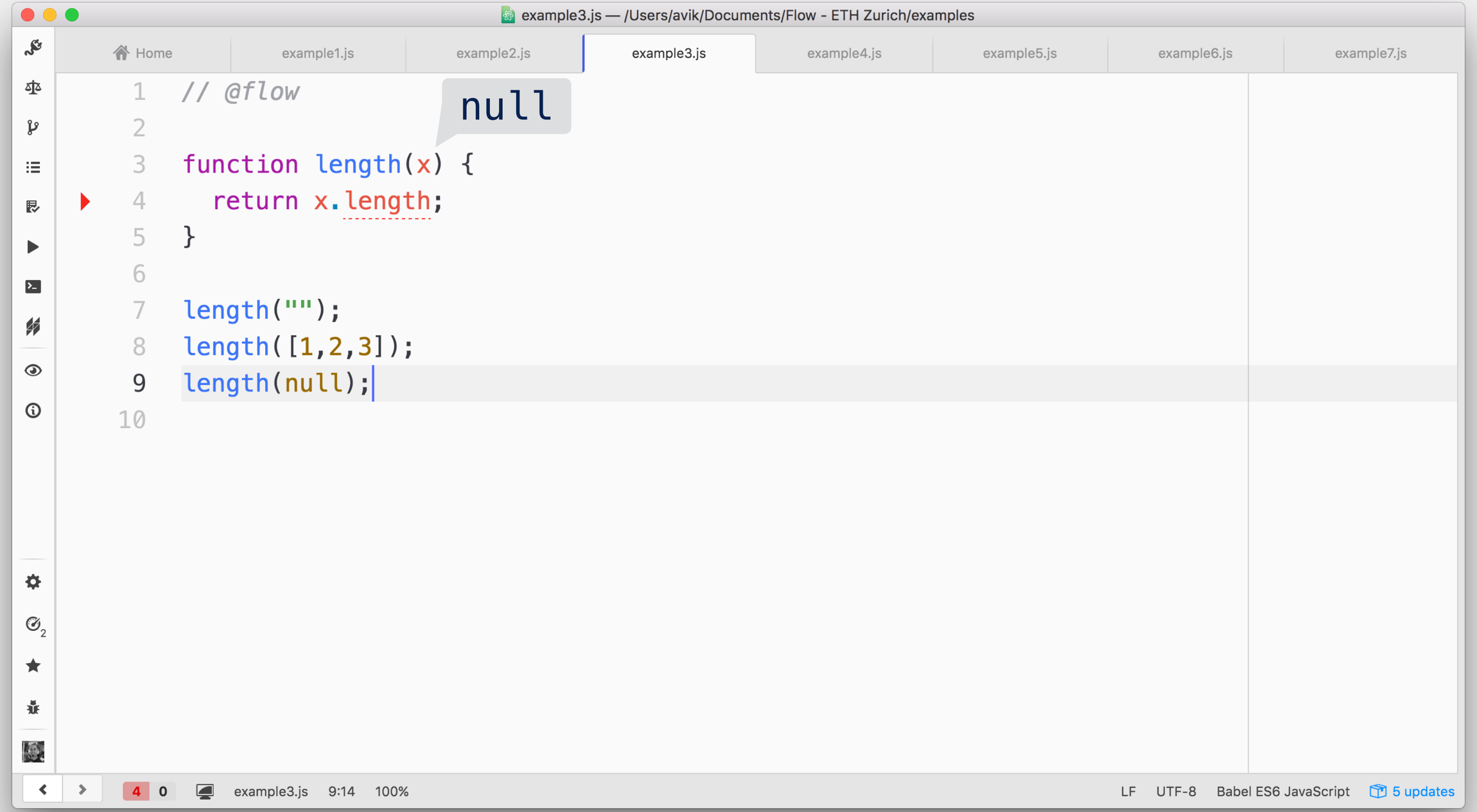
Babel ES6 JavaScript
5 updates


example3.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 return x.length;
5 }
6
7 length("");
8 length([1,2,3]);
9 length(null);
10
null
4 0
example3.js
9:14
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Babel ES6 JavaScript
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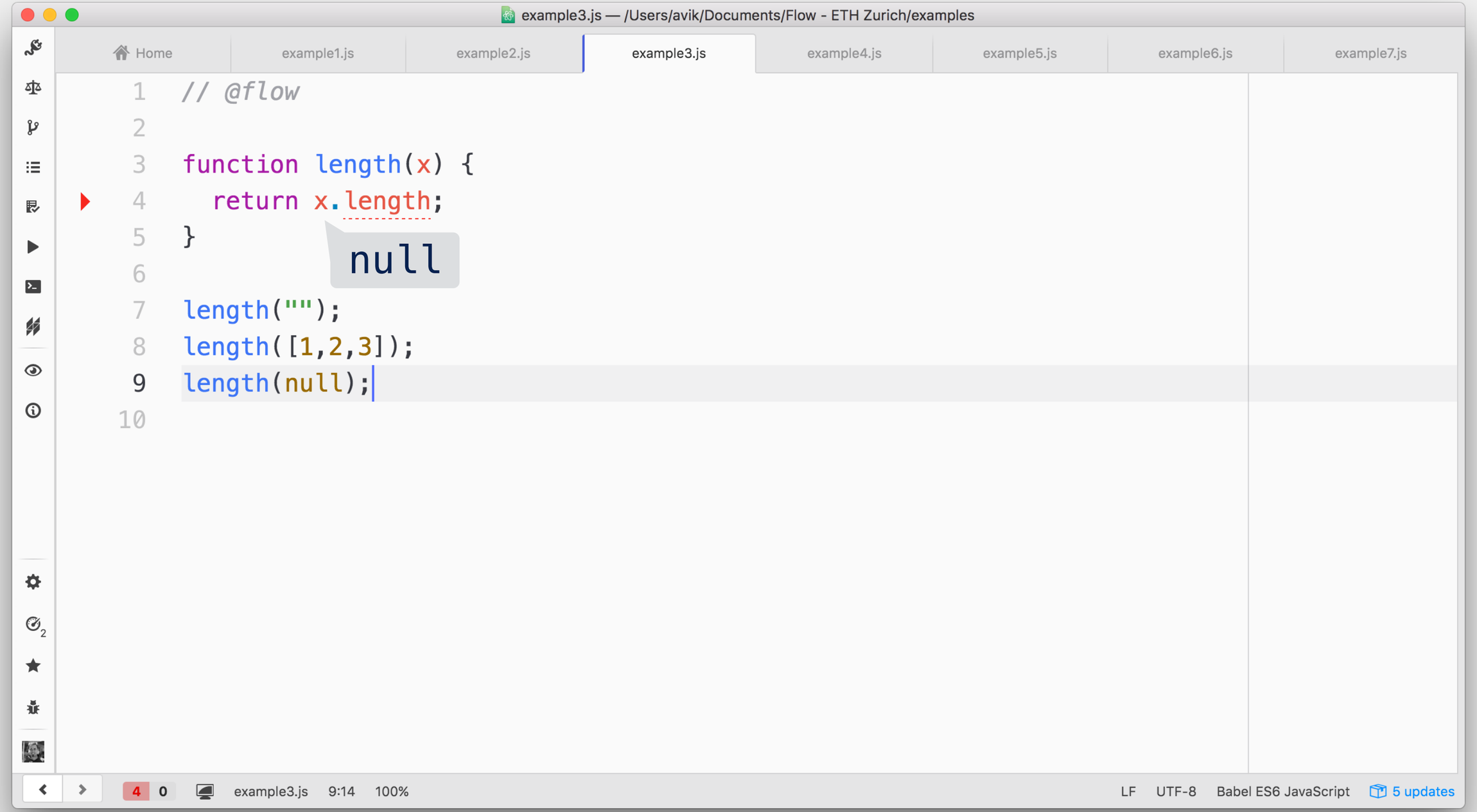
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example5.js
example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 return x.length;
5 }
null
6
7 length("");
8 length([1,2,3]);
9 length(null);
10
4 0
example3.js
9:14
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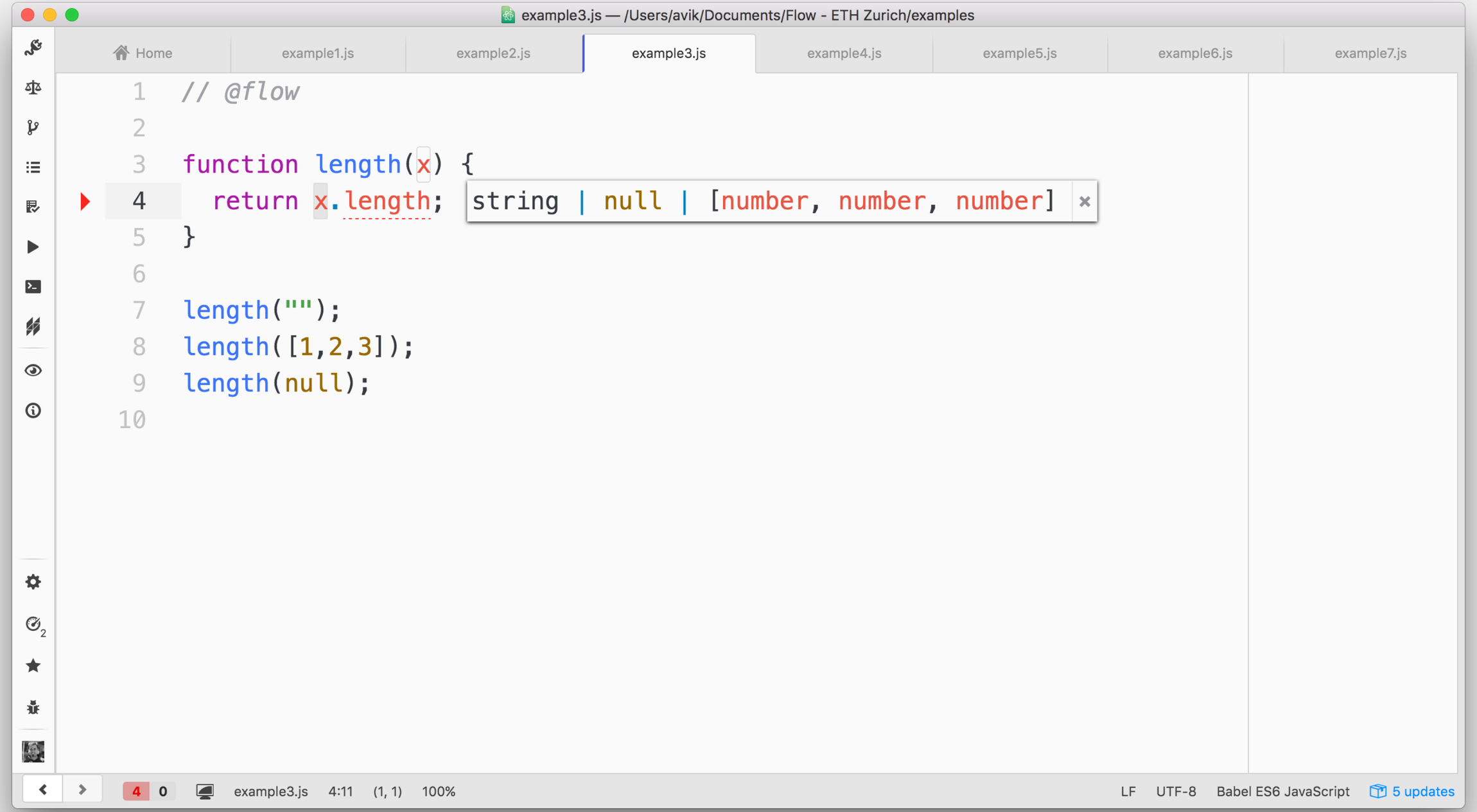
Babel ES6 JavaScript
5 updates

Flow “runs” the same code *statically*...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example5.js
example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 return x.length;
5 }
6
7 length("");
8 length([1,2,3]);
9 length(null);
10
string | null | [number, number, number]
4 0
example3.js
4:11
(1, 1)
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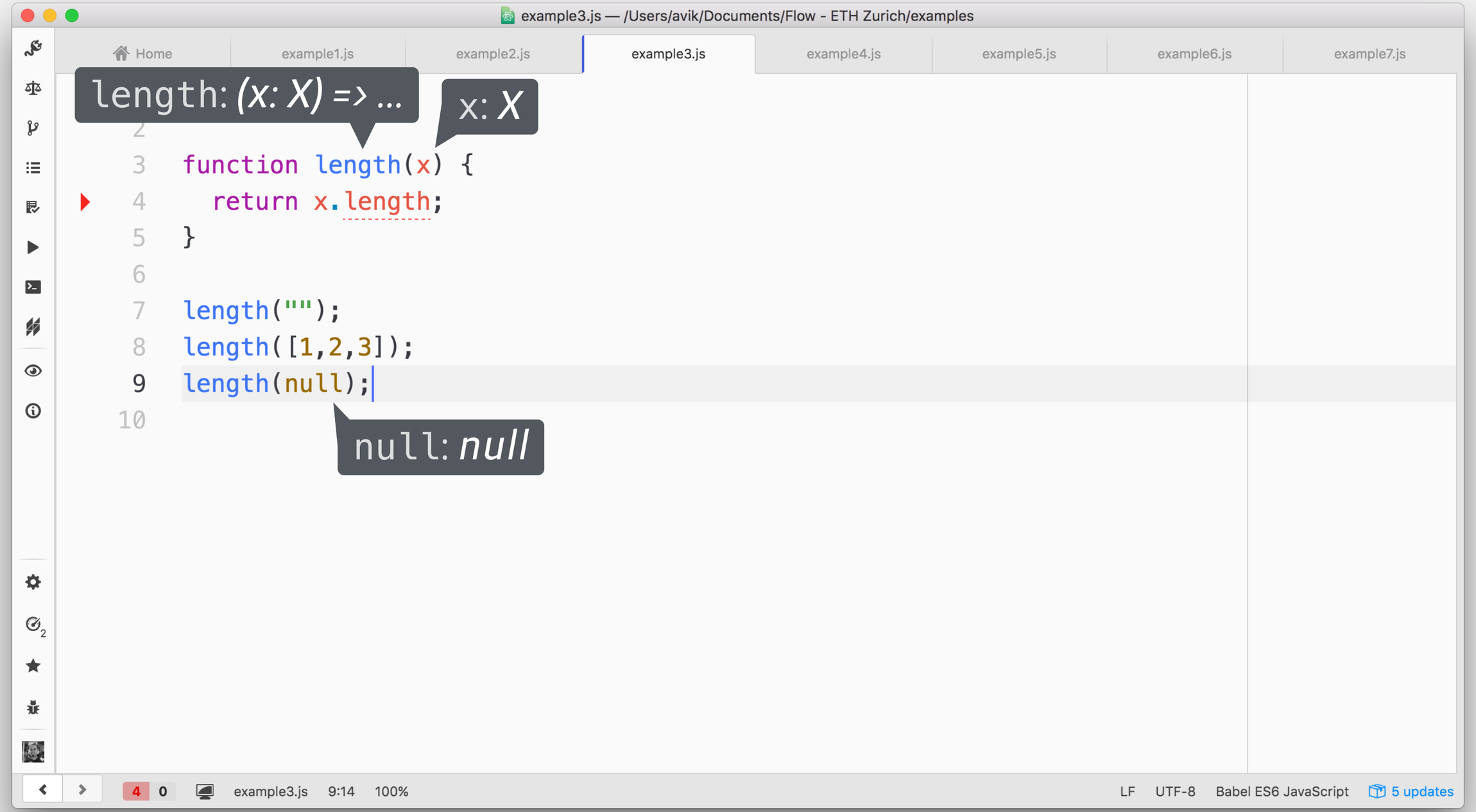
Babel ES6 JavaScript
5 updates


example3.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example5.js
example6.js
example7.js
length: (x: X) => ...
x: X
function length(x) {
return x.length;
}
length("");
length([1,2,3]);
length(null);
null: null
4 0
example3.js
9:14
100%
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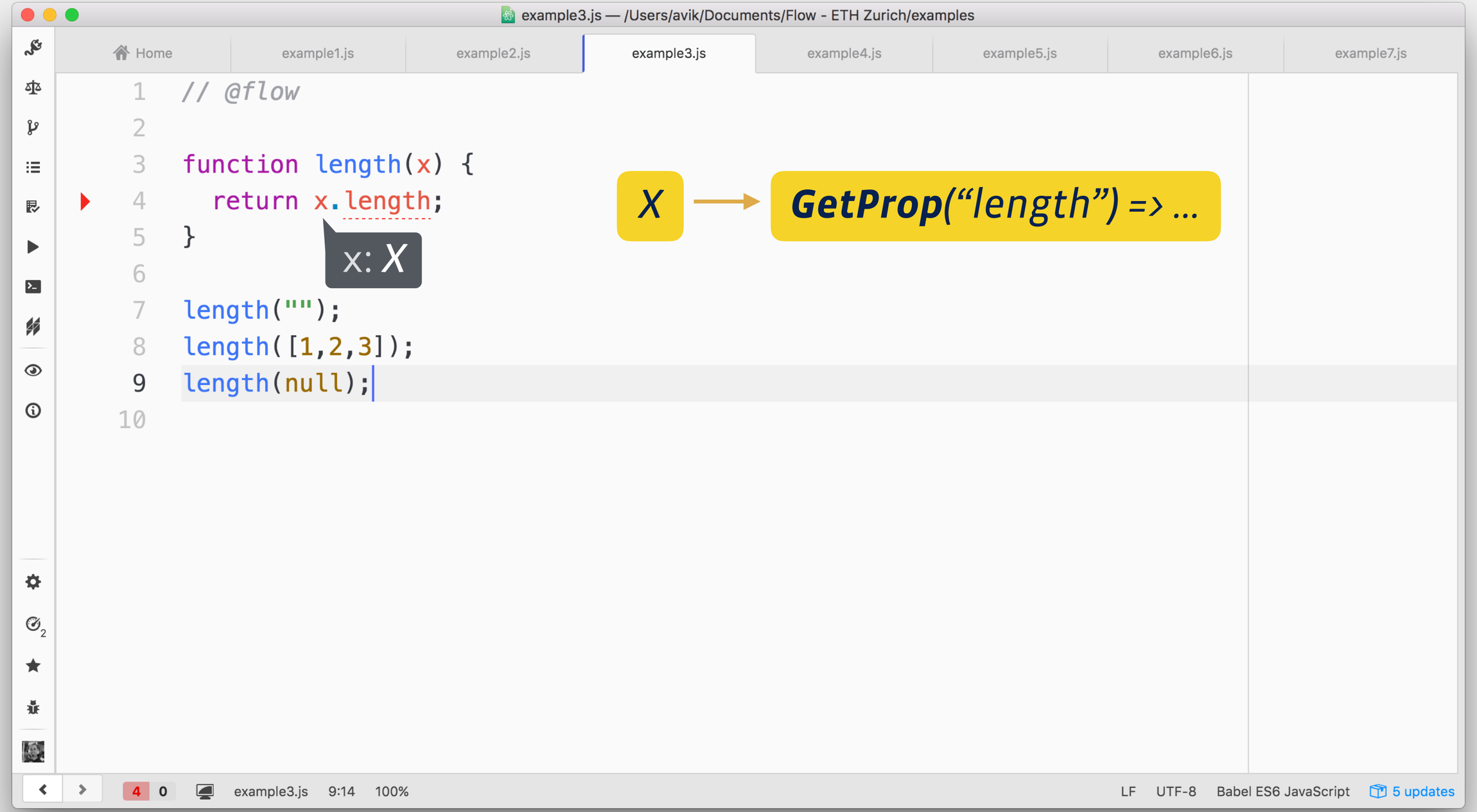
UTF-8
Babel ES6 JavaScript
5 updates


example3.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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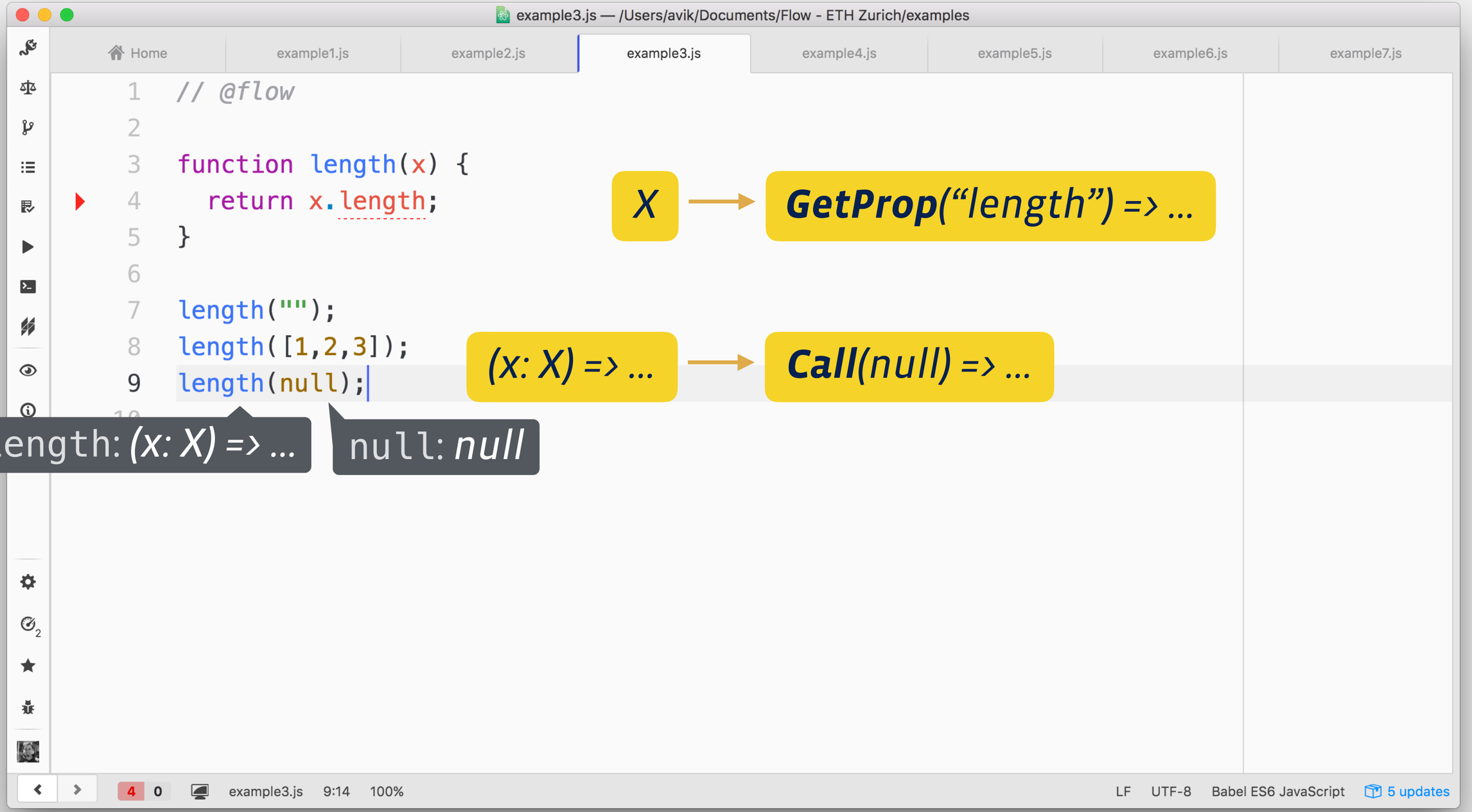
example7.js
1 // @flow
2
3 function length(x) {
4 return x.length;
5 }
6
7 length("");
8 length([1,2,3]);
9 length(null);
10
x: X
X
GetProp("length") => ...
4 0
example3.js 9:14 100%
LF UTF-8 Babel ES6 JavaScript
5 updates


example3.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example1.js
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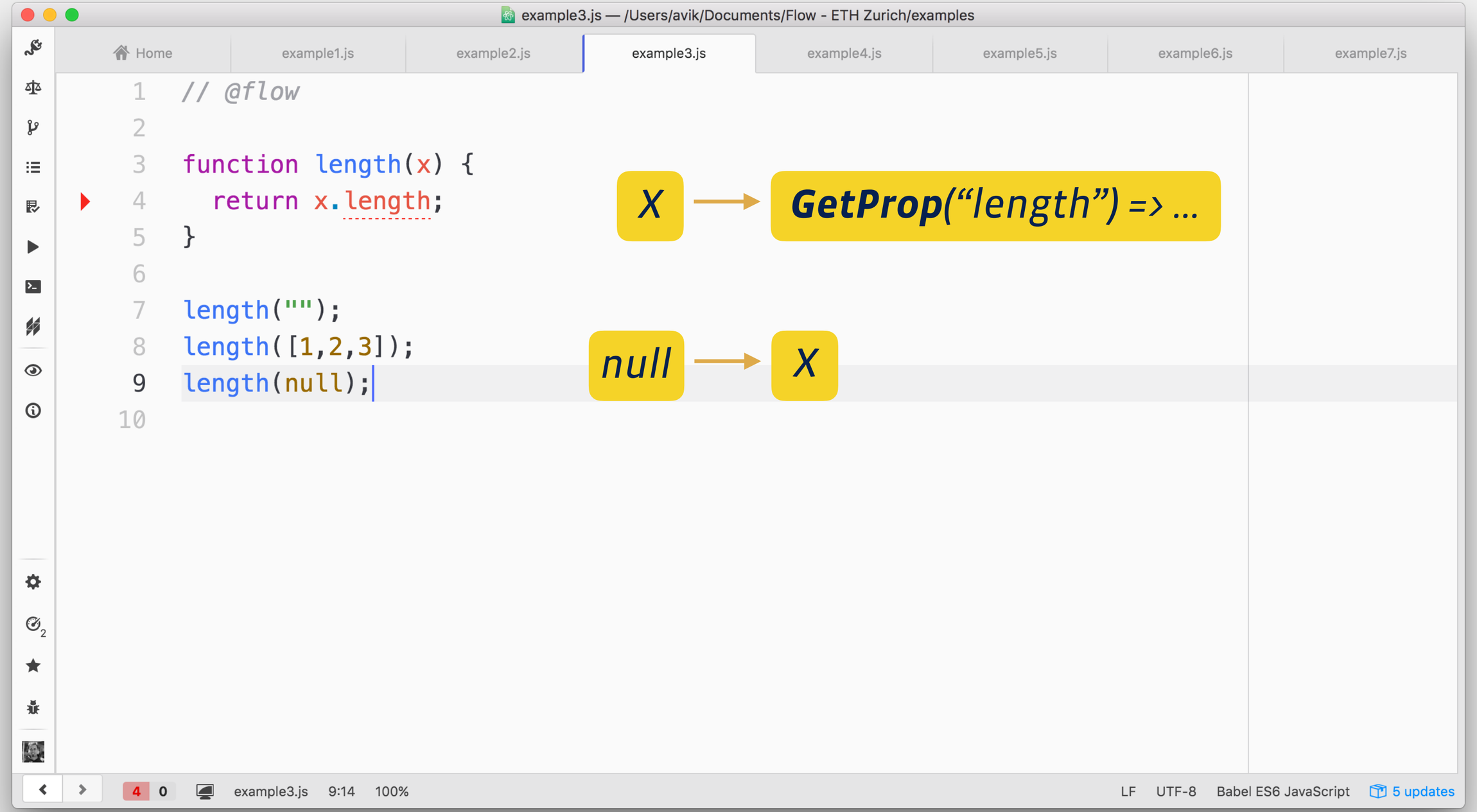
example5.js
example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 return x.length;
5 }
6
7 length("");
8 length([1,2,3]);
9 length(null);
X → GetProp("length") => ...
(x: X) => ... → Call(null) => ...
length: (x: X) => ...
null: null
4 0
example3.js 9:14 100%
LF UTF-8 Babel ES6 JavaScript
5 updates


example3.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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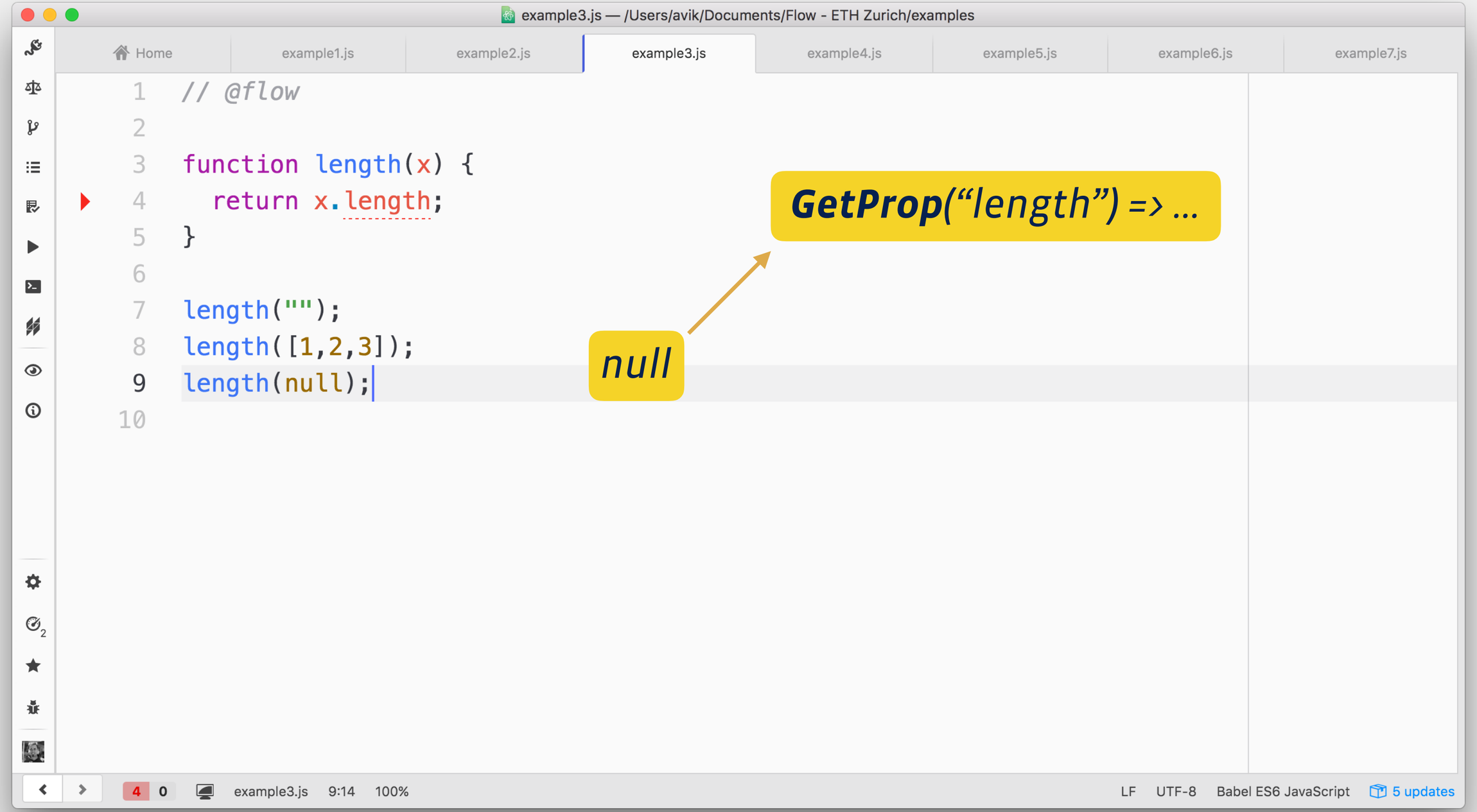
example7.js
1 // @flow
2
3 function length(x) {
4 return x.length;
5 }
6
7 length("");
8 length([1,2,3]);
9 length(null);
10
X
GetProp("length") => ...
null
X
4 0
example3.js 9:14 100%
LF UTF-8 Babel ES6 JavaScript
5 updates


example3.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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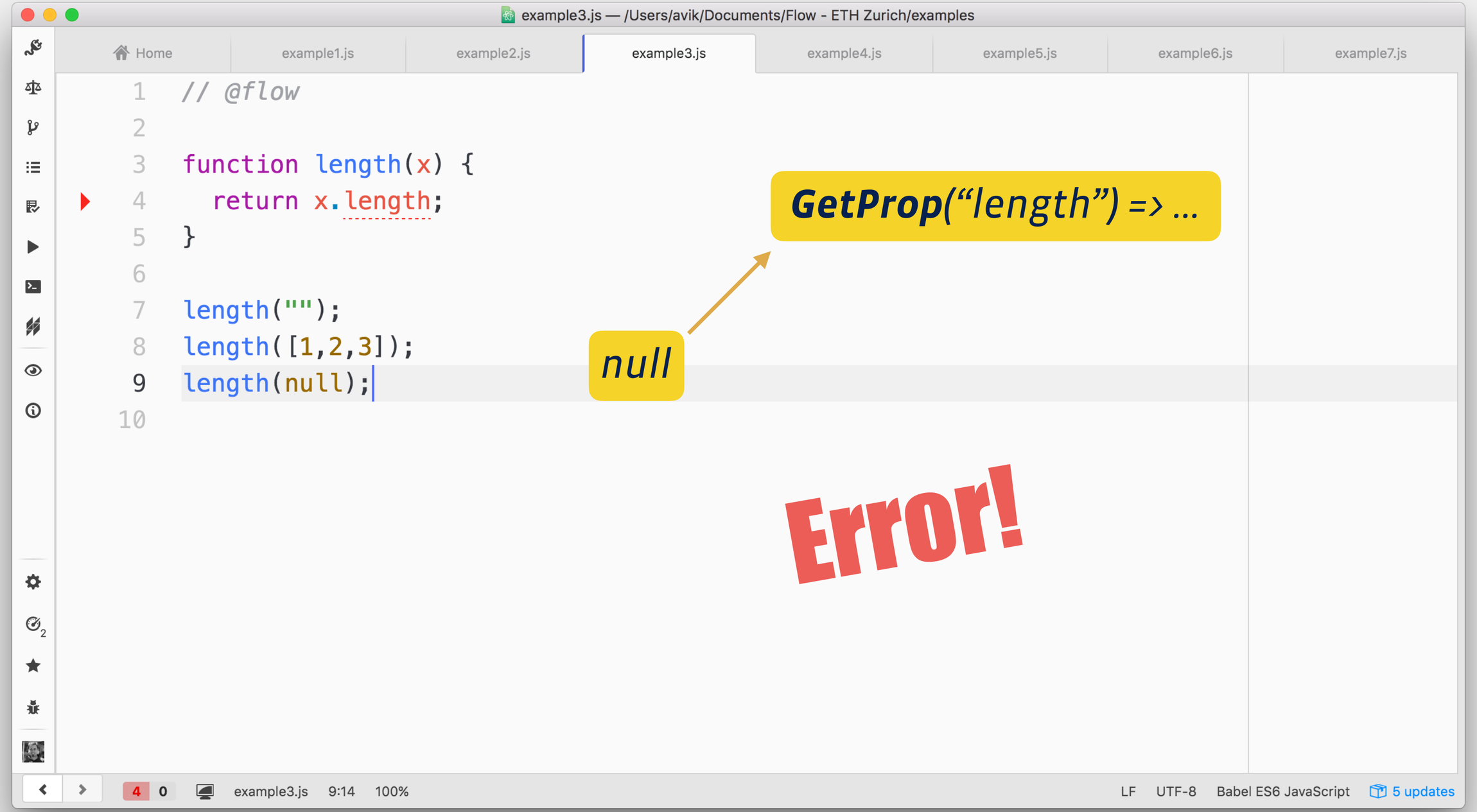
example3.js
example4.js
example5.js
example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 return x.length;
5 }
6
7 length("");
8 length([1,2,3]);
9 length(null);
10
GetProp("length") => ...
null
4 0
example3.js 9:14 100%
LF UTF-8 Babel ES6 JavaScript
5 updates


example3.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 return x.length;
5 }
6
7 length("");
8 length([1,2,3]);
9 length(null);
10
GetProp("length") => ...
null
Error!
4 0
example3.js
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100%
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Let’s fix this code!

example4.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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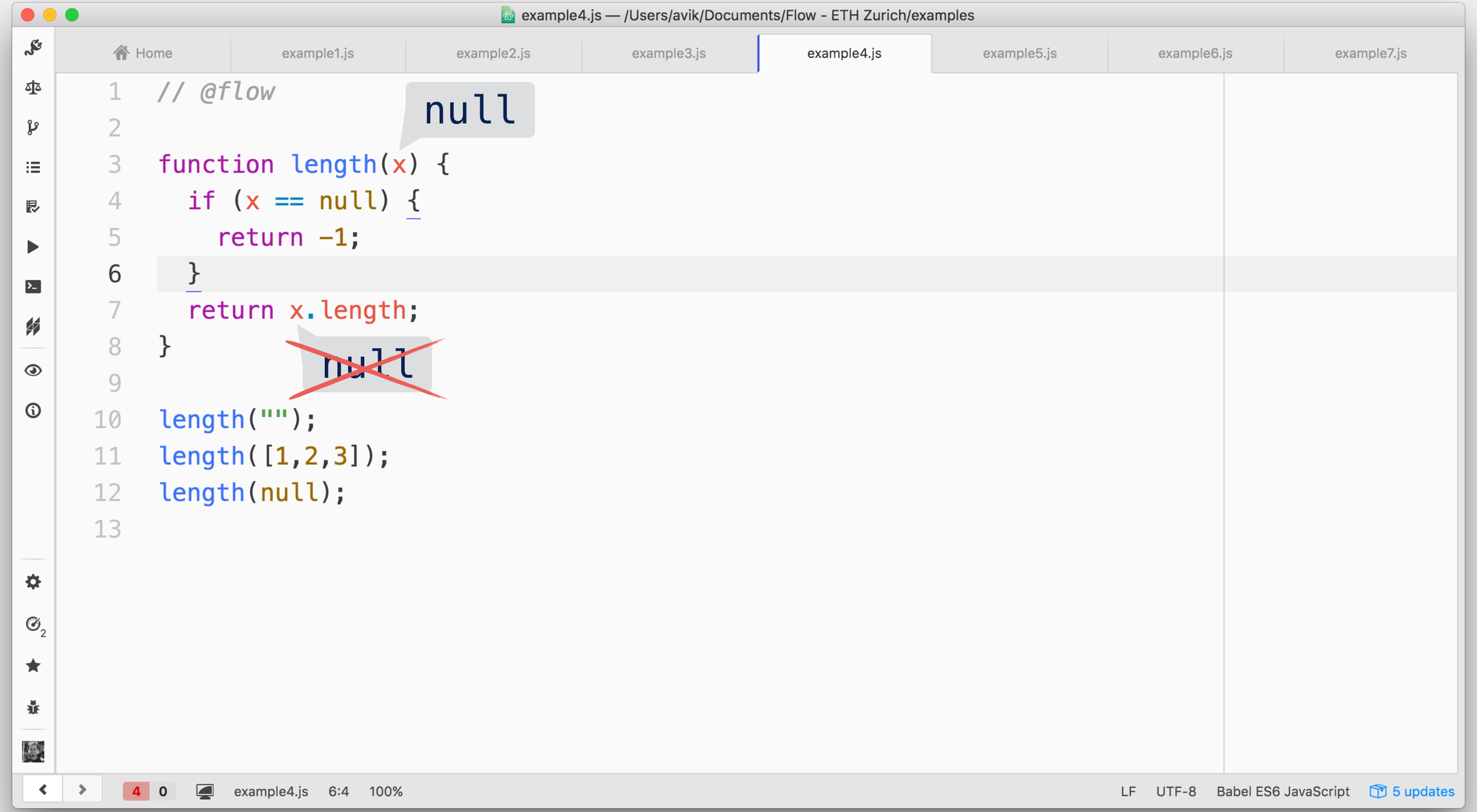
```
1  // @flow
2
3  function length(x) {
4    if (x == null) {
5      return -1;
6    }
7    return x.length;
8  }
9
10 length("");
11 length([1,2,3]);
12 length(null);
13
```

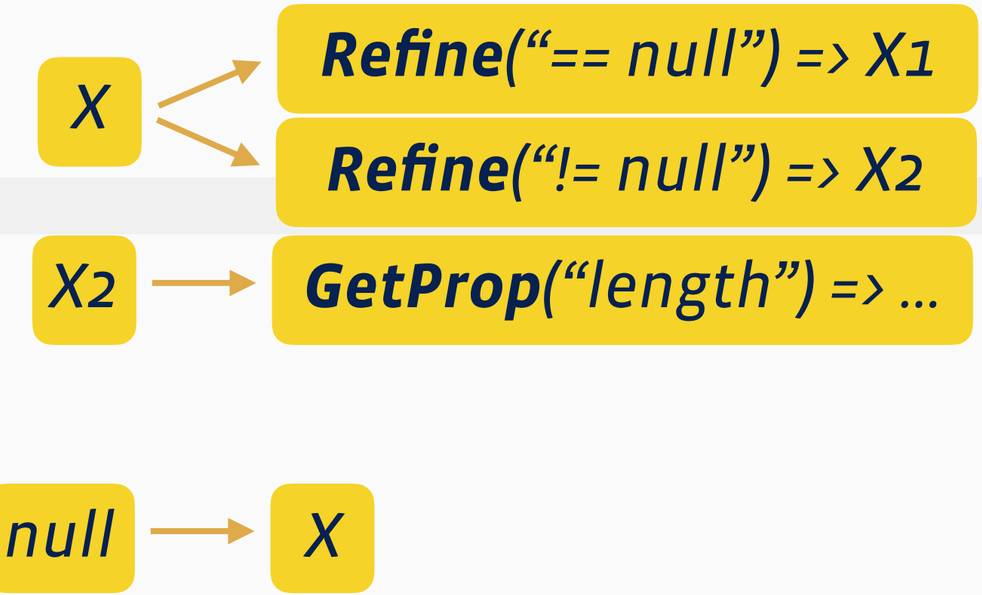
4 0 example4.js 6:4 100% LF UTF-8 Babel ES6 JavaScript 5 updates


example4.js — /Users/avik/Documents/Flow - ETH Zurich/examples
Home
example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 if (x == null) {
5 return -1;
6 }
7 return x.length;
8 }
9
10 length("");
11 length([1,2,3]);
12 length(null);
13
null
null
4 0
example4.js 6:4 100%
LF UTF-8 Babel ES6 JavaScript
5 updates

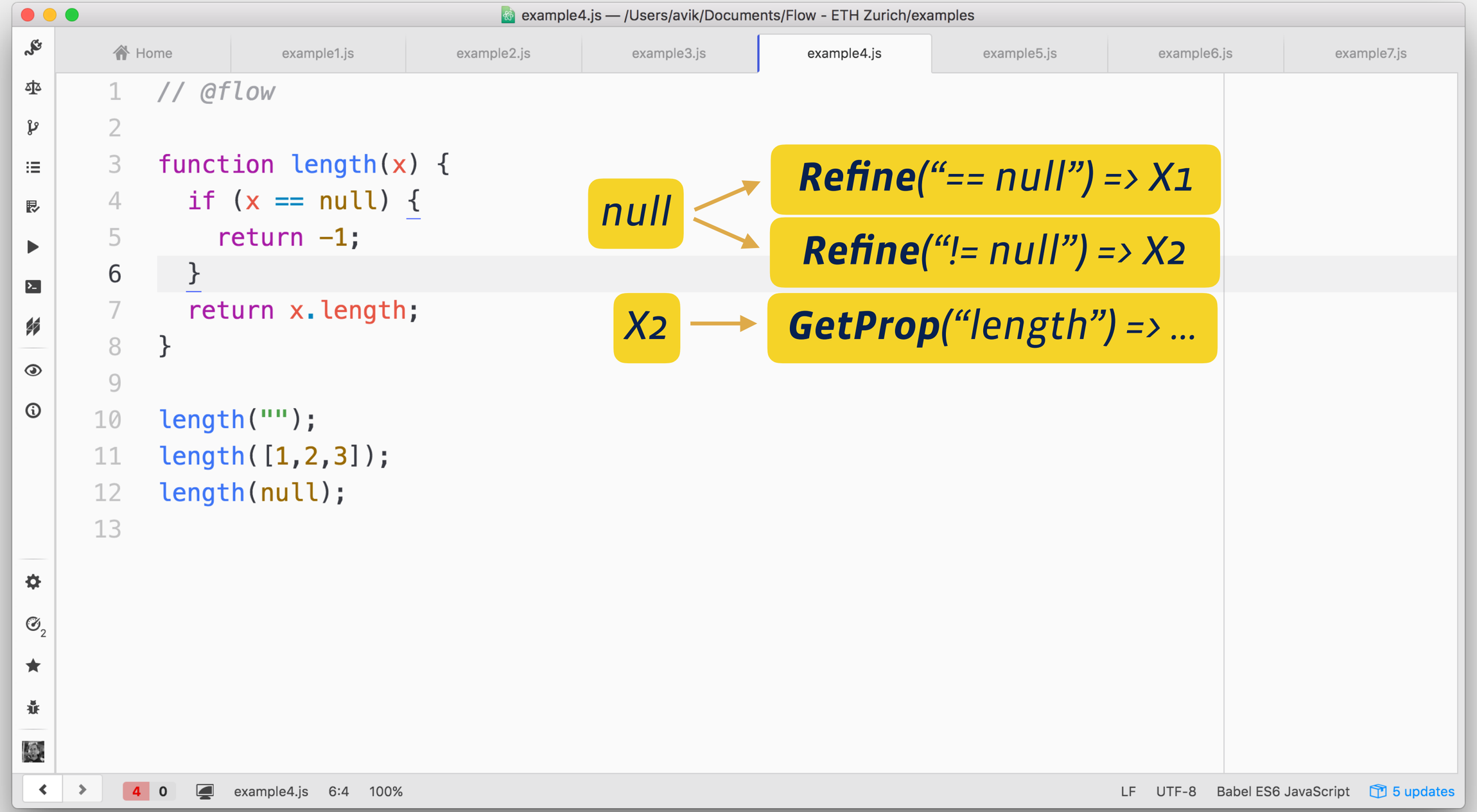
example4.js — /Users/avik/Documents/Flow - ETH Zurich/examples

Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

```
1  // @flow
2
3  function length(x) {
4    if (x == null) {
5      return -1;
6    }
7    return x.length;
8  }
9
10 length("");
11 length([1,2,3]);
12 length(null);
13
```



4 0 example4.js 6:4 100% LF UTF-8 Babel ES6 JavaScript 5 updates


example4.js — /Users/avik/Documents/Flow - ETH Zurich/examples
Home
example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 if (x == null) {
5 return -1;
6 }
7 return x.length;
8 }
9
10 length("");
11 length([1,2,3]);
12 length(null);
13
null
Refine("== null") => X1
Refine("!= null") => X2
X2
GetProp("length") => ...
4 0
example4.js 6:4 100%
LF UTF-8 Babel ES6 JavaScript
5 updates

example4.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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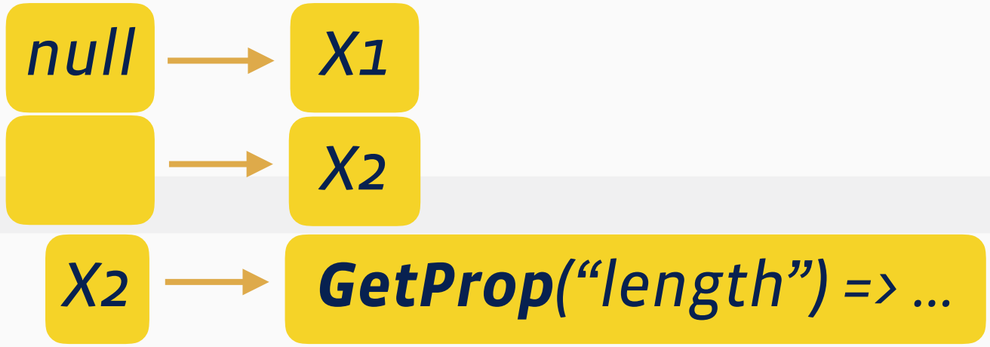
```
1  // @flow
2
3  function length(x) {
4    if (x == null) {
5      return -1;
6    }
7    return x.length;
8  }
9
10 length("");
11 length([1,2,3]);
12 length(null);
13
```



4 0 example4.js 6:4 100% LF UTF-8 Babel ES6 JavaScript 5 updates

Ready for some more code?

example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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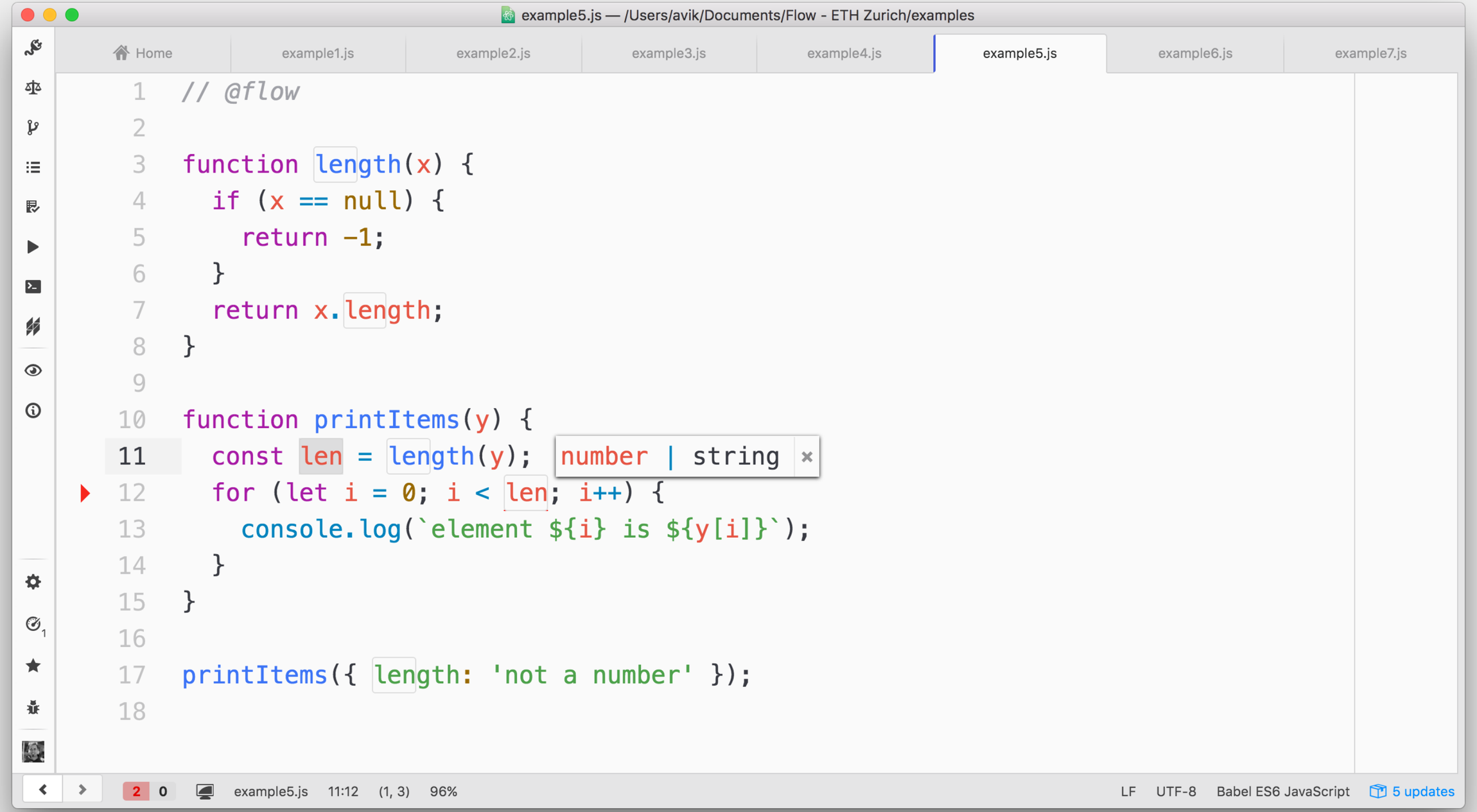
```
1  // @flow
2
3  function length(x) {
4    if (x == null) {
5      return -1;
6    }
7    return x.length;
8  }
9
10 function printItems(y) {
11   const len = length(y);
12   for (let i = 0; i < len; i++) {
13     console.log(`element ${i} is ${y[i]}`);
14   }
15 }
16
17 printItems({ length: 'not a number' });
18
```

2 0 example5.js 17:40 96% LF UTF-8 Babel ES6 JavaScript 5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
Home
example1.js
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example4.js
example5.js
example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 if (x == null) {
5 return -1;
6 }
7 return x.length;
8 }
9
10 function printItems(y) {
11 const len = length(y);
number | string
12 for (let i = 0; i < len; i++) {
13 console.log(`element ${i} is ${y[i]}`);
14 }
15 }
16
17 printItems({ length: 'not a number' });
18
2 0
example5.js
11:12
(1, 3)
96%
LF
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Babel ES6 JavaScript
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example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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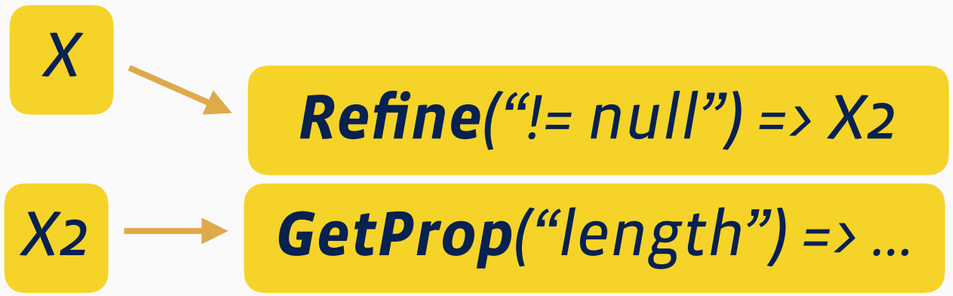
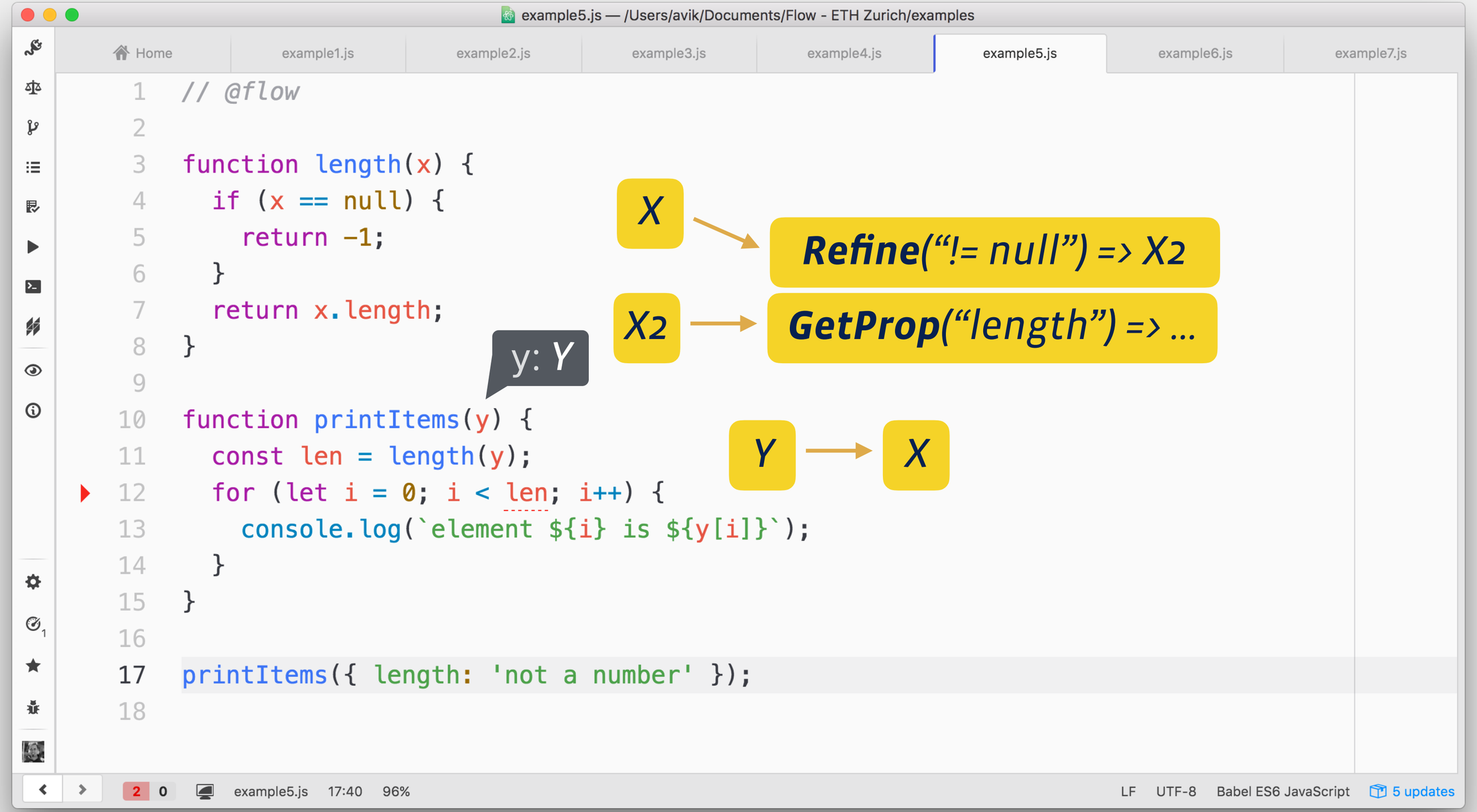
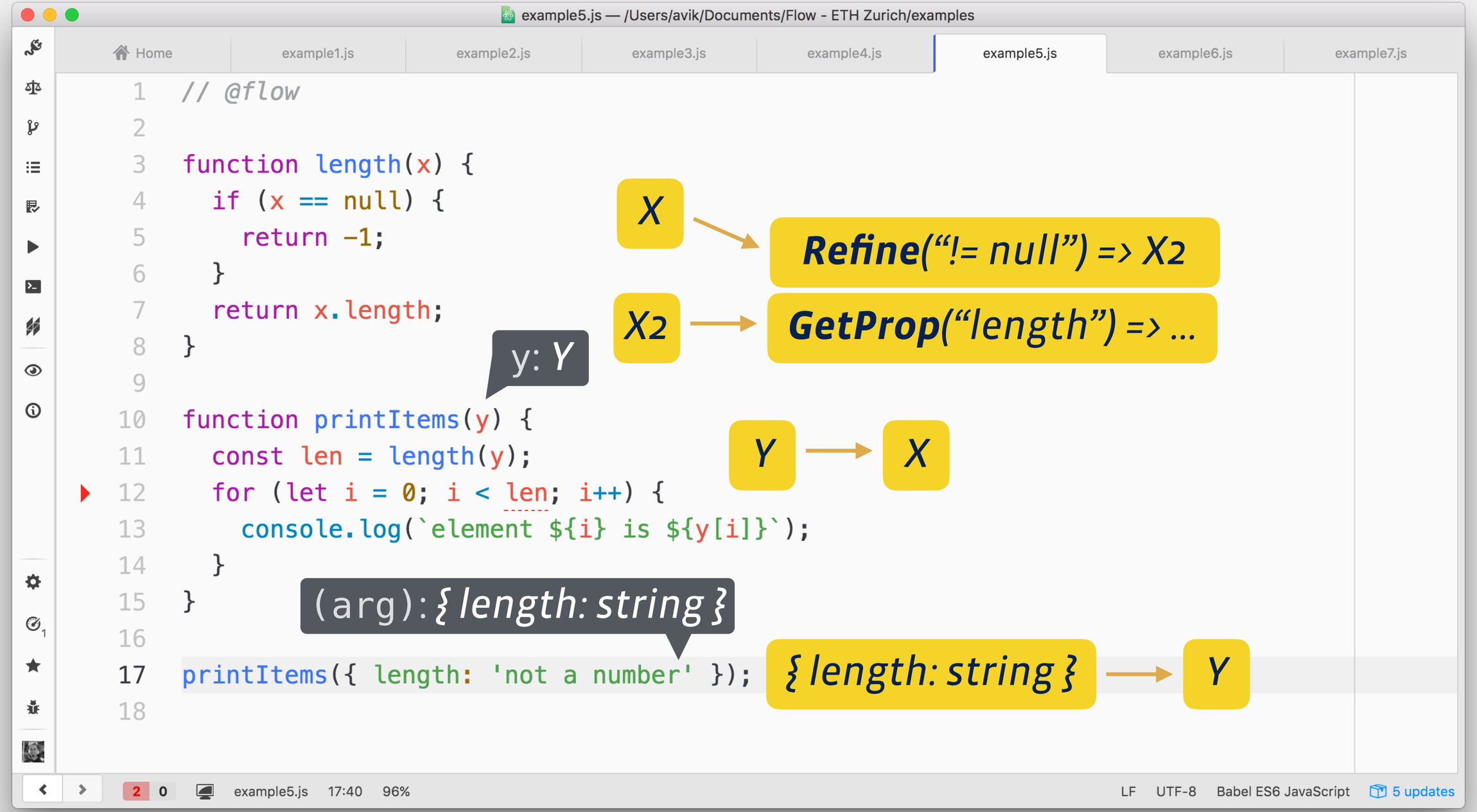
```
1  // @flow
2
3  function length(x) {
4    if (x == null) {
5      return -1;
6    }
7    return x.length;
8  }
9
10 function printItems(y) {
11   const len = length(y);
12   for (let i = 0; i < len; i++) {
13     console.log(`element ${i} is ${y[i]}`);
14   }
15 }
16
17 printItems({ length: 'not a number' });
18
```



2 0 example5.js 17:40 96% LF UTF-8 Babel ES6 JavaScript 5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
Home
example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
1 // @flow
2
3 function length(x) {
4 if (x == null) {
5 return -1;
6 }
7 return x.length;
8 }
9
10 function printItems(y) {
11 const len = length(y);
12 for (let i = 0; i < len; i++) {
13 console.log(`element ${i} is ${y[i]}`);
14 }
15 }
16
17 printItems({ length: 'not a number' });
18
y: Y
X
Refine("!= null") => X2
X2
GetProp("length") => ...
Y
X
2 0
example5.js
17:40
96%
LF
UTF-8
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
Home
example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
1 // @flow
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18
X
Refine("!= null") => X2
X2
GetProp("length") => ...
y: Y
Y
X
(arg): { length: string }
{ length: string }
Y
2 0
example5.js
17:40
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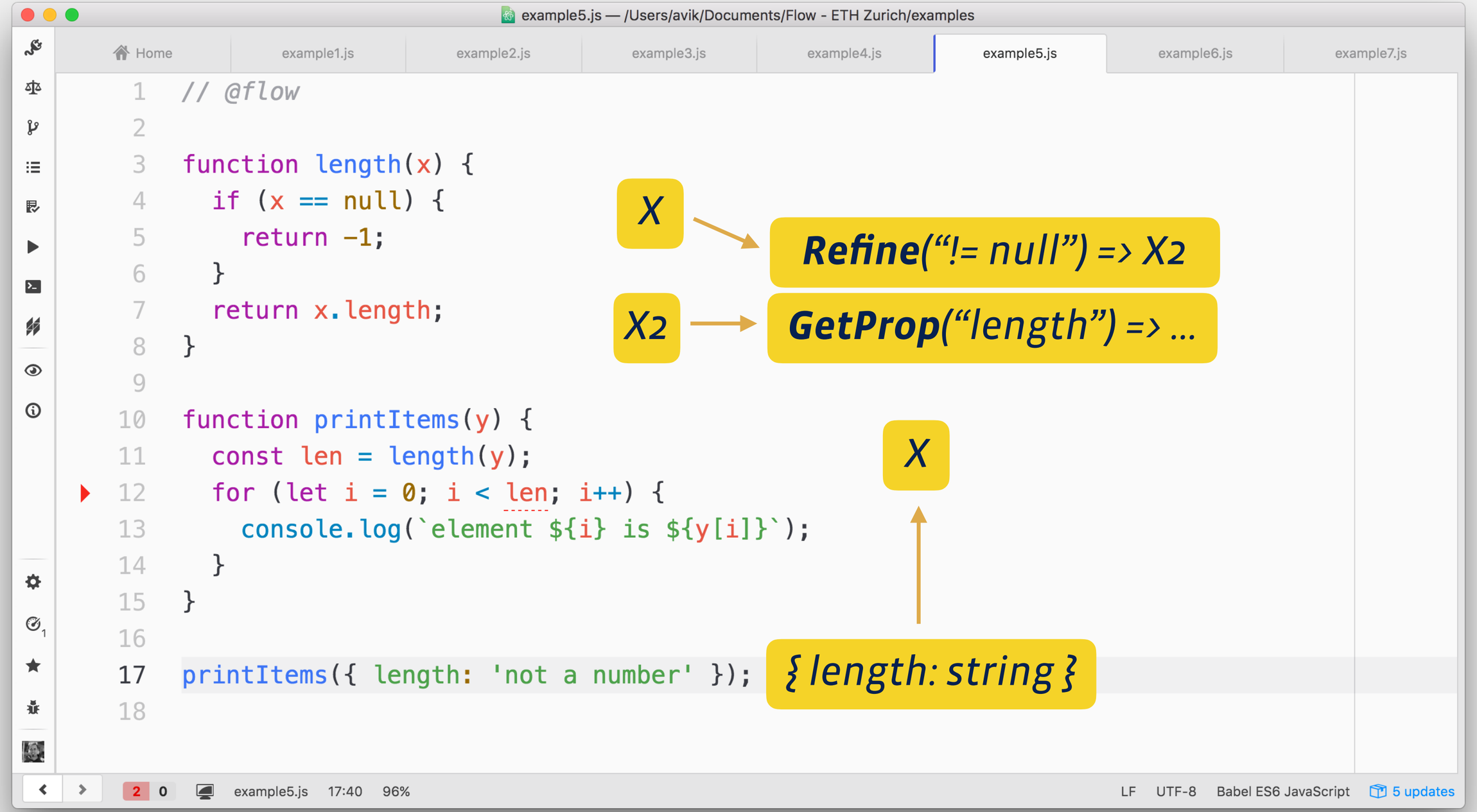
UTF-8
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
Home
example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
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18
X
Refine("!= null") => X2
X2
GetProp("length") => ...
X
{ length: string }
2 0
example5.js
17:40
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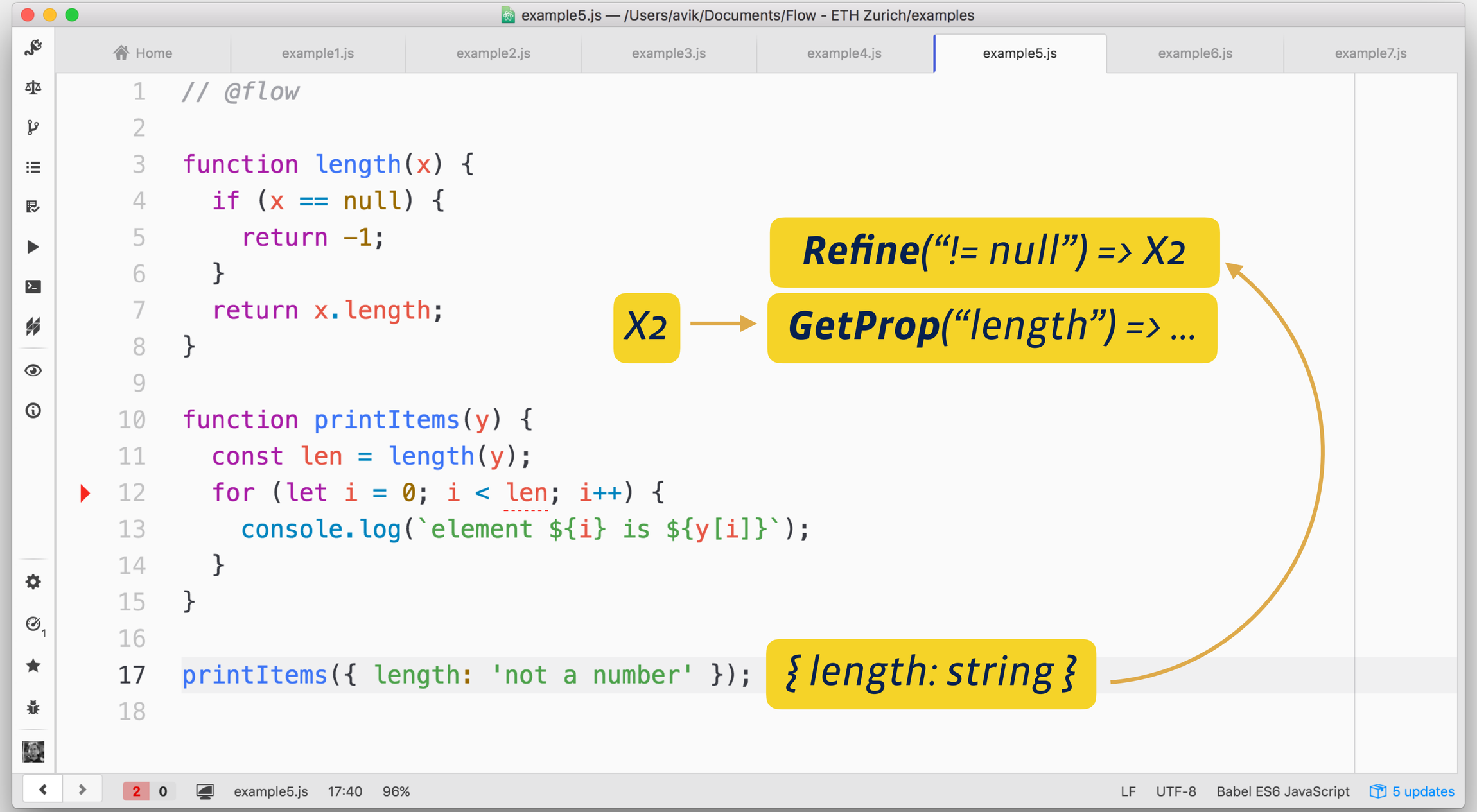
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
Home
example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
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Refine("!= null") => X2
X2
GetProp("length") => ...
{ length: string }
2 0
example5.js
17:40
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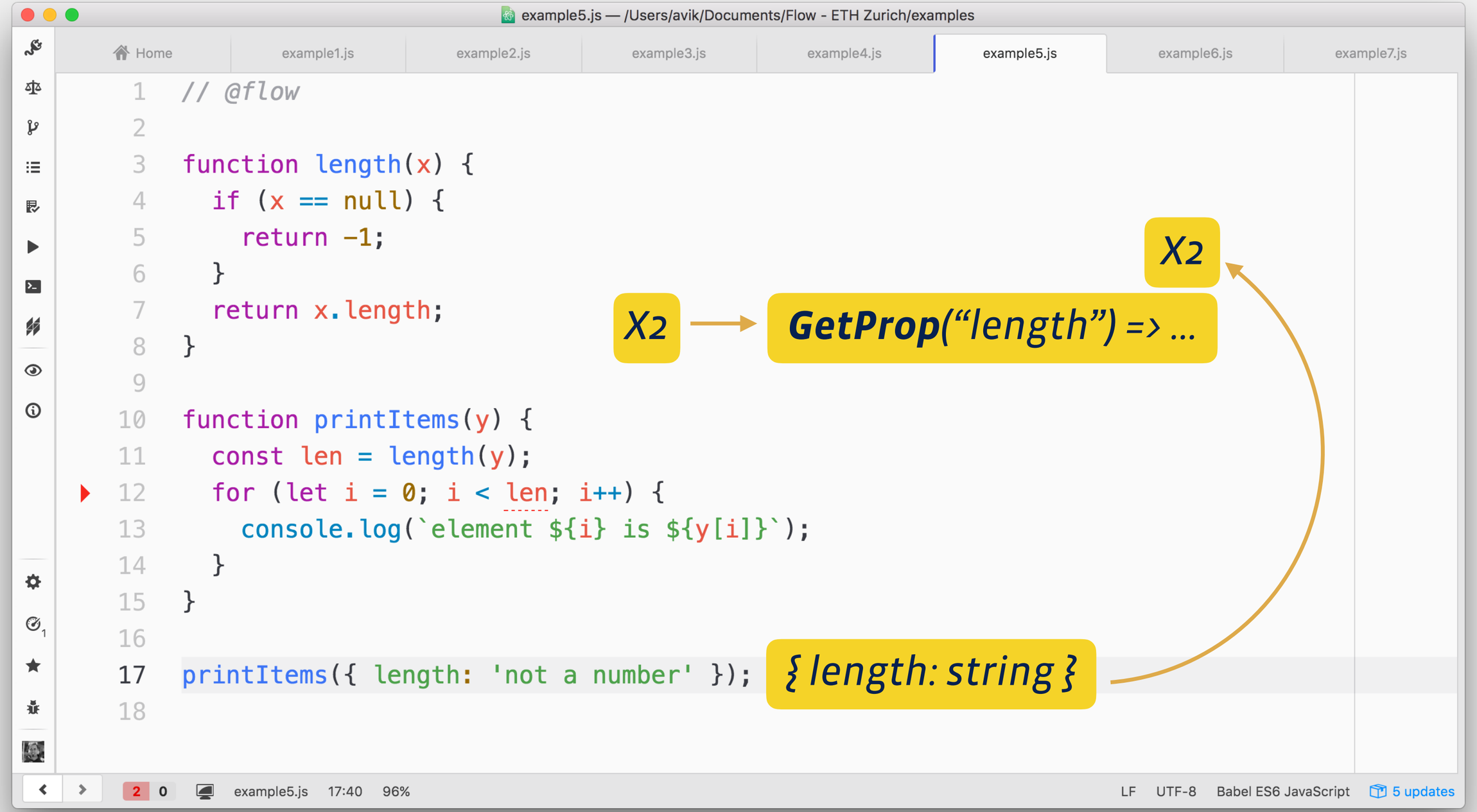
UTF-8
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example3.js
example4.js
example5.js
example6.js
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17 printItems({ length: 'not a number' });
18
X2
X2
GetProp("length") => ...
{ length: string }
2 0
example5.js
17:40
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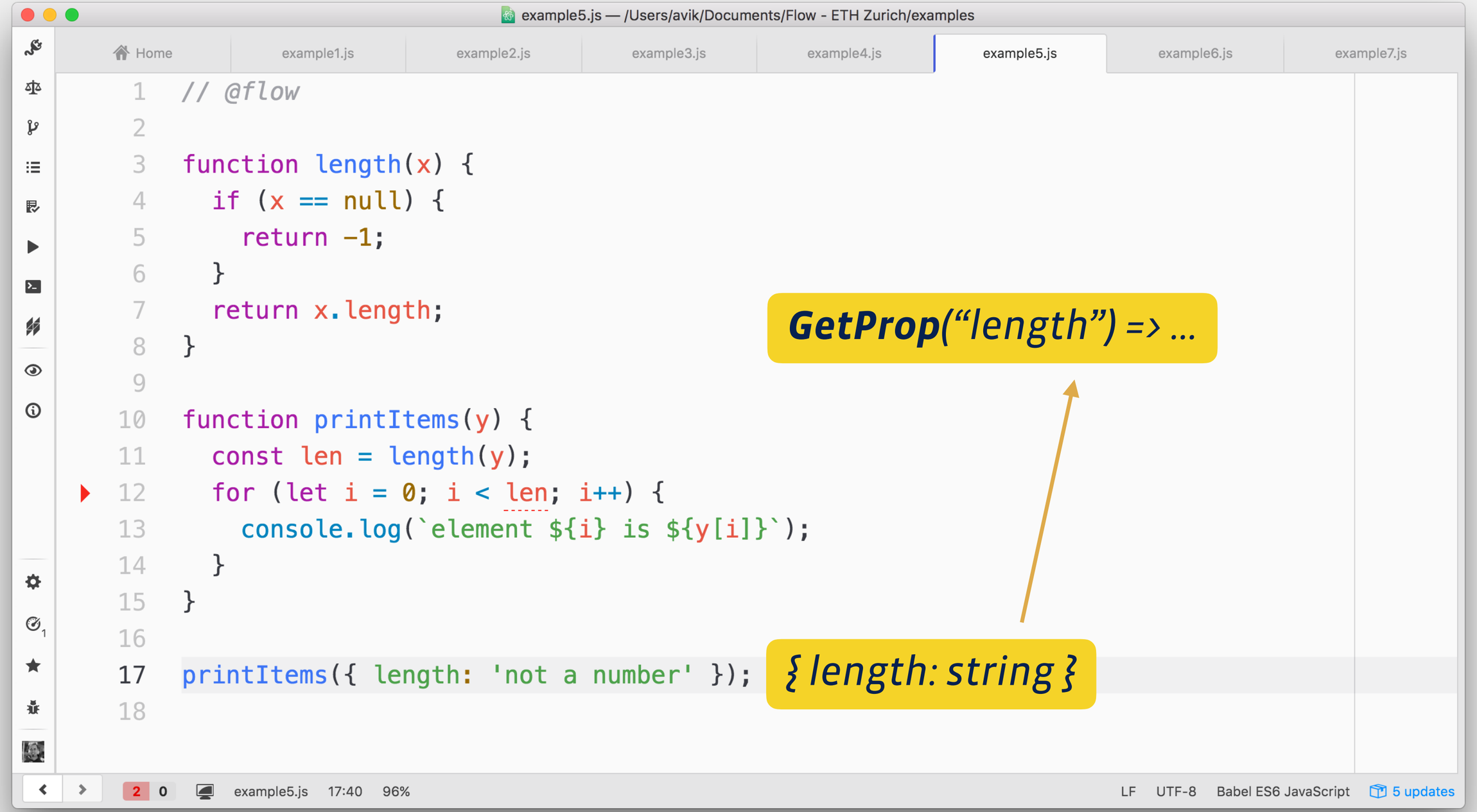
UTF-8
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example1.js
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example4.js
example5.js
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GetProp("length") => ...
{ length: string }
2 0
example5.js
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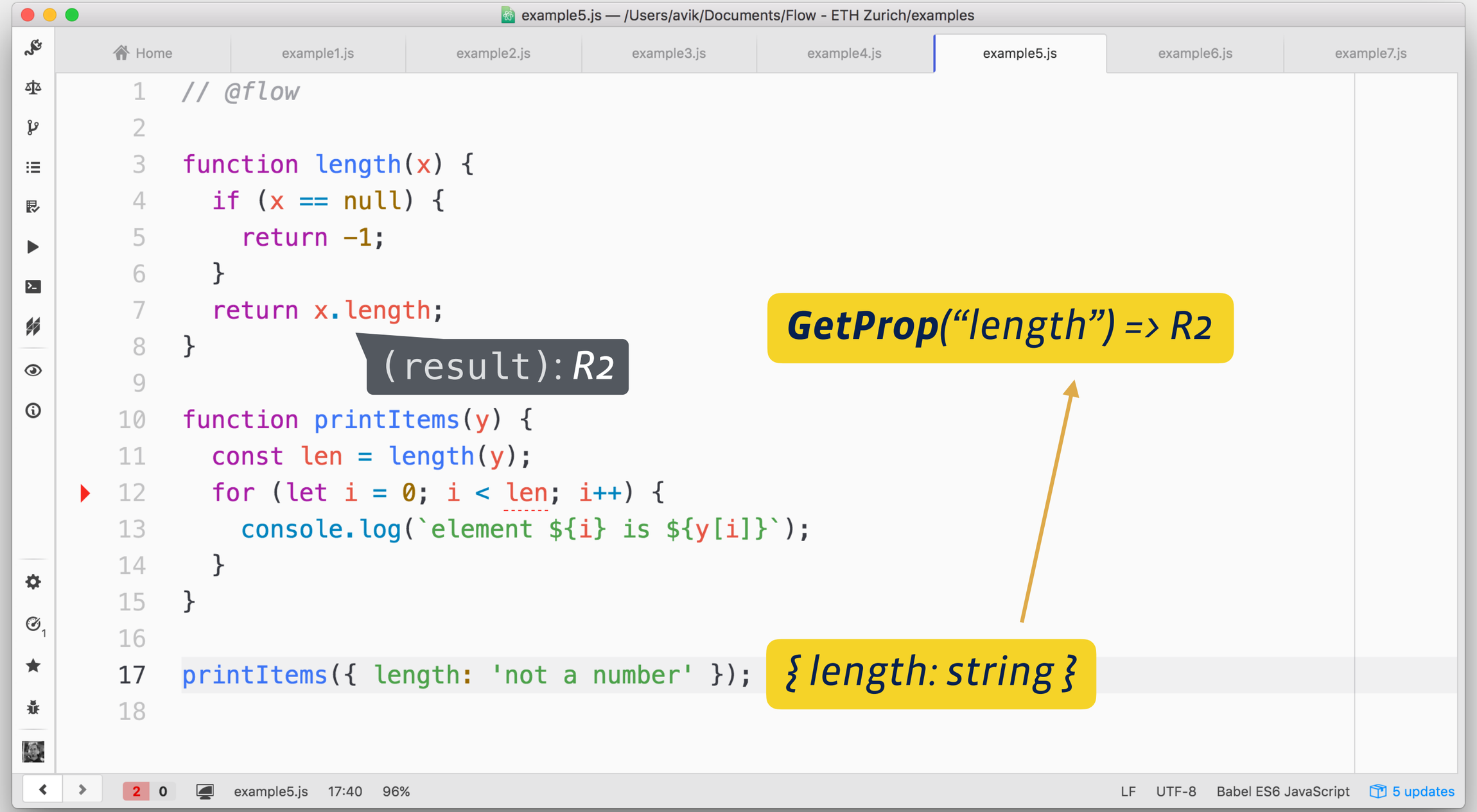
UTF-8
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example3.js
example4.js
example5.js
example6.js
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14 }
15 }
16
17 printItems({ length: 'not a number' });
18
(result): R2
GetProp("length") => R2
{ length: string }
2 0
example5.js
17:40
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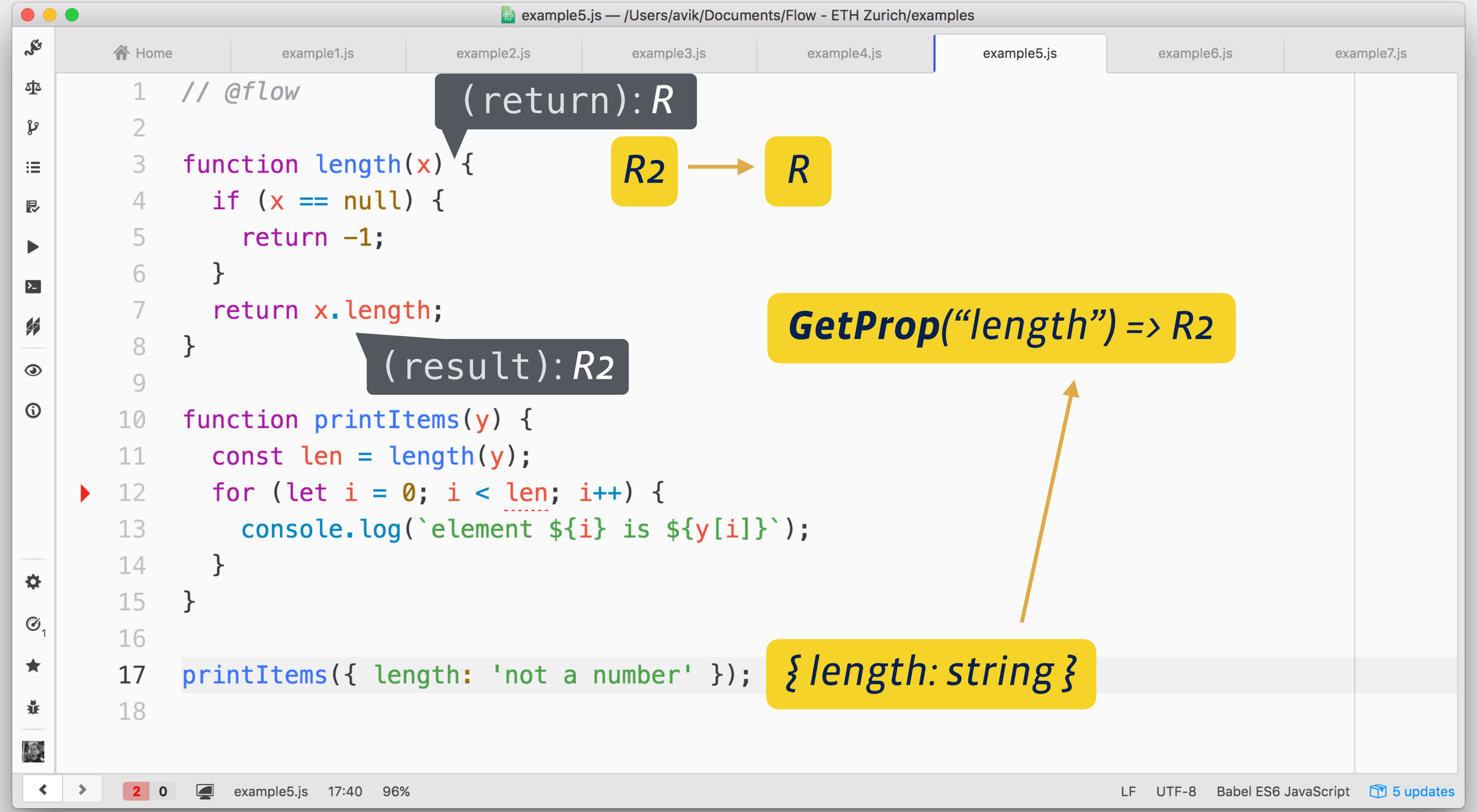
UTF-8
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example1.js
example2.js
example3.js
example4.js
example5.js
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18
(return): R
R2
R
(result): R2
GetProp("length") => R2
{ length: string }
2 0
example5.js
17:40
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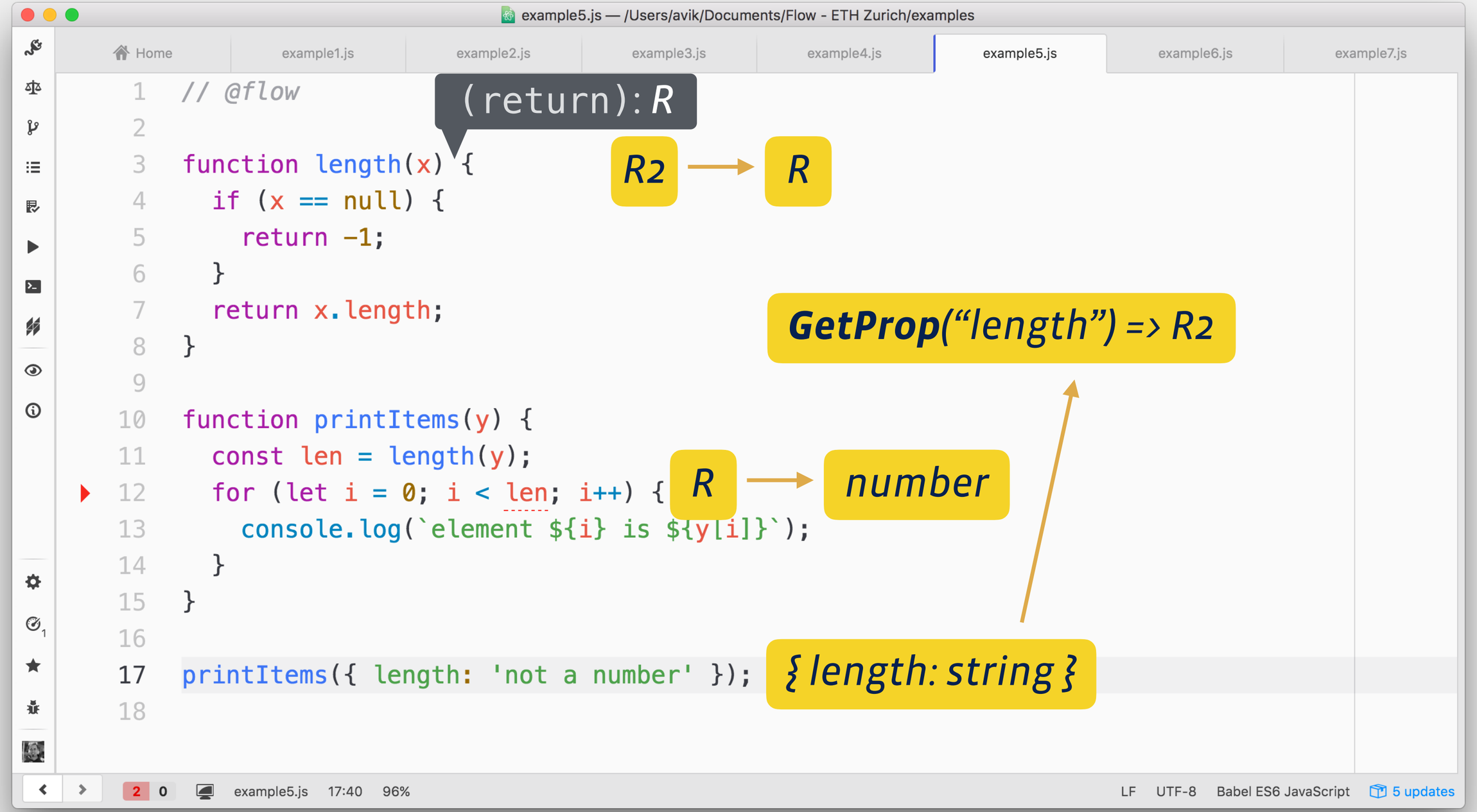
UTF-8
Babel ES6 JavaScript
5 updates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example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
(return): R
R2
R
GetProp("length") => R2
R
number
{ length: string }
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2 0
example5.js
17:40
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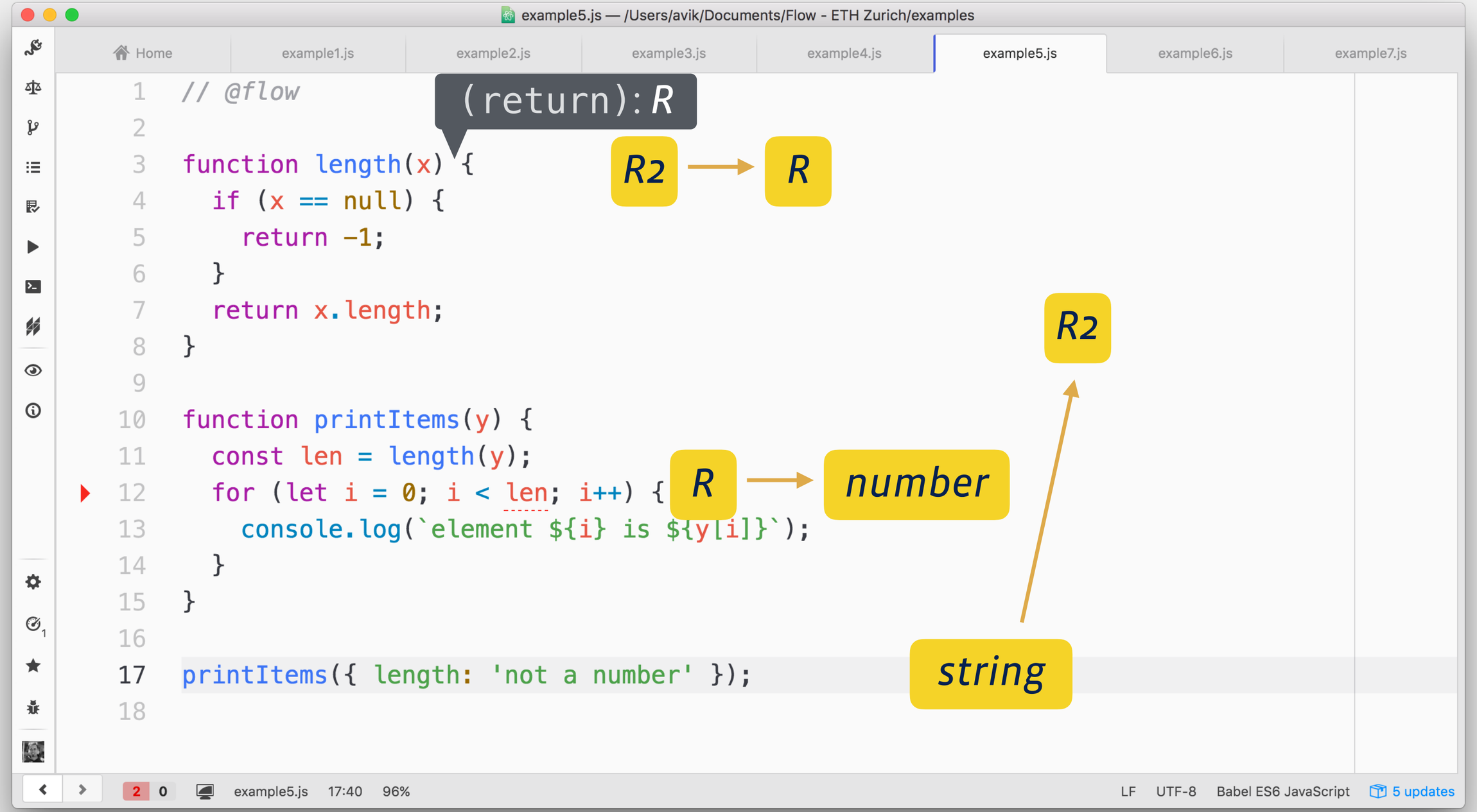
UTF-8
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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18
(return): R
R2
R
R2
R
number
string
2 0
example5.js
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Babel ES6 JavaScript
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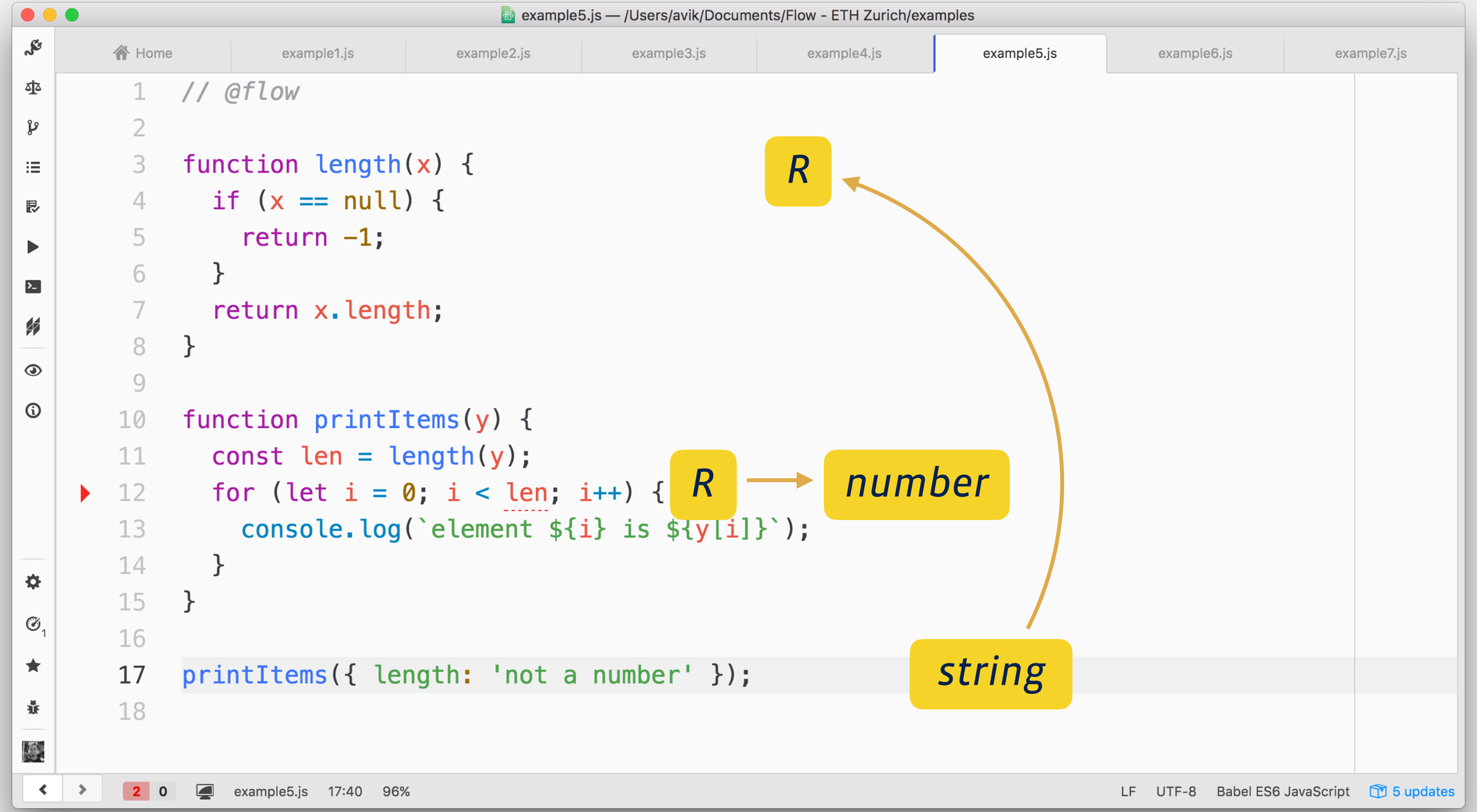
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8 }
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11 const len = length(y);
12 for (let i = 0; i < len; i++) {
13 console.log(`element ${i} is ${y[i]}`);
14 }
15 }
16
17 printItems({ length: 'not a number' });
18
R
R
number
string
2 0
example5.js
17:40
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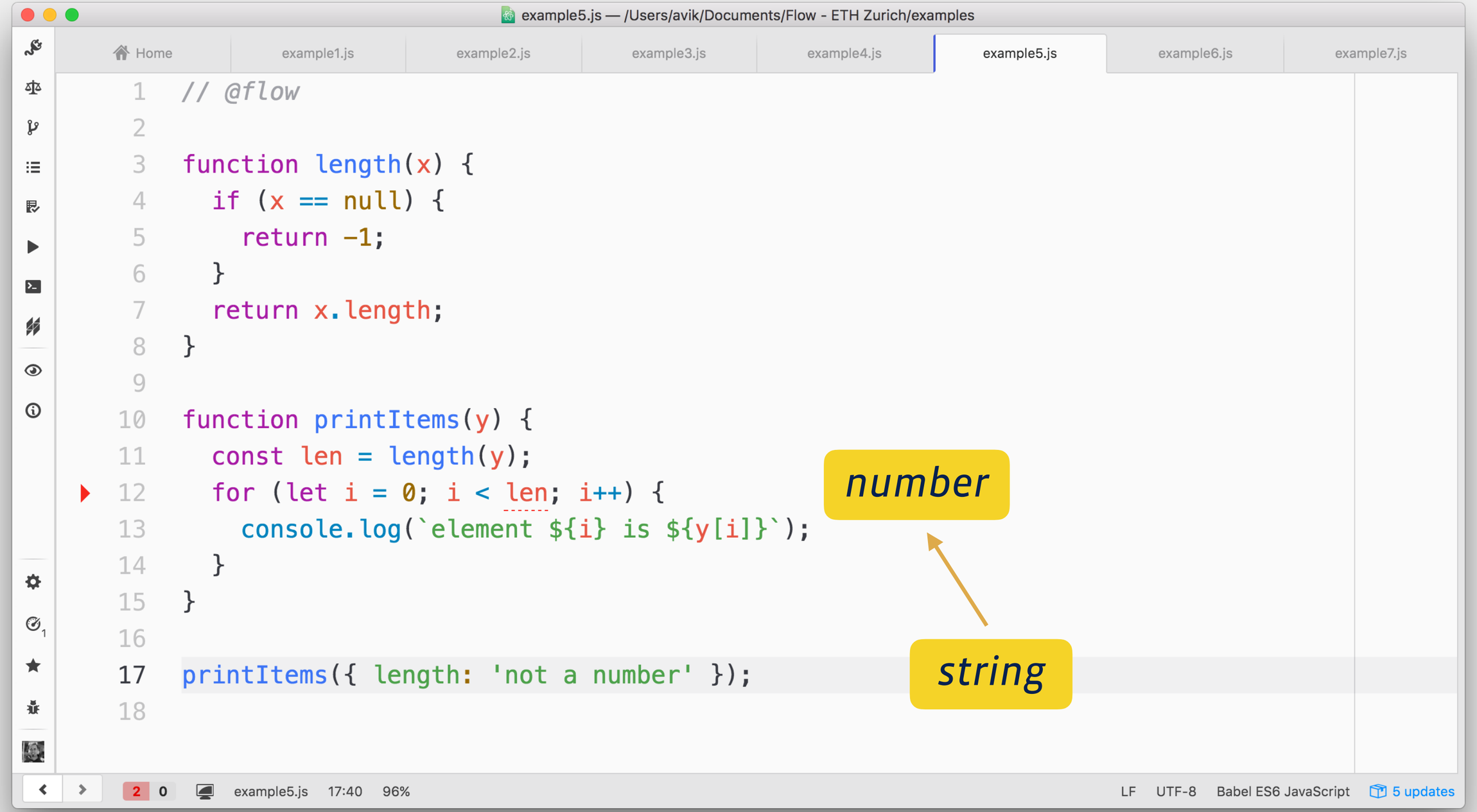
UTF-8
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
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14 }
15 }
16
17 printItems({ length: 'not a number' });
18
number
string
2 0
example5.js
17:40
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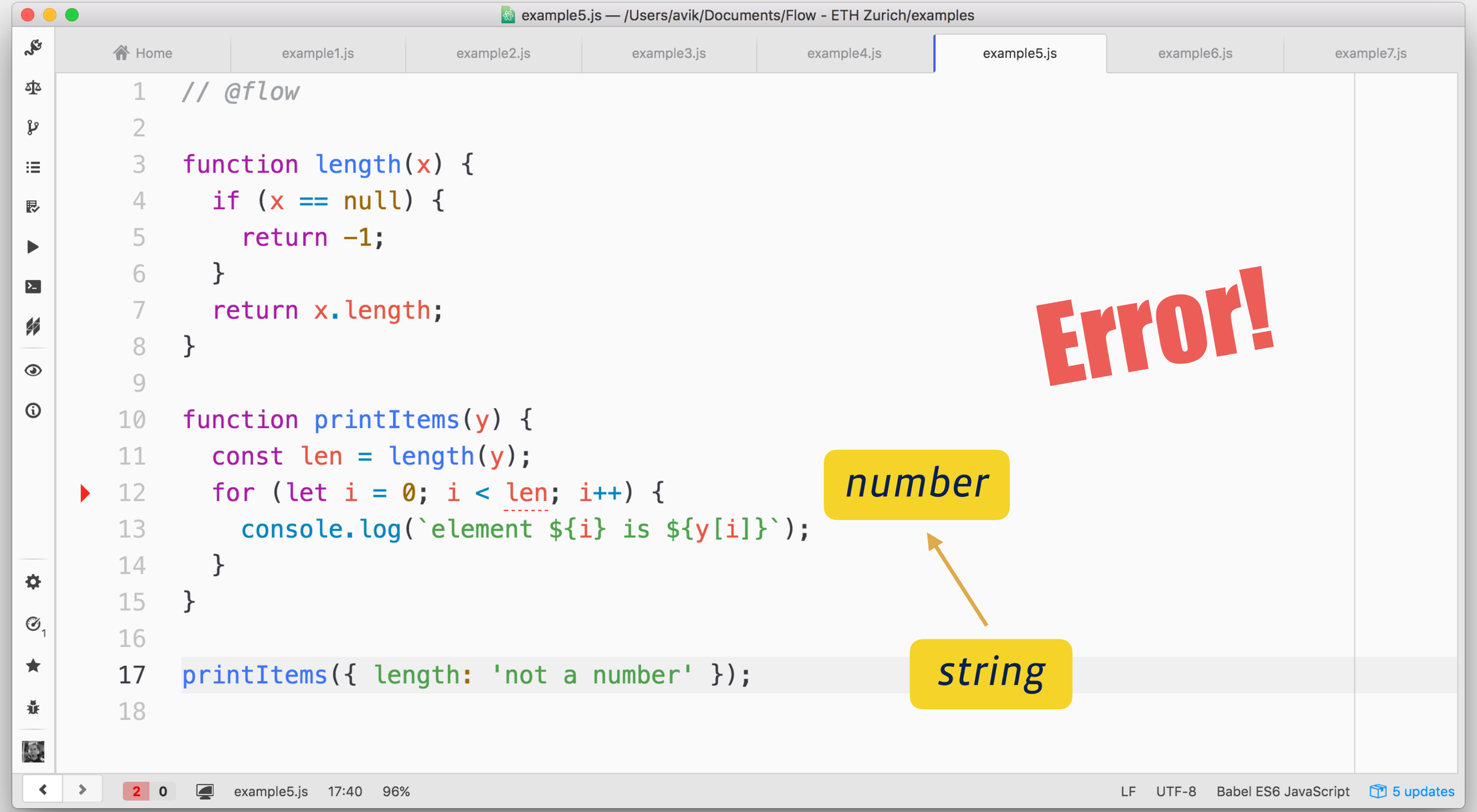
UTF-8
Babel ES6 JavaScript
5 updates


example5.js — /Users/avik/Documents/Flow - ETH Zurich/examples
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example1.js
example2.js
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example5.js
example6.js
example7.js
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5 return -1;
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7 return x.length;
8 }
9
10 function printItems(y) {
11 const len = length(y);
12 for (let i = 0; i < len; i++) {
13 console.log(`element ${i} is ${y[i]}`);
14 }
15 }
16
17 printItems({ length: 'not a number' });
18
Error!
number
string
2 0
example5.js
17:40
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LF
UTF-8
Babel ES6 JavaScript
5 updates

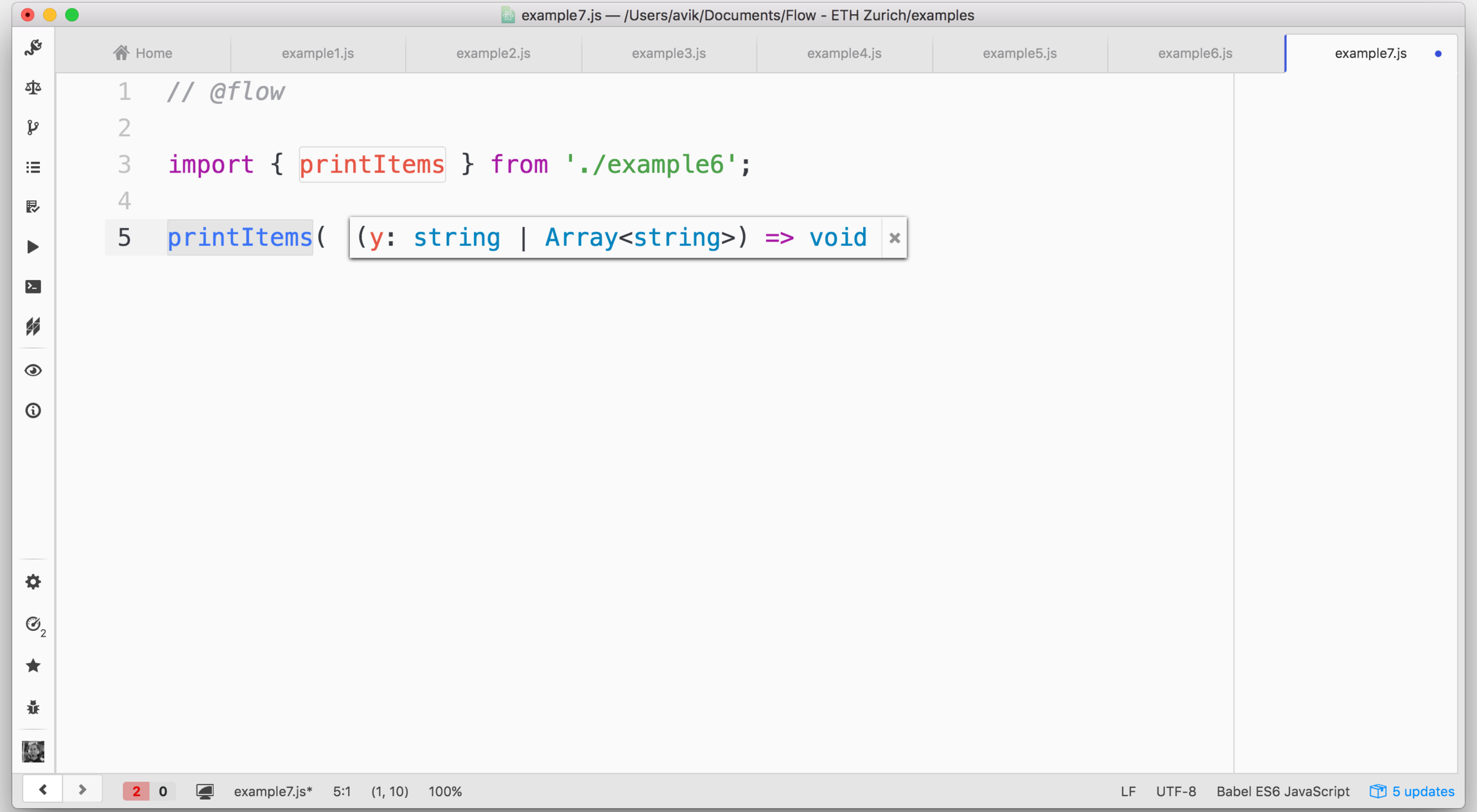
Gah, let’s pin down the API...

example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

```
1  // @flow
2
3  function length(x) {
4    return x.length;
5  }
6
7  export function printItems(y: string | Array<string>) {
8    const len = length(y);
9    for (let i = 0; i < len; i++) {
10     console.log(`element ${i} is ${y[i]}`);
11   }
12 }
13
```

2 0 example6.js 7:53 100% LF UTF-8 Babel ES6 JavaScript 5 updates


example7.js — /Users/avik/Documents/Flow - ETH Zurich/examples
Home
example1.js
example2.js
example3.js
example4.js
example5.js
example6.js
example7.js
1 // @flow
2
3 import { printItems } from './example6';
4
5 printItems((y: string | Array<string>) => void
example7.js* 5:1 (1, 10) 100%
LF UTF-8 Babel ES6 JavaScript 5 updates

property variance

object spreads

optional properties

functions as predicates

extensible objects

exact objects

open methods

Wide support for JavaScript idioms

disjoint unions

type parameter variance

tuples

literal types

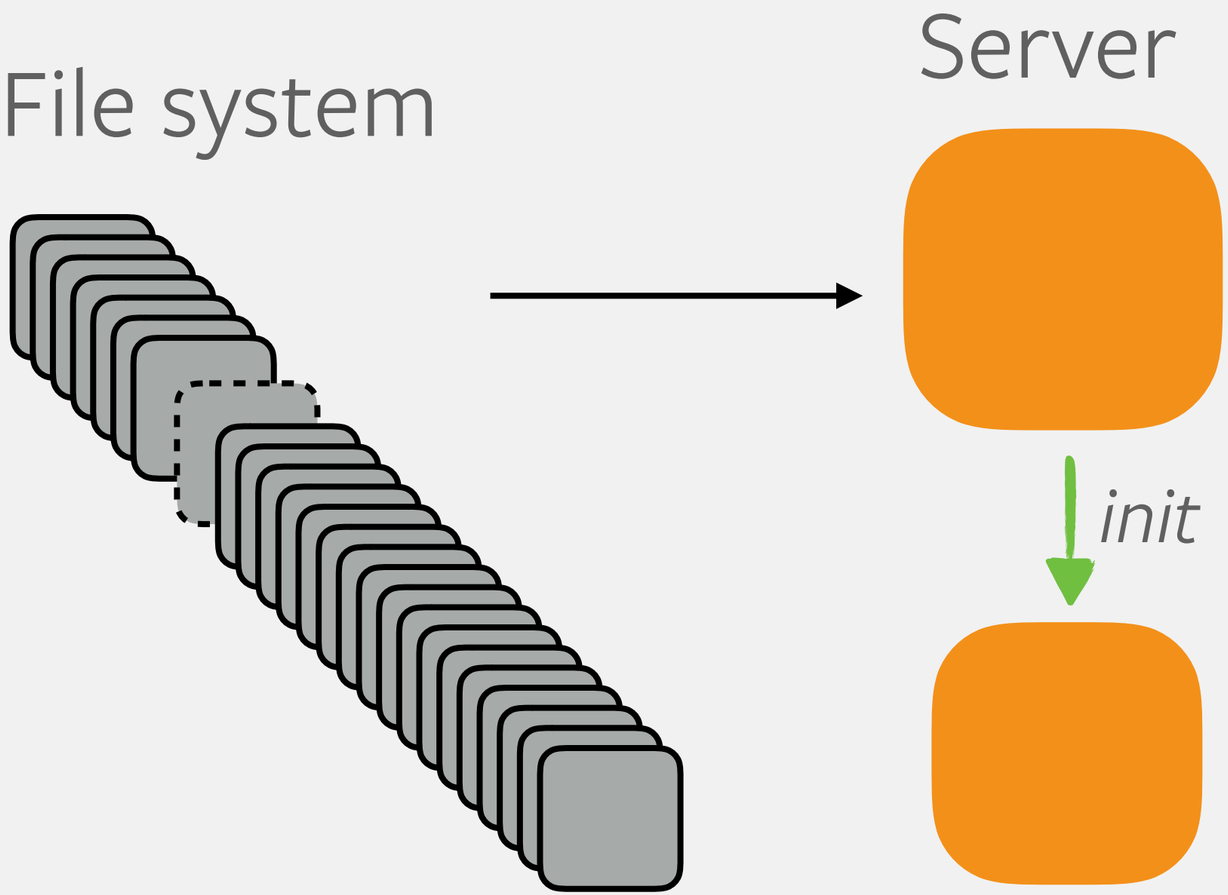
bounded generics

optional parameters

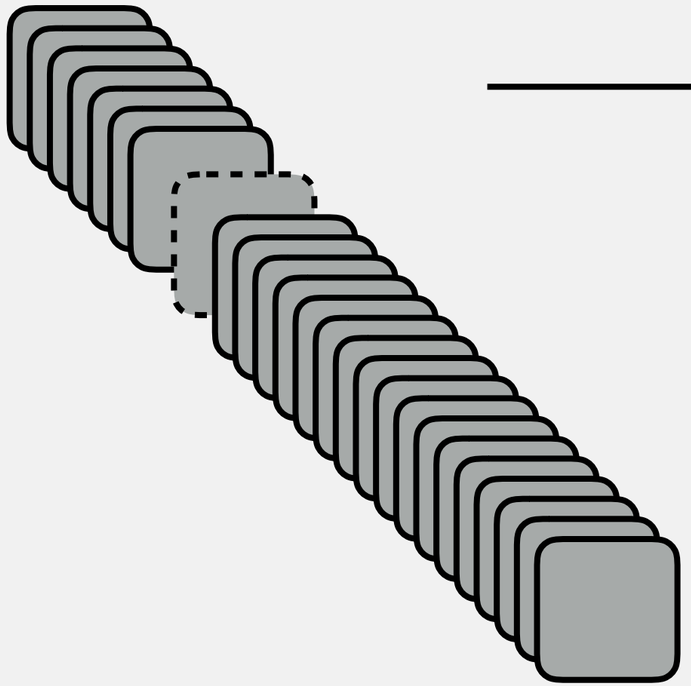
type transforms

function overloading

Design for responsiveness


File system
Server
init

File system

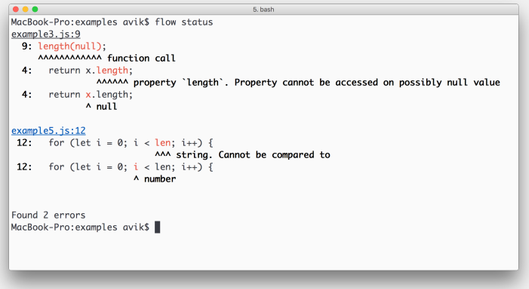


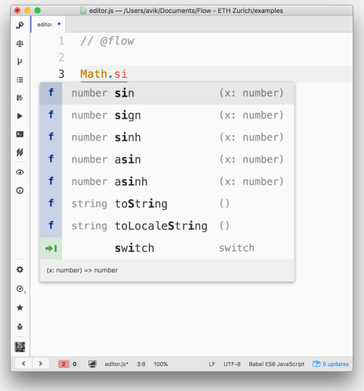
Server

init

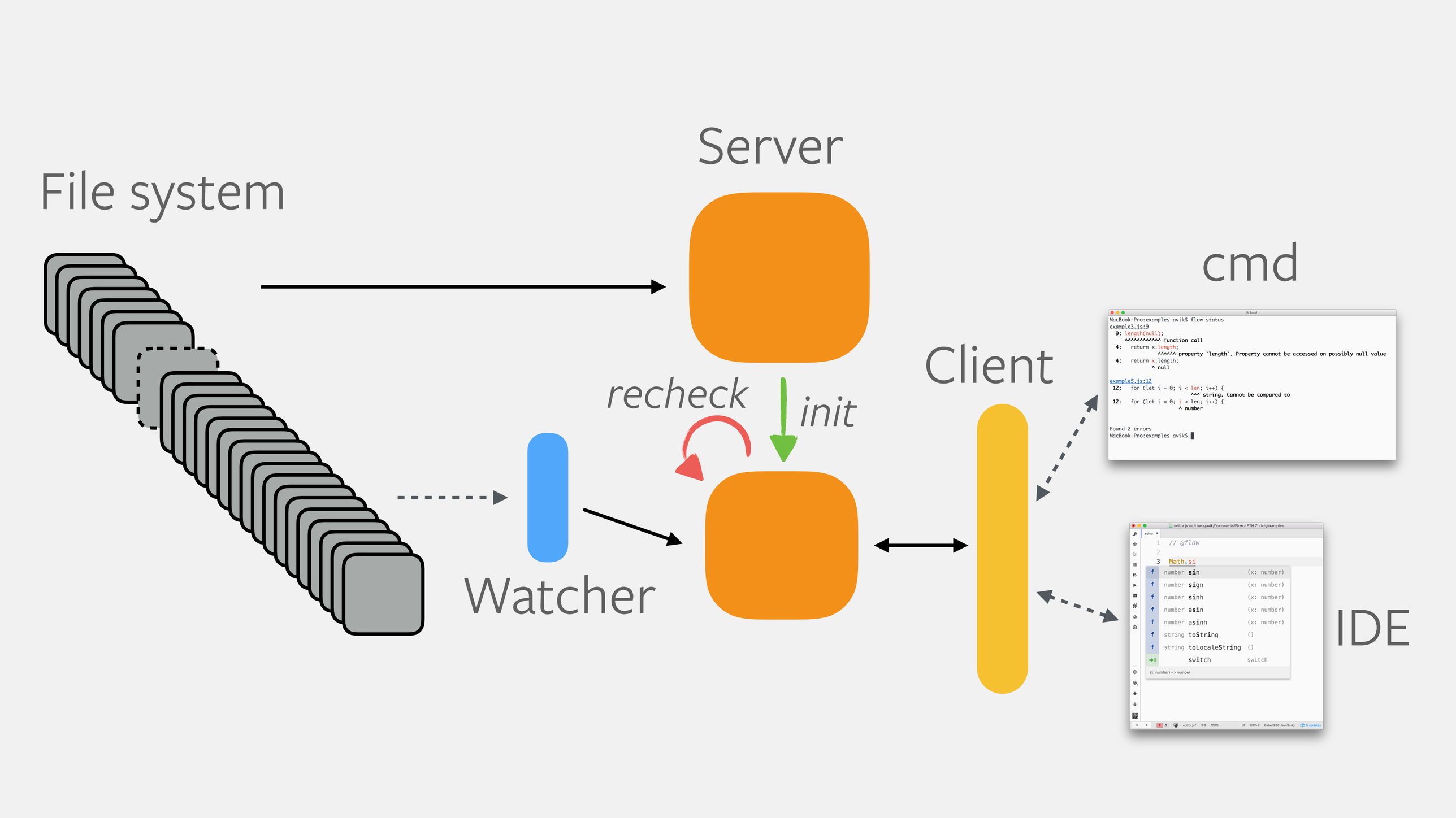
Client

cmd





IDE


File system
Server
recheck
init
Client
cmd
Watcher
IDE
5. bash
MacBook-Pro:examples avik$ flow status
example3.js:9
9: length(null);
^^^^^^^^^^^^ function call
4: return x.length;
^^^^^^ property `length`. Property cannot be accessed on possibly null value
4: return x.length;
^ null
example5.js:12
12: for (let i = 0; i < len; i++) {
^^^ string. Cannot be compared to
12: for (let i = 0; i < len; i++) {
^ number
Found 2 errors
MacBook-Pro:examples avik$
editor.js — /Users/avik/Documents/Flow - ETH Zurich/examples
// @flow
Math.si
number sin (x: number)
number sign (x: number)
number sinh (x: number)
number asin (x: number)
number asinh (x: number)
string toString ()
string toLocaleString ()
switch switch
(x: number) => number

Initializing...

example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

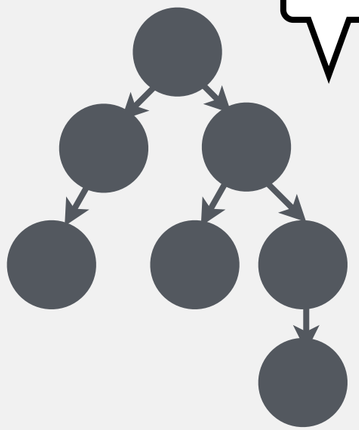
```
1  // @flow
2
3  function length(x) {
4    return x.length;
5  }
6
7  export function printItems(y: string | Array<string>) {
8    const len = length(y);
9    for (let i = 0; i < len; i++) {
10     console.log("element {i} is {y[i]}");
11   }
12 }
13
```

2 0 example6.js 7:53 100% LF UTF-8 Babel ES6 JavaScript 5 updates

example6.js

AST

Parse



example7.js — /Users/avik/Documents/Flow - ETH Zurich/examples

Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

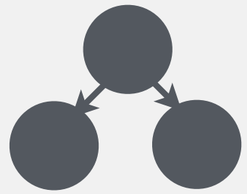
```
1  // @flow
2
3  import { printItems } from './example6';
4
5  printItems(
```

(y: string | Array<string>) => void

2 0 example7.js* 5:1 (1, 10) 100% LF UTF-8 Babel ES6 JavaScript 5 updates

example7.js

Parse



example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

```
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2
3  function length(x) {
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5  }
6
7  export function printItems(y: string | Array<string>) {
8    const len = length(y);
9    for (let i = 0; i < len; i++) {
10     console.log("element {i} is {y[i]}");
11   }
12 }
13
```

2 0 example6.js 7:53 100% LF UTF-8 Babel ES6 JavaScript 5 updates

example7.js — /Users/avik/Documents/Flow - ETH Zurich/examples

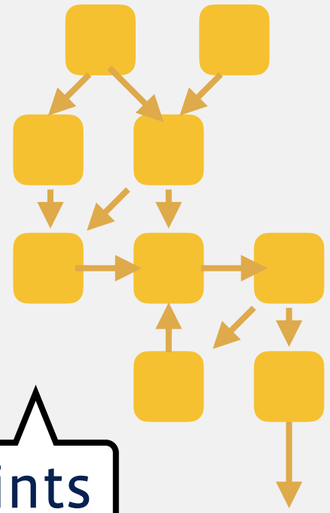
Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

```
1  // @flow
2
3  import { printItems } from './example6';
4
5  printItems(  (y: string | Array<string>) => void
```

2 0 example7.js* 5:1 (1, 10) 100% LF UTF-8 Babel ES6 JavaScript 5 updates

example6.js

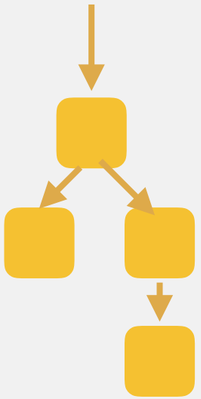
Compile



Constraints

example7.js

Compile



example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

```
1  // @flow
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5  }
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7  export function printItems(y: string | Array<string>) {
8    const len = length(y);
9    for (let i = 0; i < len; i++) {
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```

example7.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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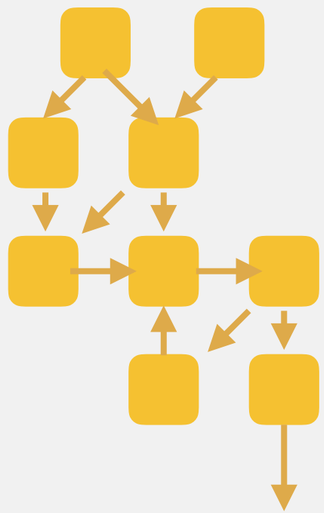
example7.js* 5:1 (1, 10) 100% LF UTF-8 Babel ES6 JavaScript 5 updates

example6.js

Link

Constraints

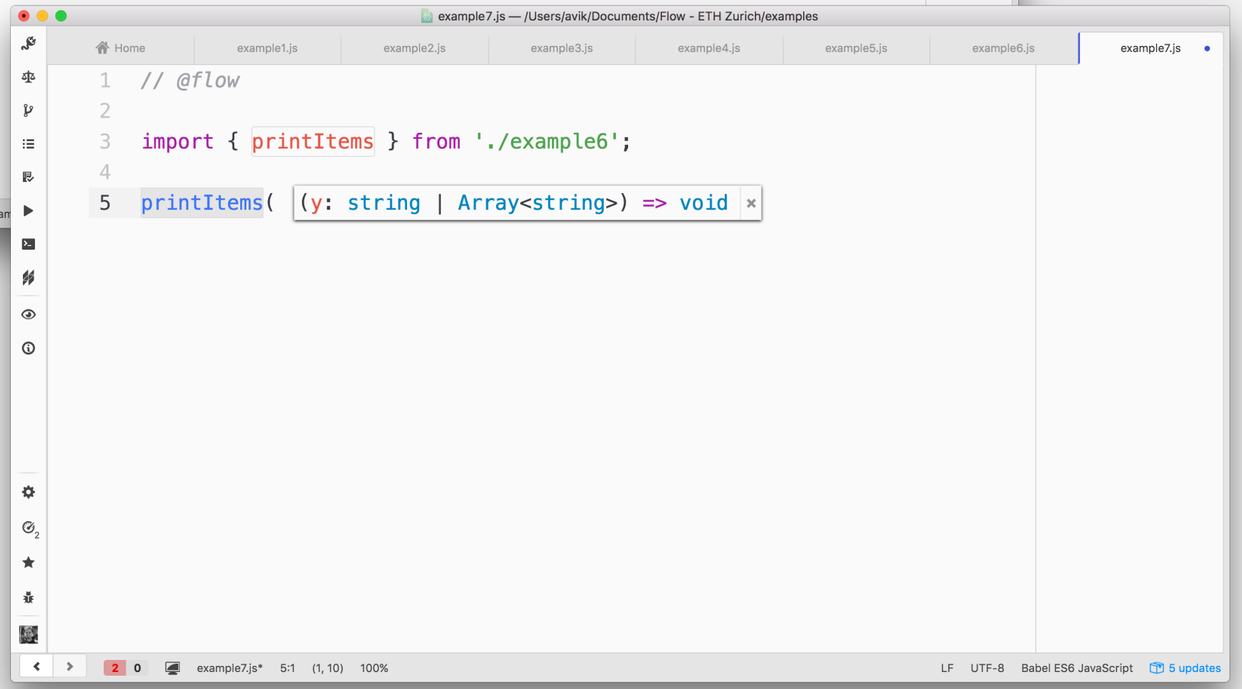


example7.js

example6.js

Link

Signature



example7.js

example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

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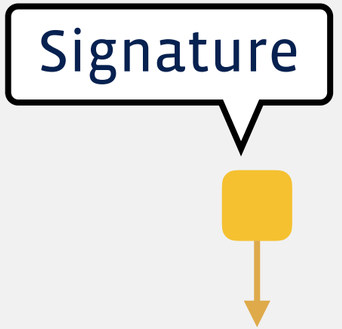
example6.js



example7.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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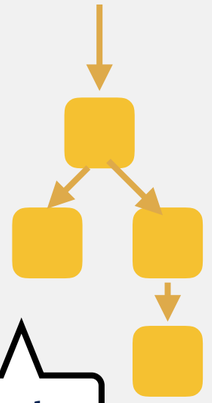
example7.js* 5:1 (1, 10) 100% LF UTF-8 Babel ES6 JavaScript 5 updates

example7.js

Link



Constraints

example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

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example6.js

example7.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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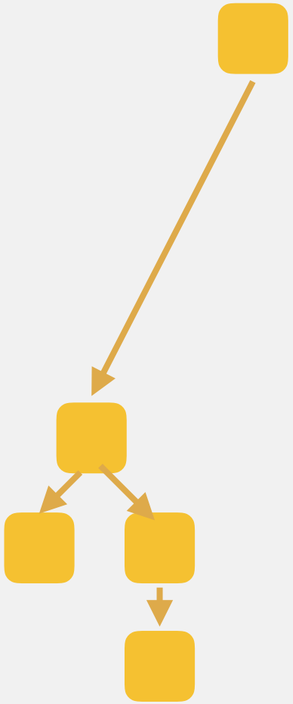
example7.js

example7.js* 5:1 (1, 10) 100% LF UTF-8 Babel ES6 JavaScript 5 updates

Link



Rechecking...

example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

Home | example1.js | example2.js | example3.js | example4.js | example5.js | example6.js | example7.js

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example7.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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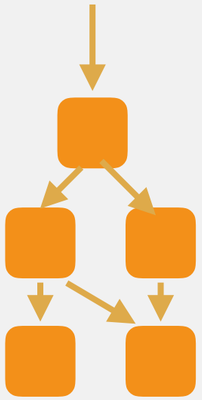
EDIT

example6.js

example7.js

Parse

Compile



example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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example7.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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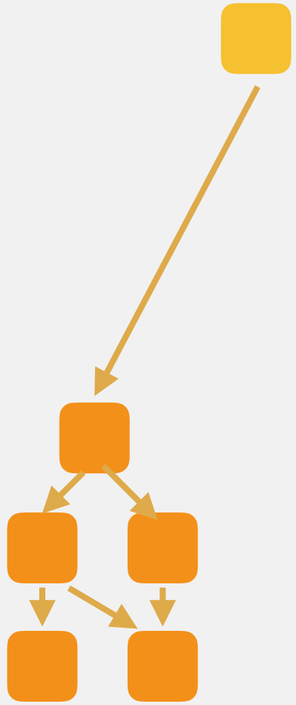
EDIT

example6.js

example7.js

Link



example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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EDIT

example7.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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2 0 example7.js* 5:1 (1, 10) 100% LF UTF-8 Babel ES6 JavaScript 5 updates

example6.js

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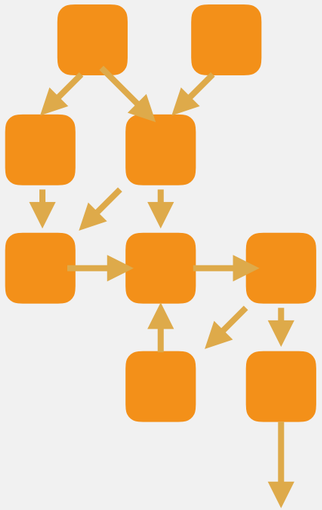
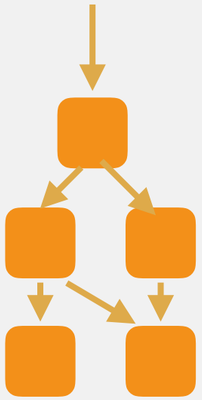
Compile



example7.js



example6.js — /Users/avik/Documents/Flow - ETH Zurich/examples

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example6.js

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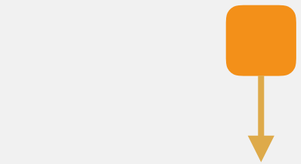

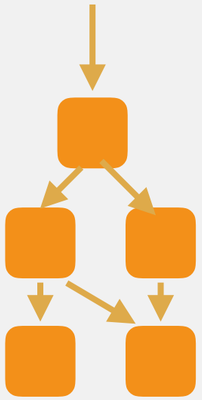

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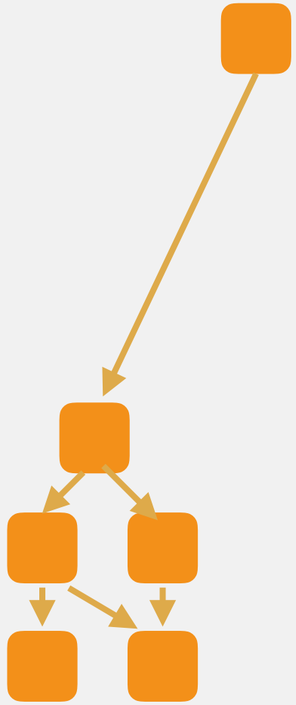
example6.js

example7.js

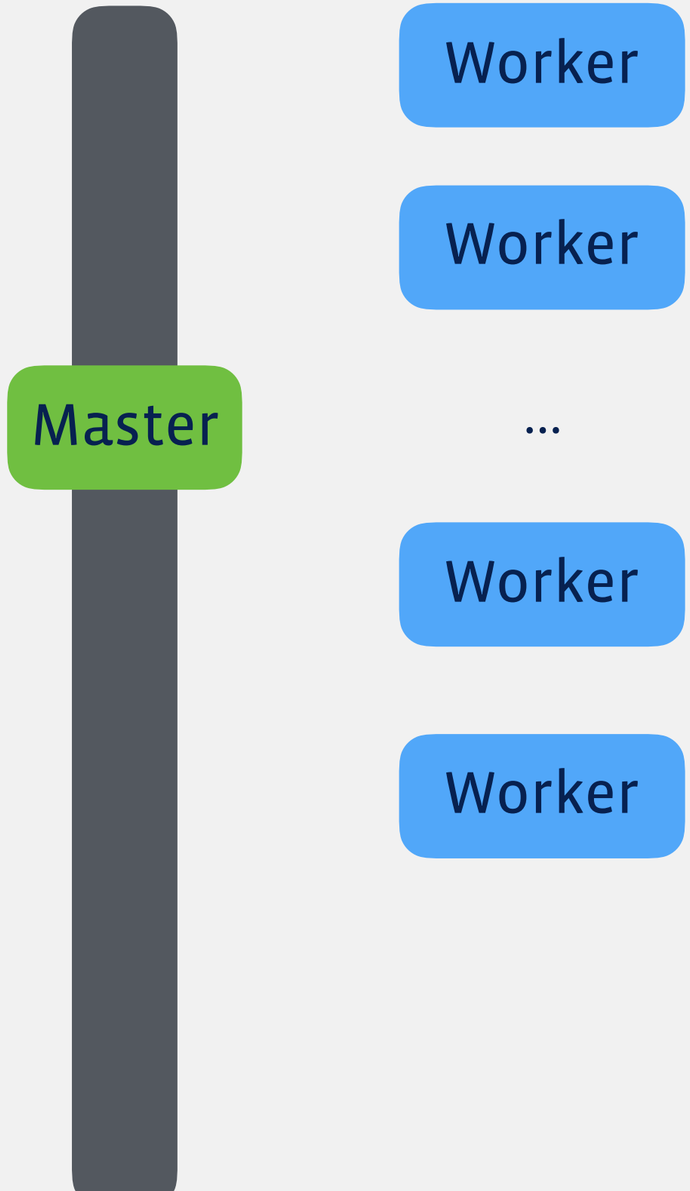
Link



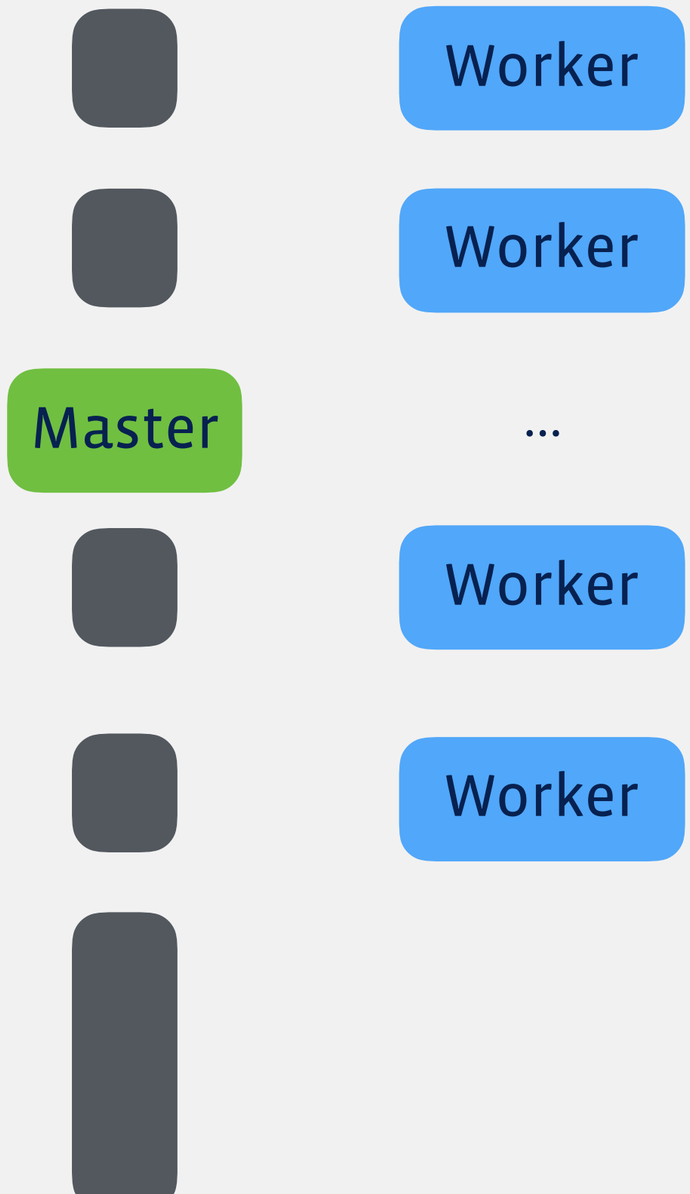
Parallelize everything!

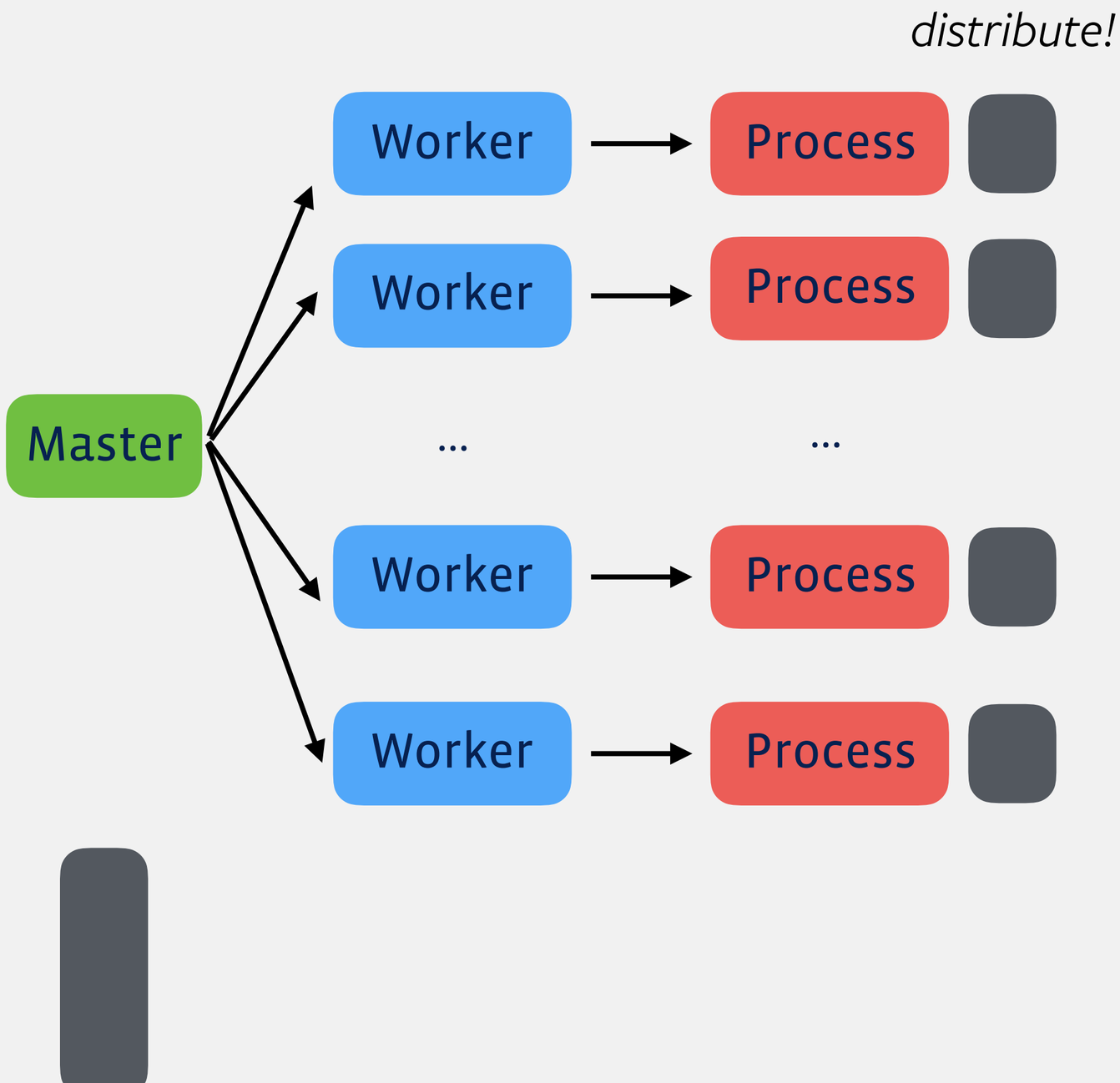
Infrastructure

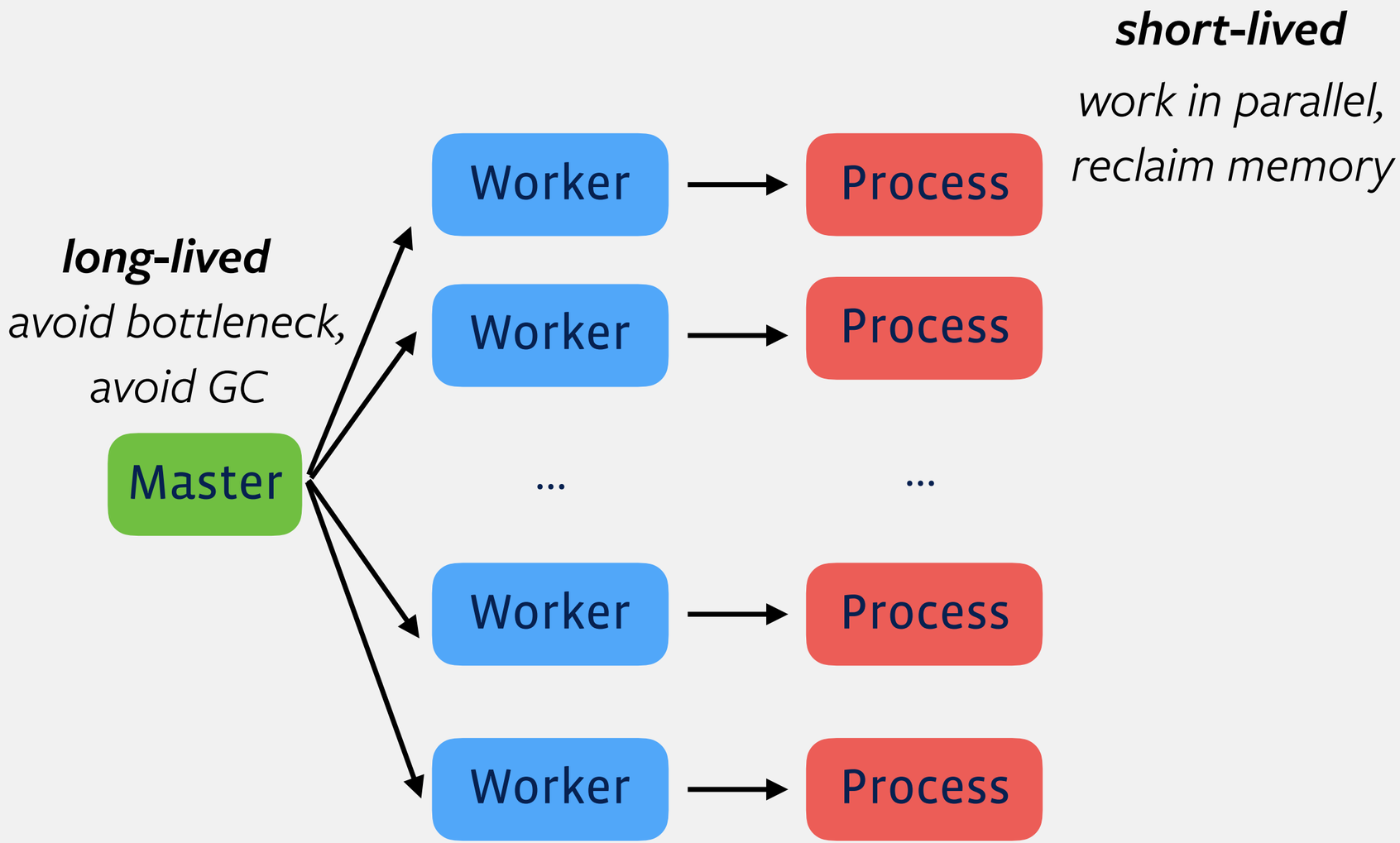
large number of jobs

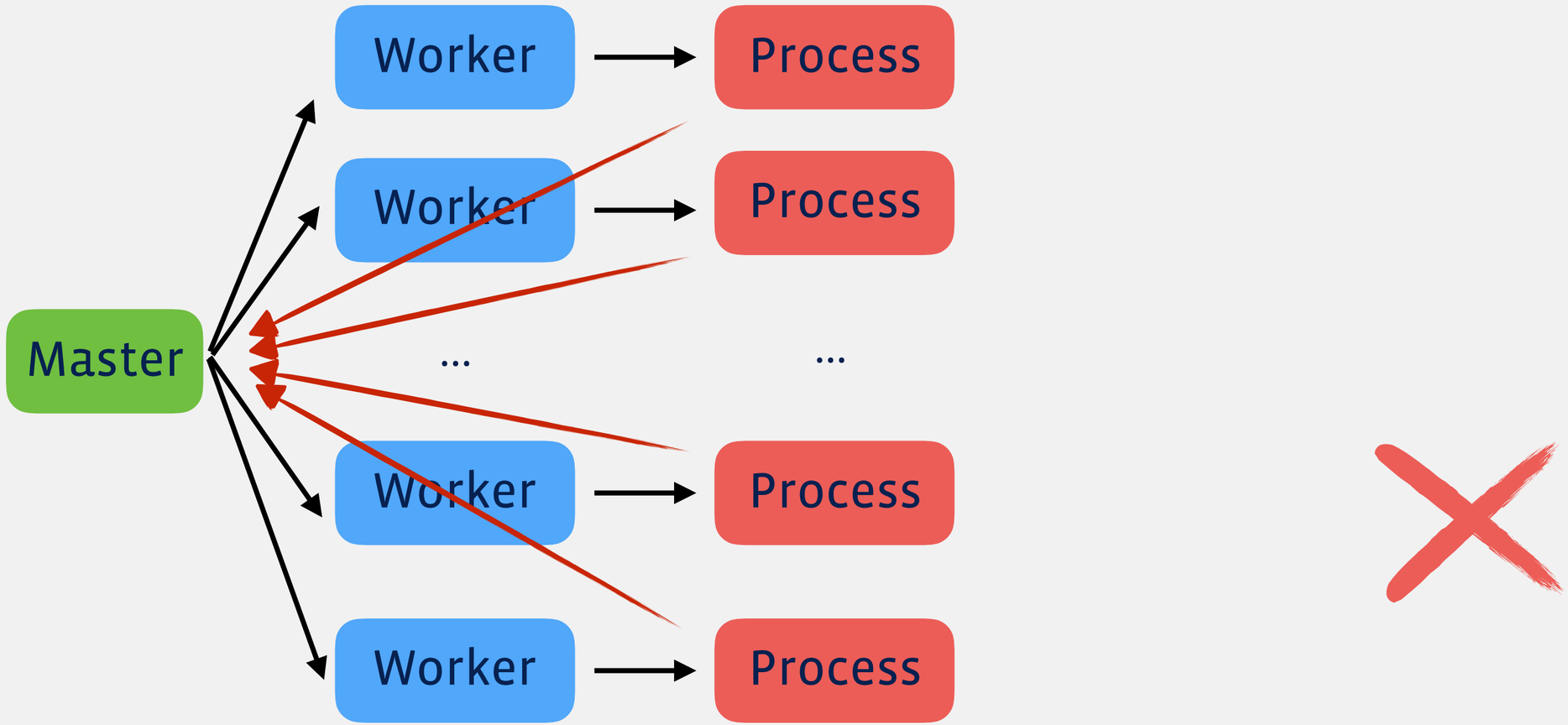


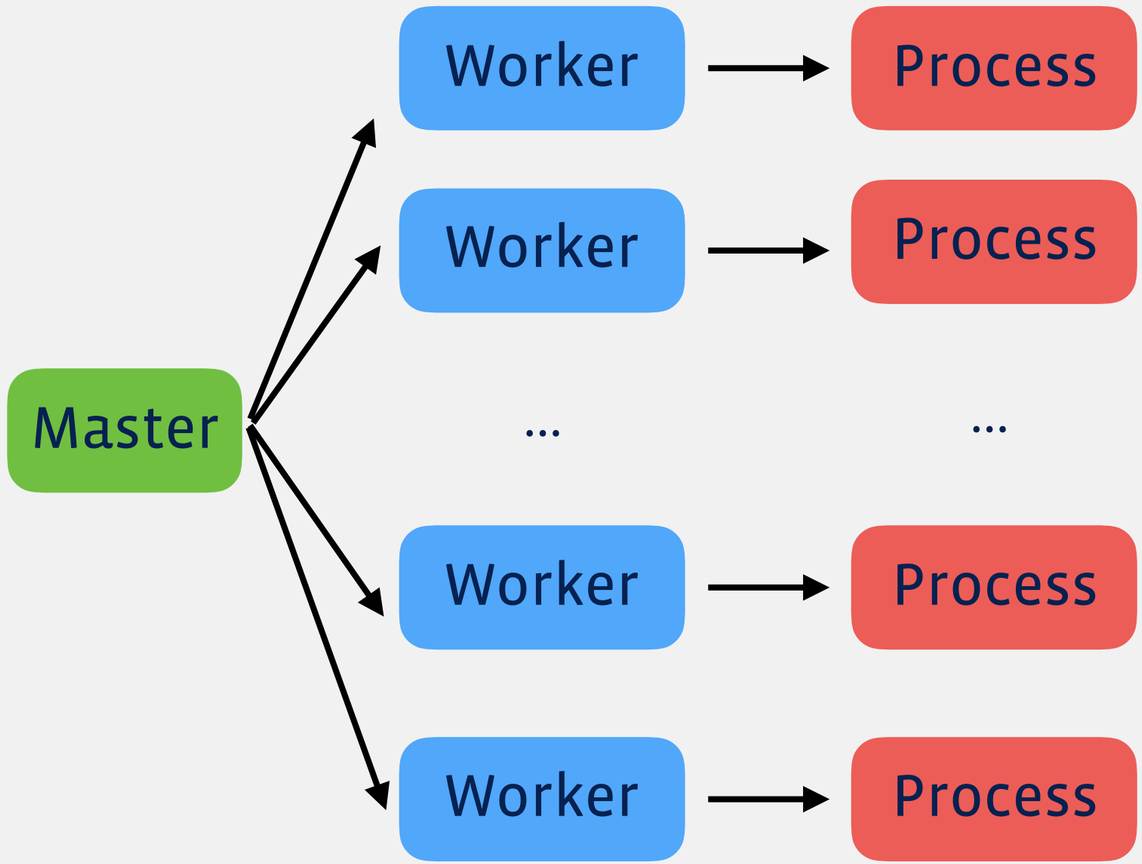
divide into buckets

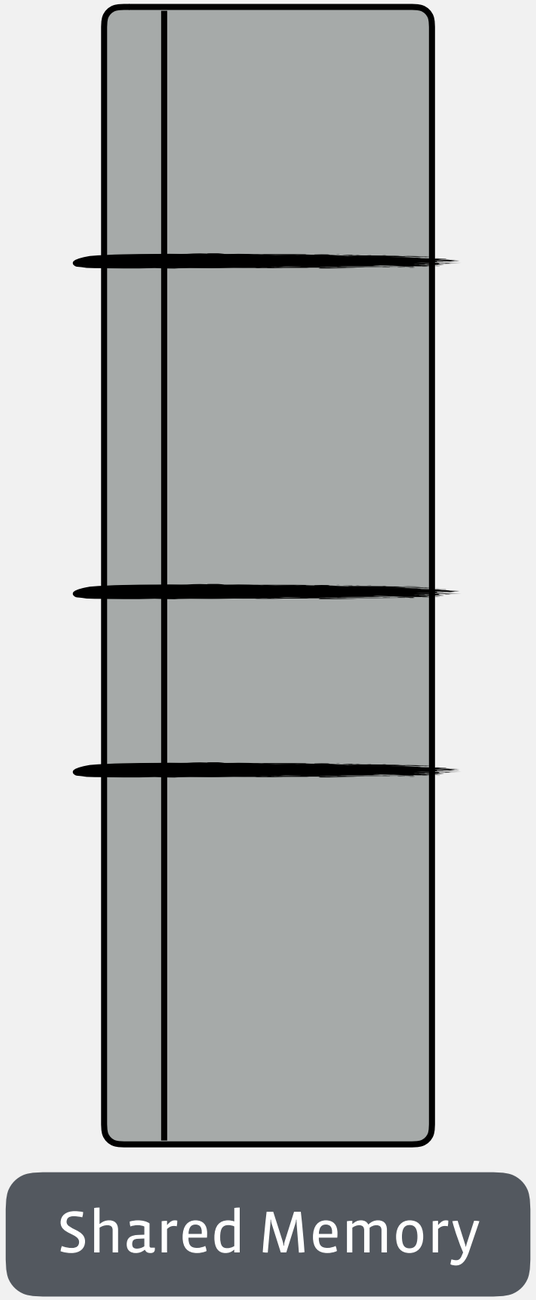


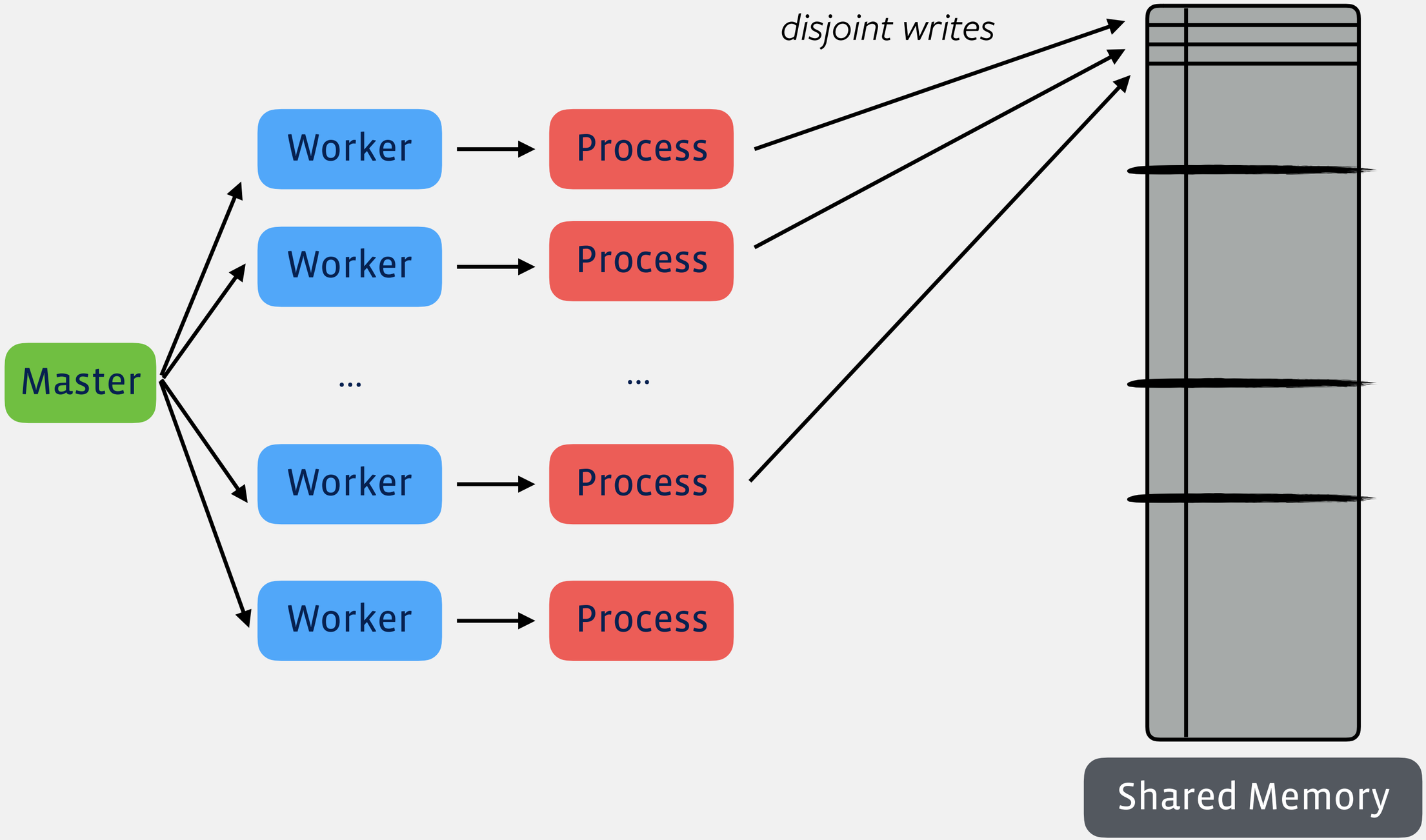

distribute!
Worker
Process
Worker
Process
Master
...
...
Worker
Process
Worker
Process


short-lived
work in parallel,
reclaim memory
long-lived
avoid bottleneck,
avoid GC
Master
Worker
Worker
...
Worker
Worker
Process
Process
...
Process
Process


Master
Worker
Worker
Worker
Worker
Process
Process
Process
Process
...
...


Master
Worker
Process
Worker
Process
...
...
Worker
Process
Worker
Process


Shared Memory


disjoint writes
Master
Worker
Worker
...
Worker
Worker
Process
Process
...
Process
Process
Shared Memory

Worker

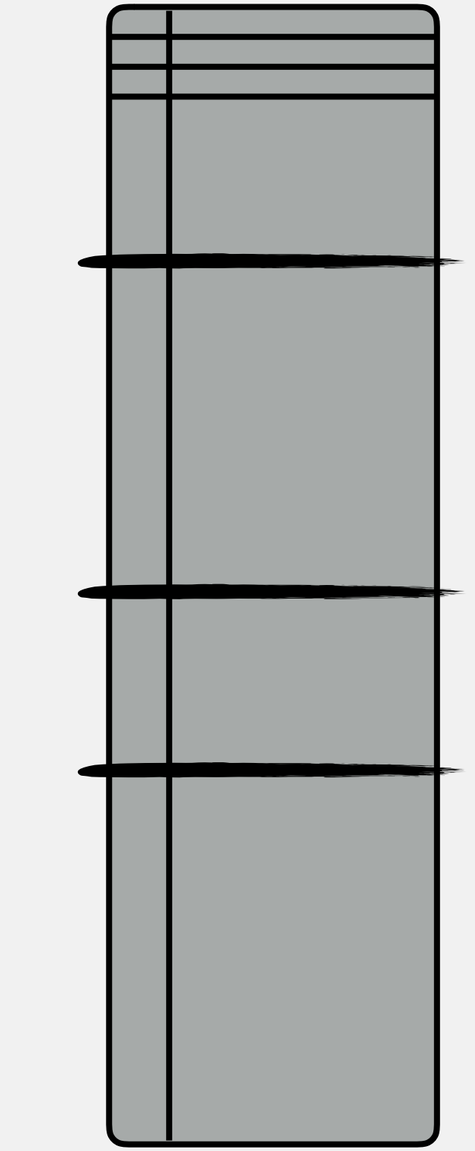
Worker

Master

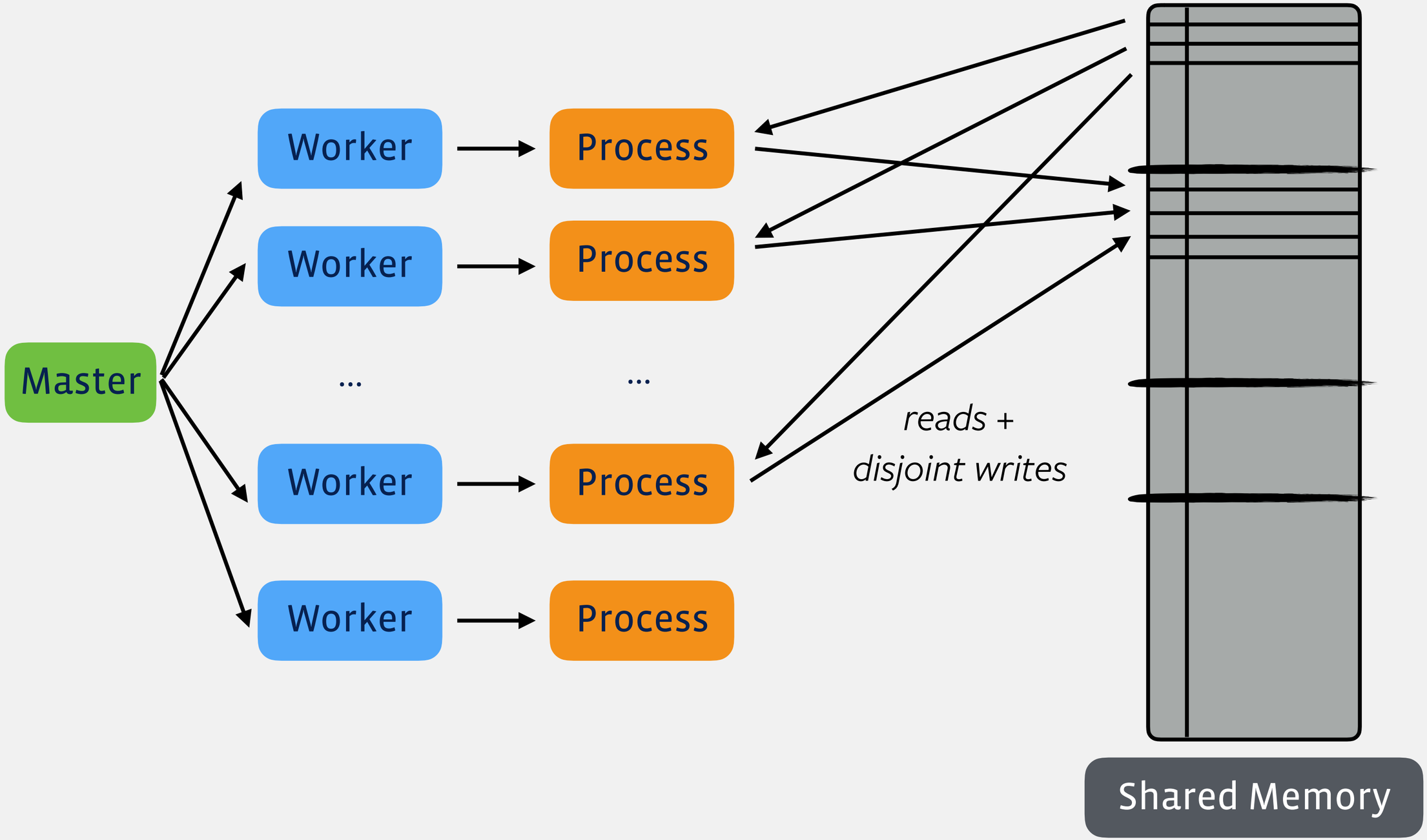
...

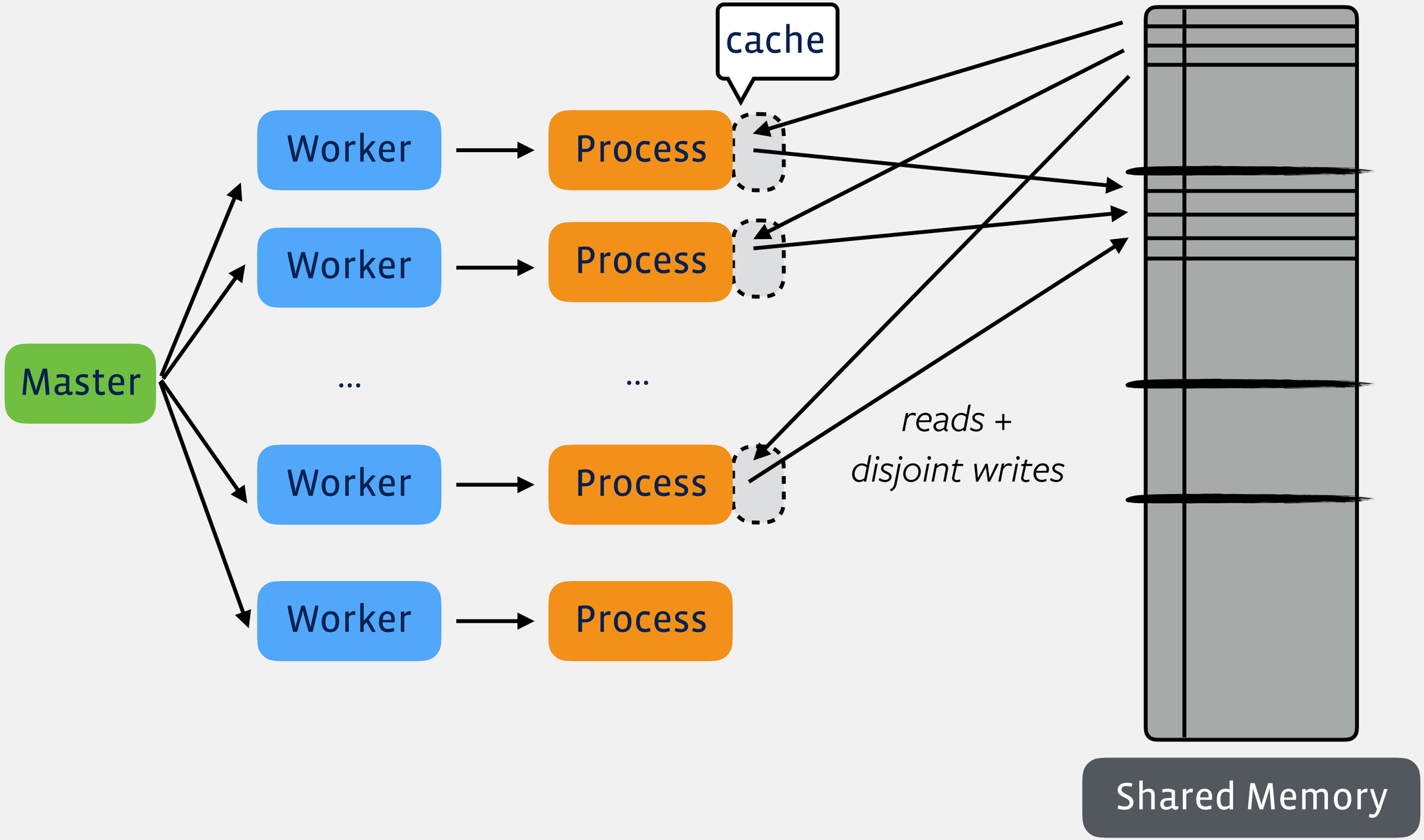
Worker

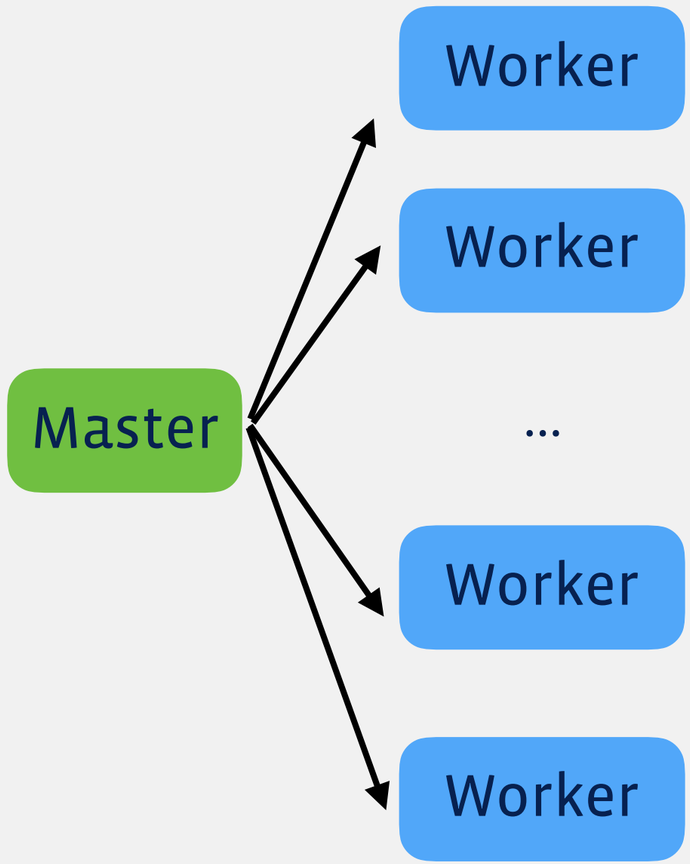
Worker

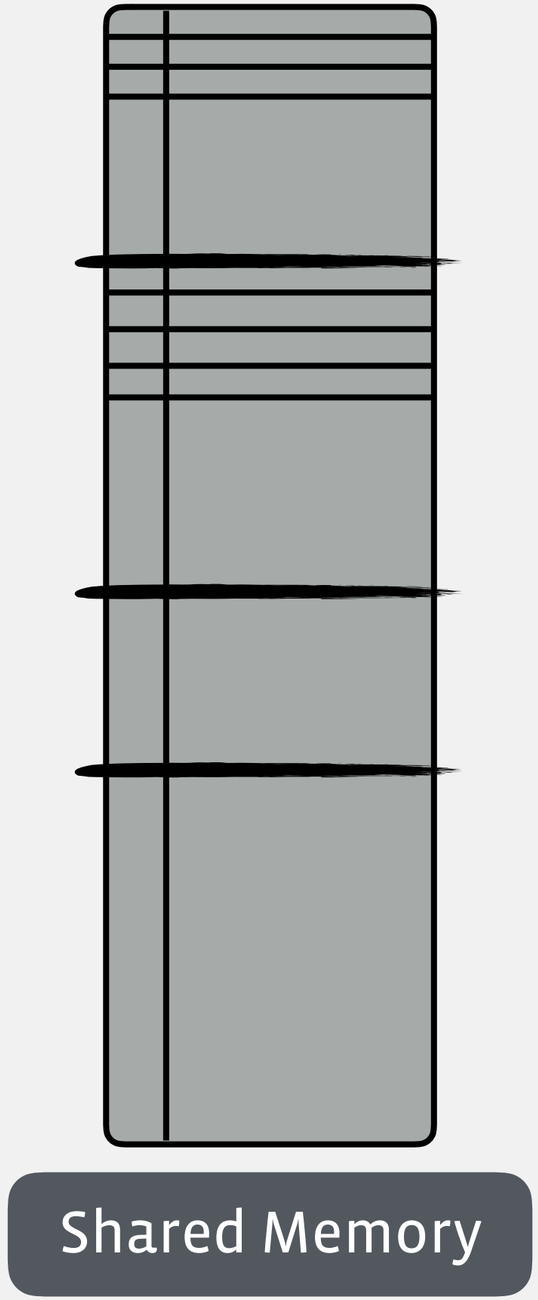


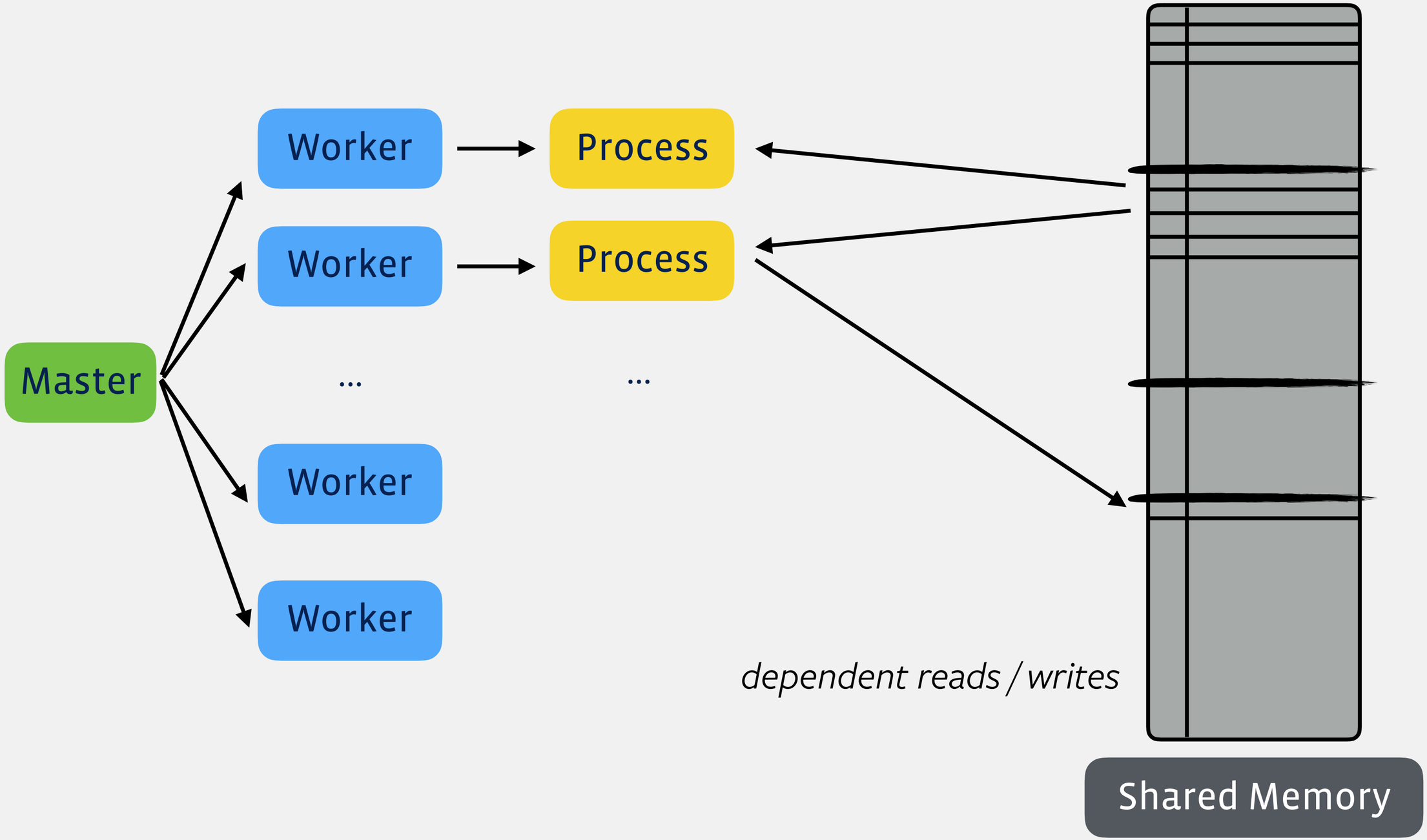
Shared Memory

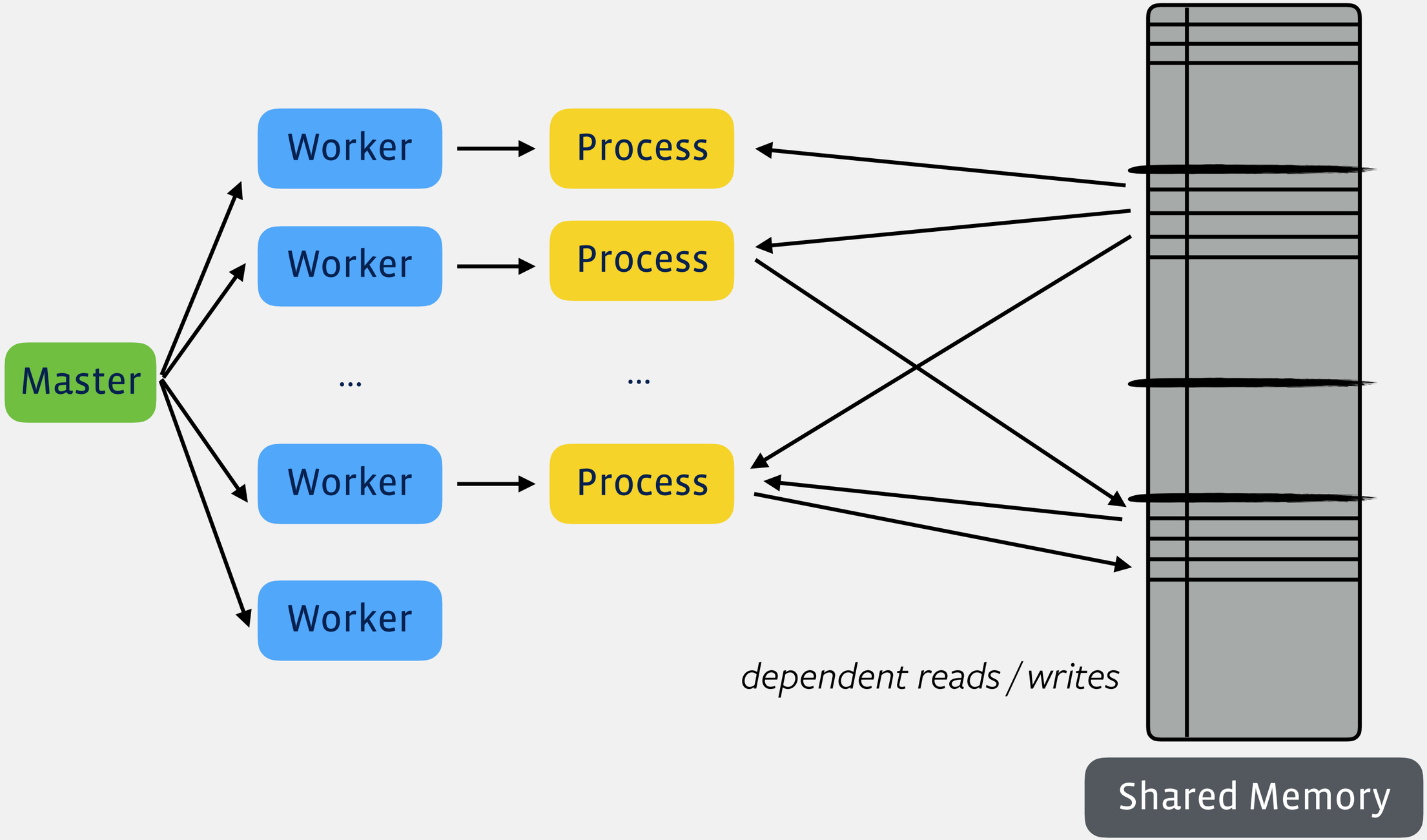

Master
Worker
Worker
...
Worker
Worker
Process
Process
...
Process
Process
reads +
disjoint writes
Shared Memory

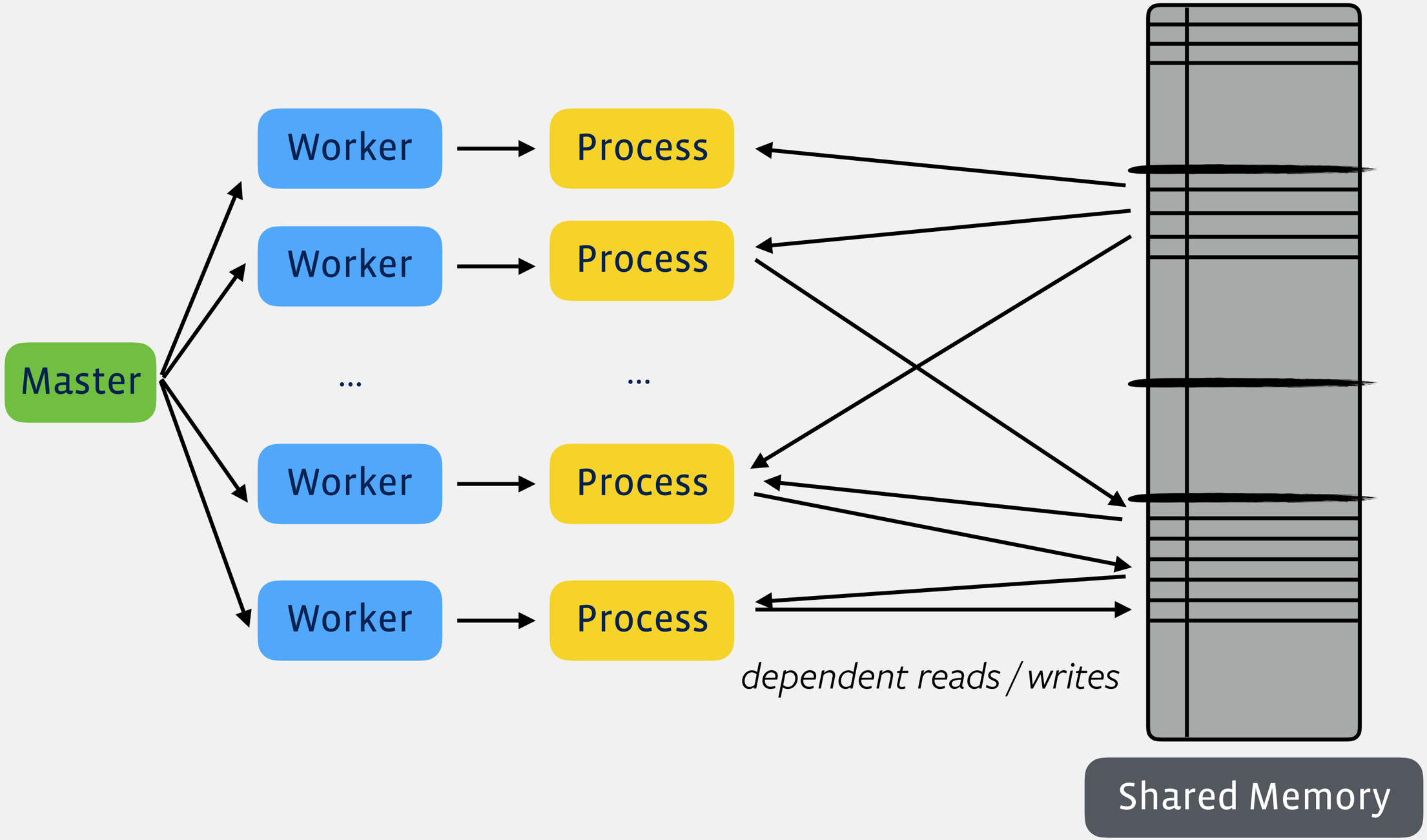

cache
Worker
Process
Worker
Process
Master
...
...
Worker
Process
Worker
Process
reads +
disjoint writes
Shared Memory


Master
Worker
Worker
...
Worker
Worker

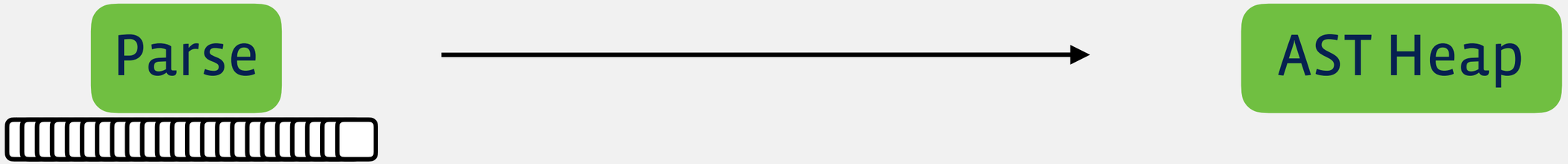

Shared Memory

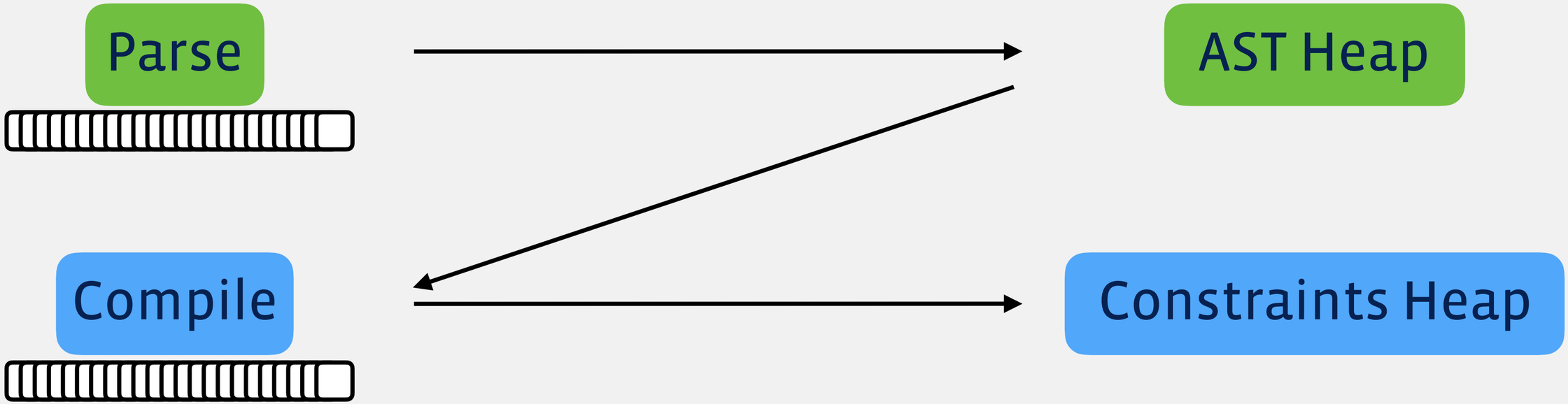

Worker
Process
Worker
Process
Master
...
...
Worker
Worker
dependent reads / writes
Shared Memory

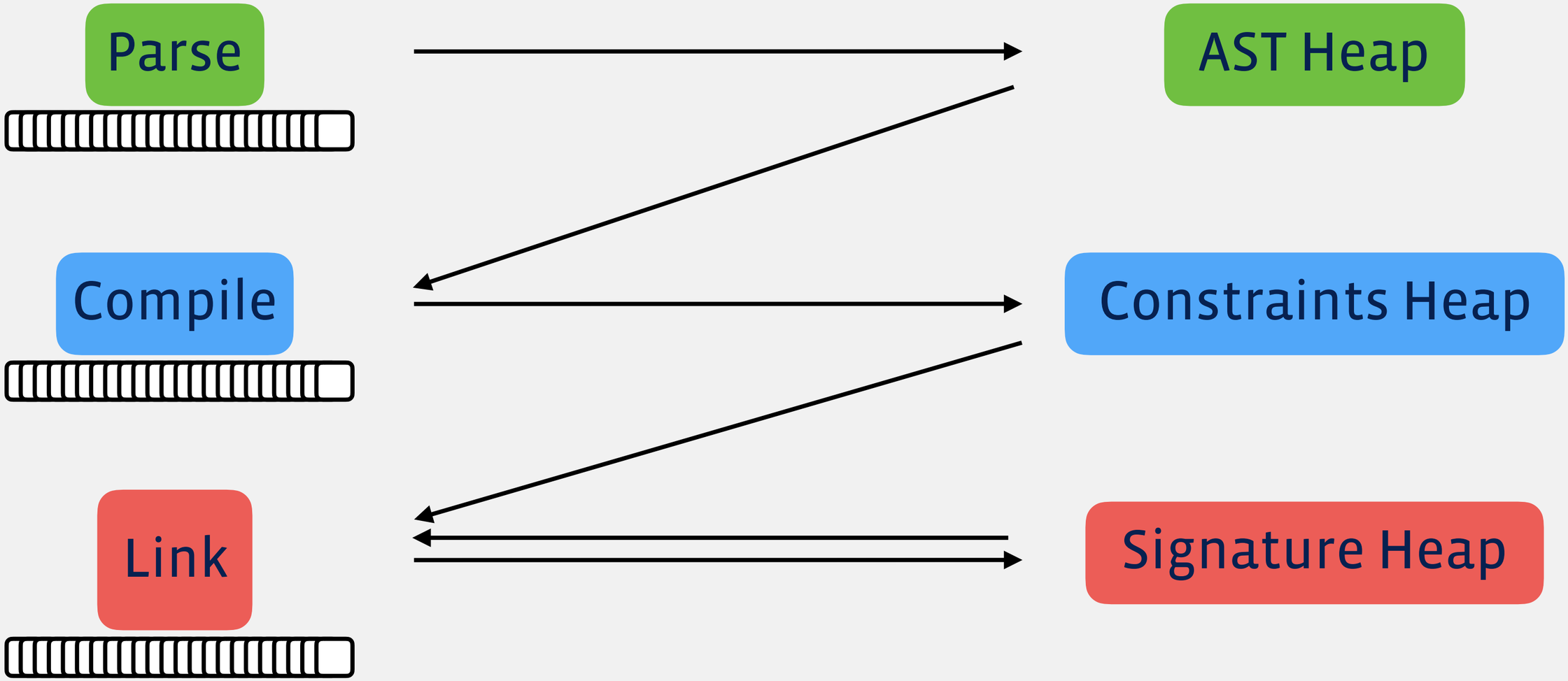

Master
Worker
Worker
...
Worker
Worker
Process
Process
...
Process
dependent reads / writes
Shared Memory

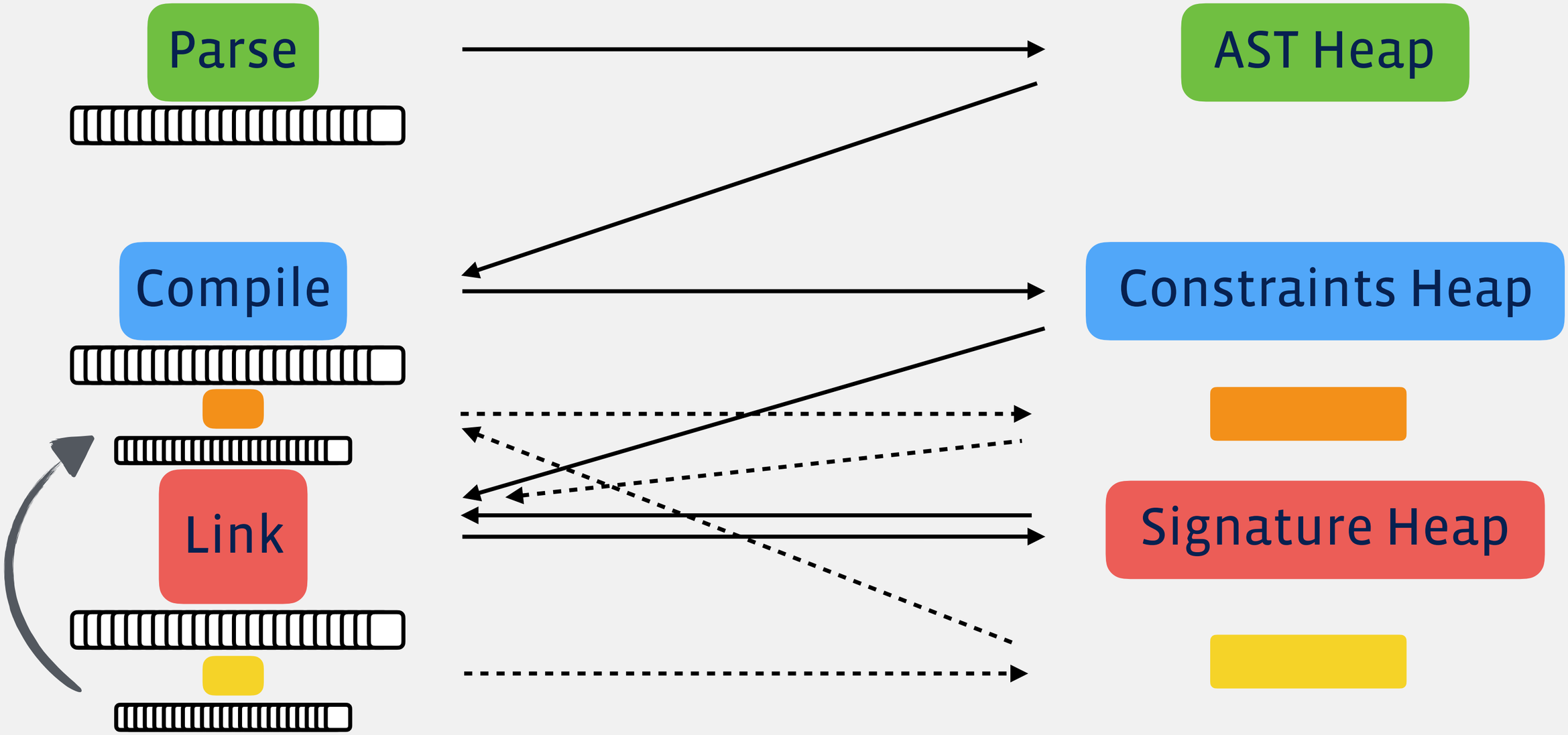

Master
Worker
Worker
...
Worker
Worker
Process
Process
...
Process
Process
dependent reads / writes
Shared Memory

Putting everything together...


Parse
AST Heap


Parse
AST Heap
Compile
Constraints Heap


Parse
Compile
Link
AST Heap
Constraints Heap
Signature Heap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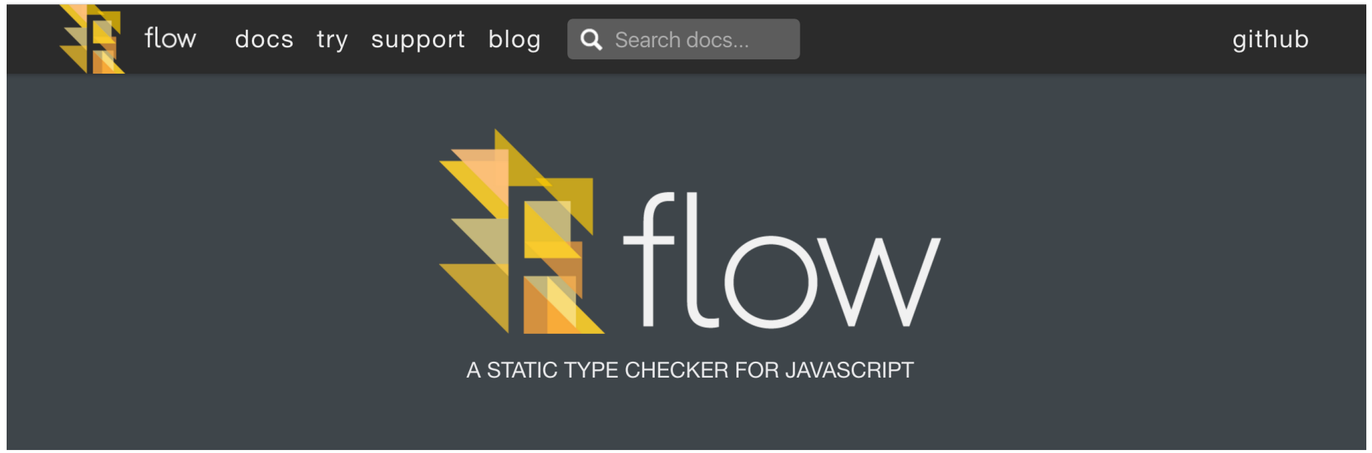

Type Inference

Flow uses type inference to find bugs even without type annotations. It precisely tracks the types of variables as they flow through your program.

Idiomatic JS

Flow is designed for JavaScript programmers. It understands common JavaScript idioms and very dynamic code.

Realtime Feedback

Flow incrementally rechecks your changes as you work, preserving the fast feedback cycle of developing plain JavaScript.

Flow can catch common bugs in JavaScript programs before they run, including:

- silent type conversions,
- `null` dereferences,
- and the dreaded `undefined is not a function`.

```
1  // @flow
2  function foo(x) {
3    return x * 10;
4  }
5  foo('Hello, world!');
```

show Flow output

☑ Fast

☑ Precise

Are you in  flow?


flow