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- **Presentation is running**

ES5 → ES6

[HoneyBook Tech Talk: Jan 4 2017]

I'm John Haugeland

In this talk

In this talk

- **What is ES6**

In this talk

- What is ES6
- **Why do we care about ES6**

In this talk

- What is ES6
- Why do we care
- **Code examples**

In this talk

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- **Code examples**
  - **We'll cover `destructuring`, `arrows`, `const`, `let`, `template strings`, `collapsed properties`, `spread`, `rest`, `default`, `modules`, and `tail calls`**

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- **How does ES6 help us**

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  - **do work faster**

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- **In summary**

Propaganda site

What is ES6

ECMA-262 Version 6.0, June 2015

What is ES6

- **Short version: it's new, useful, easier tools**

In this talk

What is ES6

What is ES6

- **Short version: it's new, useful, easier tools**

ES5 approach:

```
var container = [1,2,3,4,5],
    result;
```

```
function double(x) {
  return x*2;
}
```

```
for (var i=0, iC<container.length; i<iC; ++i) {
  result.push(double(container[i]));
}
```

In this talk

What is ES6

What is ES6

- **Short version: it's new, useful, easier tools**

ES6 approach:

```
var container = [1,2,3,4,5],
    result    = container.map(x => x*2);
```

In this talk

What is ES6

What is ES6

- Short version: it's new, useful, easier tools
- **Javascript comes in versions**

What is ES6

- Short version: it's new, useful, easier tools
- Javascript comes in versions
- **Modern browsers all do (almost) all of EcmaScript-262 Version 5**

In this talk

What is ES6

What is ES6

- Short version: it's new, useful, easier tools
- Javascript comes in versions
- **Modern browsers all do (almost) all of ~~EcmaScript-262 Version 5~~ ES5**
  - **Because that's horrible to write, we say ES5**

What is ES6

- Short version: it's new, useful, easier tools
- Javascript comes in versions
- **Modern browsers all do (almost) all of ES5**
  - **ES5 was originally ES3.1; renamed in July 2008**

In this talk

What is ES6

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  - **ES6 emerged from community, not standards**

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  - **JavaScript stagnated until 2015**
  - **`6to5` let community move on without ECMA**
  - **ES6 emerged from community, not standards**
  - **22 major changes**

In this talk

What is ES6

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- Short version: it's new, useful, easier tools
- Javascript comes in versions
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    - ES3.1; 4; 5.1; 2015; 6to5; community; 22
- **Modern browsers all do most of ES6**

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- Short version: it's new, useful, easier tools
- Javascript comes in versions
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  - ES3.1; 4; 5.1; 2015; 6to5; community; 22
- **Modern browsers all do most of ES6**
  - `Edge 14` **93%**
  - `FF50` **92%**
  - `Chrome 55`: **97%**
  - `Safari 10`: **100%**
  - `iOS 10 Safari`: **100%**
  - `Node 7`: **97%**
  - **Reference: Kangax**

In this talk

What is ES6

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- Short version: it's new, useful, easier tools
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  - ES3.1; 4; 5.1; 2015; 6to5; community; 22
- Modern browsers all do most of ES6
  - 92-100% coverage
- **Babel shims raise all of those to** `>= 98.8%`

Why do we care about ES6

Because we want to be better; faster; lazier

In this talk

What is ES6

Why care

Why do we care about ES6

- **This will help us move faster in new work**

In this talk

What is ES6

Why care

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In this talk

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In this talk

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- **This will help us make better deploys**

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- **This will help us ditch some libraries we use**

In this talk

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Why do we care about ES6

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- **This is where the world is going**
  - **We'll need this for other tools sooner or later**

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Why care

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  - **We'll need this for other tools sooner or later**
  - **We already do, for `react`**

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- **This is where the world is going**
  - **We'll need this for other tools sooner or later**
  - **We already do, for `react`**
  - **Many other tools, like `koa`, `jspm` / `systemjs`, `rollup`, `es7-membrane`, `angular 2`, `flowtype`, `typescript` also need it**

In this talk

What is ES6

Why care

Why do we care about ES6

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  - **Hiring is easier in modern tooling**

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I'll justify these after the examples. But, first, *let's see some of the actual code*.

Code examples

Finally, some actual things to learn!

In this talk

What is ES6

Why care

Examples!

Code examples

One by one, let's compare the `ES5` and the `ES6` way.

In this talk

What is ES6

Why care

Examples!
  Destructuring

Destructuring

(aka pattern matching)

In this talk

What is ES6

Why care

Examples!

Destructuring

Destructuring

In this talk

What is ES6

Why care

Examples!
Destructuring

Destructuring

Destructuring assignment (called `pattern matching` in some languages) is a much easier way to get values out of structures, with less boilerplate.

In this talk

What is ES6

Why care

Examples!

Destructuring

Destructuring

Destructuring assignment (called `pattern matching` in some languages) is a much easier way to get values out of structures, with less boilerplate.

```
function makeRectangle() {
  return { width: 5, height: 10, color: 'blue' };
}
```

```
const { width, height } = makeRectangle();
```

In this talk

What is ES6

Why care

Examples!

Destructuring

Destructuring

You may also destructure deep datastructures.

```
const person = {
  name: {
    first  : 'Bob',
    last   : 'Dobbs'
  },
  job: {
    title  : 'Subgenius',
    salary : 80000,
    site   : 'Paris'
  }
};
```

```
function GetTitleLine(personData) {
  { name: { first, last }, job: { title } } = personData;
  return first + ' ' + last + "(" + title + ")";
}
```

In this talk

What is ES6

Why care

Examples!

Destructuring

Destructuring

You can also destructure arrays.

```
const someData     = [4,1,7,2,6,3,5],
      [pivot, ...] = whatever,         /* pivot is now 4 */
      [a,b,c, ...] = whatever;         /* b is 1; c is 7 */
```

In this talk

What is ES6

Why care

Examples!

Destructuring

Destructuring

You can also destructure arrays.

```
const someData     = [4,1,7,2,6,3,5],
      [pivot, ...] = whatever,         /* pivot is now 4 */
      [a,b,c, ...] = whatever;         /* b is 1; c is 7 */
```

We'll get back to this example when we do the `spread` operator. This dovetails nicely with other stuff.

In this talk

What is ES6

Why care

Examples!

Destructuring

Destructuring

You can *also* destructure in the arguments of a function.

```
const person = {
  name: {
    first  : 'Bob',
    last   : 'Dobbs'
  },
  job: {
    title  : 'Subgenius',
    salary : 80000,
    site   : 'Paris'
  }
};
```

```
function Title({ name: { first, last }, job: { title } }) {
  return first + ' ' + last + "(" + title + ")";
}
```

In this talk

What is ES6

Why care

Examples!

- Destructuring
- Arrows

Arrow functions

In this talk

What is ES6

Why care

Examples!
- Destructuring
- Arrows

Arrow functions

Arrow functions are anonymous functions that lexically bind `this` automatically. They also have an interesting notation which allows you to throw away most of the code.

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What is ES6

Why care

Examples!

- Destructuring
- Arrows

Arrow functions

Arrow functions are anonymous functions that lexically bind `this` automatically. They also have an interesting notation which allows you to throw away most of the code.

ES5:

```
const foo = function(x) { return x*2; }
```

ES6:

```
const foo = (x) => { return x*2; }
```

In this talk

What is ES6

Why care

Examples!

- Destructuring
- Arrows

Arrow functions

If an arrow has exactly one statement, you may write it as an expression, instead. This means no `{ }` block, and no need for a `return`.

ES5:

```
const foo = function(x) { return x*2; }
```

ES6:

```
const foo = (x) => x*2;
```

In this talk

What is ES6

Why care

Examples!

- Destructuring
- Arrows

Arrow functions

If an arrow takes exactly one argument, you may also discard the parentheses around the argument. (Not with multiple or zero, though.)

ES5:

```
const foo = function(x) { return x*2; }
```

ES6:

```
const foo = x => x*2;
```

In this talk

What is ES6

Why care

Examples!
- Destructuring
- Arrows

Arrow functions

Arrows are ***super useful*** with destructuring.

```
const area = ({width, height}) => width * height;
```

In this talk

What is ES6

Why care

Examples!

- Destructuring
- Arrows

Arrow functions

Arrows are ***super useful*** with destructuring.

```
const area = ({width, height}) => width * height;
```

```
[
  { width: 4, height: 2, color: blue },
  { width: 3, height: 3, border: false },
  { width: 5, height: 1, opacity: 0.5 },
].map(
  rekt => console.log(area(rekt))
);
```

In this talk

What is ES6

Why care

Examples!

- Destructuring
- Arrows

Arrow functions

As a result, you can write code like

```
const top5_salary_sum_daily =
  people
    .filter( person  => person.alive        )
    .filter( person  => person.employed     )
    .sort  ( (a,b)   => a.salary - b.salary )  /* reverse */
    .slice(5)
    .map   ( person  => salary / 365        )
    .reduce( (acc,n) => acc + n             ); /* sum */
```

In this talk

What is ES6

Why care

Examples!

- Destructuring
- Arrows

Member `Bob Dobbs`?

```
function Title({ name: { first, last }, job: { title } }) {
  return first + ' ' + last + "(" + title + ")";
}
```

becomes

```
const Title = ({ name: { first, last }, job: { title } }) =>
  first + ' ' + last + "(" + title + ")";
```

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What is ES6

Why care

Examples!
- Destructuring
- Arrows

Arrow functions

Lexical `this` means you don't need to `.bind`.

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What is ES6

Why care

Examples!

- Destructuring
- Arrows

Arrow functions

Lexical `this` means you don't need to `.bind`.

Given

```
const someObj = { val: 25 };
const caller  = { val: 50, makeCall: () => someObj.doCall() }
```

In this talk

What is ES6

Why care

Examples!

- Destructuring
- Arrows

Arrow functions

Lexical `this` means you don't need to `.bind`.

Given

```
const someObj = { val: 25 };
const caller  = { val: 50, makeCall: () => someObj.doCall() };
```

This will return 50, not 25:

```
/* `this` refers to the caller, not someObj */
someObj.doCall = function() { return this.val; }
```

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What is ES6

Why care

Examples!

- Destructuring
- Arrows

Arrow functions

Lexical `this` means you don't need to `.bind`.

Given

```
const someObj = { val: 25 };
const caller  = { val: 50, makeCall: () => someObj.doCall() }
```

This will return 50, not 25:

```
/* `this` refers to the caller, not someObj */
someObj.doCall = function() { return this.val; }
```

This gives 25 like most people expect:

```
someObj.doCall = function() { return this.val; }.bind(someObj
```

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Why care

Examples!
- Destructuring
- Arrows

Arrow functions

Lexical `this` means you don't need to `.bind`.

Given

```
const someObj = { val: 25 };
const caller  = { val: 50, makeCall: () => someObj.doCall() }
```

This will return 50, not 25:

```
/* `this` refers to the caller, not someObj */
someObj.doCall = function() { return this.val; }
```

This gives 25 like most people expect:

```
someObj.doCall = function() { return this.val; }.bind(someObj
```

It's just handled with arrows, though.

```
someObj.doCall = () => this.val;
```

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Why care

Examples!
- Destructuring
- Arrows

Arrow function gotcha

This is Javascript, which is why we can't have nice things.

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Arrow function gotcha

This is Javascript, which is why we can't have nice things.

If your arrow returns an `object`, which also uses `{}` to delimit, the arrow is going to think you're writing a block.

```
/ error: this is a block, not an object /
const dagnabbit = () => { foo: 'bar' };
```

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Examples!
- Destructuring
- Arrows

Arrow function gotcha

This is Javascript, which is why we can't have nice things.

If your arrow returns an `object`, which also uses `{}` to delimit, the arrow is going to think you're writing a block.

```
// error: this is a block, not an object //
const dagnabbit = () => { foo: 'bar' };
```

You'll need to write

```
const dagnabbit = () => { return { foo: 'bar' }; }
```

In this talk

What is ES6

Why care

Examples!

- Destructuring
- Arrows
- Const

Const

In this talk

What is ES6

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Examples!

- Destructuring
- Arrows
- Const

Const

Stop letting things change that shouldn't change!

```
const size = 5;
...
size = 10;
```

In this talk

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Examples!

- Destructuring
- Arrows
- Const

Const

Stop letting things change that shouldn't change!

```
const size = 5;
...
size = 10;
```

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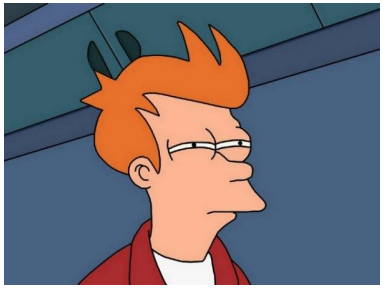
Examples!
- Destructuring
- Arrows
- Const

Const

At Tilt, we thought this wasn't going to be a big deal. We had a low-bug frontend, and we were smart programmers who didn't do silly things with name re-use.



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- Destructuring
- Arrows
- Const

Const

At Tilt, we thought this wasn't going to be a big deal. We had a low-bug frontend, and we were smart programmers who didn't do silly things with name re-use.

Moving from `var` to `const` ended up turning up almost 40 bugs basically overnight.

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What is ES6

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Examples!
- Destructuring
- Arrows
- Const

Const

At Tilt, we thought this wasn't going to be a big deal. We had a low-bug frontend, and we were smart programmers who didn't do silly things with name re-use.

Moving from `var` to `const` ended up turning up almost 40 bugs basically overnight.

We can get tooling support from `eslint`, to help us find these. This doesn't have to be an archaeological dig.

In this talk

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Why care

Examples!

- Destructuring
- Arrows
- Const
- Let

Let

In this talk

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- Let

Let

`let` is just `var` with less-stupid binding rules.

In this talk

What is ES6

Why care

Examples!
- Destructuring
- Arrows
- Const
- Let

Let

Let's see who's feeling froggy.

```
for (var i=0; i<5; ++i) {
  document.getElementById('button' + i.toString()).onClick =
    () => window.alert('Button ' + i + ' pressed!');
}
document.getElementById('button3').click();
```

What message gets alerted?

In this talk

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Why care

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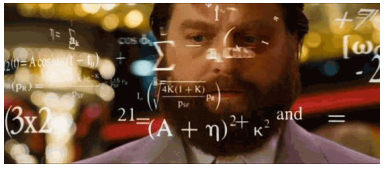
Let

```
for (var i=0; i<5; ++i) {
  document.getElementById('button' + i.toString()).onClick =
    () => window.alert('Button ' + i + ' pressed!');
}
document.getElementById('button3').click();
```

The message will be "Button 5 pressed!"

In fact, it'll say that for all of them.



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Let

```
for (var i=0; i<5; ++i) {
  document.getElementById('button' + i.toString()).onClick =
    () => window.alert('Button ' + i + ' pressed!');
}
document.getElementById('button3').click();
```

The problem is that what's being bound in that function is the actual variable, rather than the value. So, as the for loop updates the value, the functions just check the variable, and get the new value.

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Let

```
for (let i=0; i<5; ++i) {
  document.getElementById('button' + i.toString()).onClick =
    () => window.alert('Button ' + i + ' pressed!');
}
document.getElementById('button3').click();
// because of let i, now gets 3 like you'd expect
```

The problem is that what's being bound in that function is the actual variable, rather than the value. So, as the for loop updates the value, the functions just check the variable, and get the new value.

If you change the `var` to `let`, then the declaration will be remade for each pass of the loop (like most people expect,) and each handler will get its own, no longer updated copy.

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Let

`let` also disallows redefinition, which (augh) `var` does not.

```
var a = 3;
var a = 5; // legal; source of bugs when far apart
```

```
let b = 3;
let b = 5; // this is an error, thank ${religion.prophet}
```

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Let

`let` also disallows redefinition, which (augh) `var` does not.

```
var a = 3;
var a = 5; // legal; source of bugs when far apart
```

```
let b = 3;
let b = 5; // this is an error, thank ${religion.prophet}
```

The number of bugs this turned up at Womply was startling and gross.

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Let

More strictly, `let` is local scoped, whereas `var` is block scoped. That is, `var` is scoped to the block it's in, which is generally the top level function.

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Let

More strictly, `let` is local scoped, whereas `var` is block scoped. That is, `var` is scoped to the block it's in, which is generally the top level function.

Block scoping leaks.

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Let

More strictly, `let` is local scoped, whereas `var` is block scoped. That is, `var` is scoped to the block it's in, which is generally the top level function.

Block scoping leaks.

```
function foo() {
  for (var i=0; i<10; ++i) { whatever(); }
  console.log(i);  // 10
}
```

```
function bar() {
  for (let i=0; i<10; ++i) { whatever(); }
  console.log(i);  // undefined
}
```

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- Let

Let

More strictly, `let` is local scoped, whereas `var` is block scoped. That is, `var` is scoped to the block it's in, which is generally the top level function.

Block scoping leaks.

```
function foo() {
  for (var i=0; i<10; ++i) { whatever(); }
  console.log(i);  // 10
}
```

```
function bar() {
  for (let i=0; i<10; ++i) { whatever(); }
  console.log(i);  // undefined
}
```

This can cause weird bugs, especially around shadowing (this was in a PR here the other day, and ***does happen semi-frequently*** in the real world.)

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Examples!

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Let

There is almost no good reason to use `var` anymore.

If it's constant (it usually is,) use `const`.

Otherwise, please use `let`. It prevents problems.

In this talk

What is ES6

Why care

Examples!
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- Templates

Template String Literals

We now have a notation for inlining. Backticks make a "template string." Within a template string, expressions like `${foo}` are evaluated ***at assignment time***.

```
var whom = "George",
    what = `I had lunch with ${whom}.`;
```

These interpolations need not be other variables, or literals; they may be any expression.

```
const seq  = ['bob', 'linda', 'bill', 'mayhem'],
      text = `We invited: ${ seq.join(', ') }!`;
```

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Template String Literals

Template string literals may also be multi-line. To replace:

ES5:

```
function pageframe(title, menu, content) {
  const mitems = menu.join('</li><li>')
  return
'<!doctype>\
<html>\
  <head>\
    <title>' + title + '</title>\
  </head>\
  <body>\
    <ul class="menu"><li>' + mitems + '</li></ul>\
    ' + content + '\
  </body>\
</html>';
}
```

(lol the highlighter can't even render this)

In this talk

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Template String Literals

You could instead write:

ES6:

```
const pageframe = (title, menu, content) =>
`<!doctype>
<html>
  <head>
    <title>${title}</title>
  </head>
  <body>
    <ul class="menu"><li>${menu.join('</li><li>')}</li></ul>
    ${content}
  </body>
</html>
}`;
```

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Examples!

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Member `Bob Dobbs`?

```
const Title = ({ name: { first, last }, job: { title } }) =>
  first + ' ' + last + "(" + title + ")";
}
```

becomes

```
const Title = ({ name: { first, last }, job: { title } }) =>
  `${first} ${last} (${title})`;
```

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- Export

Import/export

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- Export

Import/export

The module loader we deserve

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- Export

Import/export

The module loader we deserve

Will work in browsers Real Soon Now ™

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- Export

Import/export

The module loader we deserve

Will work in browsers Real Soon Now ™

About the code, not the implementation. Can easily be converted to current tooling.

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- Export

Import/export

The module loader we deserve

Will work in browsers Real Soon Now ™

About the code, not the implementation. Can easily be converted to current tooling.

Feels like a nicer version of `require` from `node CommonJS`.

In this talk

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- Export

Import/export

The module loader we deserve

Will work in browsers Real Soon Now ™

About the code, not the implementation. Can easily be converted to current tooling.

Feels like a nicer version of `require` from `node CommonJS`.

Already works in our stack.

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Import/export

This is super useful for breaking code up and making it modular, without shenanigans.

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- Export

Import/export

This is super useful for breaking code up and making it modular, without shenanigans.

Given:

```
const Bob = { name: {first: 'Bob', last: 'Dobbs'} };
```

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Why care

Examples!
- Destructuring
- Arrows
- Const
- Let
- Templates
- Export

Import/export

This is super useful for breaking code up and making it modular, without shenanigans.

Given:

```
const Bob = { name: {first: 'Bob', last: 'Dobbs'} };
```

Utility module:

```
const getname({ name: {first, last} }) => `${first} ${last}`;
export { getname: getname };
```

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- Let
- Templates
- Export

Import/export

This is super useful for breaking code up and making it modular, without shenanigans.

Given:

```
const Bob = { name: {first: 'Bob', last: 'Dobbs'} };
```

Utility module:

```
const getname({ name: {first, last} }) => `${first} ${last}`;
export { getname: getname };
```

Dependent code:

```
import { getname } from './js/util.js';
console.log(getname(Bob));
```

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What is ES6

Why care

Examples!

- Destructuring
- Arrows
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- Templates
- Collapse

Collapsed properties

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Collapsed properties

This is kind of a minor thing, but it actually makes stuff a lot more readable, so, whatever.

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Collapsed properties

This is kind of a minor thing, but it actually makes stuff a lot more readable, so, whatever.

You know how in `SGML` you can skip the value of a property when it's the same as the key?

```
<input disabled="disabled"/>
<input disabled/>   <!-- same thing -->
```

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- Collapse

Collapsed properties

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You can do that in JS now too.

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Collapsed properties

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You know how in `SGML` you can skip the value of a property when it's the same as the key?

```
<input disabled="disabled"/>
<input disabled/>   <!-- same thing -->
```

You can do that in JS now too.

```
const a=5, b=false, c="wha";
console.log({ a: a, b: b, c: c });
console.log({ a, b, c });
/* these both say { a: 5, b: false, c: 'wha' } */
```

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- Let
- Templates
- Collapse

Collapsed properties

Given:

```
const foo = 'stuff' + someCall(),
      bar = 12,
      baz = ['what','ever'].join('');
```

Old way:

```
function DoTheThing() {
  return { foo: foo, bar: bar, baz: baz };
}
```

New way:

```
function DoTheThing() {
  return { foo, bar, baz };
}
```

In this talk

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Examples!

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- Templates
- Collapse

Member util.js?

Was:

```
const getname({ name: {first, last} }) => `${first} ${last}`;
export { getname: getname };
```

Is now:

```
const getname({ name: {first, last} }) => `${first} ${last}`;
export { getname };
```

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Collapsed properties

Given:

```
const foo = 'stuff' + someCall(),
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Old way:

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New way:

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function DoTheThing() {
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Collapsed properties

Given:

```
const foo = 'stuff' + someCall(),
      bar = 12,
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Old way:

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function DoTheThing() {
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```

New way:

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function DoTheThing() {
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}
```

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Why care

Examples!

- Destructuring
- Arrows
- Const
- Let
- Templates
- Collapse
- Tail calls

Tail calls

What's the threat here?

```
function doEach(container) {
  if (!container.length) { return; }
  console.log(container[0]);
  doEach(container.slice(1));
}
```

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Examples!

- Destructuring
- Arrows
- Const
- Let
- Templates
- Collapse
- Tail calls

Tail calls

What's the threat here?

```
function doEach(container) {
  if (!container.length) { return; }
  console.log(container[0]);
  doEach(container.slice(1));
}
```

Each recursion pushes a new stack frame onto the stack. Eventually the stack runs out.

Stack frames contain the "previous function invokation," which the VM goes back to.

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Examples!

- Destructuring
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- Let
- Templates
- Collapse
- Tail calls

Tail calls

What's the threat here?

```
function doEach(container) {
  if (!container.length) { return; }
  console.log(container[0]);
  doEach(container.slice(1));
}
```

Tail calls mean there's no stack frame to go back to, so you can recurse safely over huge data.

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What is ES6

Why care

Examples!

- Destructuring
- Arrows
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- Templates
- Collapse
- Tail calls
- Defaults

Defaults

ES5:

```
function foo(a, b) {
  a = a || 5;
  b = b || 'whatever';
  console.log(`${a}, ${b}`);
}
```

ES6:

```
function foo(a=5, b='whatever') {
  console.log(`${a}, ${b}`);
}
```

Tail calls mean there's no stack frame to go back to, so you can recurse safely over huge data.

How does ES6 help us

Let's actually get down into some specifics

In this talk

What is ES6

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Examples!

How helped

How does ES6 help us

Lots of ways, it turns out.

Let's group them into five sets.

How does ES6 help us do work faster

Simpler traversals; pattern matching; arrows; functional code; better APIs

In this talk

What is ES6

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Examples!

How helped
Work

Help us do work faster

Some of the features in ES6 can have a surprisingly dramatic impact on productivity.

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Examples!

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Work

Help us do work faster

Some of the features in ES6 can have a surprisingly dramatic impact on productivity.

- Template string literals
- Arrow functions
- Destructuring assignment
- The spread operator
- Block scoping through `let`
- `import` / `export`
- Real inheritance
- `get`ters and `set`ters
- `promise`s
- **default values**

In this talk

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Help us do work faster

Some of the features in ES6 can have a surprisingly dramatic impact on productivity.

- Template string literals
- Arrow functions
- Destructuring assignment
- The spread operator
- Block scoping through `let`
- `import` / `export`
- Real inheritance
- `get`ters and `set`ters
- `promise`s
- **default values**

Many classes of code that are common online can see 50-75% reductions in the amount of work needed to implement something. Woo less work!

How does ES6 help us find bugs faster

Stronger rules; proper classes; 'use strict'; removing manual code

In this talk

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- Work
- Debug

Help us find bugs faster

Lots of things have been added to `ES6` that make it easier to find problems.

In this talk

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Help us find bugs faster

Lots of things have been added to `ES6` that make it easier to find problems.

- `const` - let's stop letting things change which shouldn't
- `let` - makes `const` declarations in loops tolerable
- arrow lexical `this` - bye bye `.bind` (and `that`)
- typed `Array`s - eliminate many mis-fills
- pseudotype `class`es - `__prototype__` begone!
- default values - better than `||` or `!== undefined`
- `get`ters and `set`ters - as log points
- **`WeakSet` and `WeakMap` - fewer memory leaks for sure**

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Help us find bugs faster

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ES6 is stricter in important ways than ES5, and gives you the tools to be stricter, too

In this talk

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Help us find bugs faster

Lots of things have been added to `ES6` that make it easier to find problems.

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- `get`ters and `set`ters - as log points
- **`WeakSet` and `WeakMap` - fewer memory leaks for sure**

ES6 is stricter in important ways than ES5, and gives you the tools to be stricter, too

Plus, our path through `babel` means that `'use strict'` is always on.

How does ES6 help us better re-use code

Better interfaces; compositional mechanisms; tooling allows ES7 import/export

In this talk

What is ES6

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Examples!

How helped
- Work
- Debug
- Re-use

Help us better re-use code

Re-use is a very big deal.

In this talk

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- Re-use

Help us better re-use code

Re-use is a very big deal.

- The whole team's looking to combine HB and TWS
- Sean and Tracy are working on a reusable style guide
- Jonah has been looking at reusable pricing widgets
- Sean is discussing reusable component boundaries
- I'd like to move towards libraries in `NPM Private`
- Shai is looking at reusable `hb_stats` replacements
- Wendy has a re-use problem with mail
- Re-use was a big part of the "why React Native" talk
- Re-use of frames caused a Salesforce pileup for Abhi and Christina
- **It's probably on all of our minds; these are just the ones I've seen recently**

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Help us better re-use code

Re-use is a very big deal.

- (huge stupid list of examples)
- **It's probably on all of our minds**

The earlier you tackle the mechanics of ***how*** re-use works, the easier it is in the long term.

This is important because re-use is hard.

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What makes this hard?

Lots of the problems you see in earlier module systems, such as `tinyloader`s, `angular 1`, `requirejs`, `amd`, `commonjs`, and `npm commonjs` have to do with their only being designed to handle one build target (frontend, backend, custom module, etc.)

The emergence of `bower` and `systemjs` was too late; instead a second layer of packagers, starting with `browserify` and moving on to `webpack`, `rollup`, and so forth, performed a large physical inclusion with a calling convention to hard-rig portable modules.

They all sucked, and were terrible.

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Examples!

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- Debug
- Re-use

So what do we do?

In this talk

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Why care

Examples!

How helped
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- Debug
- Re-use

So what do we do?

`import/export` is **The Truth**.

In this talk

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So what do we do?

`import/export` is **The Truth**.

`import/export` is **The Way**.

In this talk

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- Re-use

So what do we do?

`import/export` is **The Truth**.

`import/export` is **The Way**.

`import/export` loves you.

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So what do we do?

`import/export` is **The Truth**.

`import/export` is **The Way**.

`import/export` loves you.

`import/export` just wants you to be happy.

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So what do we do?

`import/export` is **The Truth**.

`import/export` is **The Way**.

`import/export` loves you.

`import/export` just wants you to be happy.

There is **none other** than `import/export`.

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So what do we do?

`import/export` is **The Truth**.

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`import/export` just wants you to be happy.

There is **none other** than `import/export`.

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- Re-use

No seriously, what do we do?

You can write a tinyloader in 20 minutes. Angular's module system was two people for four days. RequireJS was one guy and was working in three days. Browserify was one guy and five days. Webpack was two dudes and a weekend. Rollup was one guy's two week project.

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No seriously, what do we do?

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Javascript itself was a six day Brendan Eich hack.

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No seriously, what do we do?

You can write a tinyloader in 20 minutes. Angular's module system was two people for four days. RequireJS was one guy and was working in three days. Browserify was one guy and five days. Webpack was two dudes and a weekend. Rollup was one guy's two week project.

Javascript itself was a six day Brendan Eich hack.

A couple hundred neckbeards fought over `import/export` for **two and a half years**.

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- Re-use

No seriously, what do we do?

You can write a tinyloader in 20 minutes. Angular's module system was two people for four days. RequireJS was one guy and was working in three days. Browserify was one guy and five days. Webpack was two dudes and a weekend. Rollup was one guy's two week project.

Javascript itself was a six day Brendan Eich hack.

A couple hundred neckbeards fought over `import/export` for two and a half years.

`import/export` is much more thoughtfully designed than most of Javascript.

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- Re-use

What's the difference?

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What's the difference?

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What's the difference?

The other stuff is about how the packaging works. `import/export` doesn't care.

`import/export` is about how the code interacts with other code. And then, it can be compiled down to `commonjs` or whatever, that `webpack` and `browserify` like, or consumed directly from `rollup` or `systemjs`.

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What's the difference?

The other stuff is about how the packaging works. `import/export` doesn't care.

`import/export` is about how the code interacts with other code. And then, it can be compiled down to `commonjs` or whatever, that `webpack` and `browserify` like, or consumed directly from `rollup` or `systemjs`.

The difference is that `import/export` is defined at the level of a language feature, so more modern tools that are legitimately aware of it, like `rollup`, can look at what's being used, and discard the rest (in a process called `tree shaking`,) which dramatically reduces package sizes.

`webpack` and `browserify` have sort of after-the-fact tree shaking, but since `commonjs` is just a set of assumptions, the environment doesn't have as strong guarantees, and can't make nearly as many exclusions.

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Who cares?

Okay, how about this, instead?

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Okay, how about this, instead?

`import/export` is

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Who cares?

Okay, how about this, instead?

`import/export` is

- **way easier to read,**

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Who cares?

Okay, how about this, instead?

`import/export` is

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- **way easier to write, and**

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Who cares?

Okay, how about this, instead?

`import/export` is

- way easier to read,
- way easier to write, and
- **will be supported in browsers,**

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Okay, how about this, instead?

`import/export` is

- way easier to read,
- way easier to write, and
- will be supported in browsers,
- **letting you do roughly what `require` does in `node`,**

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`import/export` is

- way easier to read,
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- **but portably on the frontend and the backend,**

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Because it'll finally be an actual part of the language.

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- letting you do roughly what `require` does in `node`,
- but portably on the frontend and the backend,
- **and without any tooling at all?**

Because it'll finally be an actual part of the language.

```
const is_it_nice = true;
export { is_it_nice };
```

```
import { is_it_nice } from './its_nice.js';
```

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How much work is it?

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How much work is it?

Zero.

Babel converts it to `commonjs require`, then `webpack` (or whatever) bundles it.

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How much work is it?

Zero.

Babel converts it to `commonjs require`, then `webpack` (or whatever) bundles it.

So just use it and you're done.

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How much work is it?

Zero.

Babel converts it to `commonjs require`, then `webpack` (or whatever) bundles it.

So just use it and you're done.

There's even a predictable name so that you can use it with `require` from the outside.

How does ES6 help us do better deploys

Better packaging; less repetition; easier externality; tree shaking

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Help us do better deploys

All that packaging stuff means that packagers can do a better job of

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Help us do better deploys

All that packaging stuff means that packagers can do a better job of

- **excluding duplicates**

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Help us do better deploys

All that packaging stuff means that packagers can do a better job of

- excluding duplicates
- **removing unused code**

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Help us do better deploys

All that packaging stuff means that packagers can do a better job of

- excluding duplicates
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- **preventing version contrast**

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Help us do better deploys

All that packaging stuff means that packagers can do a better job of

- excluding duplicates
- removing unused code
- **preventing version contrast**

This means smaller deploy packages

How does ES6 help us ditch existing libs

You might not need: jQuery, underscore, bluebird, ...

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- Deploy
- Ditch

Help us ditch existing libs

We've all seen the trendy websites, of the form *you might not need jQuery*, yes?

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Help us ditch existing libs

We've all seen the trendy websites, of the form *you might not need jQuery*, yes?

We all remember when Koçulu rage-quit NPM and broke the internet, yes?

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Help us ditch existing libs

We've all seen the trendy websites, of the form *you might not need jQuery*, yes?

We all remember when Koçulu rage-quit NPM and broke the internet, yes?

We all know that programmer who includes `underscore.js` to get object cloning, yes?

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`Libraries are liabilities`

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Help us ditch existing libs

We've all seen the trendy websites, of the form *you might not need jQuery*, yes?

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```
Libraries are liabilities
```

Important libraries - difficult work, like `react`, or `d3`, or `processing`, are great.

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We've all seen the trendy websites, of the form *you might not need jQuery*, yes?

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We all know that programmer who includes `underscore.js` to get object cloning, yes?

```
Libraries are liabilities
```

Important libraries - difficult work, like `react`, or `d3`, or `processing`, are great.

But including frivolous libraries for convenience functions has a ***high*** cost, and so when ES6 gives you alternatives, ***ditch the library***.

What are some downsides?

Babel; the build organization; new thinking; old code needs vetting; angular 1 modules; code style transition; learning to hate ES5; shim weight

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What are some downsides?

- **Babel**

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What are some downsides?

- **Babel**
  - `Babel` **is honestly pretty heavy**

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What are some downsides?

- **Babel**
  - **`Babel` is honestly pretty heavy**
    - **104k uncompressed, 50-80k compressed**

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What are some downsides?

- **Babel**
  - `Babel` **is heavy (50-80k)**
  - `Babel` **'s shims aren't dynamic, and have significant speed overhead**

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What are some downsides?

- **Babel**
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  - `Babel` **'s shims aren't dynamic, and have significant speed overhead**
    - **Real world hits of ~30-40% are realistic**

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What are some downsides?

- **Babel**
  - **`Babel` is heavy (50-80k)**
  - **`Babel`'s shims are 30-40% slower**
  - **`Babel` shims things that don't need to be shimmed in evergreen browsers**

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  - **`Babel`'s shims are 30-40% slower**
  - **`Babel` shims things that don't need to be shimmed in evergreen browsers**
    - **This is removable when it's time, so it's still better than a polyfill**

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- **Babel**
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  - `Babel` **over-shims**
  - `Babel` **builds can be slow**

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  - `Babel` **over-shims**
  - `Babel` **builds can be slow**
    - **Helped by utility builds and** `common.js`

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  - `Babel` **has plugins**
    - **Plugins are the devil, in general**

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    - **Plugins are the devil, in general**
    - **Plugins are how one tool ends up doing 55 jobs**

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  - `Babel` **builds can be slow**
  - `Babel` **has plugins**
    - **Plugins are the devil, in general**
    - **Plugins are how one tool ends up doing 55 jobs**
    - **When one of those jobs needs replacement, You're Screwed ™**

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  - `Babel` **has plugins**
  - `Babel` **makes coverage, testing slightly gross**

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  - `Babel` **builds can be slow**
  - `Babel` **has plugins**
  - `Babel` **makes coverage, testing slightly gross**
    - **We've already mostly gotten around this**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- **The build organization**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- **The build organization**
  - **When you have ES5 and ES6, you need to distinguish what gets transpiled and what doesn't**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- **The build organization**
  - **Distinguish what gets transpiled**
  - **Day one, this is "what have we made sure is clean ES6"**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- **The build organization**
  - **Distinguish what gets transpiled**
  - **"what have we made sure is clean"**
  - **Day two, this is "what new stuff are we writing in ES6"**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- **The build organization**
  - **Distinguish what gets transpiled**
  - **"what have we made sure is clean"**
  - **"what new stuff are we writing"**
  - **Day three, this is "how do we exclude vendor script"**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- **The build organization**
  - **Distinguish what gets transpiled**
  - **"what have we made sure is clean"**
  - **"what new stuff are we writing"**
  - **"how do we exclude vendor script"**
  - **This is particularly complex in our current layout**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- **The build organization**
  - **Distinguish what gets transpiled**
  - **"what have we made sure is clean"**
  - **"what new stuff are we writing"**
  - **"how do we exclude vendor script"**
  - **Our current layout**
  - **This can also make calling into 6 from 5 complex**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- **The build organization**
  - **Distinguish what gets transpiled**
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  - **"how do we exclude vendor script"**
  - **Our current layout**
  - **Calling into 6 from 5 can be complex**
  - **This is all handled in our current `gulpfile`.**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- **The build organization**
  - **Distinguish what gets transpiled**
  - **"what have we made sure is clean"**
  - **"what new stuff are we writing"**
  - **"how do we exclude vendor script"**
  - **Our current layout**
  - **Calling into 6 from 5 can be complex**
  - **This is all handled in our current `gulpfile`.**
  - **You don't need to handle any of this.**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- The build organization - separate; transform; exclude
- **New thinking**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- The build organization - separate; transform; exclude
- **New thinking**
  - **Language changes alter how you think**

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  - **This is honestly kind of the whole point**

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  - **But also this costs time and can be frustrating**

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- **New thinking**
  - **Language changes alter how you think**
  - **This is honestly kind of the whole point**
  - **But also this costs time and can be frustrating**
  - **Using `.reduce`, etc isn't initially easy**

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- Vetting

What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- The build organization - separate; transform; exclude
- New thinking - learn, adapt
- **Old code needs vetting**

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- **Old code needs vetting**
  - **Removed ES3 things (like `with`) are no longer allowed**

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    - **Removing `eval()` hurts Angular 1**

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  - **Babel wants `eval()` gone**
    - **Removing `eval()` hurts Angular 1**
    - **Solved by not transpiling Angular 1**

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  - **Everything is in `use strict` now**

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  - **Everything is in `use strict` now**
    - **Screws with `this`, which is an actual problem**

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  - **`eval()` gone (for the best)**
  - **Everything is in `use strict` now**
    - **Screws with `this`**
    - **Sean already took a couple bullets on `this`**

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  - **`eval()` gone (for the best)**
  - **Everything is in `use strict` now**
  - **Certain extremely weird code is no longer legal**
    - **eg `for (var i = 1 in []) {}`**

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What are some downsides?

- Babel - heavy; slow shims; slow builds; plugins; testing
- The build organization - separate; transform; exclude
- New thinking - learn, adapt
- **Old code needs vetting**
  - **Removed ES3 things (like `with`)**
  - **`eval()` gone (for the best)**
  - **Everything is in `use strict` now**
  - **Certain extremely weird code is no longer legal**
    - **eg `for (var i = 1 in []) {}`**
    - **I've never actually heard of this stuff hurting anyone, ever**

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    - **`Number` accepts octal literals now**

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    - **`Number` accepts octal literals now**
    - **Missing time zone interpretation changed**
    - **`start` and `end` symbols added to unicode strings**

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    - **`Number` accepts octal literals now**
    - **Missing time zone interpretation changed**
    - **`start` and `end` symbols**
    - **Other stuff like that, which we don't care about**

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  - **We got through one of our major branches in a couple hours' work**

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  - **Angular 1's module system is just string lookup**
    - **Angular 1 predates CommonJS / AMD / etc**
    - **Angular 1 had to invent its own module system**
    - **It's frankly a mess**

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    - **Angular 2 fixes this; for 1, you hack**

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    - **Weaving this is do-able, but a hassle**
    - **Angular 2 fixes this; for 1, you hack**
    - **It's a one-time problem in the build system**

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  - **Sean already mostly fixed this in our codebase**

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  - **Things you trust vs things that are new**
  - **Learning to hate ES5 is a lot of work**

In summary

Hooray, he's almost in shut-up mode