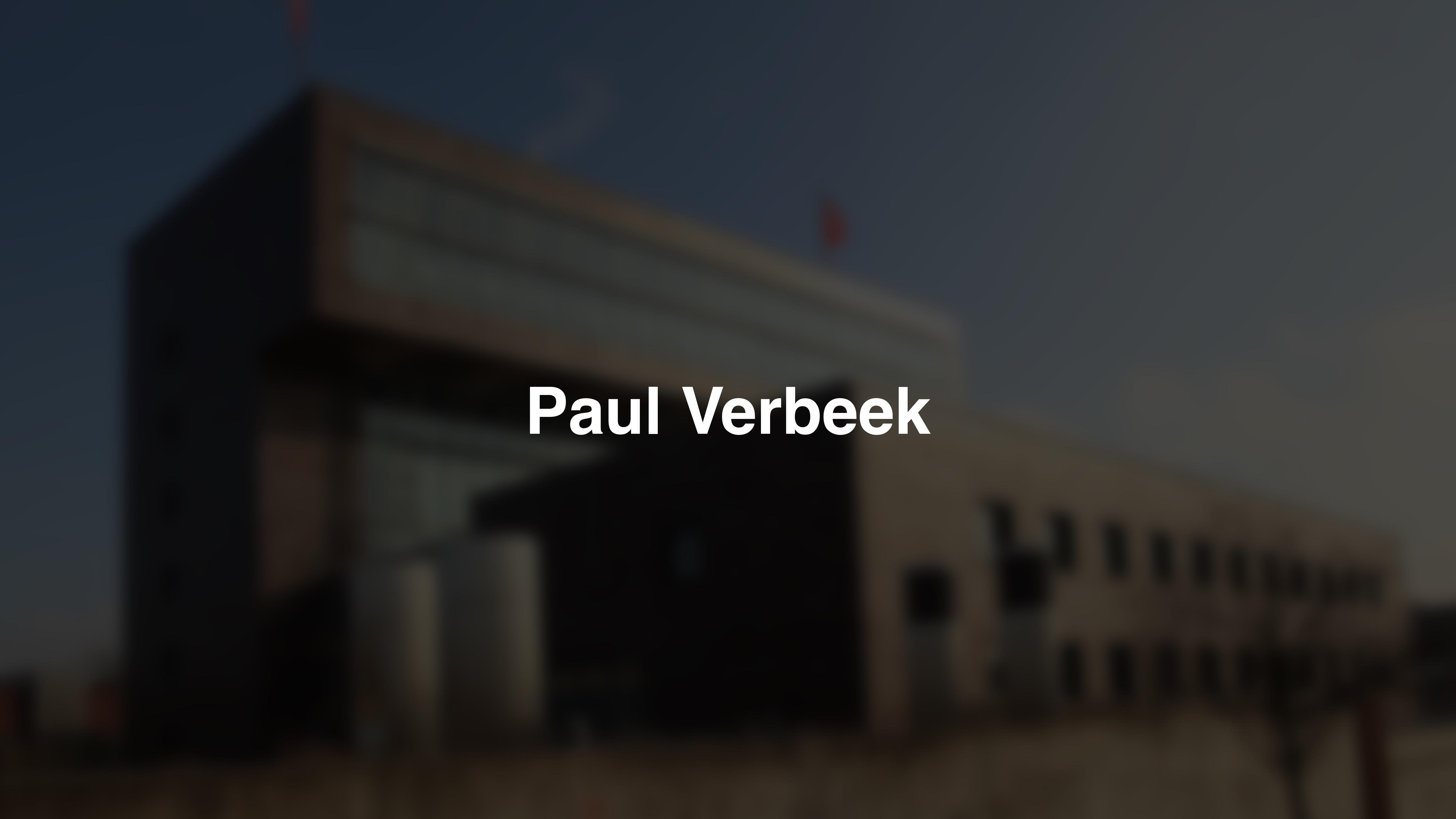


ES6 is so 2015
meet ES2016!



Paul Verbeek



Booking.com

workingatbooking.com



nlhtml5.org

ES6 is so 2015
meet ES2016!

ECMA-262

(a timeline)

ECMA-262

(a timeline)

December 1995 Announcement of JavaScript by Sun and Netscape

ECMA-262

(a timeline)

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ECMA-262

(a timeline)

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ECMA-262

(a timeline)

December 1995 Announcement of JavaScript by Sun and Netscape

"JavaScript will be the most effective method to connect HTML-based content to Java applets.

- Bill Joy, co-founder Sun

<https://web.archive.org/web/20070916144913/http://wp.netscape.com/newsref/pr/newsrelease67.html>

ECMA-262

(a timeline)

December 1995 Announcement of JavaScript by Sun and Netscape
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(a timeline)

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"ECMAScript was always an unwanted trade name that sounds like a skin disease.

- Brendan Eich, creator of JavaScript

[https://mail.mozilla.org/pipermail/es-discuss/
2006-October/000133.html](https://mail.mozilla.org/pipermail/es-discuss/2006-October/000133.html)

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ECMA-262

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- July 2008** ~~ES4, Abandoned due to complexity~~
- December 2009** ES5, strict mode, JSON, get/set, and more
- June 2011** ES5.1, to align with ISO/IEC 16262 3rd edition

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ECMA-262

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- December 2009** ES5, strict mode, JSON, get/set, and more
- June 2011** ES5.1, to align with ISO/IEC 16262 3rd edition
- June 2015** ES6/ES2015, a lot of stuff!
- 2016** ES2016, not lot of stuff!

The TC39 process

AKA. bunch of white guys



The TC39 process

The TC39 process

Stage 0: Strawman

Free-form ideas, reviewed in TC39 meetings

The TC39 process

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Formally accepted proposal

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Stage 4: Finished

Ready for standard, passes unit tests

ECMAScript 2016

ECMA-262 7th edition

The ECMAScript® 2016 Language Specification



Following slides will mostly contain
code

Exponentiation Operator

$x^{**} y$

`Math.pow(x, y);`

```
x ** y  
Math.pow(x, y);
```

```
let squared = 2 ** 2;  
// same as 2 * 2
```

```
x ** y  
Math.pow(x, y);
```

```
let squared = 2 ** 2;  
// same as 2 * 2
```

```
let cubed = 3;  
cubed *= 3;  
// same as cubed = 3 * 3 * 3
```

Exponentiation Operator



Exponentiation Operator



Array.prototype.includes

```
['a', 'b', 'c'].index0f('a') >= 0; // true  
['a', 'b', 'c'].index0f('d') >= 0; // false
```

```
['a', 'b', 'c'].index0f('a') >= 0; // true  
['a', 'b', 'c'].index0f('d') >= 0; // false
```

```
['a', 'b', 'c'].includes('a'); // true  
['a', 'b', 'c'].includes('d'); // false
```

```
['a', 'b', NaN].index0f(NaN) >= 0; // false  
['a', 'b', NaN].includes(NaN); // true
```

```
['a', 'b', NaN].indexOf(NaN) >= 0; // false
```

```
['a', 'b', NaN].includes(NaN); // true
```

```
[ , , ].indexOf(undefined) >= 0; // false
```

```
[ , , ].includes(undefined); // true
```

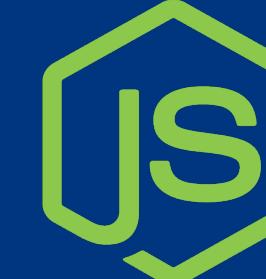
Wait? includes? Why not contains?

Wait? includ
y not contains?

Array.prototype.includes



Array.prototype.includes



ECMA-262 8th edition

The ECMAScript® 2017 Language Specification

Not really...

Stage 4: Finished

Ready for standard, passes unit tests

Stage 4: Finished

Ready for standard, passes unit tests

- Object.values/Object.entries

Stage 4: Finished

Ready for standard, passes unit tests

- Object.values/Object.entries
- String padding

Stage 4: Finished

Ready for standard, passes unit tests

- Object.values/Object.entries
- String padding
- Object.getOwnPropertyDescriptors()

Stage 4: Finished

Ready for standard, passes unit tests

- Object.values/Object.entries
- String padding
- Object.getOwnPropertyDescriptors()

<https://github.com/tc39/proposals/blob/master/finished-proposals.md>

Object.values / Object.entries

```
const obj = { name: 'Paul', age: 30 };
```

```
let keys = Object.keys(obj);  
// ['name', 'age']
```

```
const obj = { name: 'Paul', age: 30 };
```

```
let keys = Object.keys(obj);  
// ['name', 'age']
```

```
let values = Object.values(obj);  
// ['Paul', 30]
```

```
const obj = { name: 'Paul', age: 30 };
```

```
let keys = Object.keys(obj);  
// ['name', 'age']
```

```
let values = Object.values(obj);  
// ['Paul', 30]
```

```
let entries = Object.entries(obj);  
// [['name', 'Paul'], ['age', 30]]
```

```
const obj = { name: 'Paul', age: 30 };

let keys = Object.keys(obj);
// ['name', 'age']

let values = Object.values(obj);
// ['Paul', 30]

let entries = Object.entries(obj);
// [['name', 'Paul'], ['age', 30]]

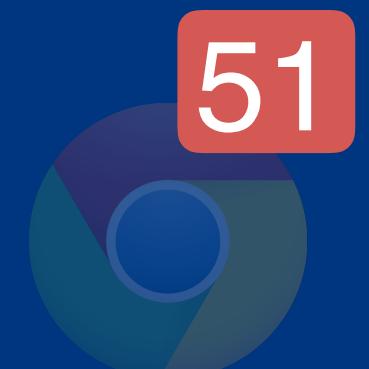
for (let [key,value] of Object.entries(obj)) {
    console.log(` ${key}: ${value}`);
}

// 'name': 'Paul'
// 'age': 30
```

Object.values / Object.entries



Object.values / Object.entries



String padding

String padding

insert left-pad joke

```
'1'.padStart(3, '0');  
// '001'
```

```
'1'.padEnd(3, '0');  
// '100'
```

```
'1'.padStart(3, '0');  
// '001'
```

```
'1'.padEnd(3, '0');  
// '100'
```

```
'Ruhr'.padEnd(9, 'JS');  
// 'RuhrJSJSJ'
```

```
'1'.padStart(3, '0');  
// '001'
```

```
'1'.padEnd(3, '0');  
// '100'
```

```
'Ruhr'.padEnd(9, 'JS');  
// 'RuhrJSJSJ'
```

```
'foo'.padStart(8);  
//      foo'
```

String padding



String padding



Object.getOwnPropertyDescriptors()

Object.getOwnPropertyDescriptors()



```
const obj = {
  [Symbol('foo')]: 123,
  get bar() { return 'abc' },
};

console.log(Object.getOwnPropertyDescriptors(obj));

// Output:
// { [Symbol('foo')]:
//   { value: 123,
//     writable: true,
//     enumerable: true,
//     configurable: true },
//   bar:
//   { get: [Function: bar],
//     set: undefined,
//     enumerable: true,
//     configurable: true } }
```

Copying properties into an object

```
var o1 = { a: 1 };
var o2 = { b: 2 };

Object.assign(o1, o2);
console.log(o1); // { a: 1, b: 2 }
```

Copying properties into an object

```
const source = {
  set foo(value) {
    console.log(value);
  }
};
console.log(Object.getOwnPropertyDescriptor(source, 'foo'));
// { get: undefined,
//   set: [Function: foo],
//   enumerable: true,
//   configurable: true }
```

Copying properties into an object

```
const source = {
  set foo(value) {
    console.log(value);
  }
};
console.log(Object.getOwnPropertyDescriptor(source, 'foo'));
// { get: undefined,
//   set: [Function: foo],
//   enumerable: true,
//   configurable: true }

const target = {};
Object.assign(target, source);
console.log(Object.getOwnPropertyDescriptor(target, 'foo'));
// { value: undefined,
//   writable: true,
//   enumerable: true,
//   configurable: true }
```

Copying properties into an object

```
const source = {
  set foo(value) {
    console.log(value);
  }
};

const target = {};
Object.defineProperties(target, Object.getPrototypeOf(source));

console.log(Object.getOwnPropertyDescriptor(target, 'foo'));
// { get: undefined,
//   set: [Function: foo],
//   enumerable: true,
//   configurable: true }
```

Cloning objects

```
const clone = Object.create(  
    Object.getPrototypeOf(obj),  
    Object.getOwnPropertyDescriptors(obj)  
) ;
```

Object.getOwnPropertyDescriptors()



Object.getOwnPropertyDescriptors()



Stage 3: Candidate

Spec text complete, has at least 2 implementations

Stage 3: Candidate

Spec text complete, has at least 2 implementations

- SIMD.JS - SIMD APIs + polyfill

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Stage 3: Candidate

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- SIMD.JS - SIMD APIs + polyfill
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- Trailing commas in function parameter lists and calls

Stage 3: Candidate

Spec text complete, has at least 2 implementations

- SIMD.JS - SIMD APIs + polyfill
- Async functions
- Trailing commas in function parameter lists and calls
- Function.prototype.toString revision

SIMD.JS

SIMD
(pronounced sim-dee)

Single Instruction/Multiple Data

SISD

$$\begin{array}{c} A_0 \\ + \\ B_0 \\ = \\ C_0 \end{array}$$
$$\begin{array}{c} A_1 \\ + \\ B_1 \\ = \\ C_1 \end{array}$$
$$\begin{array}{c} A_2 \\ + \\ B_2 \\ = \\ C_2 \end{array}$$
$$\begin{array}{c} A_3 \\ + \\ B_3 \\ = \\ C_3 \end{array}$$

SIMD

$$\begin{array}{c} A_0 \\ A_1 \\ A_2 \\ A_3 \\ + \\ B_0 \\ B_1 \\ B_2 \\ B_3 \\ = \\ C_0 \\ C_1 \\ C_2 \\ C_3 \end{array}$$

```
let a = SIMD.Float32x4(1.0, 2.0, 3.0, 4.0);  
let b = SIMD.Float32x4(5.0, 6.0, 7.0, 8.0);  
let c = SIMD.Float32x4.add(a, b);
```

```
let d = SIMD.Bool32x4(1,0,0,1);
```

```
SIMD.Bool32x4.anyTrue(d);  
SIMD.Bool32x4.allTrue(d);
```

Example

[http://peterjensen.github.io/mandelbrot/js/
mandelbrot-asm.html](http://peterjensen.github.io/mandelbrot/js/mandelbrot-asm.html)

SIMD.JS



SIMD.JS



14

Async functions

```
function doSomethingAsync(callback) {
  setTimeout(function () {
    if (typeof callback === 'function') {
      callback('something');
    }
  }, 1000)
}
```

```
function doSomethingAsync(callback) {
    setTimeout(function () {
        if (typeof callback === 'function') {
            callback('something');
        }
    }, 1000)
}

function doWork() {
    console.log('start');
    doSomethingAsync(function (value) {
        console.log(value)
    });
}

doWork();
console.log('working');
// 'start'
// 'working'
// 'something'
```

```
function doSomethingAsync() {
    return new Promise(function (resolve, reject) {
        setTimeout(function () {
            resolve('something');
        }, 1000)
    });
}

function doWork() {
    console.log('start');
    doSomethingAsync().then(function (value) {
        console.log(value)
    });
}

doWork();
console.log('working');
// 'start'
// 'working'
// 'something'
```

```
function doSomethingAsync() {
  return new Promise(function (resolve, reject) {
    setTimeout(function () {
      resolve('something');
    }, 1000)
  });
}

async function doWork() {
  console.log('start');
  var value = await doSomethingAsync();
  console.log(value);
}

doWork();
console.log('working');
// 'start'
// 'working'
// 'something'
```

```
function doSomethingAsync() {
    return new Promise(function (resolve, reject) {
        setTimeout(function () {
            resolve('something');
        }, 1000)
    });
}

async function doWork() {
    console.log('start');
    var value = await doSomethingAsync();
    console.log(value);
    value += await doSomethingAsync();
    console.log(value);
}

doWork();
console.log('working');
// 'start'
// 'working'
// 'something'
// 'somethingsomething'
```

```
function doSomethingAsync() {
    return new Promise(function (resolve, reject) {
        setTimeout(function () {
            reject('you failed! hah!');
        }, 1000)
    });
}

async function doWork() {
    console.log('start');
    var value;
    try {
        value = await doSomethingAsync();
    } catch (e) {
        value = 'error: ' + e.message;
    }
    console.log(value);
}

doWork();
console.log('working');
// 'start'
// 'working'
// 'you failed! hah!'
```

<https://ponyfoo.com/articles/understanding-javascript-async-await>

Async functions



Async functions



Trailing commas in function parameter lists and calls

Trailing commas in objects and arrays

```
let obj = {  
    first: 'Jane',  
    last: 'Doe',  
};  
  
let arr = [  
    'red',  
    'green',  
    'blue',  
];  
console.log(arr.length); // 3
```

In function parameter lists and calls

```
function foo(  
    param1,  
    param2,  
) {}
```

```
foo(  
    'abc',  
    'def',  
) ;
```

Trailing commas in function parameter lists and calls



Trailing commas in function parameter lists and calls



Stage 2: Draft

Has description of syntax and semantics

- Asynchronous Iterators
- `function.sent` metaproPERTY
- Rest/Spread properties
- Shared memory and atomics
- `System.global`
- Lifting Template Literal Restriction

Stage 1: Proposal

Formally accepted proposal

- *export * as ns from “mod”; statements*
- *export v from “mod”; statements*
- *Class and Property Decorators*
- ArrayBuffer.transfer
- Observable
- String.prototype.{trimLeft,trimRight}
- Class Property Declarations

Stage 1: Proposal (continued)

Formally accepted proposal

- String#matchAll
- Private Fields
- WeakRefs
- Frozen Realms
- Cancelable Promises

Stage 0: Strawman

Free-form ideas, reviewed in TC39 meetings

- *String.prototype.at*
- *Zones*
- *Object enumerables*
- Defensible Classes
- Relationships
- Structured Clone
- Annex B - HTML Attribute Event Handlers
- Reflect.isCallable/Reflect.isConstructor
- Additional metaproPERTIES
- Function Bind Syntax

Stage 0: Strawman (continued)

Free-form ideas, reviewed in TC39 meetings

- Do Expressions
- RegExp additions
- 64-Bit Integer Operations
- Method Parameter Decorators
- Function Expression Decorators
- Updates to Tail Calls to include an explicit syntactic opt-in

Edge 14 is going to be awesome :-)

Edge 14 is going to be awesome :-)



COMPAT
ES

ECMAScript 5 6 next intl non-standard compatibility table

Sort by Engine types ▾ Show obsolete platforms □ Show unstable platforms ✓

Flattr 40 by kangax Gratipay & webbedspace & zloirock Fork 323

V8 SpiderMonkey JavaScriptCore Chakra Other
Minor difference (1 point) Useful feature (2 points) Significant feature (4 points)
Landmark feature (8 points)

<img alt="A compatibility matrix table showing support for ECMAScript features across various engines. The columns represent engines: Current browser, Traceur, Babel + core-js[1], Type-Script + core-js, es7-shim, IE 11, Edge 12[2], Edge 13[2], Edge 14[2], FF 45 ESR, FF 47, FF 48, FF 49, CH 50[1], CH 51[1], CH 52[1], SF 5.1 - 8, SF 9, SF 10, SF 11, SF 12, SF 13, SF 14, SF 15, SF 16, SF 17, SF 18, SF 19, SF 20, SF 21, SF 22, SF 23, SF 24, SF 25, SF 26, SF 27, SF 28, SF 29, SF 30, SF 31, SF 32, SF 33, SF 34, SF 35, SF 36, SF 37, SF 38, SF 39, SF 40, SF 41, SF 42, SF 43, SF 44, SF 45, SF 46, SF 47, SF 48, SF 49, SF 50, SF 51, SF 52, SF 53, SF 54, SF 55, SF 56, SF 57, SF 58, SF 59, SF 60, SF 61, SF 62, SF 63, SF 64, SF 65, SF 66, SF 67, SF 68, SF 69, SF 70, SF 71, SF 72, SF 73, SF 74, SF 75, SF 76, SF 77, SF 78, SF 79, SF 80, SF 81, SF 82, SF 83, SF 84, SF 85, SF 86, SF 87, SF 88, SF 89, SF 90, SF 91, SF 92, SF 93, SF 94, SF 95, SF 96, SF 97, SF 98, SF 99, SF 100, SF 101, SF 102, SF 103, SF 104, SF 105, SF 106, SF 107, SF 108, SF 109, SF 110, SF 111, SF 112, SF 113, SF 114, SF 115, SF 116, SF 117, SF 118, SF 119, SF 120, SF 121, SF 122, SF 123, SF 124, SF 125, SF 126, SF 127, SF 128, SF 129, SF 130, SF 131, SF 132, SF 133, SF 134, SF 135, SF 136, SF 137, SF 138, SF 139, SF 140, SF 141, SF 142, SF 143, SF 144, SF 145, SF 146, SF 147, SF 148, SF 149, SF 150, SF 151, SF 152, SF 153, SF 154, SF 155, SF 156, SF 157, SF 158, SF 159, SF 160, SF 161, SF 162, SF 163, SF 164, SF 165, SF 166, SF 167, SF 168, SF 169, SF 170, SF 171, SF 172, SF 173, SF 174, SF 175, SF 176, SF 177, SF 178, SF 179, SF 180, SF 181, SF 182, SF 183, SF 184, SF 185, SF 186, SF 187, SF 188, SF 189, SF 190, SF 191, SF 192, SF 193, SF 194, SF 195, SF 196, SF 197, SF 198, SF 199, SF 200, SF 201, SF 202, SF 203, SF 204, SF 205, SF 206, SF 207, SF 208, SF 209, SF 210, SF 211, SF 212, SF 213, SF 214, SF 215, SF 216, SF 217, SF 218, SF 219, SF 220, SF 221, SF 222, SF 223, SF 224, SF 225, SF 226, SF 227, SF 228, SF 229, SF 229, SF 230, SF 231, SF 232, SF 233, SF 234, SF 235, SF 236, SF 237, SF 238, SF 239, SF 239, 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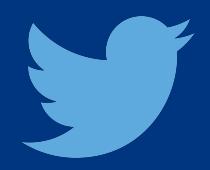
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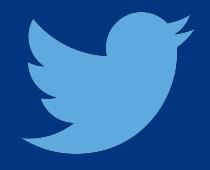


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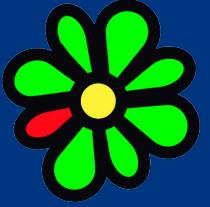
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Questions?