Promises in JavaScript

14TH JUN 2017

Have you encountered promises in JavaScript and wondered what they are? Why are they called promises? Are they related to a promise you make to another person in any way?

Furthermore, why do you use promises? What benefits do they have over traditional callbacks for asynchronous JavaScript operations?

In this article, you're going to learn all about JavaScript promises. You'll understand what they are, how to use them and why they're preferred over callbacks.

So, what is a promise?

A **promise** is an object that will *return a value in future*. Because of this "in future" thing, Promises are well suited for asynchronous JavaScript operations.

(If you're unsure what asynchronous JavaScript means, you might not be ready for this article. I suggest you go through this article on callbacks first before coming back here).

The concept of a JavaScript promise is better explained through an analogy, so let's do just that to help make the concept clearer.

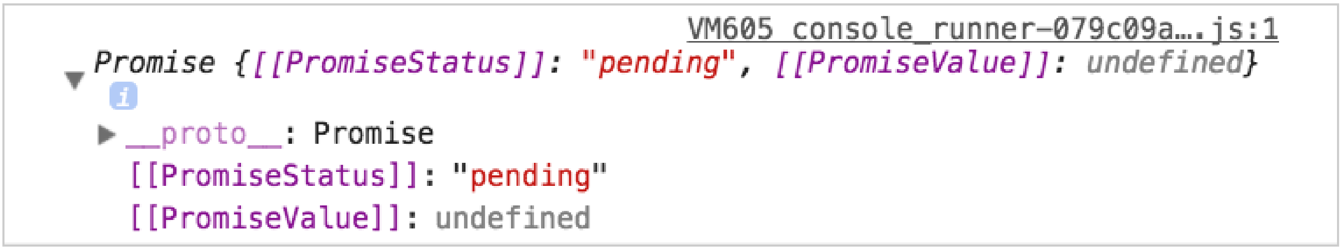
Imagine you're preparing for a birthday party for your niece next week. As you speak about the party, you friend, Jeff, offered to help. Delighted, you asked him to buy a black forest birthday cake. Jeff said okay.

Here, Jeff has given you his word that he'll buy you a black forest birthday cake. It's a promise. In JavaScript, a promise works the same way as a promise in real life. The JavaScript version of scenario can be written in the following way:

```
// jeffBuysCake is a promise
const promise = jeffBuysCake('black forest')
```

(You'll learn how to construct `jeffBuysCake` later. For now, take it that its a promise).

Right now, Jeff hasn't acted on his promise yet. In JavaScript, we say the promise is `pending`. You can verify this if you `console.log` a promise object.



```
                                          VM605 console_runner-079c09a….js:1
 ▼ Promise {[[PromiseStatus]]: "pending", [[PromiseValue]]: undefined}
   ▶ __proto__: Promise
     [[PromiseStatus]]: "pending"
     [[PromiseValue]]: undefined
```

Logging jeffBuysCake shows that the promise is pending.

(When we construct `jeffBuysCake` together later, you will be able to verify this console.log statement for yourself).

You begin to plan your next steps after talking to Jeff. You realize that you can carry on the party as planned if Jeff keeps to his words and buys you a black forest cake in time for the party.

If Jeff does buy the cake, we say the promise is `resolved` in JavaScript. When a promise gets resolved, you do the next thing in a `.then` call:

```
jeffBuysCake('black forest')
.then(partyAsPlanned) // Woohoo! 🎉🎉🎉
```

But if Jeff doesn't buy you the cake, you got to run to the bakery yourself. (Damn you, Jeff!). If this happens, we say the promise is `rejected`.

When a promise gets rejected, you do your contingency plan in a `.catch` call.

```
jeffBuysCake('black forest')
.then(partyAsPlanned)
.catch(buyCakeYourself) // Grumble Grumble... #*$%
```

This, my friend, is an anatomy of a Promise.

In JavaScript, we usually use promises to get or modify a piece of information. When the promise resolves, we do something with the data that comes back. When the promise rejects, we handle the error:

```
getSomethingWithPromise()
.then(data => {/* do something with data */})
.catch(err => {/* handle the error */})
```

Now, you know how a promise work. Let's dive in further and examine how to construct a promise.

Constructing a promise

You can make a promise by using `new Promise`. This Promise constructor takes in a function that contains two arguments — `resolve` and `reject`.

```
const promise = new Promise((resolve, reject) => {
/* Do something here */
})
```

If `resolve` is called, the promise succeeds and continues into the `then` chain. The parameter you pass into `resolve` would be the argument in the next `then` call:

```
const promise = new Promise((resolve, reject) => {
// Note: only 1 param allowed
return resolve(27)
})

// Parameter passed resolve would be the arguments passed into then.
promise.then(number => console.log(number)) // 27
```

If `reject` is called, the promise fails and continues into the `catch` chain. Likewise, the parameter you pass into `reject` would be the argument in the `catch` call.

```
const promise = new Promise((resolve, reject) => {
// Note: only 1 param allowed
return reject('💩💩💩')
})

// Parameter passed into reject would be the arguments passed into
catch.
promise.catch(err => console.log(err)) // 💩💩💩
```

(Can you see that both resolve and reject are callbacks? 😉).

Let's practice a little and try to construct `jeffBuysCake` promise.

First of all, you know that Jeff says he'll buy a cake. That's a promise. So, let's begin with an empty promise:

```
const jeffBuysCake = cakeType => {
return new Promise((resolve, reject) => {
// Do something here
})
}
```

Next, Jeff says he's going to buy the cake in a week. Let's use a `setTimeout` function to simulate this wait for seven days. Instead of seven days, we'll wait for one second:

```
const jeffBuysCake = cakeType => {
return new Promise((resolve, reject) => {
setTimeout(()=> {
// Checks if Jeff buys a black forest cake
}, 1000)
})
}
```

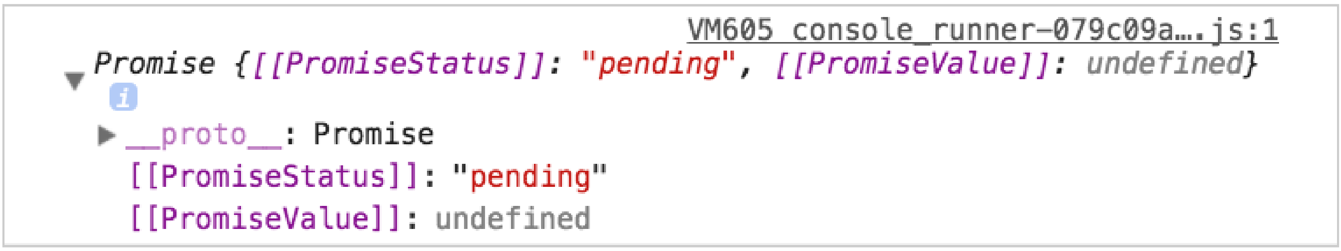
If Jeff bought a black forest cake after one second, we return the promise and pass the black forest cake into `then`.

If Jeff bought another type of cake, we reject the promise and say `no cake`, which causes the promise to go into `catch`.

```
const jeffBuysCake = cakeType => {
return new Promise((resolve, reject) => {
setTimeout(()=> {
if (cakeType === 'black forest') {
  resolve('black forest cake!')
} else {
  reject('No cake 😢')
}
}, 1000)
})
}
```

Let's test this promise out. When you `console.log` the promise below, you should see that the promise is pending. (The status would only be pending if you checked the console immediately. Feel free to extend the timeout to ten seconds if you need more time to check the console).

```
const promise = jeffBuysCake('black forest')
console.log(promise)
```

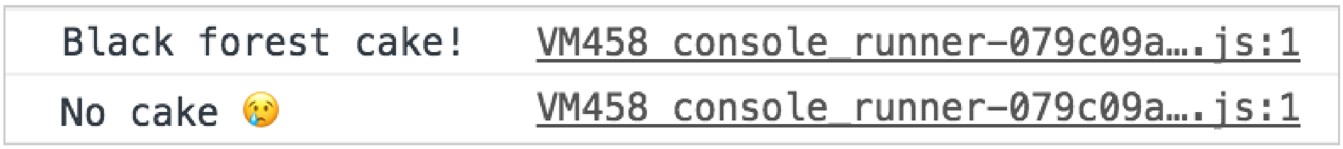


```
                                   VM605 console_runner-079c09a….js:1
▼Promise {[[PromiseStatus]]: "pending", [[PromiseValue]]: undefined}
   ▶__proto__: Promise
    [[PromiseStatus]]: "pending"
    [[PromiseValue]]: undefined
```

> Logging jeffBuysCake shows that the promise is pending.

If you add `then` and `catch` into the promise chain, you'll also see `black forest cake!` or `no cake 😥` depending on the type of cake you passed into `jeffBuysCake`

```
const promise = jeffBuysCake('black forest')
.then(cake => console.log(cake))
.catch(nocake => console.log(nocake))
```



```
Black forest cake!    VM458 console_runner-079c09a….js:1
No cake 😢             VM458 console_runner-079c09a….js:1
```

> The console shows either black forest cake or no cake, depending on what you pass into jeffBuysCake.

Not too hard to make a promise, isn't it? 😉.

Since you know what is a promise, how to make one and how to use one, let's answer the next question — why use a promise instead of a callback for asynchronous JavaScript?

(Before we move on, here's a quick signup form if you'd like to read similar articles from me every Wednesday).

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Promises vs. Callbacks

There are three reasons why developers prefer promises over callbacks:

1. Promises reduces the amount of nested code
2. Promises allow you to visualize the execution flow easily
3. Promises let you handle all errors at once at the end of the chain.

To see these three benefits in action, let's write some JavaScript code that does some asynchronous things with both callbacks and promises.

For this process, imagine you're running an online shop. You need to charge a customer whenever he buys something, then, you enter their information into your database. Lastly, you'll send them an email:

1. Charge a customer
2. Add customer to database
3. Send email to customer

Let’s break in down step by step. First of all, you need a way to get information from your frontend to your backend. Normally, you’d use a post request for these operations.

If you use Express and Node, your initial code might look like the following. Don’t worry if you don’t know any Node or Express. They’re not the main part of the article. Just follow along:

```
// A little bit of NodeJS here. This is how you'll get data from the
frontend through your API.
app.post('/buy-thing', (req, res) => {
const customer = req.body

// Charge customer here
})
```

Let’s go through the first step with callback-based code first. Here, you want to charge a customer. If this charge is successful, you add their information to a database. If the charge fails, you throw an error, so your server can handle the error.

The code looks like this:

```
// Callback based code
app.post('/buy-thing', (req, res) => {
const customer = req.body

// First operation: charge the customer
chargeCustomer(customer, (err, charge) => {
if (err) throw err
// Add to database here
})
})
```

Now, let’s switch to promise-based code. Likewise, you charge a customer. If the charge is successful, you add their information to the database with a `then` call. If the charge fails, you handle it automatically within the `catch` call:

```
// Promised based code
app.post('/buy-thing', (req, res) => {
const customer = req.body

// First operation: charge the customer
chargeCustomer(customer)
.then(/* Add to database */)
.catch(err => console.log(err))
})
```

Moving on, you add your customer information to your database when the charge succeeds. If your database operation succeeds, you send an email to your customer. Otherwise, you throw an error.

With these steps in mind, the callback-based code looks like this:

```
// Callback based code
app.post('/buy-thing', (req, res) => {
const customer = req.body

chargeCustomer(customer, (err, charge) => {
if (err) throw err

// Second operation: Add to database
addToDatabase(customer, (err, document) => {
if (err) throw err
// Send email here
})
})
})
```

For the promised-based code, if your database operation succeeds, you send the email in the next `then` call. If your database operation fails, the error automatically gets handled in the final `catch` statement:

```
// Promised based code
app.post('/buy-thing', (req, res) => {
const customer = req.body

chargeCustomer(customer)
// Second operation: Add to database
.then(_ => addToDatabase(customer))
.then(/* Send email */)
.catch(err => console.log(err))
})
```

Moving on to the last step, you send an email to your customer when the database operation succeeds. If this emails is sent successfully, you notify your frontend with a success message. Otherwise, you throw an error:

Here's how the callback-based code looks like:

```
app.post('/buy-thing', (req, res) => {
const customer = req.body

chargeCustomer(customer, (err, charge) => {
if (err) throw err

addToDatabase(customer, (err, document) => {
if (err) throw err
```

```
  sendEmail(customer, (err, result) => {
    if (err) throw err

    // Tells frontend success message.
    res.send('success!')
  })
  })
  })
  })
```

And here's how the promise-based code looks like:

```
  app.post('/buy-thing', (req, res) => {
  const customer = req.body

  chargeCustomer(customer)
  .then(_ => addToDatabase(customer))
  .then(_ => sendEmail(customer) )
  .then(result => res.send('success!')))
  .catch(err => console.log(err))
  })
```

See why it's much easier to write asynchronous code with promises instead of callbacks? You switch from callback hell into the happy-chain-land 😂.

Firing off multiple promises at once.

An additional benefit promises have over callbacks is that you can fire off two (or many) promises at the same time if the operations aren't dependent on each other, but both results are needed to perform a third action.

To do so, you use the `Promise.all` method, then pass in an array of promises you'd like to wait for. Your `then` argument would then be an array that contains the results from your promises:

```
const friesPromise = getFries()
const burgerPromise = getBurger()
const drinksPromise = getDrinks()

const eatMeal = Promise.all([
friesPromise,
burgerPromise,
drinksPromise
])
.then([fries, burger, drinks] => {
console.log(`Chomp. Awesome ${burger}! 🍔`)
console.log(`Chomp. Delicious ${fries}! 🍟`)
console.log(`Slurp. Ugh, shitty drink ${drink} 🤢 `)
})
```

(Note: there's also a method called `Promise.race`, but I haven't found a proper use case for it. You can check it out here).

Finally, let's talk about browser support! Why learn promises if you can't use it in production. Right?

Browser support for Promise

The awesome news is: promises are supported in all major browsers!

If you need to support IE 11 and below, you can use Promise Polyfill by Taylor Hakes. It supports promises up to IE8! 😮.

Wrapping up

You learned all about promises in this article. In short, promises are rad. It helps you write asynchronous code without taking a step into callback hell.

Although you probably want to use promises whenever you can, there are cases where callbacks makes sense too. Don't forget about callbacks 😉.

If you have a question, leave it in the comments below and I'll get back to you as soon as I can.

Thanks for reading. Did this article help you in any way? If I did, I hope you consider sharing it; you might just help someone who felt the same way you did before reading the article. Thank you.

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Name

Yaroslav Kuzyo • 10 months ago

Agreeing with previous comment, it would be great to have rss from your blog. I like the way how you explain programming concepts. Thank you

1 • Reply • Share ›

Alex Bush • a year ago

Really enjoy the articles. It would be nice if I could subscribe to your blog through Feedly.

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Dan Levy • a year ago

This is a brilliant article, well done Zell.

One gotcha I noticed: make sure you `res.send` in the error/catch handler (if you are doing so in a sibling `.then`)

I have found an approach that dovetails well with this pattern &

Express code.

So after writing the following:

```
app.post('/buy-thing', (req, res) => {
const customer = req.body

chargeCustomer(customer)
.then(_ => addToDatabase(customer))
.then(_ => sendEmail(customer) )
.then(result => res.send('success!')))
.catch(err => console.log(err))
})
```

see more

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Vladimir Maxymenko • a year ago

Thank you, Zell! I'm looking forward to reading about async/await from you.

3 ^ | ⌄ • Reply • Share ›

Andrey Karamnoff • a year ago

Thanks a lot, dear Zell. Please, publish async/await next

1 ^ | ⌄ • Reply • Share ›

mlops • a year ago

Waitting for your new courses. Tanks. 😁

^ | ⌄ • Reply • Share ›

MoronVV • a year ago

Thank for this great article!
What about speed of callbacks vs promises?

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Negligible difference

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