14 de agosto de 2022

Promesa

Imagina que eres un cantante destacado y los fans preguntan día y noche por tu próxima canción.

Para obtener algo de alivio, promete enviárselo cuando se publique. Les das a tus fans una lista. Pueden completar sus direcciones de correo electrónico, de modo que cuando la canción esté disponible, todas las partes suscritas la reciban instantáneamente. E incluso si algo sale muy mal, digamos, un incendio en el estudio, y no puedes publicar la canción, igualmente serán notificados.

Todos están contentos: tú, porque la gente ya no te aglomera, y los fans, porque no se perderán la canción.

Esta es una analogía de la vida real de cosas que tenemos a menudo en programación:

1. Un “código de producción” que hace algo y lleva tiempo. Por ejemplo, algún código que carga los datos a través de una red. Eso es un "cantante".
2. Un “código consumidor” que quiere el resultado del “código productor” una vez que esté listo. Muchas funciones pueden necesitar ese resultado. Estos son los "fanáticos".
3. Una *promesa* es un objeto JavaScript especial que vincula el "código productor" y el "código consumidor". En términos de nuestra analogía: esta es la "lista de suscripción". El "código de producción" toma el tiempo necesario para producir el resultado prometido, y la "promesa" hace que ese resultado esté disponible para todo el código suscrito cuando esté listo.

La analogía no es muy precisa, porque las promesas de JavaScript son más complejas que una simple lista de suscripción: tienen características y limitaciones adicionales. Pero para empezar está bien.

La sintaxis del constructor de un objeto de promesa es:

```
let promise = new Promise(function(resolve, reject) {
  // executor (the producing code, "singer")
});
```

La función a la que se pasa `new Promise` se llama *ejecutor* . Cuando `new Promise` se crea, el ejecutor se ejecuta automáticamente. Contiene el código de producción que eventualmente debería producir el resultado. En términos de la analogía anterior: el albacea es el “cantante”.

Sus argumentos `resolve` y `reject` son devoluciones de llamada proporcionadas por el propio JavaScript. Nuestro código solo está dentro del ejecutor.

Cuando el ejecutor obtenga el resultado, ya sea pronto o tarde, no importa, debería llamar a una de estas devoluciones de llamada:

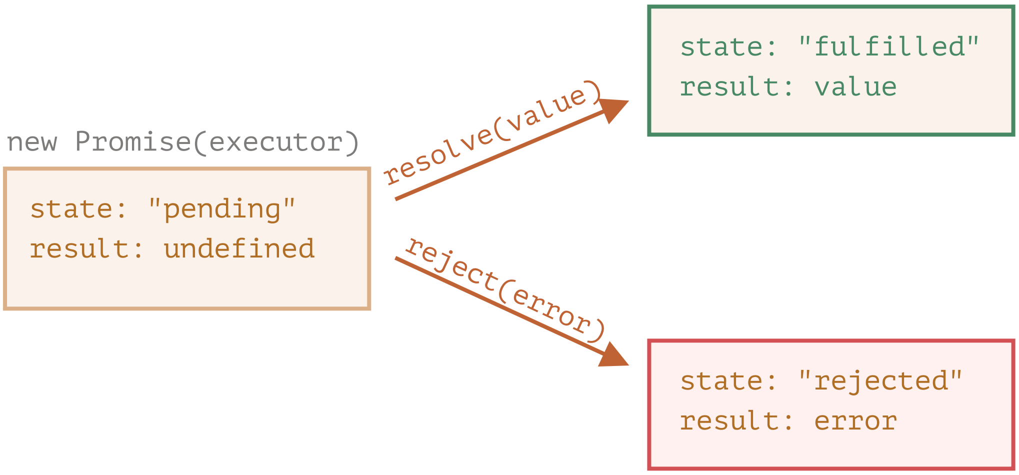
- `resolve(value)` — si el trabajo se finaliza con éxito, con resultado `value` .
- `reject(error)` — si se ha producido un error, `error` es el objeto del error.

Para resumir: el ejecutor se ejecuta automáticamente e intenta realizar un trabajo. Cuando finaliza el intento, llama `resolve` si tuvo éxito o `reject` si hubo un error.

El `promise` objeto devuelto por el `new Promise` constructor tiene estas propiedades internas:

- `state` — Inicialmente `"pending"` , luego cambia a `"fulfilled"` cuando `resolve` se llama o `"rejected"` cuando `reject` se llama.
- `result` — inicialmente `undefined` , luego cambia a `value` cuando `resolve(value)` se llama o `error` cuando `reject(error)` se llama.

Entonces el ejecutor finalmente pasa `promise` a uno de estos estados:



Later we'll see how "fans" can subscribe to these changes.

Here's an example of a promise constructor and a simple executor function with "producing code" that takes time (via `setTimeout`):

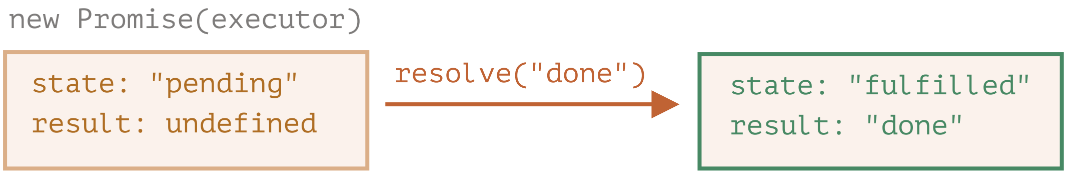
```
let promise = new Promise(function(resolve, reject) {
  // the function is executed automatically when the promise is constructed

  // after 1 second signal that the job is done with the result "done"
  setTimeout(() => resolve("done"), 1000);
});
```

We can see two things by running the code above:

1. The executor is called automatically and immediately (by `new Promise`).
2. The executor receives two arguments: `resolve` and `reject` . These functions are pre-defined by the JavaScript engine, so we don't need to create them. We should only call one of them when ready.

   After one second of "processing", the executor calls `resolve("done")` to produce the result. This changes the state of the `promise` object:

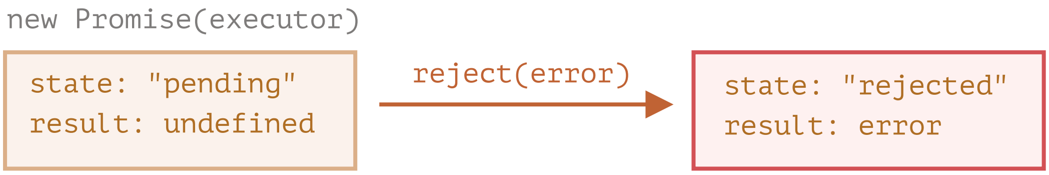


That was an example of a successful job completion, a “fulfilled promise”.

And now an example of the executor rejecting the promise with an error:

```
let promise = new Promise(function(resolve, reject) {
  // after 1 second signal that the job is finished with an error
  setTimeout(() => reject(new Error("Whoops!")), 1000);
});
```

The call to `reject(...)` moves the promise object to `"rejected"` state:



To summarize, the executor should perform a job (usually something that takes time) and then call `resolve` or `reject` to change the state of the corresponding promise object.

A promise that is either resolved or rejected is called “settled”, as opposed to an initially “pending” promise.

There can be only a single result or an error

The executor should call only one `resolve` or one `reject`. Any state change is final.

All further calls of `resolve` and `reject` are ignored:

```
let promise = new Promise(function(resolve, reject) {
  resolve("done");

  reject(new Error("…")); // ignored
  setTimeout(() => resolve("…")); // ignored
});
```

The idea is that a job done by the executor may have only one result or an error.

Also, `resolve`/`reject` expect only one argument (or none) and will ignore additional arguments.

Reject with `Error` objects

In case something goes wrong, the executor should call `reject`. That can be done with any type of argument (just like `resolve`). But it is recommended to use `Error` objects (or objects that inherit from `Error`). The reasoning for that will soon become apparent.

Immediately calling `resolve` / `reject`

In practice, an executor usually does something asynchronously and calls `resolve` / `reject` after some time, but it doesn't have to. We also can call `resolve` or `reject` immediately, like this:

```
let promise = new Promise(function(resolve, reject) {
  // not taking our time to do the job
  resolve(123); // immediately give the result: 123
});
```

For instance, this might happen when we start to do a job but then see that everything has already been completed and cached.

That's fine. We immediately have a resolved promise.

The `state` and `result` are internal

The properties `state` and `result` of the Promise object are internal. We can't directly access them. We can use the methods `.then` / `.catch` / `.finally` for that. They are described below.

Consumers: then, catch

A Promise object serves as a link between the executor (the "producing code" or "singer") and the consuming functions (the "fans"), which will receive the result or error. Consuming functions can be registered (subscribed) using the methods `.then` and `.catch`.

then

The most important, fundamental one is `.then`.

The syntax is:

```
promise.then(
  function(result) { /* handle a successful result */ },
  function(error) { /* handle an error */ }
);
```

The first argument of `.then` is a function that runs when the promise is resolved and receives the result.

The second argument of `.then` is a function that runs when the promise is rejected and receives the error.

For instance, here’s a reaction to a successfully resolved promise:

```
let promise = new Promise(function(resolve, reject) {
  setTimeout(() => resolve("done!"), 1000);
});

// resolve runs the first function in .then
promise.then(
  result => alert(result), // shows "done!" after 1 second
  error => alert(error) // doesn't run
);
```

The first function was executed.

And in the case of a rejection, the second one:

```
let promise = new Promise(function(resolve, reject) {
  setTimeout(() => reject(new Error("Whoops!")), 1000);
});

// reject runs the second function in .then
promise.then(
  result => alert(result), // doesn't run
  error => alert(error) // shows "Error: Whoops!" after 1 second
);
```

If we’re interested only in successful completions, then we can provide only one function argument to `.then` :

```
let promise = new Promise(resolve => {
  setTimeout(() => resolve("done!"), 1000);
});

promise.then(alert); // shows "done!" after 1 second
```

catch

If we’re interested only in errors, then we can use `null` as the first argument: `.then(null, errorHandlingFunction)` . Or we can use `.catch(errorHandlingFunction)` , which is exactly the same:

```
let promise = new Promise((resolve, reject) => {
  setTimeout(() => reject(new Error("Whoops!")), 1000);
});

// .catch(f) is the same as promise.then(null, f)
promise.catch(alert); // shows "Error: Whoops!" after 1 second
```

The call `.catch(f)` is a complete analog of `.then(null, f)`, it's just a shorthand.

Cleanup: finally

Just like there's a `finally` clause in a regular `try {...} catch {...}`, there's `finally` in promises.

The call `.finally(f)` is similar to `.then(f, f)` in the sense that `f` runs always, when the promise is settled: be it resolve or reject.

The idea of `finally` is to set up a handler for performing cleanup/finalizing after the previous operations are complete.

E.g. stopping loading indicators, closing no longer needed connections, etc.

Think of it as a party finisher. No matter was a party good or bad, how many friends were in it, we still need (or at least should) do a cleanup after it.

The code may look like this:

```
new Promise((resolve, reject) => {
  /* do something that takes time, and then call resolve or maybe reject */
})
  // runs when the promise is settled, doesn't matter successfully or not
  .finally(() => stop loading indicator)
  // so the loading indicator is always stopped before we go on
  .then(result => show result, err => show error)
```

Please note that `finally(f)` isn't exactly an alias of `then(f,f)` though.

There are important differences:

1. A `finally` handler has no arguments. In `finally` we don't know whether the promise is successful or not. That's all right, as our task is usually to perform "general" finalizing procedures.

   Please take a look at the example above: as you can see, the `finally` handler has no arguments, and the promise outcome is handled by the next handler.

2. A `finally` handler "passes through" the result or error to the next suitable handler.

   For instance, here the result is passed through `finally` to `then`:

   ```
   new Promise((resolve, reject) => {
     setTimeout(() => resolve("value"), 2000);
   })
     .finally(() => alert("Promise ready")) // triggers first
     .then(result => alert(result)); // <-- .then shows "value"
   ```

   As you can see, the `value` returned by the first promise is passed through `finally` to the next `then`.

   That's very convenient, because `finally` is not meant to process a promise result. As said, it's a place to do generic cleanup, no matter what the outcome was.

And here’s an example of an error, for us to see how it’s passed through `finally` to `catch`:

```
new Promise((resolve, reject) => {
  throw new Error("error");
})
  .finally(() => alert("Promise ready")) // triggers first
  .catch(err => alert(err));  // <-- .catch shows the error
```

3. A `finally` handler also shouldn’t return anything. If it does, the returned value is silently ignored.

   The only exception to this rule is when a `finally` handler throws an error. Then this error goes to the next handler, instead of any previous outcome.

To summarize:

- A `finally` handler doesn’t get the outcome of the previous handler (it has no arguments). This outcome is passed through instead, to the next suitable handler.
- If a `finally` handler returns something, it’s ignored.
- When `finally` throws an error, then the execution goes to the nearest error handler.

These features are helpful and make things work just the right way if we use `finally` how it’s supposed to be used: for generic cleanup procedures.

We can attach handlers to settled promises

If a promise is pending, `.then/catch/finally` handlers wait for its outcome.

Sometimes, it might be that a promise is already settled when we add a handler to it.

In such case, these handlers just run immediately:

```
// the promise becomes resolved immediately upon creation
let promise = new Promise(resolve => resolve("done!"));

promise.then(alert); // done! (shows up right now)
```

Note that this makes promises more powerful than the real life “subscription list” scenario. If the singer has already released their song and then a person signs up on the subscription list, they probably won’t receive that song. Subscriptions in real life must be done prior to the event.

Promises are more flexible. We can add handlers any time: if the result is already there, they just execute.

Example: loadScript

Next, let’s see more practical examples of how promises can help us write asynchronous code.

We’ve got the `loadScript` function for loading a script from the previous chapter.

Here’s the callback-based variant, just to remind us of it:

```
function loadScript(src, callback) {
  let script = document.createElement('script');
  script.src = src;

  script.onload = () => callback(null, script);
  script.onerror = () => callback(new Error(`Script load error for ${src}`));

  document.head.append(script);
}
```

Let’s rewrite it using Promises.

The new function `loadScript` will not require a callback. Instead, it will create and return a Promise object that resolves when the loading is complete. The outer code can add handlers (subscribing functions) to it using `.then`:

```
function loadScript(src) {
  return new Promise(function(resolve, reject) {
    let script = document.createElement('script');
    script.src = src;

    script.onload = () => resolve(script);
    script.onerror = () => reject(new Error(`Script load error for ${src}`));

    document.head.append(script);
  });
}
```

Usage:

```
let promise = loadScript("https://cdnjs.cloudflare.com/ajax/libs/lodash.js/4.17

promise.then(
  script => alert(`${script.src} is loaded!`),
  error => alert(`Error: ${error.message}`)
);

promise.then(script => alert('Another handler...'));
```

We can immediately see a few benefits over the callback-based pattern:

Promises	Callbacks
Promises allow us to do things in the natural order. First, we run `loadScript(script)` , and `.then` we write what to do with the result.	We must have a `callback` function at our disposal when calling `loadScript(script, callback)` . In other words, we must know what to do with the result *before* `loadScript` is called.
We can call `.then` on a Promise as many times as we want. Each time, we're adding a new "fan", a new subscribing function, to the "subscription list". More about this in the next chapter: Promises chaining.	There can be only one callback.

So promises give us better code flow and flexibility. But there's more. We'll see that in the next chapters.

Tasks

Re-resolve a promise?

What's the output of the code below?

```
let promise = new Promise(function(resolve, reject) {
  resolve(1);

  setTimeout(() => resolve(2), 1000);
});

promise.then(alert);
```

solution

Delay with a promise

The built-in function `setTimeout` uses callbacks. Create a promise-based alternative.

The function `delay(ms)` should return a promise. That promise should resolve after `ms` milliseconds, so that we can add `.then` to it, like this:

```
function delay(ms) {
  // your code
}

delay(3000).then(() => alert('runs after 3 seconds'));
```

solution

Animated circle with promise

Reescribe la `showCircle` función en la solución de la tarea Círculo animado con devolución de llamada para que devuelva una promesa en lugar de aceptar una devolución de llamada.

El nuevo uso:

```
showCircle(150, 150, 100).then(div => {
  div.classList.add('message-ball');
  div.append("Hello, world!");
});
```

Tome la solución de la tarea Círculo animado con devolución de llamada como base.

solución

Leccion previa

Siguiente lección

Compartir

Mapa tutorial

Comentarios

- Si tiene sugerencias sobre qué mejorar, envíe un problema de GitHub o una solicitud de extracción en lugar de comentar.
- Si no puede entender algo en el artículo, explíquelo.
- Para insertar algunas palabras de código, use la `<code>` etiqueta, para varias líneas, envuélvalas en `<pre>` una etiqueta, para más de 10 líneas, use una caja de arena (plnkr , jsbin , codepen …)