

Promises

Promises are special JS objects.

- how to create these objs
- how to consume
- properties

How promises work behind the scene ??

The promise object we create has 4 major properties

1) status / State

2) value

3) on Fulfillment

4) on Reject

* status / status Shows current promise status

state

1) pending state

2) fulfilled state

→ success

3) rejected state

→ error

* value → when status of the promise is pending , this value property is undefined . The moment promise ^{status → fulfilled} is resolved , the value property is updated from undefined to the new value (this value we can consider as the returned value) resolved value)

So the value property acts like a placeholder till the time promise finishes .

* on fulfillment - This is an array, which contains functions that we attach to our promise object.
(To a promise object we can attach some func' using then() method) · When the value property is updated from undefined, to the new value, JS gives chance to these attached func' one by one with the value property as their argument (if there is no piece of code in the call stack & global code (ge))

status
values
on fullfillment :
[f, g, h, i]

for (i=0; i<10¹⁰; i++)
{ }

return new Promise(function(resolve, reject) {

3)

Promise constructor this constructor takes (callback as argument)

```
new Promise (function (resolve, reject) {  
    // write here  
})
```

3)

→ To create a promise call the promise

constructor:

→ the promise constructor takes a callback as an argument.

→ the callback passed inside constructor, expects arguments resolve, reject → func7

→ then inside the callback write your logic

→ if you want to return something on success,
then call **return func** with whatever value
you want to return.

~~Q~~

When do we consider a promise fulfilled??

→ if we call `resolve()` funcⁿ, we consider it fulfilled.

→ we consider it rejected if we call `reject()`;

Creation of a promise obj is sync.

```
12  ✓ function demo2(val) {  
13    ✓   return new Promise(function (resolve, reject) {  
14      ✓     console.log("Start");  
15      ✓       setTimeout(function process() {  
16          ✓         console.log("Completed timer");  
17          ✓           if(val%2 = 0) {  
18              ✓             // even number  
19              ✓               resolve("Even");  
20            ✓             } else {  
21                ✓                 // odd number  
22                ✓                  reject("Odd");  
23                ✓                }  
24                ✓              }, 10000);  
25                ✓              console.log("Somewhere");  
26            ✓        });  
27        }
```

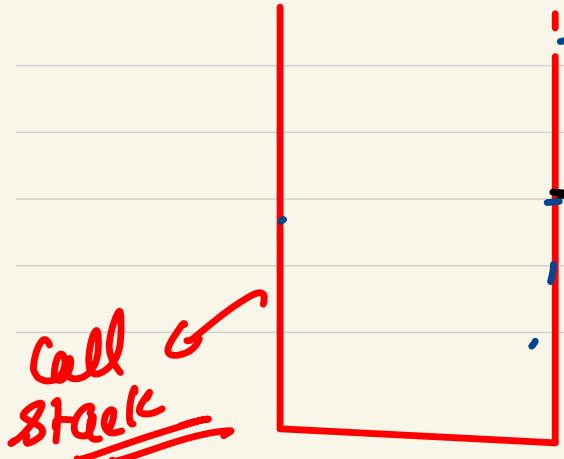
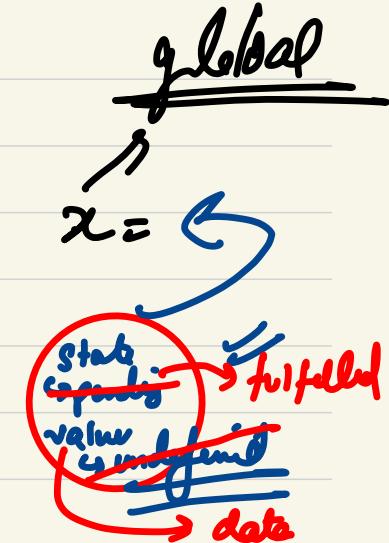
construct → callback to ember

Start
Somewhere
Completed timer

```

1 function fetchData(url) {
2     return new Promise(function resolve, reject) {
3         console.log("going to start the download");
4         setTimeout(function process() {
5             let data = "Dummy downloaded data";
6             console.log("download completed");
7             resolve(data);
8         }, 10000);
9         console.log("Timer to mimic download started");
10    });
11 }
12
13 console.log("Starting the program");
14 console.log("We are expecting to mimic a downloader");
15 x = fetchData("www.google.com");
16 console.log("New promise object created successfully, but downloading still going on");
17

```



Starting the program
 we are expecting ----- download
going to start download
Time to mimic download started
New prom obj on.
download completed

Consuming a promise

The promise consumption is the main beauty, using which we will avoid inversion of control.

Whenever we call a function, returning a promise, we will get a promise object which is like any object that we can store in a variable:

→ Now, the question , will JS wait here ??

```
39 let response = fetchData("www.datadrive.com");
```

stores the
promise object

function returns a promise
object

Pas Will JS wait here for promise to be resolved

if it involves any sync piece of code ?.

→ if creation of promise involves sync piece of code
it will wait, otherwise not.

```
function fetchData(url) {
    return new Promise(function (resolve, reject) {
        console.log("Started downloading from", url);
        // setTimeout(function processDownloading() {
        //     let data = "Dummy data";
        //     console.log("Download completed");
        //     resolve(data);
        // }, 7000);
        for(let i = 0; i < 10000000000; i++) {}
        resolve("dummy data");
    });
}
```

this callback is
hanging along
sync piece of
code, so
JS will have
to wait for

promise object creation.

And just after the for loop , we also resolve the
promise so we get a resolved promise.

```
6 function fetchData(url) {  
7     return new Promise(function (resolve, reject) {  
8         console.log("Started downloading from", url);  
9         setTimeout(function processDownloading() {  
10             let data = "Dummy data";  
11             console.log("Download completed");  
12             resolve(data);  
13         }, 7000);  
14     });  
15 }  
16
```

promise object
will get created
easily as this is
a blocking piece

of code, but initially it will be pending.

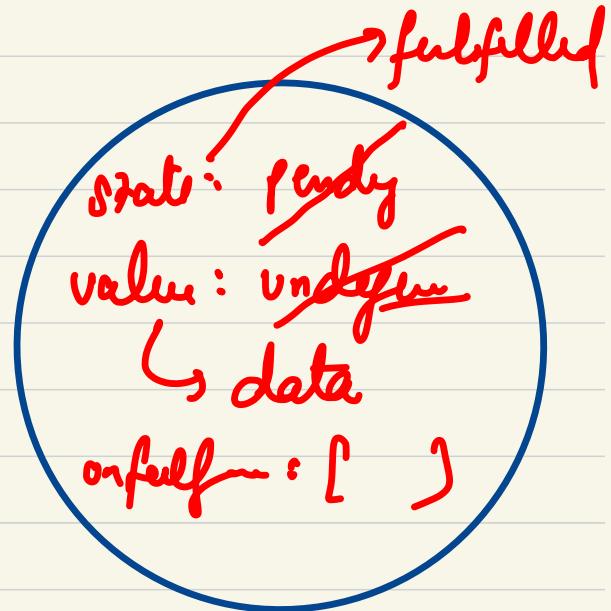
As the fulfillment happens after a timer of
7 sec.

Now technically, when promise gets resolved,
we have to execute some functions.

→ We can use `.then()` function on the promise object, to bind the functions we want to execute once we fulfill a promise.

The `.then()` function takes function as an argument that we want to execute after promise fulfills, and the argument function takes `value` property as parameter.

```
6  function fetchData(url) {  
7      return new Promise(function (resolve, reject) {  
8          console.log("Started downloading from", url);  
9          setTimeout(function processDownloading() {  
10             let data = "Dummy data"; →  
11             console.log("Download completed"); →  
12             resolve(data);  
13             console.log("hello");  
14             // resolve("sanket");// these lines will not be executed  
15             // resolve(12345);  
16         }, 7000);  
17     });  
18 }
```



hello

```
downloadPromise = fetchdata ("www.google.com");
```

(2) new Promise
downloadPromise . then (function f (value) {
 console.log (value)
 return "Sanket";
})

The .then function itself returning a new promise.

```
71 let downloadPromise = fetchData("www.datadrive.com");
72 downloadPromise
73 .then(function processDownload(value) {
74     console.log("downloading done with following value", value);
75     return value;
76 })
77 .then(function processWrite(value) {
78     return writeFile(value);
79 })
80 .then(function processUpload(value) {
81     return uploadData(value, "www.drive.google.com");
82 })
```

state
fulfilled

fulfilled

event loop



event queue



microtask
queue

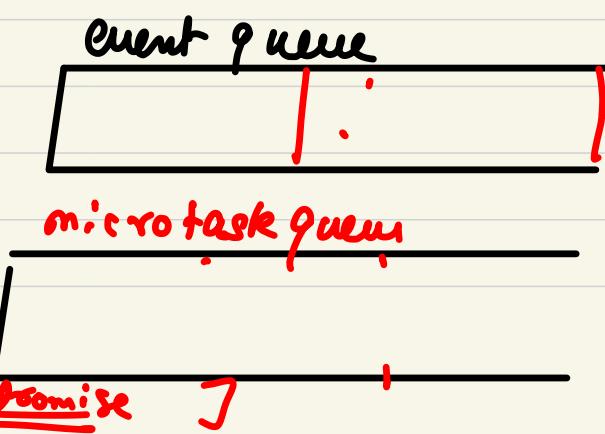
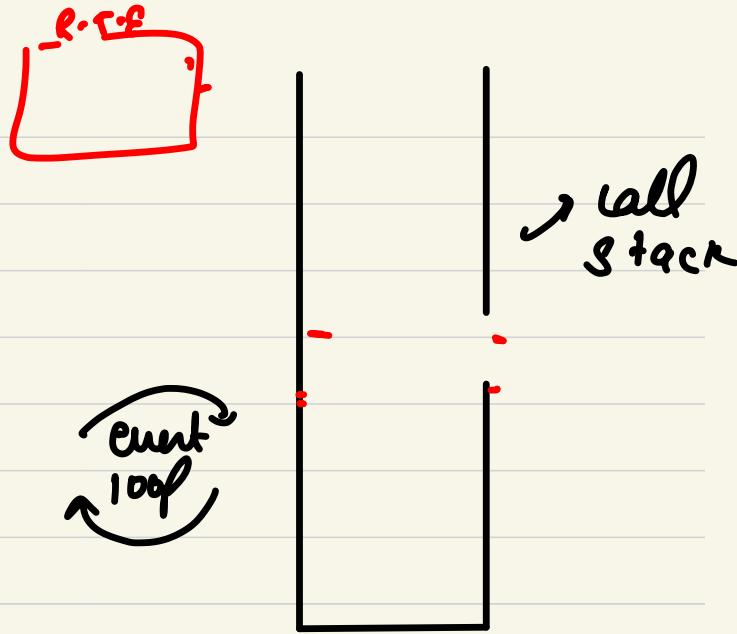
```

1 → console.log("Start of the file");
2
3 setTimeout(function timer1() {
4     console.log("Timer 1 done");
5 }, 0);
6
7 for(let i = 0; i < 100000000000; i++) {
8     // something
9 }
10
11 let x = Promise.resolve("Sanket's promise");
12 x.then(function processPromise(value) {
13     console.log("Whose promise ? ", value);
14 });
15
16 setTimeout(function timer2() {
17     console.log("Timer 2 done");
18 }, 0);
19
20 console.log("End of the file");

```

Start of file
 End of file
 Whose promise, Sanket's promise
 Timer 1 done
 Timer 2 done

$x = \text{resolved value}$
 Sanket's promise
 $\text{On fulfillment} \rightarrow \underline{\text{processPromise}}$



Microtask queue has a higher priority.

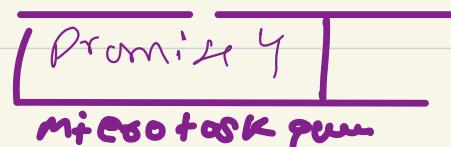
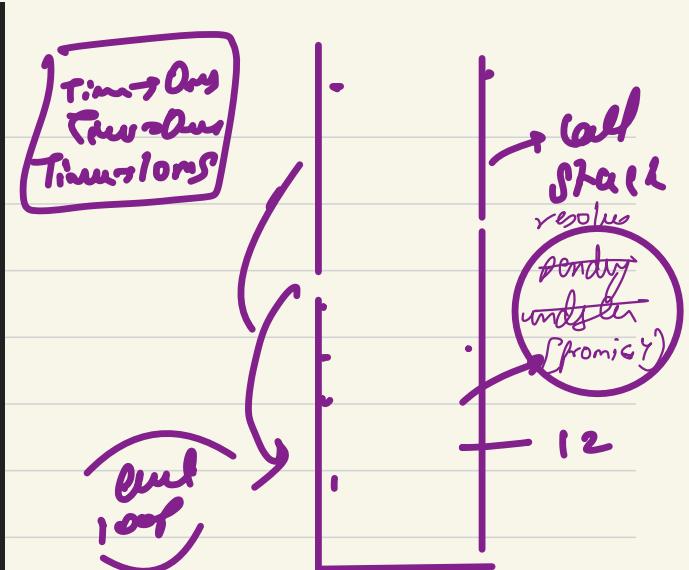
promise → callbacks → microtask queue

normal callback → event queue.

```

1 function dummyPromise() {
2     return new Promise(function(f, resolve, reject) {
3         setTimeout(function () {
4             resolve("Timer's promise")
5         }, 10000);
6     });
7 }
8 console.log("Start of the file"); ①
9
10 setTimeout(function timer1() {
11     console.log("Timer 1 done");
12     let y = dummyPromise();
13     y.then(function promiseY(value) {
14         console.log("Whose promise ?", value); ⑥
15     });
16 }, 0);
17
18
19 let x = Promise.resolve("Sanket's promise");
20 x.then(function processPromise(value) {
21     console.log("Whose promise ? ", value); ③
22 });
23
24 setTimeout(function timer2() {
25     console.log("Timer 2 done"); ⑤
26 }, 0);
27
28 console.log("End of the file"); ②
29
30 λ = value → Sanket's promise (Promise)
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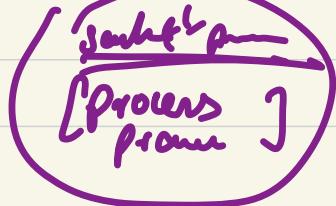


```

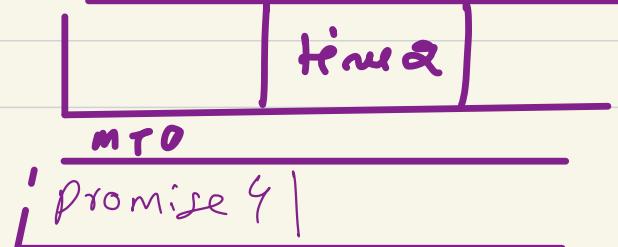
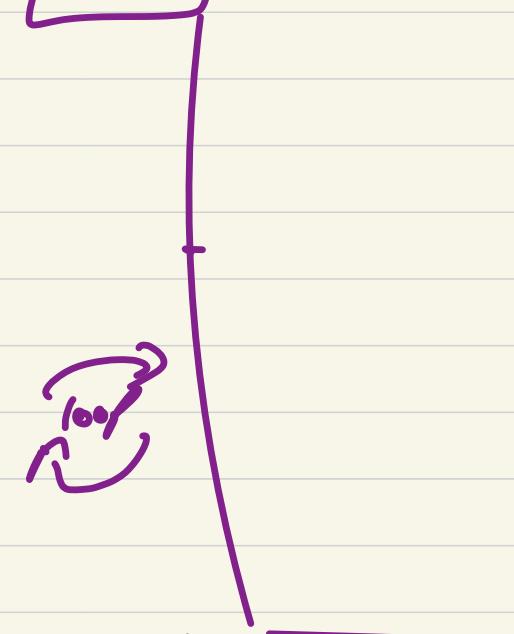
8  console.log("Start of the file");
9
10 settimeout(function timer1() {
11   console.log("Timer 1 done"); 1
12   let y = Promise.resolve("Immediately promise");
13   y.then(function promiseY(value) {
14     console.log("Whose promise?", value); 2
15   });
16 }, 0);
17
18
19 y = Promise.resolve("Sanket's promise");
20 y.then(function processPromise(value) {
21   console.log("Whose promise? ", value); 3
22 });
23
24 settimeout(function timer2() {
25   console.log("Timer 2 done"); 4
26 }, 0);
27
28 console.log("End of the file");

```

$x \rightarrow$



5
Tim 0ms
Tim 1ms

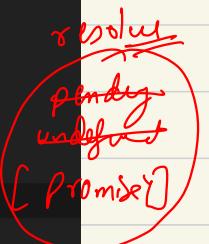


Yeo! → immediate promise (Promise)

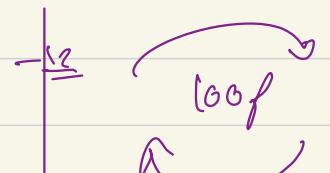
```

1 function dummyPromise() {
2     return new Promise(function(resolve, reject) {
3         setTimeout(function() {
4             resolve("Timer's promise")
5         }, 0);
6     });
7 }
8 console.log("Start of the file"); ①
9
10 setTimeout(function timer1() {
11     console.log("Timer 1 done"); ④
12     let y = dummyPromise();
13     → y.then(function promiseY(value) {
14         console.log("Whose promise?", value); ⑥
15     });
16 }, 0);
17
18
19 let x = Promise.resolve("Sanket's promise");
20 x.then(function processPromise(value) {
21     console.log("Whose promise ? ", value); ③
22 });
23
24 setTimeout(function timer2() {
25     console.log("Timer 2 done"); ⑤
26 }, 0);
27
28 } console.log("End of the file"); ②

```



Timer → OmS
 Timer → OmS
 Timer - OmS
 ↗ call stack
 $x = \text{value} \rightarrow \text{Sanket's promise}$
 (processPromise)



event queue



microtask queue



async & await

↳ We can declare a function async.

→ if you declare a funcⁿ async, it does the following →

- ① It allows the use of await keyword.
- ② if you declare a function async, it allows consumption of a promise using await.
- ③ an async function always converts your

returns value to a promise.

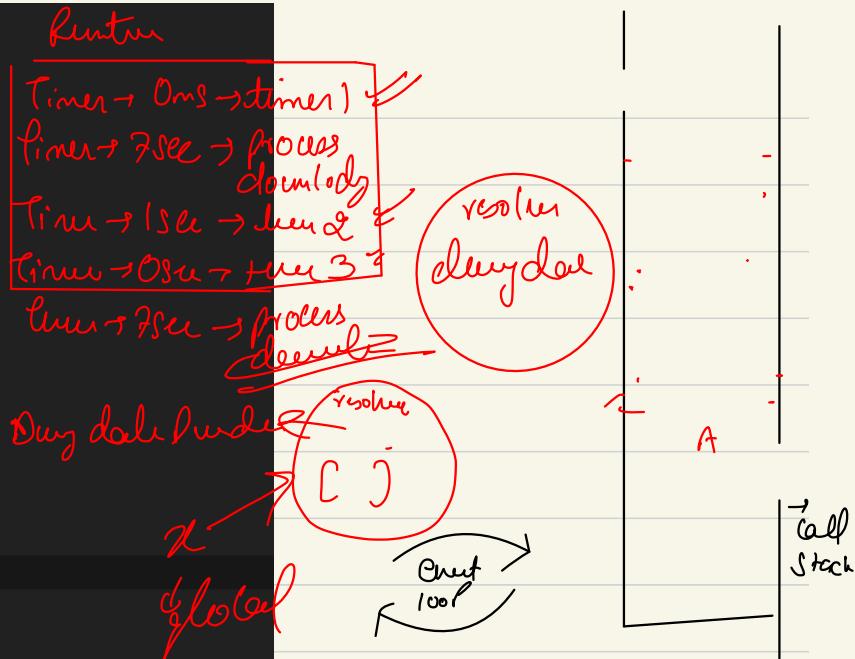
```

1 function fetchData(url) {
2     return new Promise(function resolve, reject) {
3         (11) (9) console.log("Started downloading from", url);
4         setTimeout(function processDownloading() {
5             let data = "Dummy data";
6             (12) console.log("Download completed");
7             resolve(data);
8         }, 7000);
9     });
10 }
11 async function processing() {
12     console.log("Entering processing");
13     let value1 = await fetchData("www.youtube.com");
14     console.log("youtube downloading done");
15     let value2 = await fetchData("www.google.com");
16     console.log("google downloading done");
17     console.log("Exiting processing");
18     return value1 + value2;
19 }
20 console.log("Start");
21 setTimeout(function timer1() {console.log("timer 1")}, 0);
22 console.log("after setting timer 1");
23 let x = processing();
24 x.then(function A(value) {
25     console.log("finally processing promise resolves with ", value);
26 });
27 setTimeout(function timer2() {console.log("timer 2")}, 1000);
28 setTimeout(function timer3() {console.log("timer 3")}, 0);
29 console.log("End");

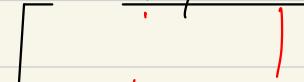
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Annotations:

- Line 3: Circled '11' and '9'.
- Line 6: Circled '12'.
- Line 8: Circled '9'.
- Line 13: Circled '3'.
- Line 15: Circled '10'.
- Line 17: Circled '13'.
- Line 19: Circled '1'.
- Line 24: Circled 'A'.
- Line 25: Circled '15'.
- Line 27: Circled '8'.
- Line 28: Circled '7'.
- Line 29: Circled '5'.
- Line 11: Handwritten 'dummy data' with arrows pointing to 'data' in the code.
- Line 12: Handwritten 'dummy data' with arrows pointing to 'data' in the code.
- Line 13: Handwritten 'dummy data' with arrows pointing to 'data' in the code.
- Line 14: Handwritten 'dummy data' with arrows pointing to 'data' in the code.
- Line 16: Handwritten 'dummy data' with arrows pointing to 'data' in the code.
- Line 17: Handwritten 'dummy data' with arrows pointing to 'data' in the code.
- Line 21: Handwritten 'timer 1' with an arrow pointing to 'timer1'.
- Line 22: Handwritten 'timer 1' with an arrow pointing to 'timer1'.
- Line 24: Handwritten 'processing()' with an arrow pointing to 'x'.
- Line 25: Handwritten 'value' with an arrow pointing to 'value' in 'value1 + value2'.
- Line 27: Handwritten 'timer 2' with an arrow pointing to 'timer2'.
- Line 28: Handwritten 'timer 3' with an arrow pointing to 'timer3'.
- Line 29: Handwritten 'End' with an arrow pointing to 'console.log("End")'.



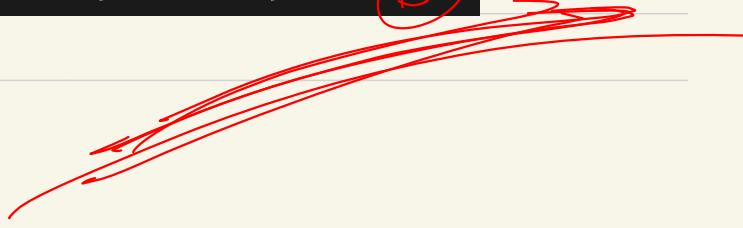
event queue



microtask queue



```
Start ①
after setting timer 1 ②
Entering processing ③
Started downloading from www.youtube.com ④
End ⑤
timer 1 ⑥
timer 3 ⑦
timer 2 ⑧
Download completed ⑨
youtube downloading done ⑩
Started downloading from www.google.com ⑪
Download completed ⑫
google downloading done ⑬
Exiting processing ⑭
finally processing promise resolves with Dummy data⑮
```



→ Inside async func thus look sync,

but over its async \Rightarrow

