



Node.js

Blocking & NonBlocking

Introduction

Synchronous code

```
1 const filesystem=require('fs');  
  // readFileSync takes as arguments the filepath and the character encoding  
2 var textread= filesystem.readFileSync('./txt/filetoread.txt','utf8');  
3 console.log(textread);
```

→ Synchronous code → blocking code

- This means that each statement is processed one after the other
- So each line waits for the result of the previous one
- Thus each line blocks the execution of the rest of the code

Asynchronous code

- Asynchronous code allow us to transfer heavy work in the background, in order for the rest of the code to continue being executed
- Asynchronous code - > non-blocking code
- Lets change file reading code to asynchronous code...

from Synchronous to Asynchronous

- **fs.readFile()** method syntax:
- `fs.readFile(filename, encoding, callback_function)`
- **filename**: holds the name/path of the file to read
- **encoding**: holds the encoding of file (default : 'utf8')
- **callback_function**: a function that is called **after** reading of file. It takes two parameters:
 - **err**: If any error occurs
 - **data**: Contents of the file.

callback_function

- callbacks for some are considered the foundation of Node.js
- In Node.js we are able to use callback functions in order to implement **asynchronous** behavior
- A callback -> is a function **called at the completion of a given task**
 - any blocking is prevented that way
 - it allows other code to run in the meantime

callback_function

- The general idea is that the callback is the last parameter (in a method or function)
- it gets called after the function is done with all operations.
- **Usually** the **first** parameter of the callback is ->error value.
- If a callback has no error then **error param is null** and the rest is/are the return value(s).

Asynchronous code

```
read_async.js > ...
1  const filesystem=require('fs');
2
3  // simplest way to read a file in Node.js is to use the fs.readFile() method,
4  // passing it the file path, encoding and a callback
5  //function that will be called with the file data (and the error):
6  filesystem.readFile('./txt/filetoread.txt', 'utf8', (err, data)=>{
7
8      // Display the file content
9      console.log(data);
0      console.log(err);
1  });
2
3  console.log('readFile called');
```

Asynchronous code

- Question: When we execute the code above, which log do we expect to see first?

Asynchronous code

```
ull Stack Javascript Development\nodejs\first_app> node read_async.js  
readFile called
```

```
I will be your teacher for this course! Yeah!
```

```
null → no error
```

So the file is being read in the background and then, immediately execution is moved on to the next statement, printing to the console

Once the data is read-> **callback** function will get called to be executed in the main single thread

Asynchronous code error example

```
ode read_async.js
readFile called
undefined
[Error: ENOENT: no such file or directory, open 'C:\Users\Aristea\Dropbox\My PC (DESKTOP-Q7S4FTP)\Documents\Papei\JS course\Full Stack Javascript Development\nodejs\first_app\txt\ss.txt'] {
  errno: -4058,
  code: 'ENOENT',
  syscall: 'open',
  path: 'C:\\Users\\Aristea\\Dropbox\\My PC (DESKTOP-Q7S4FTP)\\Documents\\Papei\\JS course\\Full Stack Javascript Development\\nodejs\\first_app\\txt\\ss.txt'
```

no data

Why is this important...

- Node.js is single threaded ->each application runs in a single thread
- All user accessing the application they access the same thread
//not like php for example that each user has a different thread
- When a users blocks a thread with synchronous code all users need to wait for the code to be executed
- Imagine thousands of users....

Why is this important...

- So Node.js to avoid that, we use asynchronous, non-blocking code.
- In asynchronous code -> we **upload heavy work** to be worked on in the **background**
 - once that work is done -> a **callback function** is called to handle the result.
- During all that time.... rest of the code can still be executed (thus no blocking by a heavy task)

Why is this important...

- The NodeJs event loop is a single thread
- **But** when this single thread encounters blocking i/o => it will delegate the task to a separate pool of worker threads.

Embedded async code

```
first_app > JS read_async_embedded.js > ...
1  const filesystem=require('fs');
2  // readFileSync takes as arguments the filepath and the character encoding
3
4  filesystem.readFile('./txt/not_embeddd.txt', 'utf8', (err, data)=>{
5    if(err) return console.log("oops!!!")
6    //not_embedded.txt contains the word embedded, that is the name of the second file
7    filesystem.readFile(`./txt/${data}.txt`, 'utf8', (err, data1)=>{
8
9      // Display the file content
10     console.log(data1);
11     console.log(err);
12   });
13 }
14 };
15
16 console.log('Reading file....');
```

return
stops
execution

Embedded async code

```
Reading file....  
Hello there!  
I am the embedded!  
I hope everything is understandable, have a nice day!  
null
```

Lets see how we can perform the following:

- Create directory with asynchronous function :

```
const fs = require('fs');
fs.mkdir('newdir', (err)=>{
  if(err){
    console.log('failed to create directory');
    return console.error(err);
  }else{
    console.log('Directory created successfully');
  }
});
```


To be continued...

<https://nodejs.org/api/fs.html>