

Node Introduction

Hello world and a bit more...

Prerequisites

- ▶ **Basic Javascript**
- ▶ **Basic HTML**

How we teach - SQ3R

- ▶ **Survey**
- ▶ **Ask question**
- ▶ **Code**
- ▶ **Compare**
- ▶ **Review**

Our goals

- ▶ **What is node?**
- ▶ **What are the benefits of using node?**
- ▶ **Write our first node program**
- ▶ **Debugging our app**
- ▶ **Learn to use the REPL for faster development**
- ▶ **Learn about the different parts of node**

What is node? - EX

- ▶ **Node is a JavaScript runtime**

What is JavaScript

- ▶ **Programming language**
- ▶ **Dynamic language**
- ▶ **Interpreted. no compiler**
- ▶ **Single threaded***
- ▶ **Began as the scripting language of the web**
- ▶ **At first only Browsers could run JavaScript now we can use JavaScript to write server applications, mobile apps, desktop apps**

JavaScript History

- ▶ **First graphical web browser Mosaic was released in 1993**
- ▶ **In 1994 Netscape browser was released and took the majority of the browser market**
- ▶ **Netscape wanted the web pages to be more dynamic with the ability to run a programming language**
- ▶ **JS prototype was released in May 1995**
- ▶ **In 1996 JavaScript was given to ECMAScript to define the specification of the language.**
- ▶ **The latest versions:**
 - **ES6 - 2015, ES7 - 2016, ES8 - 2017, ES9 - 2018**

What is Node - EX

- ▶ **JavaScript runtime - can run js files**
- ▶ **Let's see this in action with a small EX**
- ▶ **Install node**
- ▶ **create a js file that prints hello world to the console**
- ▶ **run that script using node**

What is Node - EX

- ▶ **Event driven**
- ▶ **this means it will run our script and that script can subscribe to events**
- ▶ **Let's see this in action with a small EX**
- ▶ **Create a js script which use setTimeout to register a callback function that will run after a certain time has passed**

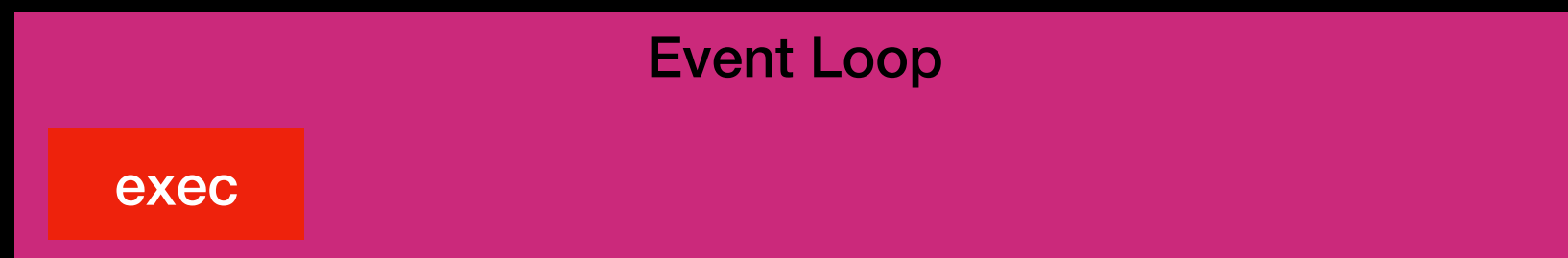
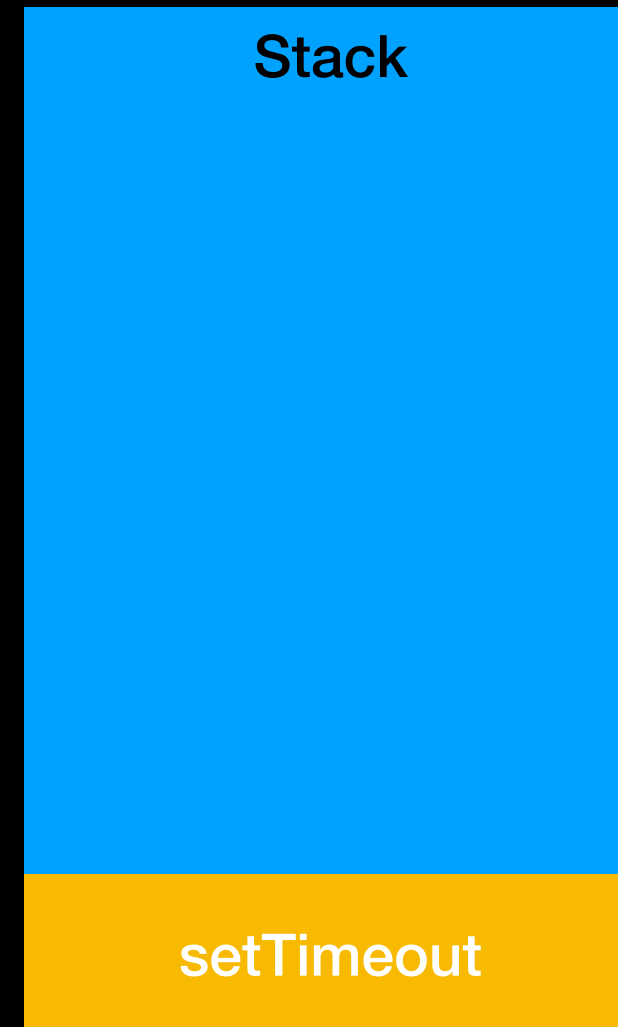
What is Node - Event loop

- ▶ **How does node activate our callback with setTimeout after a certain time passed. Did node block everything and waited?**
- ▶ **We can place a console.log after the timer to verify that node did not block**
- ▶ **The code that is currently running is placed on the Stack**
- ▶ **JS is single threaded so we have a single Stack**
- ▶ **For async stuff node uses C++ API's**
- ▶ **after the async stuff return it will placed the callback function in a queue called the event loop**

What is Node - Event loop

Our code:

`setTimeout(exec, 2000)`



What is Node - Stack

- ▶ **We have a single stack**
- ▶ **Code we run is in a frame along with all the variables values**
- ▶ **The event loop can not push stuff to the stack if the stack is not empty**

What is Node - C++ API's

- ▶ **node is a combination of JS v8 engine combined with C++ API's**
- ▶ **the c++ API's use multithreading**
- ▶ **by default node has a thread pool of 4 threads (can be increased if needed)**
- ▶ **The C++ will utilise those threads**
- ▶ **The C++ will also use kernel API's which also run concurrently**
- ▶ **So although JS is a single threaded it does not mean we are not using multi threading it just mean we have a single Stack**

What is Node - Event Loop

- ▶ **Simplifying the event loop - you can look at the event loop as a queue**
- ▶ **that queue will init when we start the node process**
- ▶ **the queue will run forever**
- ▶ **the event loop can push stuff on the stack if the stack is empty**

Benefits of using node

- ▶ **Let's go over some of the benefits of using node as our server technology**

Benefits of using node - performance

- ▶ <https://medium.com/@mihaigeorge.c/web-rest-api-benchmark-on-a-real-life-application-ebb743a5d7a3>
- ▶ Node performance is really good especially with tasks like database, networking and file system

Benefits of using node - Easy learning curve

- ▶ **Node is really minimalistic and simple to learn**
- ▶ **The use of js means an even easier learning curve for frontend web developers**

Benefits of using node - Cross Platform

- ▶ **Node will run on all the popular OS**
- ▶ **no need for a server running windows**

Benefits of using node - Single Thread

- ▶ **We only have one stack trace to deal with which means no multi threading programming**
- ▶ **Still the C++ section is utilizing the thread pool which by default consists of 4 thread**
- ▶ **This means that we only have to deal with single thread while node will take care of using concurrency**

Benefits of using node - Microservices

- ▶ **Very easy to publish packages**
- ▶ **Very easy to use community packages**
- ▶ **Very large community developing packages**

Debugging - EX

- ▶ **Let's try and place a breakpoint in our previous js script**
- ▶ **On the IDE of your choice try to place a breakpoint and run your the script with the debugger.**

Node REPL

- ▶ **We saw that we can use node runtime to run js scripts with the command:**
 - **> node <filename>**
- ▶ **We can also activate the runtime by typing**
 - **> node**
- ▶ **You can then write js commands and see the result of running those commands**
- ▶ **Each command you type is Read then Evaluated then the result is Printed and this process is Looped while the repl is activated**
- ▶ **Let's open the REPL and examine how to use this tool**

Node REPL -EX - Hello world

- ▶ **Activate the REPL**
- ▶ **type hello world to the console**
- ▶ **notice that hitting the tab key will suggest how to complete the command**
- ▶ **you can type multiple commands by typing:**
 - **.editor**
 - **after finishing type ctrl + D fo run the commands**
- ▶ **You can save what you type by typing**
 - **.save <path-and-filename>**
 - **.load <path-and-filename>**

Node REPL -TIP - Debug Console REPL

- ▶ **You can activate the REPL while pausing on a breakpoint**
- ▶ **All the variables will be available in your REPL**
- ▶ **you can write your code and see the result right away which is really comfortable**
- ▶ **for multiple lines hit Shift + Enter**

Summary

- ▶ **This lesson is the entry point for understanding basic concepts in node**
- ▶ **We started writing simple programs and ran them with node along with placing breakpoints and understanding how we can use the REPL to help us with our code writing.**