The New York Code + Design Academy

INTRODUCTION TO

Agenda

- Quick Intro
- Node.js: The Beginning
- What Is Node.js?
- Why Use Node.js?
- Installing Node.js

WHAT IS NODE.JS?

Node.js® is a JavaScript runtime built on Chrome's V8 JavaScript engine. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient. Node.js' package ecosystem, npm, is the largest ecosystem of open source libraries in the world.

No, but really, what is Node?

- It's a javascript runtime for outside of the browser, either on your computer or on a server, using Chrome's V8 javascript engine.
- It allows us to share work between our frontend and backend code, since it's all javascript!
- It also provides us better tools for writing the kinds of scripts we've been writing so far.
- It's very performant, due to javascript's asynchronous nature.

What is a JavaScript Engine?

- A program that interprets JavaScript code into native machine code.
- Sometimes referred to as an interpreter.
- Example engines include:
  - V8 (Google, Opera, Node)
  - SpiderMonkey (Mozilla)
  - JavaScriptCore (Apple)
  - Chakra (Microsoft)

What is a JavaScript Runtime?

- A library used by the JavaScript Engine to implement functions during runtime aka execution of a program.
- These libraries often include functions for communicating with the user's computer in a cross-platform way, like:
  - File reading and writing
  - User input (window and document events)
  - Memory management (Making new variables, removing old ones)
- Example runtimes include:
  - Node.js
  - Browsers

Google Chrome

- Uses a **client-side** JS Runtime
- Built in to the browser directly
- Handles tasks, such as:
  - Reading inputs from the user
  - Communicating things the user did to a server

Node.js

- Is a **server-side** JS Runtime
- Is installed on a computer or server
- Handles tasks, such as:
  - HTTP requests
  - File I/O Requests
  - Database queries

Node.js® is a JavaScript runtime built on Chrome's V8 JavaScript engine. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient. Node.js' package ecosystem, npm, is the largest ecosystem of open source libraries in the world.

Node is Event-Driven

Remember the JavaScript Event-Handling lecture?

- When this **event** happens, do this **action**.
  - *Example:* When a user `clicks` this button, `display` this menu.
  - This is considered a *Client-Side* event.

Node is Event-Driven

- Some common server-side events, include;
  - `connect`
  - `abort`
  - open
  - `close`
- *Example:* When this file is open, append the date.

Node is Event-Driven

- Node is always **listening** for new events
- When Node recognizes an event, it sends the relating action off to process, then creates a `callback`.
  - A **`callback`** is just that, Node calls back that action, so it can answer another event.
  - *Example:* When this file is open, append the date...**brb**...Ok, now `close` the file.

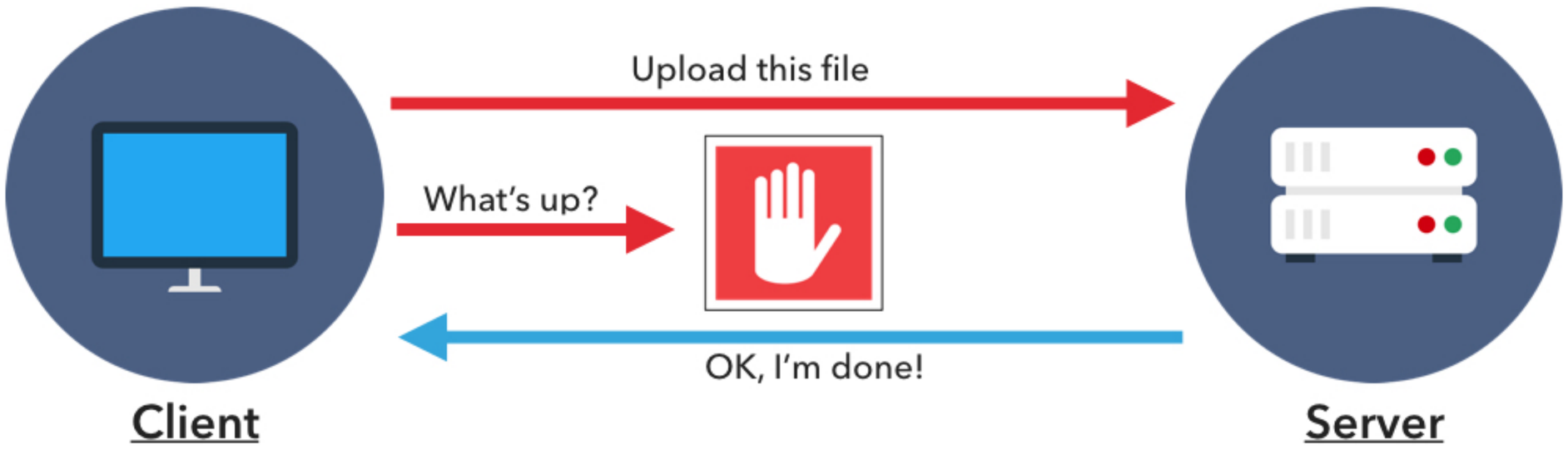
Node is Non-Blocking

- Non-Blocking operations are sometimes referred to as **Asynchronous** operations
- Other code will execute while Node waits for the asynchronous operation to complete

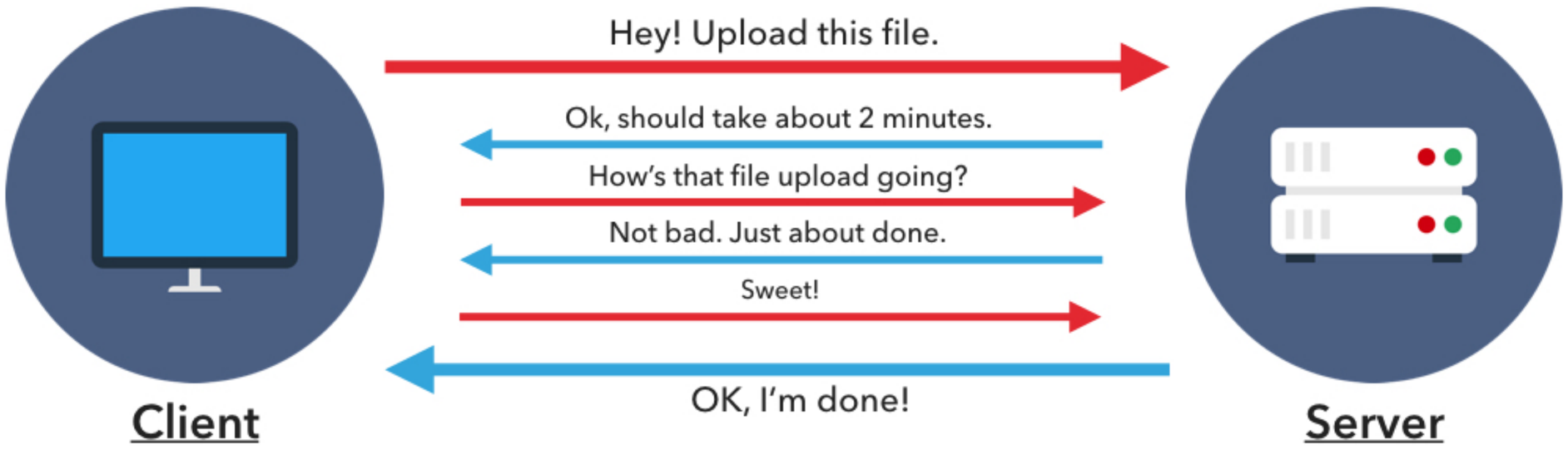
vs Blocking

- Blocking operations are sometimes referred to as **Synchronous** operations
- No other code can execute until the synchronous operation completes
- If the operation is slow, this can be an issue

BLOCKING



NON- BLOCKING



Synchronous Code

```
# Synchronous/Blocking

// this function will sit in a loop for the specified timeout
function pause(milliseconds) {
    var dt = new Date();
    while ((new Date()) - dt <= milliseconds) { /* Do nothing */ }
}

console.log("I will happen first!");

pause(1000);
// nothing can happen until the above line finishes
console.log("I have to wait.");


/* OUTPUT:

I will happen first!
// nothing happens for 1 second
I have to wait.

*/
```

Node is Single-Threaded

- A thread is a single computer process
- Node's main Event Loop runs in a single thread
- Events and Callbacks are queued in the order they are received

Event Loop Example

- A web request is received
- Node executes the handler for that request
- The handler initiates a database query, with a callback
- Node is free and able to handle other requests
- The database query ends, and Node is notified (event)
- Node adds the callback to the queue
- Node executes the handler after processing any events before it in the queue

WHY USE NODE.JS?

What does it offer?

- Node allows us to take the tools we learn for building interfaces, and apply it to all sorts of other problems.
- With a common language between our frontend and backend code, we can reuse more and be more diverse as developers.
- There is a huge community of other JS developers, and a ton of open source software to use.

Write for more than the web

- Node also empowers us to use javascript to make:
  - desktop, android, iOS applications
  - handy automated scripts
  - video games
  - persistent data servers

INSTALLING NODE.JS

Installation Steps

1. Go to https://nodejs.org
2. Click the **LTS** download button
3. Open Installer
4. Follow prompts to complete the installation

Basic Node Terminal Commands

- `node`
  - opens an interactive shell where you can execute JavaScript code
- `node file_name.js`
  - executes JavaScript code that is in a file
- `node -v`
  - displays the version of Node installed on your computer

Exercise #1: Hello Node!

- Using the Node interactive shell, output `Hello Node!` in the terminal
- Save a `Hello Node!` script in a file and execute that file in the Terminal

Challenge: Descending String Interval

Using our newfound Node knowledge, try to tackle this assignment.

- *Hint 1: Printing out stuff to the terminal is just the same as in a browser.*
- *Hint 2: You will probably want to use setTimeout for the delays!*
- *Hint 3: Did you know a function can call itself? Whoa! Might be useful...*