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# Introduction to Node.js

## What is Node.js?

Node.js is an **open-source, cross-platform JavaScript runtime environment** that allows developers to execute JavaScript code outside of a browser. It is widely used for building scalable and high-performance applications.

**Key Features of Node.js:**

* **V8 Engine**: Node.js runs on the V8 JavaScript engine (also used in Google Chrome), which makes it fast and efficient.
* **Asynchronous and Event-Driven**: Node.js handles I/O operations (network requests, database access, file system operations) asynchronously, meaning it doesn’t block the execution of other code.
* **Single-Threaded, Non-Blocking I/O**: Unlike traditional multi-threaded models, Node.js operates on a single thread but can handle multiple requests concurrently.
* **Rich Package Ecosystem**: Node.js has a vast collection of open-source modules available via npm (Node Package Manager), making development faster and easier.

**What is a Module in Node.js?**

A **module** in Node.js is a reusable block of code that can be imported into other files. It helps in organizing the code and improving maintainability.

**Types of Modules in Node.js:**

1. **Core Modules**: Built-in modules provided by Node.js, such as http, fs, path, os.
2. **Local Modules**: Custom modules created by developers within a project.
3. **Third-Party Modules**: Modules installed via npm, like express, mongoose, dotenv.

## The HTTP Module in Node.js

The **http module** in Node.js allows the creation of web servers and handling HTTP requests and responses.

**Creating a Basic Web Server:**

const { createServer } = require('node:http'); // Importing the HTTP module

const hostname = '127.0.0.1'; // Localhost IP

const port = 3000; // Port number

const server = createServer((req, res) => {

res.statusCode = 200; // HTTP status code for success

res.setHeader('Content-Type', 'text/plain'); // Setting response header

res.end('Hello World'); // Sending response body

});

server.listen(port, hostname, () => {

console.log(`Server running at http://${hostname}:${port}/`);

});

**Explanation:**

1. ``: Loads the built-in HTTP module.
2. ``: Creates an HTTP server that listens for incoming requests.
3. **Request and Response Objects**:
   * req: Represents the HTTP request (contains request headers, method, URL, etc.).
   * res: Represents the HTTP response (used to send data back to the client).
4. ``: Binds the server to a specific port and hostname.
5. ``: Ends the response and sends data to the client.

**Running the Server:**

1. Save the file as server.js.
2. Run the command:
3. node server.js
4. Open a browser and visit http://127.0.0.1:3000/ to see the output.
5. **Asynchronous programming and callbacks**
6. **Timers**
7. **Promises**
8. **Async and Await**
9. **Closures**
10. **The Event Loop**

**Asynchronous Programming and Callbacks** JavaScript is single-threaded, meaning it executes one operation at a time. However, asynchronous programming allows tasks like I/O operations, network requests, and timers to run in the background without blocking the main thread. This is crucial in Node.js since it handles multiple requests efficiently.

Callbacks**:** A callback is a function passed as an argument to another function and executed later. Callbacks are commonly used in asynchronous operations. Callback functions are a way to ensure certain code runs only after another code has already finished execution.

Example:

function greet(name, callback) {

console.log('Hello ' + name);

callback();

}

function logEnd() {

console.log('Function execution ended.');

}

// Passing 'logEnd' as a callback to the 'greet' function

greet('Alice', logEnd);

// Output:

// Hello Alice

// Function execution ended.

Another Example:

function processUserData(userId, callback) {

// Simulate fetching user data with a 1.5-second delay

setTimeout(() => {

if (userId) {

callback(null, { id: userId, name: "John Doe" }); // Success case

} else {

callback("User ID not provided", null); // Error case

}

}, 1500);

}

* **processUserData:** This function takes two parameters: userId and callback.
  + userId: The ID of the user whose data is to be fetched.
  + callback: A function that will be executed after the data fetching operation completes.
* **setTimeout:** Simulates a delay of 1.5 seconds to mimic an asynchronous operation (like fetching data from a server).
  + After 1.5 seconds, it checks if userId is provided.
  + If userId is provided, it calls the callback function with null as the first argument (indicating no error) and a user object { id: userId, name: "John Doe" } as the second argument (indicating success).
  + If userId is not provided, it calls the callback function with an error message "User ID not provided" as the first argument and null as the second argument.

**2. Function Call**

javascript

processUserData(1, (error, user) => {

if (error) {

console.log("Error:", error); // Logs error message if userId is not provided

} else {

console.log("User Data:", user); // Logs user data if successful

}

});

* **processUserData(1, callback):** Calls the processUserData function with 1 as the userId and an anonymous function as the callback.
  + Inside the callback function:
    - It checks if there is an error.
      * If there is an error, it logs the error message to the console.
      * If there is no error, it logs the user data to the console.

Timers Timers allow executing code after a specified delay or at intervals. JavaScript provides three main timer functions:

* setTimeout(fn, delay): Executes fn after delay milliseconds.
* setInterval(fn, delay): Repeats execution of fn every delay milliseconds.
* clearTimeout and clearInterval: Stop the execution of timers.

Example:

setTimeout(() => console.log("Executed after 2 seconds"), 2000);

let interval = setInterval(() => console.log("Repeating every 1 second"), 1000);

setTimeout(() => clearInterval(interval), 5000); // Stops after 5 seconds

A Promise in JavaScript is an object representing the eventual completion (or failure) of an asynchronous operation and its resulting value. It provides a cleaner, more robust way to handle asynchronous operations compared to traditional callback functions, which can lead to callback hell.

**Key Concepts**

* **Pending:** The initial state; neither fulfilled nor rejected.
* **Fulfilled:** The operation completed successfully.
* **Rejected:** The operation failed.

**Creating a Promise**

const myPromise = new Promise((resolve, reject) => {

const success = true; // You can change this to `false` to simulate failure

if (success) {

resolve("Operation succeeded!"); // If successful, resolve the promise

} else {

reject("Operation failed."); // If failed, reject the promise

}

});

**Handling Promises**

You can handle promises using then and catch methods:

|  |
| --- |
| The then and catch methods are used to handle the outcome of a Promise in JavaScript.  **then Method**  The then method is used to handle the resolved value of a Promise. It takes up to two arguments:   1. A callback function for the onFulfilled case (when the Promise is resolved successfully). 2. An optional callback function for the onRejected case (when the Promise is rejected).   **catch Method**  The catch method is used to handle the rejected value of a Promise. It takes one argument, a callback function for the onRejected case. |

myPromise

.then((message) => {

console.log("Success:", message); // Runs if the promise is resolved

})

.catch((error) => {

console.log("Error:", error); // Runs if the promise is rejected

});

**Using Async/Await**

Async/await syntax provides an even cleaner way to work with promises:

|  |
| --- |
| **Asynchronous in JavaScript**  In JavaScript, asynchronous operations don't block the execution of other code. This is achieved using constructs like callbacks, Promises, and the async/await syntax.  **async Keyword**  The async keyword is used to declare an asynchronous function. This function returns a Promise implicitly, and you can use the await keyword within it.  **await Keyword**  The await keyword can only be used inside an async function. It pauses the execution of the async function until the Promise is resolved or rejected.  **Handling Errors**  When using async and await, it's important to handle errors using try and catch blocks. If the awaited Promise is rejected, the code in the catch block will execute. |

async function handleOperations() {

try {

const result1 = await asyncOperation1;

console.log(result1);

const result2 = await asyncOperation2;

console.log(result2);

} catch (error) {

console.error(error);

}

}

handleOperations();

In this example, async keyword is used to define an asynchronous function, and await pauses the function execution until the promise settles.

**Summary**

* **Promises** simplify asynchronous code, making it more readable and manageable.
* **Then** and **catch** methods handle success and error cases.
* **Chaining** allows for sequential asynchronous operations.
* **Async/await** provides a syntactically cleaner approach for dealing with promises.

Async and Await async and await make asynchronous code look synchronous and are used with Promises.

Example:

function fetchData() {

return new Promise((resolve, reject) => {

setTimeout(() => {

resolve("Data fetched successfully!");

}, 2000);

});

}

async function getData() {

console.log("Fetching data...");

try {

const data = await fetchData(); // Pauses here until fetchData() is resolved

console.log(data); // Logs "Data fetched successfully!" after 2 seconds

} catch (error) {

console.error("Error:", error); // Catches and logs any error from fetchData()

}

console.log("Done fetching data.");

}

getData();

**Breakdown of the Example**

1. **fetchData Function:**
   * Returns a Promise that resolves with the message "Data fetched successfully!" after a 2-second delay.
2. **getData Function:**
   * Declared as an async function.
   * Logs "Fetching data..." to the console.
   * Uses await to wait for fetchData to resolve and assigns the resolved value to the data variable.
   * Logs the data to the console.
   * Logs "Done fetching data." to the console after the asynchronous operation is complete.

## Closures

A closure is a function that remembers the environment in which it was created. It allows a function to access variables from its outer (enclosing) scope even after that outer function has finished executing.

Here's an example to illustrate the concept:

function outerFunction() {

const outerVariable = 'I am from the outer scope';

function innerFunction() {

console.log(outerVariable); // Accesses outerVariable even after outerFunction is done

}

return innerFunction;

}

const myClosure = outerFunction();

myClosure(); // Logs: 'I am from the outer scope'

Explanation:

* outerFunction creates a local variable outerVariable and defines innerFunction.
* innerFunction has access to outerVariable even after outerFunction has returned.
* myClosure holds the innerFunction, which still has access to outerVariable due to closure.

The Event Loop The Event Loop handles JavaScript's asynchronous operations, ensuring that non-blocking code is executed efficiently. It processes the **Call Stack**, **Web APIs**, **Callback Queue**, and **Microtask Queue (Promises)** in a cyclic manner.

Example:

console.log("Start");

setTimeout(() => console.log("Timeout callback"), 0);

Promise.resolve().then(() => console.log("Promise resolved"));

console.log("End");

**Output:**

Start

End

Promise resolved

Timeout callback

Promises are executed before setTimeout because they are in the **Microtask Queue**, which has higher priority than the **Callback Queue**.

**V8 JavaScript Engine 🏎️**

V8 is the JavaScript engine that makes Chrome and Node.js run JavaScript fast. Let's break it down:

1. **What is V8?**
   * It is the engine that runs JavaScript code inside Google Chrome.
   * Node.js also uses it to run JavaScript outside the browser.
2. **What does it do?**
   * It **parses** (reads) and **executes** JavaScript code.
   * The browser provides extra features like the **DOM (Document Object Model)** and other Web APIs.
3. **Other JavaScript Engines:**
   * 🦊 **SpiderMonkey** → Used in Mozilla Firefox
   * 🍏 **JavaScriptCore (Nitro)** → Used in Safari
   * 🔷 **V8** → Used in Chrome & Edge (Edge now uses Chromium)

**How JavaScript Runs in V8 (Compilation & Performance) 🚀**

1. **JavaScript was originally "interpreted"** (executed line by line).
2. **Now, V8 compiles JavaScript** before running it (this makes it faster).
3. **JIT (Just-In-Time) Compilation**
   * Instead of running directly, JavaScript is first **compiled into machine code** (fast format for computers).
   * This speeds up execution a lot, which is crucial for big applications like Google Maps.

npm (Node Package Manager) **– Your JavaScript Toolbox 📦**

**What is npm?**

* **npm = Node.js package manager** (used to install and manage code libraries).
* It has **millions of reusable packages** for JavaScript developers.

**Installing All Dependencies**

* If a project has a package.json file, run:
* npm install
  + This installs all required libraries in the **node\_modules** folder.

**Common npm Flags**

|  |  |
| --- | --- |
| **Flag** | **Meaning** |
| --save | Adds package to dependencies (default in npm 5+) |
| --save-dev | Adds package to development dependencies |
| --no-save | Installs but does not add to package.json |
| --save-optional | Adds to optional dependencies |
| -S | Shortcut for --save |
| -D | Shortcut for --save-dev |

**Updating Packages**

* npm update
* Update a specific package:
* npm update <package-name>

**Versioning with npm**

* You can install a specific version of a package:
* npm install <package-name>@<version>

## Understanding ECMAScript 2015 (ES6) and Beyond in Node.js

**1. What is ECMAScript (ES6)?**

* ES6 (ECMAScript 2015) introduced many modern JavaScript features.
* Node.js follows the latest updates of this standard by using the **V8 engine**.

**2. Features in Node.js**

There are three types of JavaScript features in Node.js:

1. **Shipping features** – Fully stable and enabled by default.
2. **Staged features** – Almost ready but require a special flag (--harmony).
3. **In-progress features** – Still being developed, risky to use.

👉 **To check available in-progress features:**  
Run this command in your terminal:

node --v8-options | grep "in progress"

**Development vs Production in Node.js**

* Node.js itself has no special settings for "development" or "production."
* However, some libraries check the **NODE\_ENV** variable to adjust their settings.

**Best Practice: Set NODE\_ENV to Production**

NODE\_ENV=production node app.js

* This improves performance by disabling extra debugging tools.

**Why NODE\_ENV Can Be a Bad Practice?**

* Developers sometimes use it to change how the code works in different environments:

if (process.env.NODE\_ENV === 'development') {

console.log("Development mode!");

}

if (process.env.NODE\_ENV === 'production') {

console.log("Production mode!");

}

* This can **cause unexpected bugs** because **staging and production behave differently**.
* Instead, use **feature flags or config files** to handle environment-specific behavior.

## WebAssembly in Node.js

**1. What is WebAssembly?**

* A super-fast, low-level language that runs in **browsers and Node.js**.
* You can write WebAssembly (.wasm files) in languages like **C, C++, Rust, or AssemblyScript**.

**2. WebAssembly Key Concepts**

* **Module** – The compiled WebAssembly file (.wasm).
* **Memory** – A resizable memory buffer.
* **Table** – A list of references (like function pointers).
* **Instance** – A running version of a WebAssembly module.

**1️⃣ What is Undici?**

🔹 **Undici** is an HTTP client library for **Node.js** that powers the fetch API.  
🔹 It is built **from scratch** and does **not** use Node.js's built-in HTTP module.  
🔹 It is **high-performance** and good for handling many requests efficiently.

**2️⃣ Basic Usage of Fetch API with Undici**

## 📌 GET Request (Fetching Data)

Here's how you can make a GET request to fetch data in Node.js using the node-fetch library.

// Import the node-fetch library

const fetch = require('node-fetch');

// URL of the API you want to fetch data from

const apiURL = 'https://jsonplaceholder.typicode.com/posts';

// Function to fetch data

async function fetchData() {

try {

const response = await fetch(apiURL);

if (!response.ok) {

throw new Error('Network response was not ok ' + response.statusText);

}

const data = await response.json();

displayData(data);

} catch (error) {

console.error('There was a problem with the fetch operation:', error);

}

}

// Function to display data

function displayData(data) {

data.forEach(item => {

console.log(`ID: ${item.id}, Title: ${item.title}`);

});

}

// Call fetchData

fetchData();

**Explanation**

* **API URL**: Replace 'https://jsonplaceholder.typicode.com/posts' with the URL of the API you want to fetch data from.
* **Import node-fetch**: This line imports the node-fetch library, which allows you to use the fetch function in Node.js.
* **fetchData Function**: Uses fetch to make a GET request to the API.
  + await fetch(apiURL): Waits for the response from the API.
  + Checks if the response is OK. If not, throws an error.
  + await response.json(): Parses the response as JSON.
* **displayData Function**: Logs the fetched data to the console.
  + Iterates over the data and logs each item's ID and title.

## 📌 POST Request (Sending Data)

// Import the node-fetch library

const fetch = require('node-fetch');

// URL of the API you want to post data to

const apiURL = 'https://jsonplaceholder.typicode.com/posts';

// Data to be sent in the POST request

const data = {

title: 'foo',

body: 'bar',

userId: 1

};

// Function to make a POST request

async function postData() {

try {

const response = await fetch(apiURL, {

method: 'POST',

headers: {

'Content-Type': 'application/json'

},

body: JSON.stringify(data)

});

if (!response.ok) {

throw new Error('Network response was not ok ' + response.statusText);

}

const responseData = await response.json();

console.log('Response:', responseData);

} catch (error) {

console.error('There was a problem with the fetch operation:', error);

}

}

// Call postData

postData();

**Explanation**

* **API URL**: Replace 'https://jsonplaceholder.typicode.com/posts' with the URL of the API you want to post data to.
* **Data**: This is the data you want to send in the POST request. It is converted to a JSON string using JSON.stringify(data).
* **postData Function**: Uses fetch to make a POST request to the API.
  + method: 'POST': Specifies that this is a POST request.
  + headers: Sets the Content-Type to application/json to indicate that the request body contains JSON data.
  + body: Contains the data to be sent, converted to a JSON string.
  + await fetch(apiURL, { method, headers, body }): Sends the request and waits for the response.
  + Checks if the response is OK. If not, throws an error.
  + await response.json(): Parses the response as JSON and logs it to the console.

# 📦 Node.js Module System

Node.js follows a **module system** to organize code into separate files. This helps make the code reusable, maintainable, and easy to manage.

## 1️⃣ Global Object

* In Node.js, the **global object** is an object that is accessible from anywhere in your application.
* It provides built-in functions and variables.
* Unlike in browsers (where the global object is window), in Node.js, the global object is **global**.

✅ **Example:**

console.log(global); // Prints all global properties

console.log(global.setTimeout); // Shows that setTimeout is a global function

## 2️⃣ Modules

* A **module** is just a JavaScript file that contains some code.
* Node.js organizes code into different files (modules) to keep things clean.
* There are **three types** of modules:
  1. **Built-in modules** (provided by Node.js, like fs, http, path)
  2. **User-defined modules** (files you create)
  3. **Third-party modules** (installed via npm, like express)

### 3️⃣ Creating a Module

* To create a module, you write some code inside a separate file and **export** it using module.exports.

📄 **math.js**

function add(a, b) {

return a + b;

}

module.exports = add; // Exporting function

### 4️⃣ Loading a Module

* To use a module in another file, we **import** it using require().

📄 **app.js**

const add = require('./math'); // Importing math.js

console.log(add(5, 3)); // Output: 8

### 5️⃣ Module Wrapper Function

* Every module in Node.js is **wrapped** inside a function before execution.
* This function provides the following arguments:
  + exports → Shortcut for exporting
  + require → Function to import modules
  + module → Object representing the current module
  + \_\_filename → Path of the current file
  + \_\_dirname → Directory of the current file

✅ **Example:**

console.log(\_\_filename); // Prints the full path of this file

console.log(\_\_dirname); // Prints the directory where this file is located

## 6️⃣ Path Module

 **Joining Paths:** Combines multiple path segments into one.

 **Resolving Paths:** Converts a sequence of paths into an absolute path.

 **Extracting Parts:** Retrieves information like directory name, base name, extension, etc.

 **Normalization:** Normalizes a path, resolving .. and . segments.

// Import the path module from Node.js

const path = require('path');

// Join multiple path segments into a single path

const fullPath = path.join('/users', 'md', 'projects');

// Log the full joined path

console.log('Full Path:', fullPath);

// Resolve a sequence of paths into an absolute path

const absolutePath = path.resolve('users', 'md', 'projects');

// Log the absolute path

console.log('Absolute Path:', absolutePath);

// Get the last portion (file name) of a path

const fileName = path.basename('/users/md/projects/index.html');

// Log the file name

console.log('File Name:', fileName);

// Get the directory name of a path

const dirName = path.dirname('/users/md/projects/index.html');

// Log the directory name

console.log('Directory Name:', dirName);

// Get the extension of the path

const extName = path.extname('/users/md/projects/index.html');

// Log the extension name

console.log('Extension Name:', extName);

## 7️⃣ OS Module

* The os module is a **built-in module** that provides system-related information.

✅ **Example:**

const os = require('os');

console.log(os.type()); // OS type (Windows/Linux/Mac)

console.log(os.freemem()); // Free memory in bytes

console.log(os.totalmem()); // Total memory in bytes

console.log(os.platform()); // OS platform (win32, linux, darwin)

**📦 Node.js Module System**

Node.js provides **built-in modules** that help developers perform different tasks easily, such as working with files, handling events, and creating servers.

## 1️⃣ File System (FS) Module

* The **fs (File System) module** is used to interact with files and directories.
* It allows you to:
  + Read files
  + Write files
  + Delete files
  + Rename files
  + Create directories, etc.

✅ **Example: Reading a File**  
📄 **app.js**

const fs = require('fs');

// Read file asynchronously

fs.readFile('example.txt', 'utf8', (err, data) => {

if (err) {

console.error(err);

return;

}

console.log(data); // Prints the content of example.txt

});

✅ **Example: Writing to a File**

fs.writeFile('output.txt', 'Hello, Node.js!', (err) => {

if (err) throw err;

console.log('File written successfully!');

});

## 2️⃣ Events Module

* The **events module** allows Node.js to handle and trigger events.
* It follows the **Observer pattern** (one part of the code listens for events while another part triggers them).
* We use the EventEmitter class to create and manage events.

✅ **Example: Creating and Emitting an Event**

const EventEmitter = require('events');

const emitter = new EventEmitter();

// Define an event listener

emitter.on('greet', () => {

console.log('Hello! Event triggered.');

});

// Emit (trigger) the event

emitter.emit('greet');

## 3️⃣ Event Arguments

* We can **pass data (arguments)** while emitting an event.
* This helps send information along with an event.

✅ **Example: Passing Arguments in Events**

emitter.on('userLoggedIn', (username) => {

console.log(`User ${username} has logged in.`);

});

emitter.emit('userLoggedIn', 'Luffy');

// Output: User Luffy has logged in.

**4️⃣ Extending EventEmitter**

* Instead of using EventEmitter directly, we can create our own **custom class** that extends it.
* This is useful when we need custom event-handling logic inside a class.

✅ **Example: Creating a Custom EventEmitter Class**

const EventEmitter = require('events');

class Logger extends EventEmitter {

log(message) {

console.log(message);

this.emit('messageLogged', { id: 1, text: message });

}

}

const logger = new Logger();

logger.on('messageLogged', (eventData) => {

console.log('Listener received:', eventData);

});

logger.log('Hello, World!');

**Explanation:**

1. We create a class Logger that **extends** EventEmitter.
2. The log() method prints a message and emits an event.
3. When the event is emitted, a listener handles it.

**5️⃣ HTTP Module**

* The http module helps create web servers and handle requests.
* It is used to build backend applications in Node.js.

✅ **Example: Creating a Simple Web Server**

const http = require('http');

const server = http.createServer((req, res) => {

res.writeHead(200, { 'Content-Type': 'text/plain' });

res.end('Hello, this is a Node.js server!');

});

server.listen(3000, () => {

console.log('Server is running on port 3000...');

});

**Explanation:**

1. We import the http module.
2. We create a server that sends "Hello, this is a Node.js server!" as a response.
3. The server listens on **port 3000**.

**6️⃣ Node Core Recap**

**🔥 Summary of Key Node.js Concepts**

| **Concept** | **Description** |
| --- | --- |
| **FS Module** | Works with files (read, write, delete, rename). |
| **Events Module** | Handles and triggers custom events. |
| **Event Arguments** | Passes data when emitting events. |
| **Extending EventEmitter** | Creates custom event-handling classes. |
| **HTTP Module** | Builds web servers in Node.js. |

**🚀 Final Thoughts**

* The **FS module** helps with files.
* The **Events module** lets us handle and trigger custom events.
* We can **pass data in events** and **extend EventEmitter** for custom event logic.
* The **HTTP module** helps create servers.

Would you like a more detailed explanation of any part? 😊🔥

# Code With Mosh:

Absolutely! Let's break down what's happening in your code.

**app.js**

javascript

const EventEmitter = require('events');

//Raise an event

emitter.emit('messageLogged', { id: 1, url: "http://" }); //emit means making a noise, produce - signalling that an event has happened

const Logger = require('./logger');

const logger = new Logger();

// Register a listener

logger.on('messageLogged', (arg) => {

console.log('Listener called', arg);

});

logger.log('message');

**logger.js**

javascript

const EventEmitter = require('events');

var url = 'http://mylogger.io/log';

class Logger extends EventEmitter {

log(message) {

// Send an HTTP request

console.log(message);

this.emit('messageLogged', { id: 1, url: "http://" }); //emit means making a noise, produce - signalling that an event has happened

}

}

module.exports = log; //we can change exports variables name here

**Explanation**

1. **EventEmitter:**
   * The EventEmitter class in Node.js allows us to create, manage, and handle custom events. Think of it as a way to signal different parts of your application when something significant happens.
2. **Emitting an Event:**
   * In app.js, we see emitter.emit('messageLogged', { id: 1, url: "http://" }). This line is responsible for emitting or signaling that the messageLogged event has occurred. The object { id: 1, url: "http://"} is passed as the data accompanying the event.
3. **Creating Logger Class:**
   * In logger.js, a Logger class is defined that extends EventEmitter. This means that Logger inherits all the functionality of the EventEmitter class.
4. **Logging a Message:**
   * Inside the Logger class, there is a log method that takes a message as an argument. This method prints the message to the console and then emits the messageLogged event, providing an object with id and url.
5. **Module Export:**
   * The Logger class is exported from logger.js using module.exports. This makes it available to other files that require logger.js.
6. **Using Logger Class:**
   * In app.js, the Logger class is imported, and an instance of it is created (const logger = new Logger()).
   * A listener is registered for the messageLogged event using logger.on('messageLogged', (arg) => { ... }). This listener will be called whenever the messageLogged event is emitted, and arg will contain the accompanying data.
   * The log method is called on the logger instance, which prints the message and triggers the messageLogged event.

# PDF, DOCX, PPT, TEXT file read using library in node

## PDF File Parsing

**Package Installation Command:**

bash

npm install pdf-parse

**Example Code:**

javascript

// Import the built-in 'fs' (file system) module

const fs = require('fs');

// Import the 'pdf-parse' library for parsing PDF files

const pdf = require('pdf-parse');

// Specify the path to the PDF file

const filePath = '../Introduction to Node Note-01.pdf';

// Read the PDF file as a buffer

fs.readFile(filePath, (err, data) => {

// Handle any errors that occur while reading the file

if (err) throw err;

// Parse the PDF data

pdf(data).then(pdfData => {

// Log the text content of the PDF to the console

console.log(pdfData.text);

}).catch(error => {

// Handle any errors that occur while parsing the PDF

console.error("Error reading file", error);

});

});

**Parsing Different Types of Files in Node.js**

**1. PDF Files**

* **Library:** pdf-parse
* **Usage:** Extracts text content from PDF files.
* **Example:** The code snippet above demonstrates how to read and parse a PDF file.

**2.** DOCX Files

* **Package Installation Command:**

bash

npm install mammoth

* **Example Code:**

javascript

// Import the built-in 'fs' (file system) module

const fs = require('fs');

// Import the 'mammoth' library for parsing DOCX files

const mammoth = require('mammoth');

// Specify the path to the DOCX file

const filePath = 'example.docx';

// Read the DOCX file as a buffer

fs.readFile(filePath, (err, data) => {

// Handle any errors that occur while reading the file

if (err) throw err;

// Parse the DOCX data to extract raw text

mammoth.extractRawText({ buffer: data })

.then(result => {

// Log the text content of the DOCX to the console

console.log(result.value);

})

.catch(error => {

// Handle any errors that occur while parsing the DOCX

console.error("Error reading file", error);

});

});

**3.** PPT Files

* **Package Installation Command:**

bash

npm install pptx2json

* **Example Code:**

javascript

// Import the built-in 'fs' (file system) module

const fs = require('fs');

// Import the 'pptx2json' library for parsing PPTX files

const pptx2json = require('pptx2json');

// Specify the path to the PPTX file

const filePath = 'example.pptx';

// Parse the PPTX data to extract content

pptx2json(filePath).then(result => {

// Log the parsed data from the PPTX file to the console

console.log(result);

}).catch(error => {

// Handle any errors that occur while parsing the PPTX

console.error("Error reading file", error);

});

**4.** Text Files

* **Library:** Built-in fs module (no need to install)
* **Usage:** Reads plain text files.
* **Example Code:**

javascript

// Import the built-in 'fs' (file system) module

const fs = require('fs');

// Specify the path to the text file

const filePath = 'example.txt';

// Read the text file with UTF-8 encoding

fs.readFile(filePath, 'utf8', (err, data) => {

// Handle any errors that occur while reading the file

if (err) throw err;