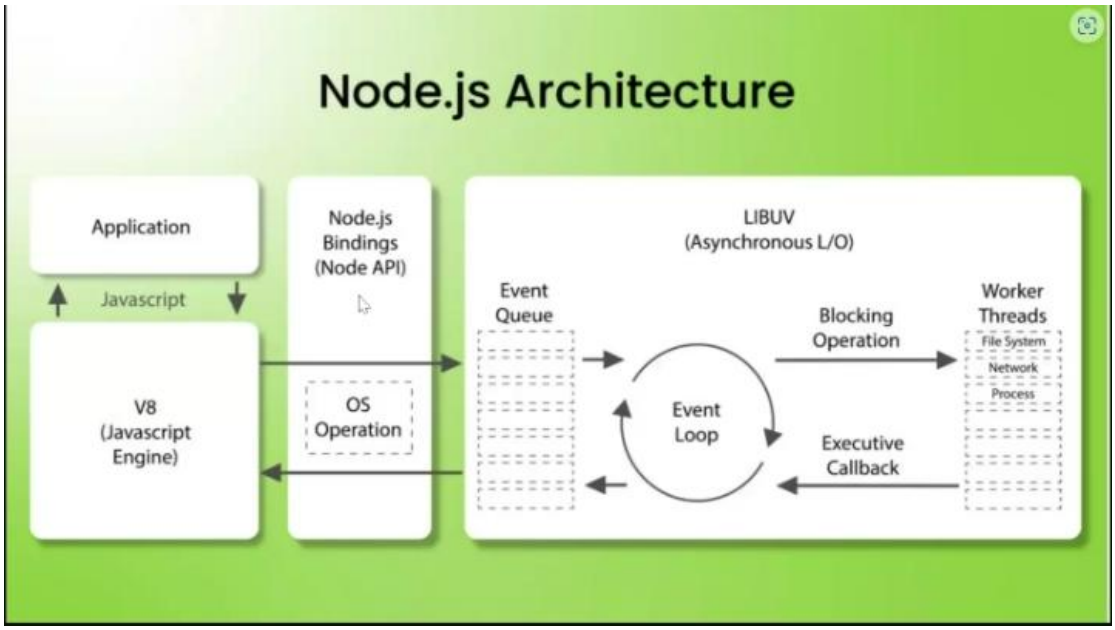
Node js Architecture



Node.js operates on a single-threaded, non-blocking architecture that efficiently handles both synchronous and asynchronous operations. When a Node.js application starts, its JavaScript code is executed by the V8 engine, which runs all synchronous tasks line by line.

Asynchronous operations are handed off to Node.js's asynchronous APIs. These APIs, provided by the Node.js bindings, act as a bridge between the JavaScript code and the underlying system's capabilities. Once an asynchronous task is triggered, it is passed to libuv**.**

While libuv handles these asynchronous tasks, the main thread of the Node.js application remains free to continue executing other parts of the code. Completed tasks are returned to libuv, which queues them up for execution in the Event Queue. The Event Loop continuously checks this queue to see if there are any tasks that need to be processed. When the Event Loop finds a task, it executes the associated callback function in the main thread.

This process allows Node.js to efficiently manage multiple operations simultaneously without blocking the execution of other tasks. If a setTimeout function is used to delay an operation, the delay timer runs in the background. Once the timer expires, the callback is added to the Event Queue and eventually processed by the Event Loop, ensuring the application remains responsive throughout.

Advantages of Node.js over browser

1. Node.js has a vast package ecosystem through npm (Node Package Manager), providing pre-built modules and libraries for virtually any functionality you need.
2. Node.js allows JavaScript to run on the server.
3. We can directly interact with the file system, perform I/O operations, and access system-level resources like processes and network sockets. Browsers restrict these capabilities for security reasons.
4. Advanced debugging and profiling tools that aren't available for browser-based JavaScript.
5. Running JavaScript in Node.js eliminates the need to worry about differences in how browsers interpret JavaScript, as Node.js runs on a consistent runtime (V8).