NodeJS

01

Presented by
Subhash EP

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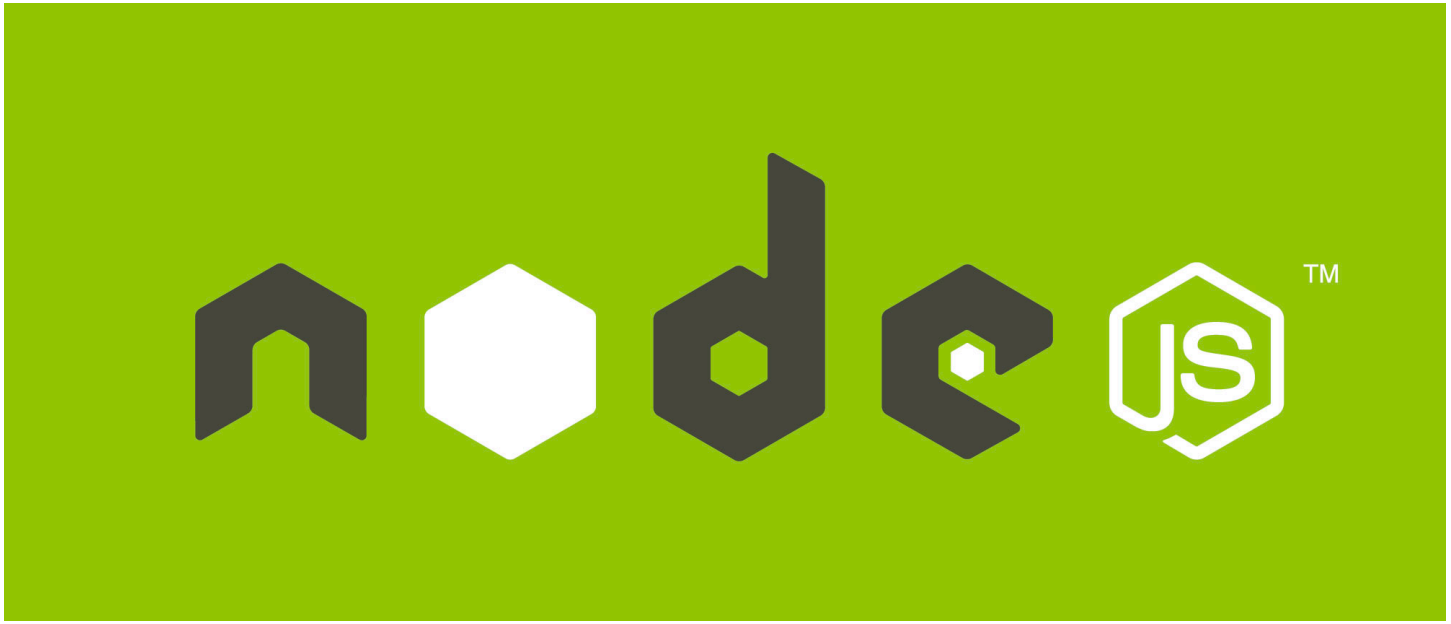
node
JS
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Install NodeJS

Windows Installer (.msi)	32-bit	64-bit
Windows Binary (.exe)	32-bit	64-bit
Mac OS X Installer (.pkg)	Universal	
Mac OS X Binaries (.tar.gz)	32-bit	64-bit
Linux Binaries (.tar.gz)	32-bit	64-bit
SunOS Binaries (.tar.gz)	32-bit	64-bit
Source Code	node-v0.10.26.tar.gz	

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command-line tools

- node
- npm

REPL

- Read
- Evaluate
- Print
- Loop

Node REPL

- To test and experiment with code
- When you run node without any command line arguments,
  - it puts you in the REPL mode
- To view the options available,
  - type .help and press Enter in REPL mode

Node REPL Demo

Executing Node.js Scripts

- You can execute a JavaScript source file in Node.js
  - by simply passing the file to node on the command line
    - Create a new JS file helloworld.js in code directory
    - node code/helloworld

Node JS Execution Demo

Basics

- Variables
  - var
- console.log
- Data Types
  - Numbers – 1,2,3,..,..
  - Boolean – true / false
  - Arrays – [ ]
  - Object Literals – { }

Basics (cont.)

- Functions
- Immediately Executing Functions
- Anonymous Functions
- High-Order Functions

Basics Demo

Closures

- In JavaScript, a closure is a function to which the variables of the surrounding context are bound by reference.

```
1. function getMeAClosure() {
2.     var seeMe = "here I am";
3.     return (function theClosure() {
4.         return {canYouSeeIt: seeMe ? "yes!": "no"};
5.     });
6. }
7.
8. var closure = getMeAClosure();
9. closure().canYouSeeIt; //"yes!"
```

Lexical Scope

- lexical scope of a function is statically defined by the function's physical placement within the written source code

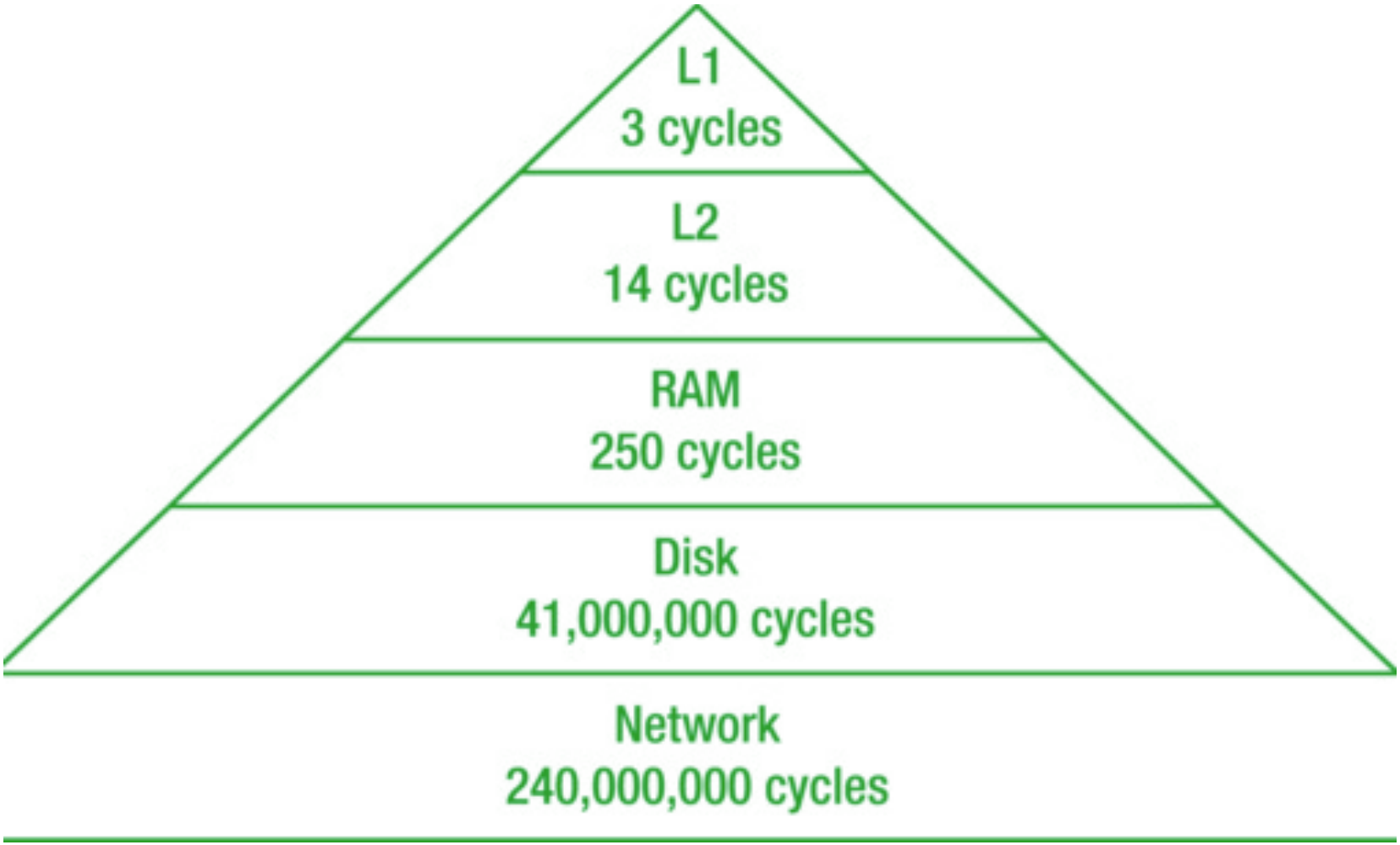
```
1. var x = "global";
2.  function outer() {
3.     var y = "outer";
4.      function inner() {
5.         var x = "inner";
6.     }
7. }
```

Closures Demo

Node.js Performance

- Node.js is focused on creating highly performing applications.
- How?
- First let us introduce the I/O scaling problem.
- Then let us see how it has been solved
  - traditionally,
  - followed by Node.js

I/O Scaling Problem – typical scene



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I/O Problem Explained

- You can clearly see that Disk and Network access is in a completely different category from accessing data that is available in RAM and CPU cache

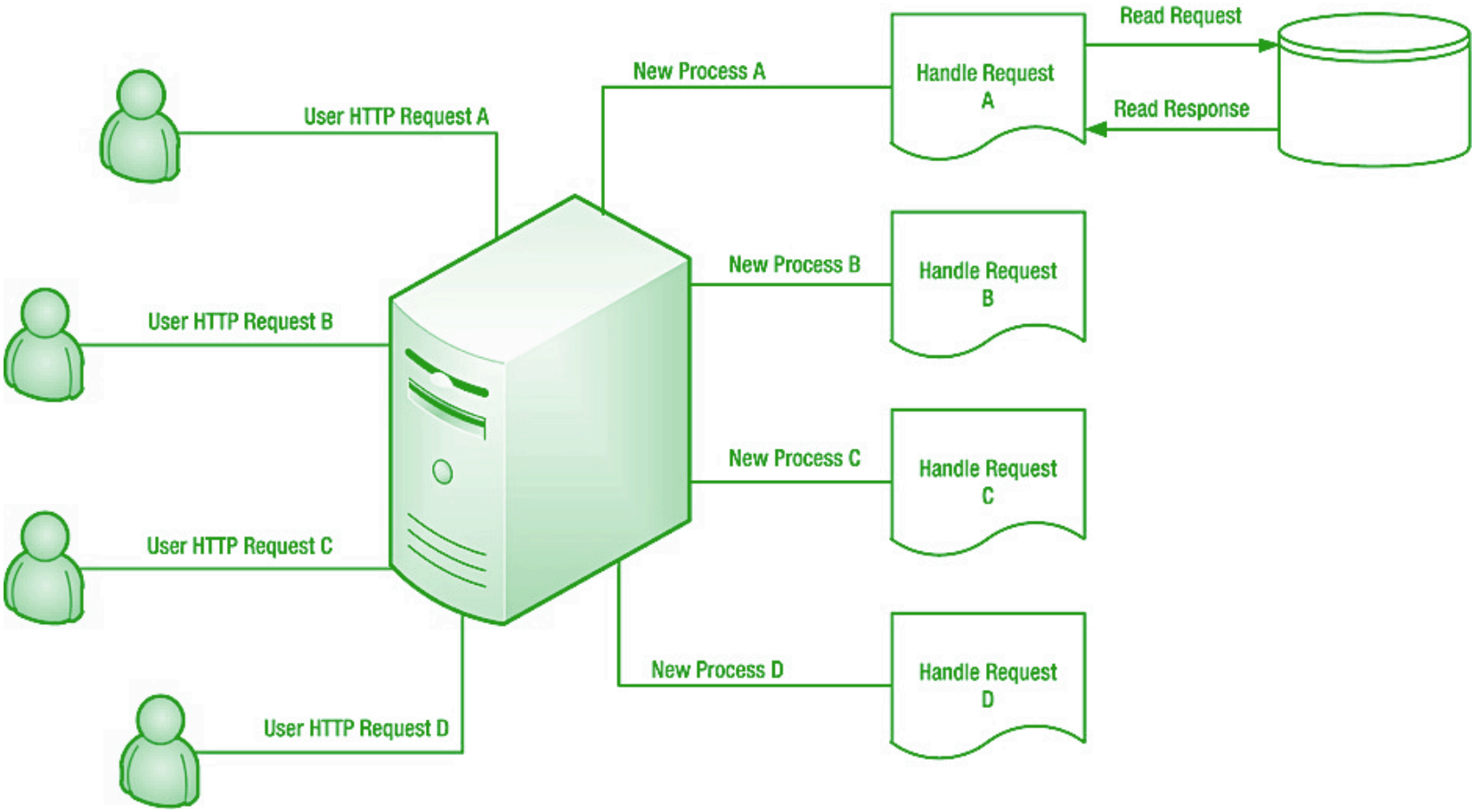
I/O Problem Explained

- Most web applications depend on reading data from disk or from another network source (for example, a database query).
- When an HTTP request is received and we need to load data from a database, typically this request will be spent waiting for a disk read or a network access call to complete.

I/O Problem Explained

- These open connections and pending requests consume server resources (memory and CPU).
- In order to handle a large number of requests from different clients using the same web server, we have the I/O scaling problem.

Traditional - Process Per Request



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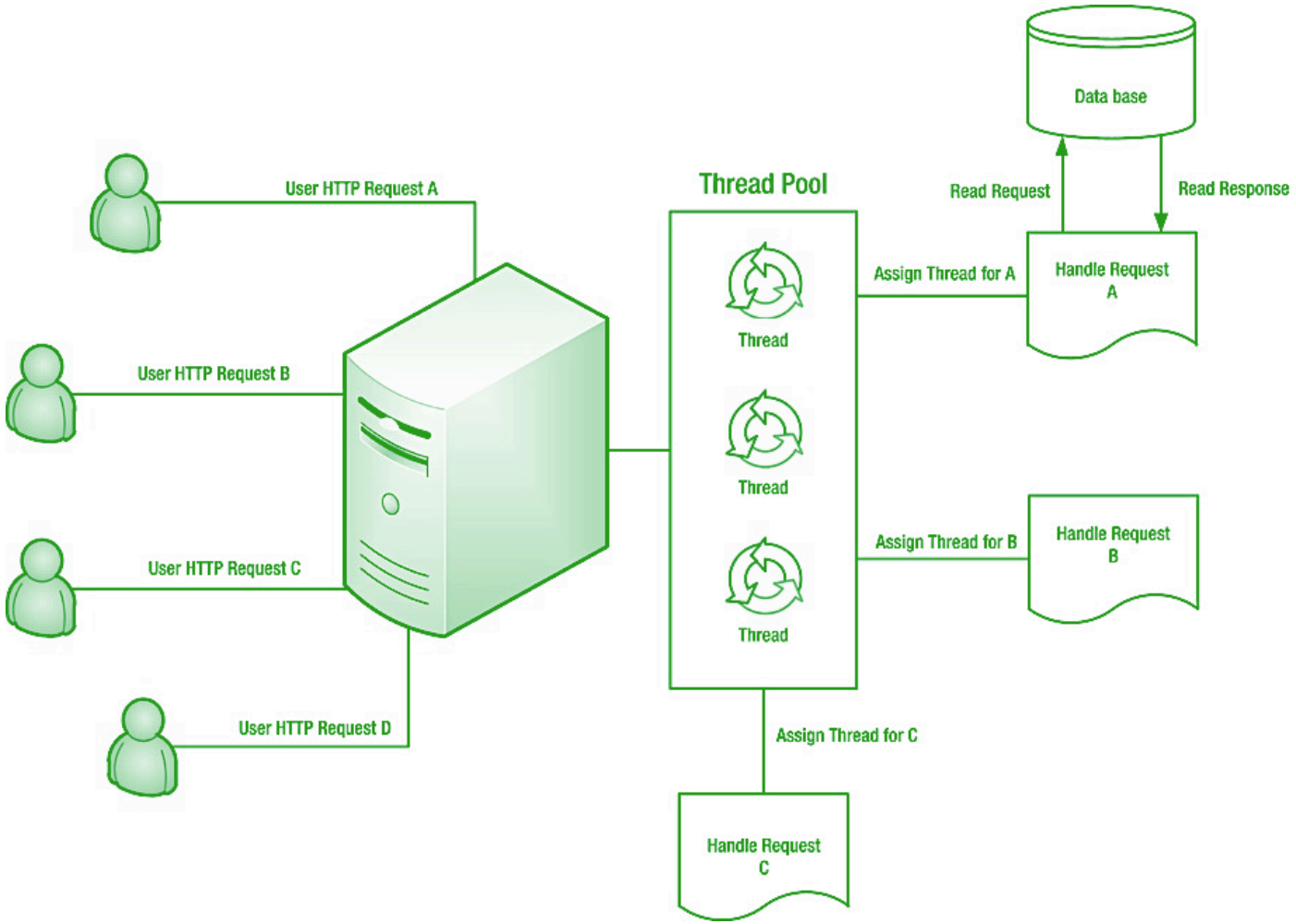
Traditional – Thread Pool



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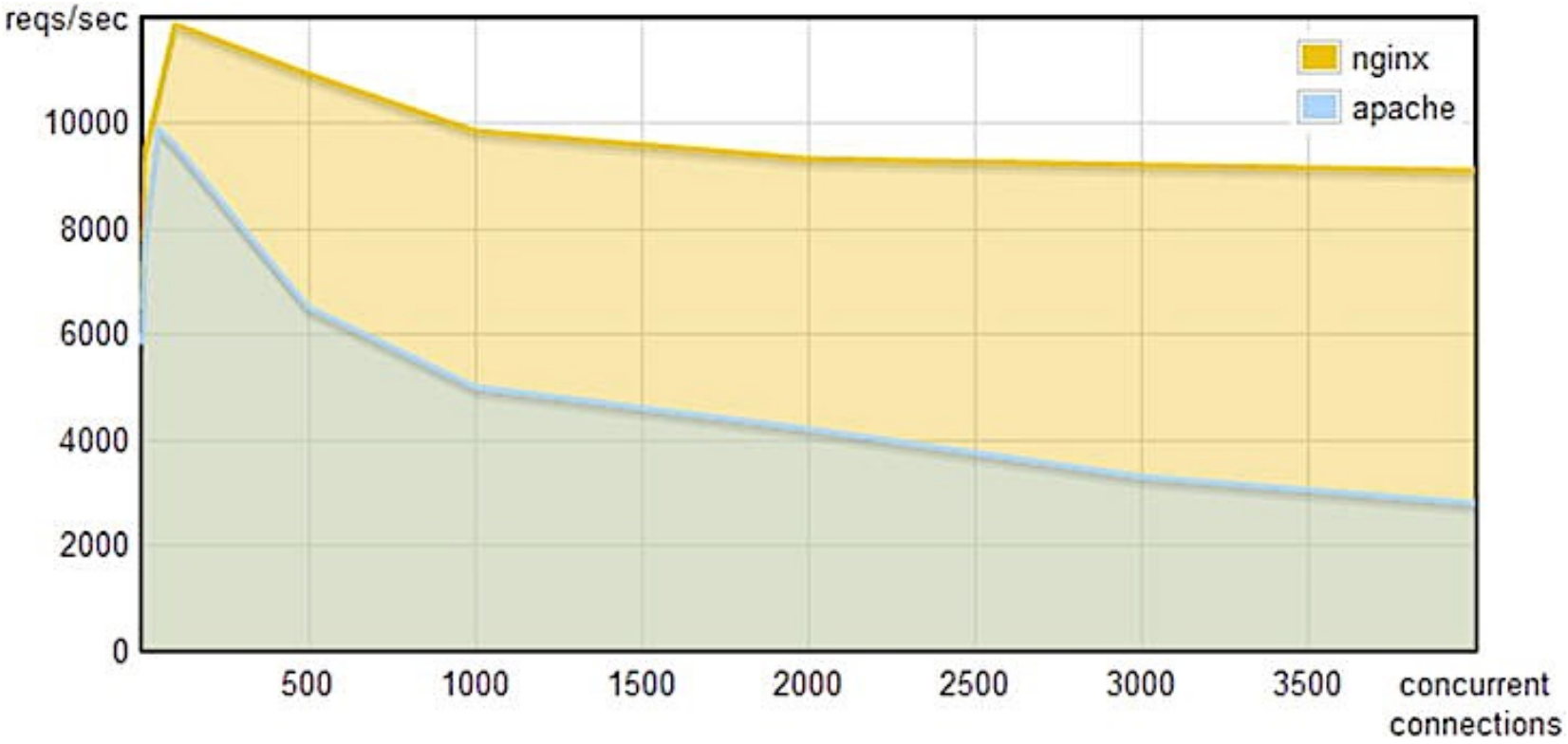
The Nginx Way

- We have seen that creating separate processes and separate threads to handle requests results in wasted OS resources.
- The way Node.js works is that there is a single thread handling requests.
- The idea that a single threaded server can perform better than a thread pool server is not new to Node.js

The Nginx Way

- Nginx is built on this principle.
- Nginx is a single-threaded web server and can handle a tremendous amount of concurrent requests.

benchmark comparing Nginx to Apache



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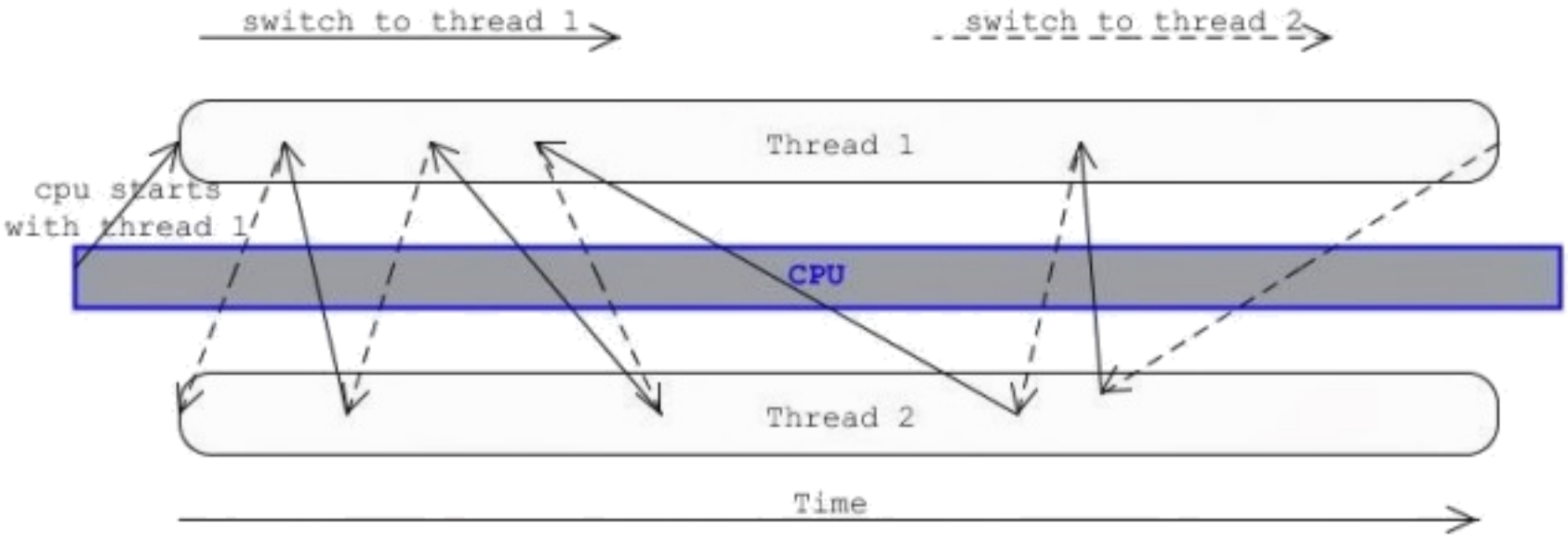
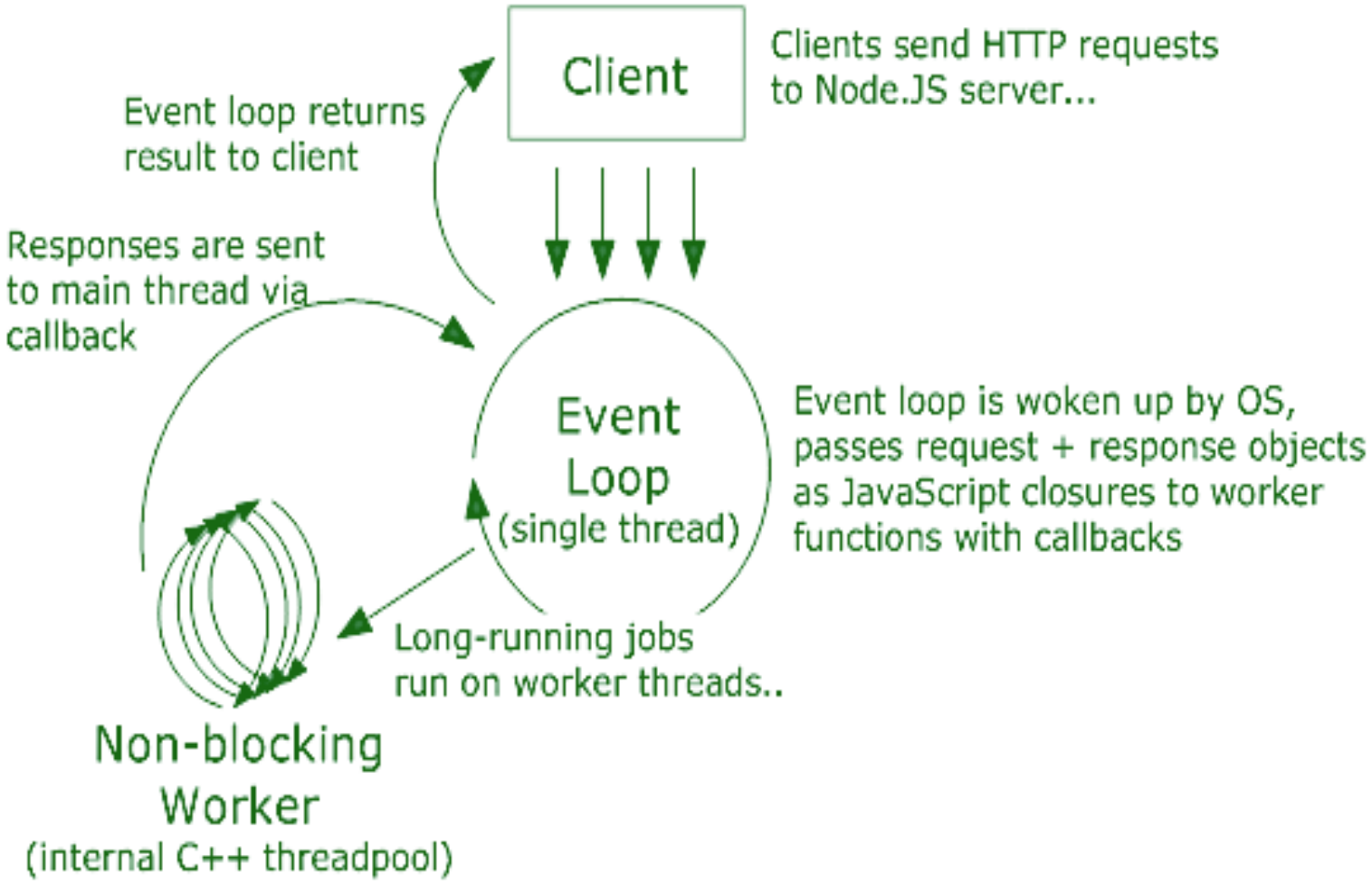
Threads require context switching



They require evils such as synchronization and create headaches with maintaining concurrency

node.js has an Event Queue



Why use JavaScript?

- Web developers are already a little familiar with it
- JavaScript has never needed more than one thread because it's entirely event-driven
- JavaScript never had any type of blocking I/O because it has no built-in I/O API's

Blocking I/O

- Syncronous function call in C#

```
public static void getConfig() {
    StreamReader sr = new StreamReader("cfg.txt");
    using (("TestFile.txt")) {
      String line = sr.ReadToEnd();
      Console.WriteLine(line);
    }
}
:
function will wait for results..
```

Asynchronous I/O

- Asyncronous function call in node.js

```
function getConfig(req, res) {
    fs.readFile ("c:\\config.xml", function(err,
data) {
        if (!err) res.send(200, JSON.stringify(data));
    });
}
:
execution falls through and continues..
```

What about Error handling?

- If function is synchronous, simply return an error
- If function is asynchronous, then first arg returned is err
- If flow is more complex, then add an event listener and emit an error event from anywhere within your code as opposed to using try / catch / throw which really only work on synchronous code.

node.js uses Google's V8

- Compiles JavaScript to machine language, as opposed to bytecode, for speed
- Uses advanced optimization techniques, such as copy elision to avoid duplication of objects
- Made from Scratch, its Open Source, and its used in used in MongoDB and Chrome

Why look into node.js

- Very active Open Source community
  - socket.io express uglify-js less-css async jade mongo
- Designed for building fast and scalable real-time mobile applications and websites. *Its coming to Desktop too!*
- Dynamic language that is consistently asynchronous and compatible with browser code libraries.

Performance Demo

That's all

End of Session

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