NodeJS
Part 1

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Agenda

1. What is NodeJS?
2. Modules
3. Module Patterns
4. Native Modules
5. File System Module
6. Recursion
7. Node Package Manager
8. Express

Before we start ...

Why do we need NodeJS?

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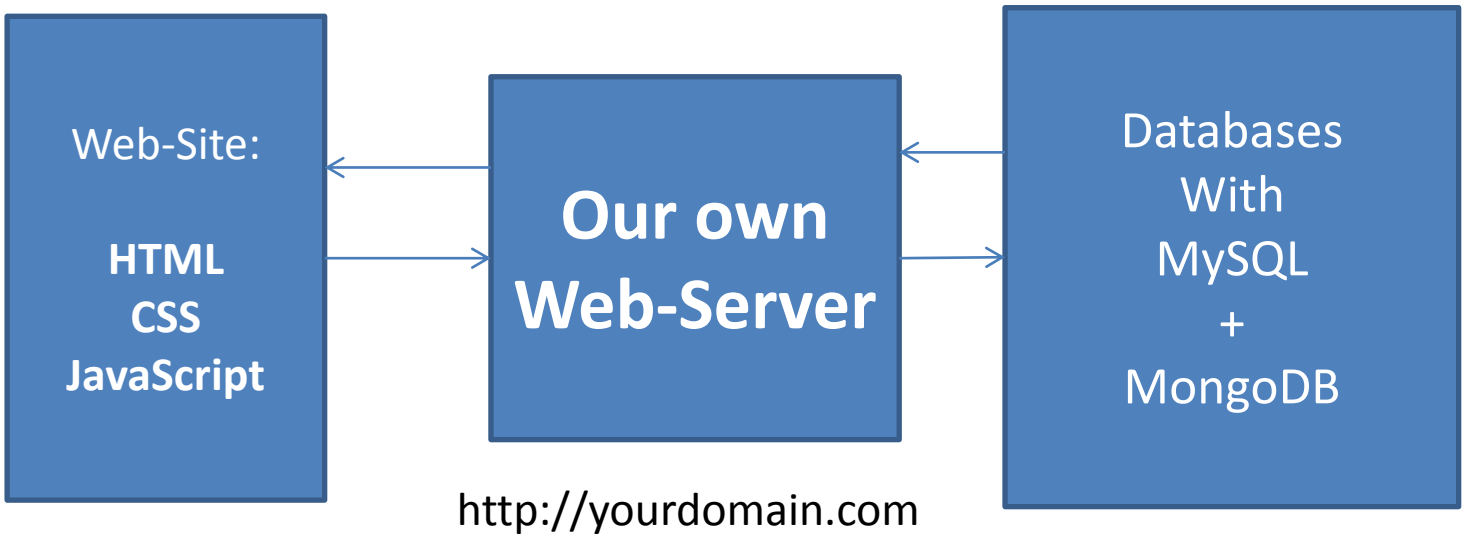
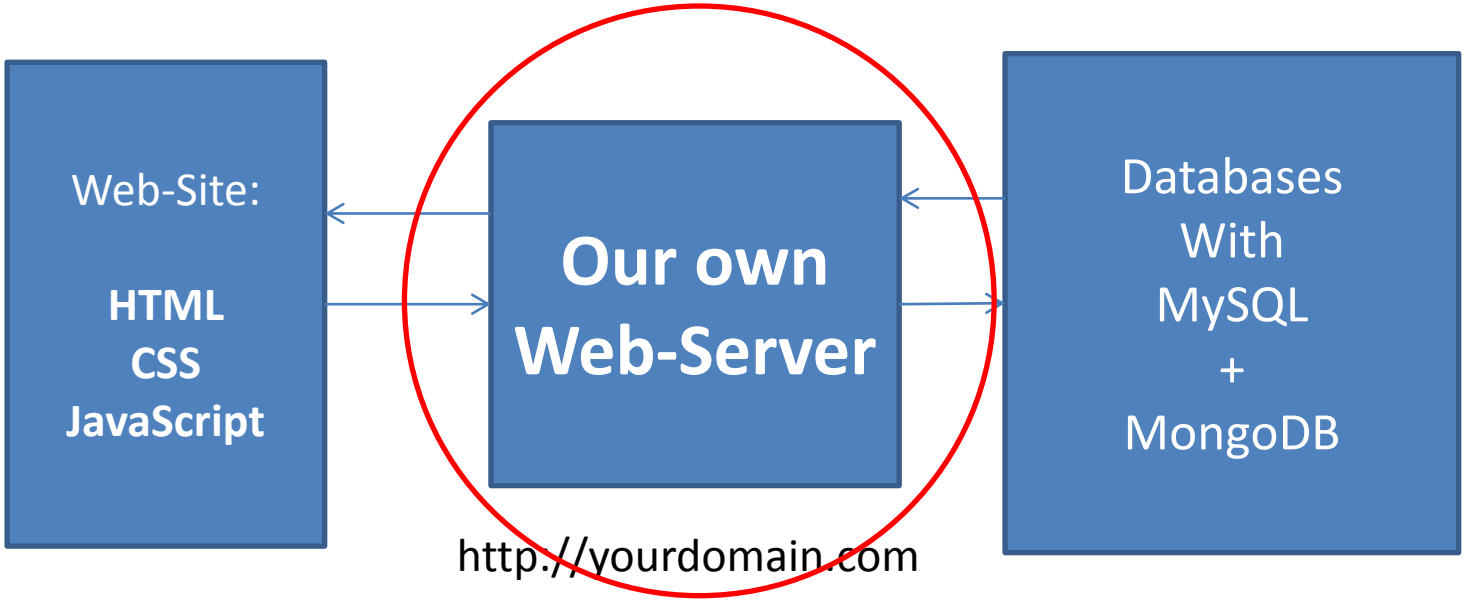


Before we start ...

Why do we need NodeJS?



1. What is NodeJS?

NodeJS is an **run-time environment** for executing JavaScript code **server-side.**

- Non-blocking, event-driven programming paradigm

  (More on that later in **Non-Blocking /Asynchronicity**)

1. What is NodeJS?

- NodeJS operates JavaScript on the server-side, including
  - File Access
  - Database Access
  - Process Access
  - Network Access

1. What is NodeJS?

- However,

NodeJS is mostly used as HTTP-WebServer

2. Modules

Module:

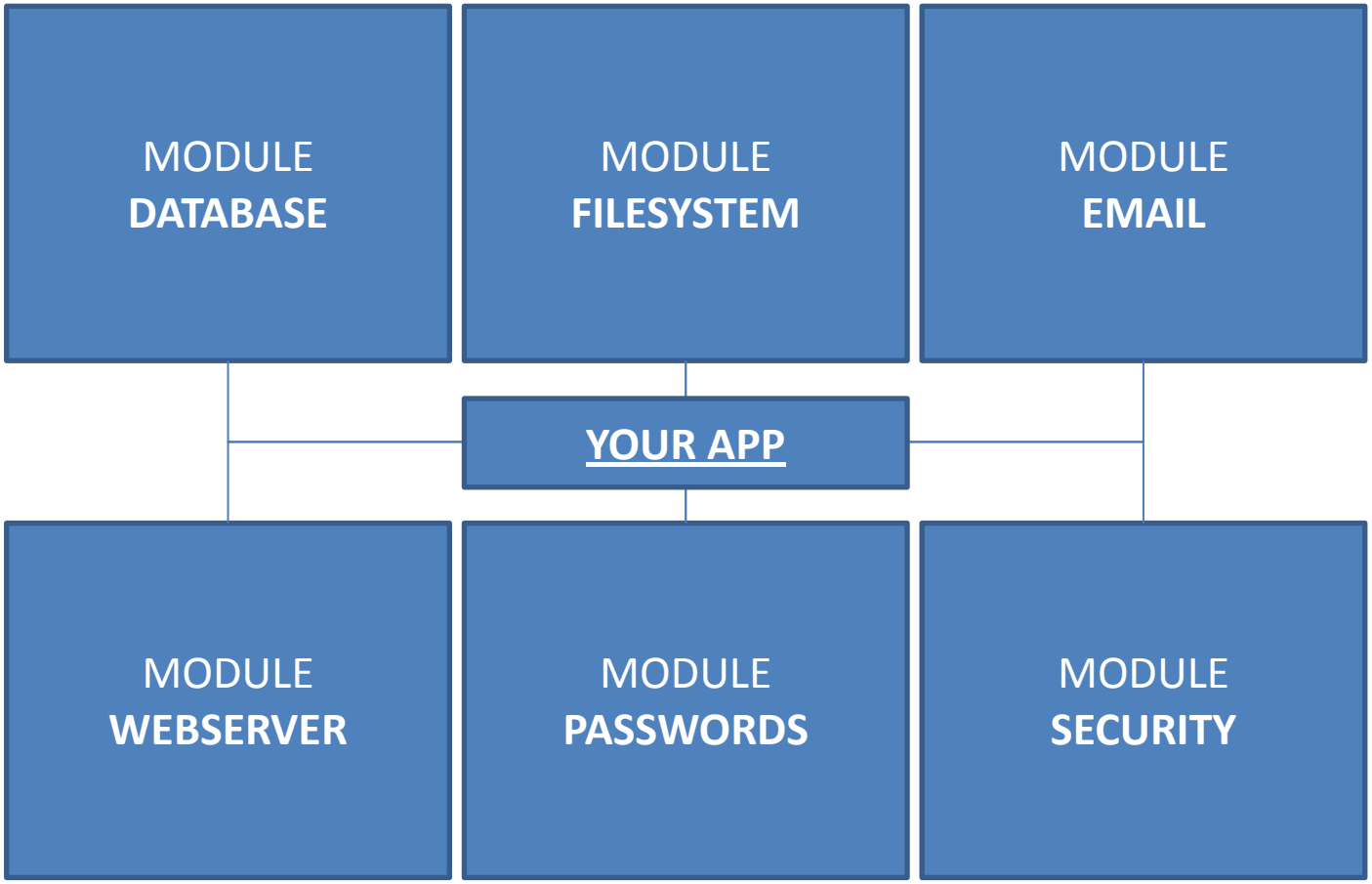
A reusable block of code whose existence does not accidentally impact other code.

= One of the fundamentals of NodeJS

2. Modules

YOUR NODEJS APPLICATION
(i.e. Your Web-Server)

2. Modules


MODULE
DATABASE
MODULE
FILESYSTEM
MODULE
EMAIL
YOUR APP
MODULE
WEBSERVER
MODULE
PASSWORDS
MODULE
SECURITY

2. Modules

- Lets build our first module ...

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- Lets build our first module ...

- **require() is a function**, that you pass a ‘path‘
- *module.exports* is the **return statement of require()**

3. Module Patterns

- There are multiple ways of defining a module

4. Native Modules

- A list of native modules for NodeJS
- https://nodejs.org/api

5. File System Module

- Deals with files
  - Read: **readFileSync(path);**
  - Write: **writeFileSync(path, string);**
  - Append: **appendFileSync(path, string);**
  - Delete: **unlinkSync(path);**
  - Show contents of a folder: **readdirSync(path);**

6. Recursion

Recursion:
A function that calls itself.

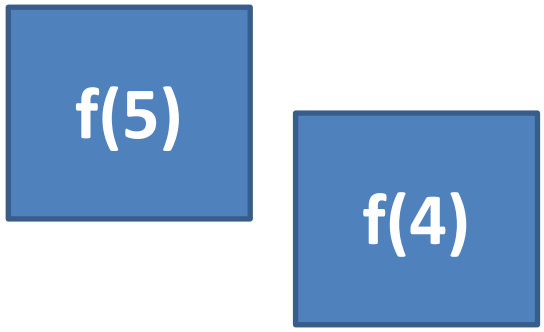
```
function f(x) {
    if(x === 0)
        console.log(‘ x is 0, end of recursion stack‘);
    else
        console.log(‘x is ‘ + x);
        f(x-1);
}
```

6. Recursion

f(5) is called.

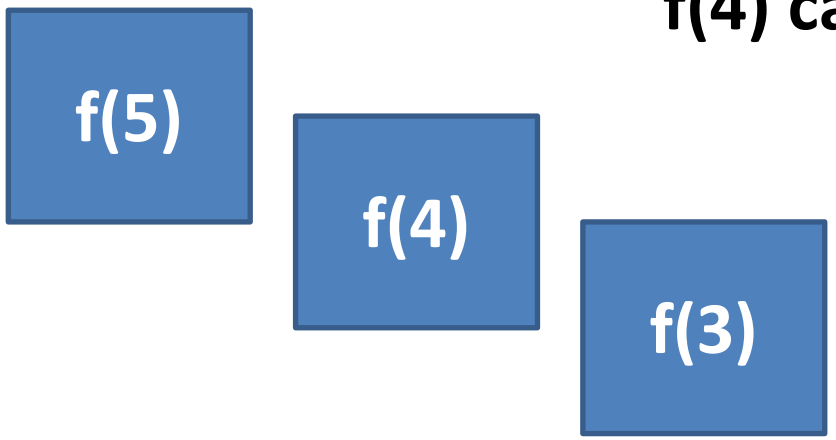
6. Recursion

f(5) calls f(4)



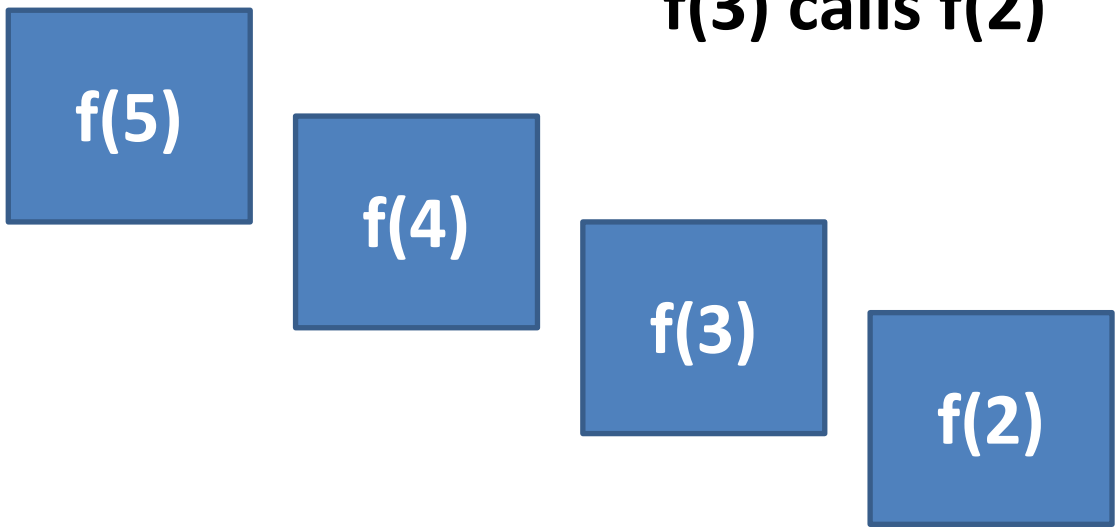
6. Recursion

f(4) calls f(3)



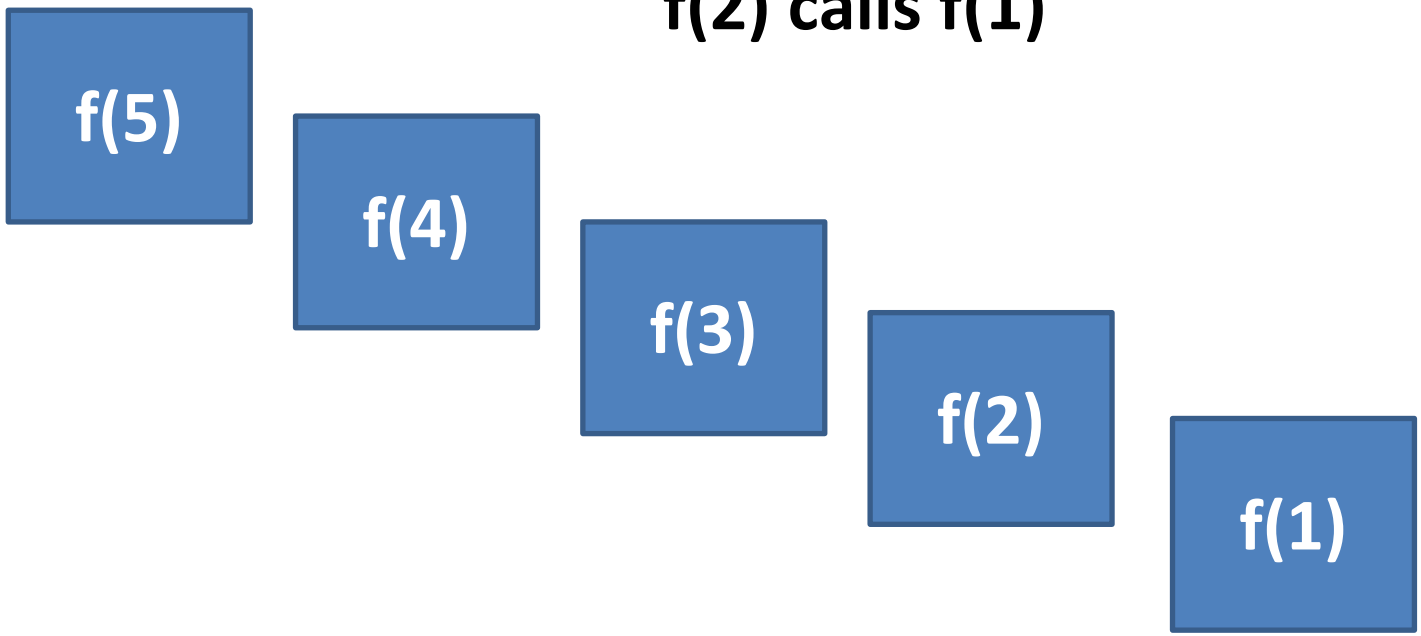
6. Recursion

f(3) calls f(2)



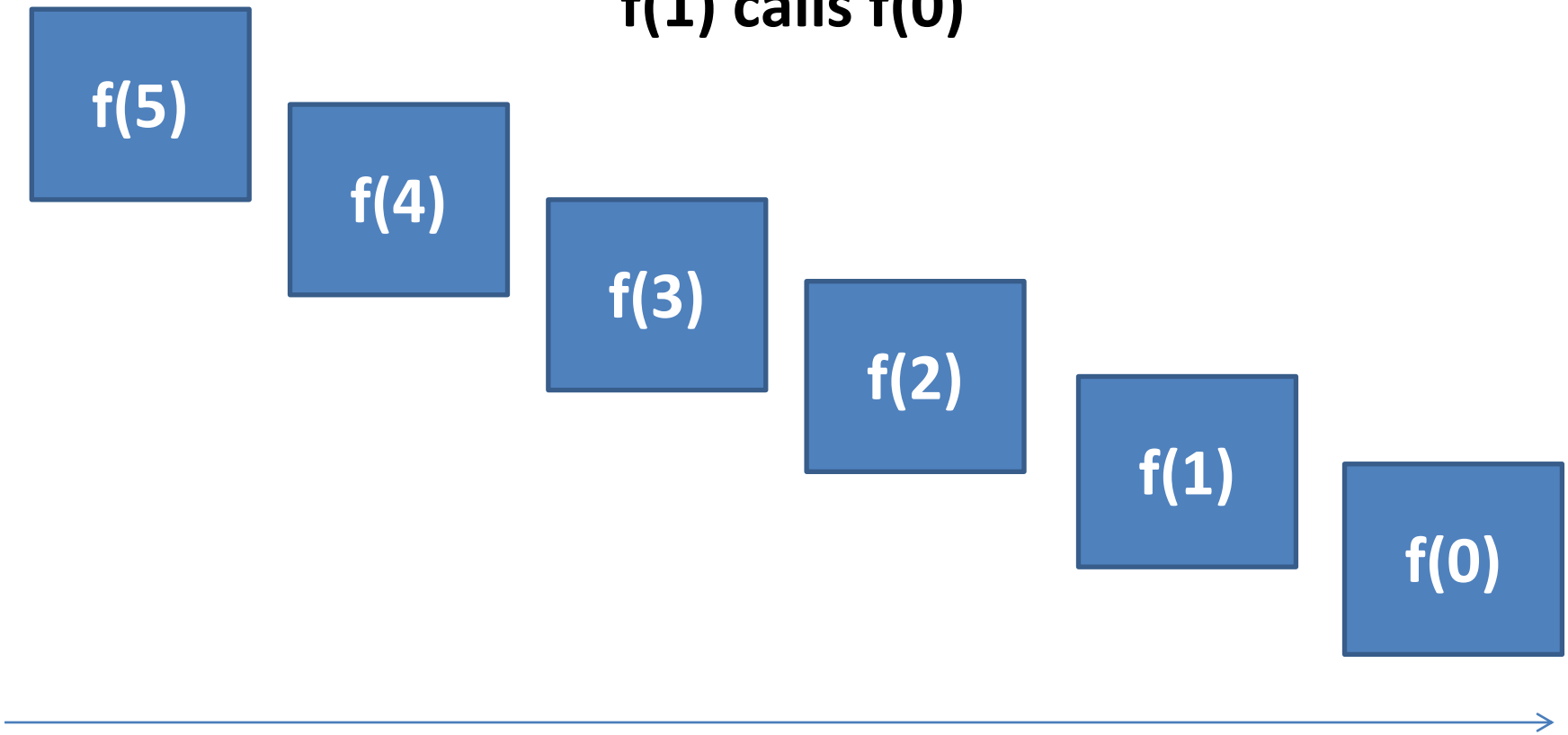
6. Recursion

f(2) calls f(1)



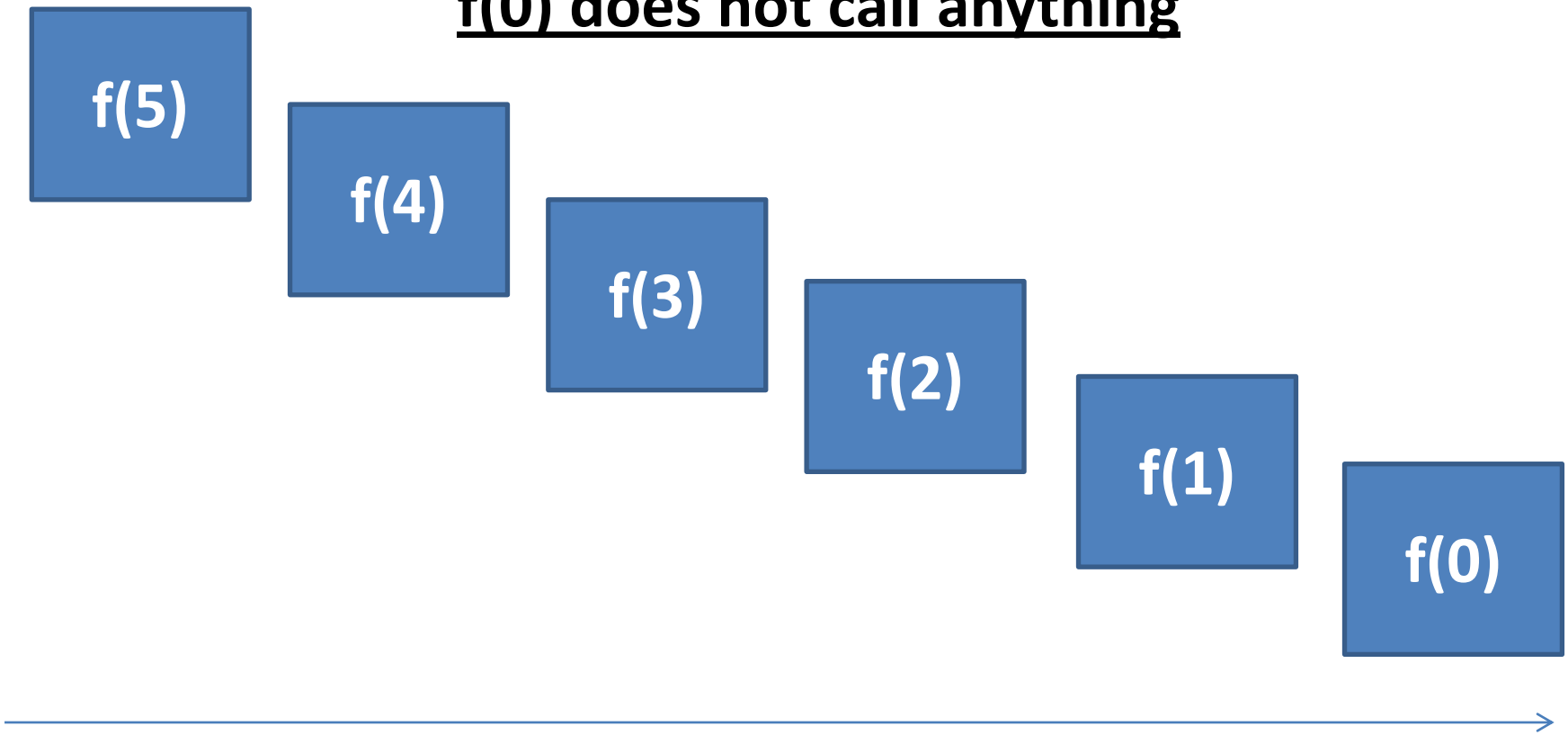
6. Recursion

f(1) calls f(0)



6. Recursion

f(0) does not call anything



end of recursion stack

6. Recursion

Task:

1. Write a function sum(x) which sums up all values from 1 to x. I.e. sum(5) would add up
   1+2+3+4+5=15. Use recursion for that.

2a. Write a function ***listFiles(path)*** which lists all files and folders of a given **path**.

2b. Extend **listFiles(path)** by also showing the subfolders. Implement that using recursion.

7. Node Package Manager

- = NPM
- A collection of code that you can use in your code
- Package Management System:

  = Software that automates installing and updating packages.
- Deals with what version you have or need and manages dependencies

7. Node Package Manager

- Lets go to npmjs.com

8. Express

- A node package that simplifies usage with http-module
- Lets install it ...

8. Express

- Routing:

  Mapping HTTP-Requests to content

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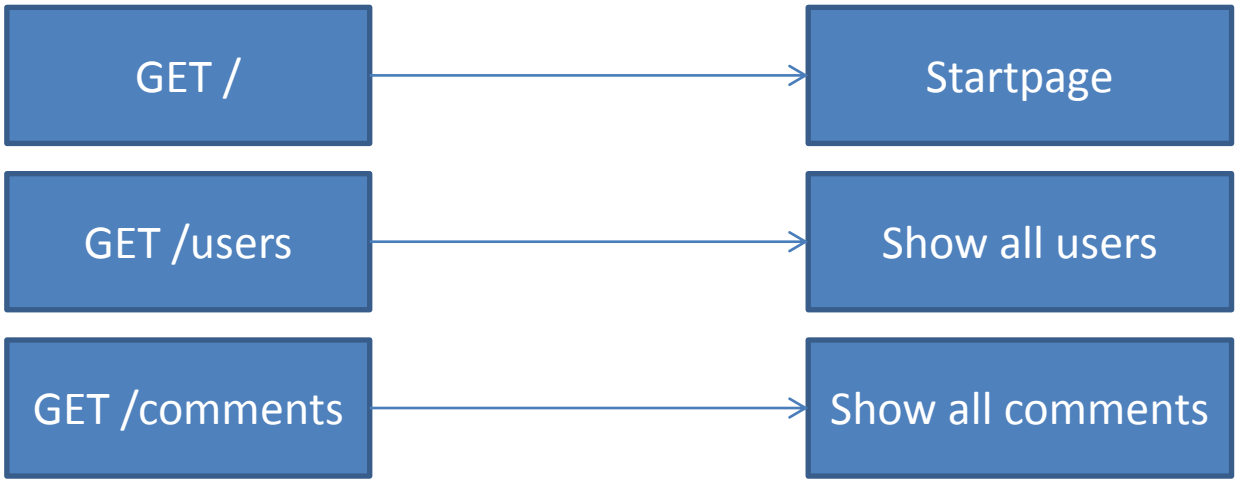
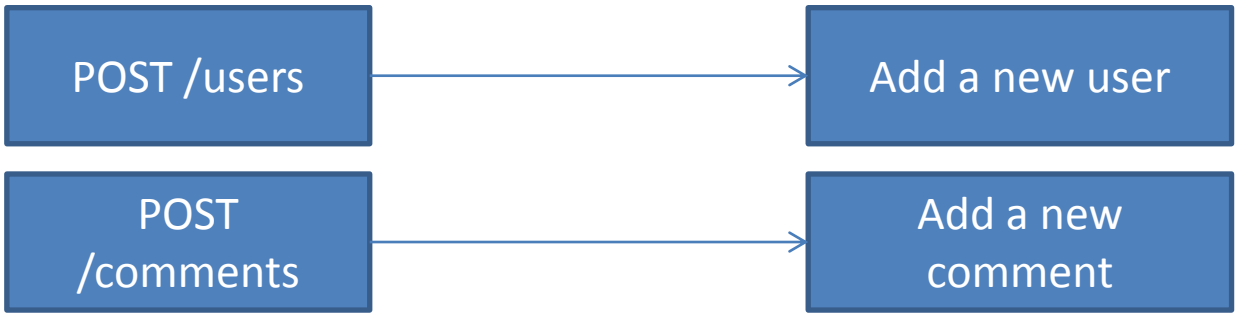
  Mapping HTTP-Requests to content



8. Express

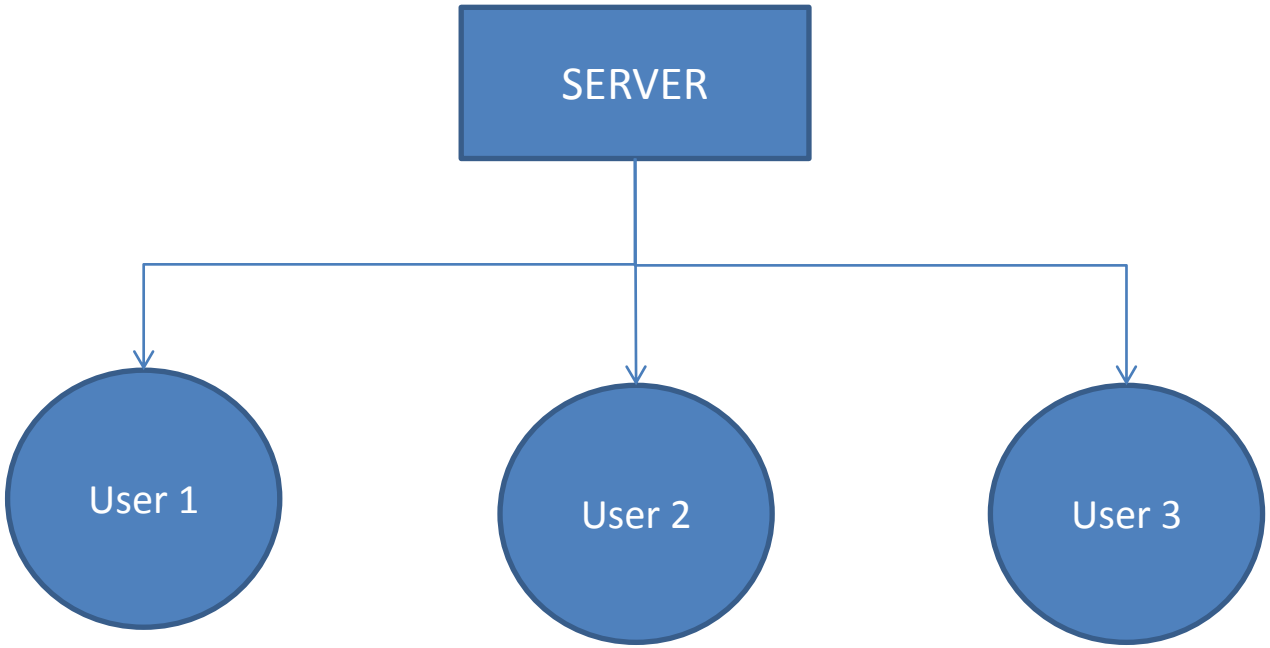
- Routing:

  Mapping HTTP-Requests to content



9. Non-Blocking/Asynchronicity

- Webservers like Java/PHP/Ruby on Rails ...



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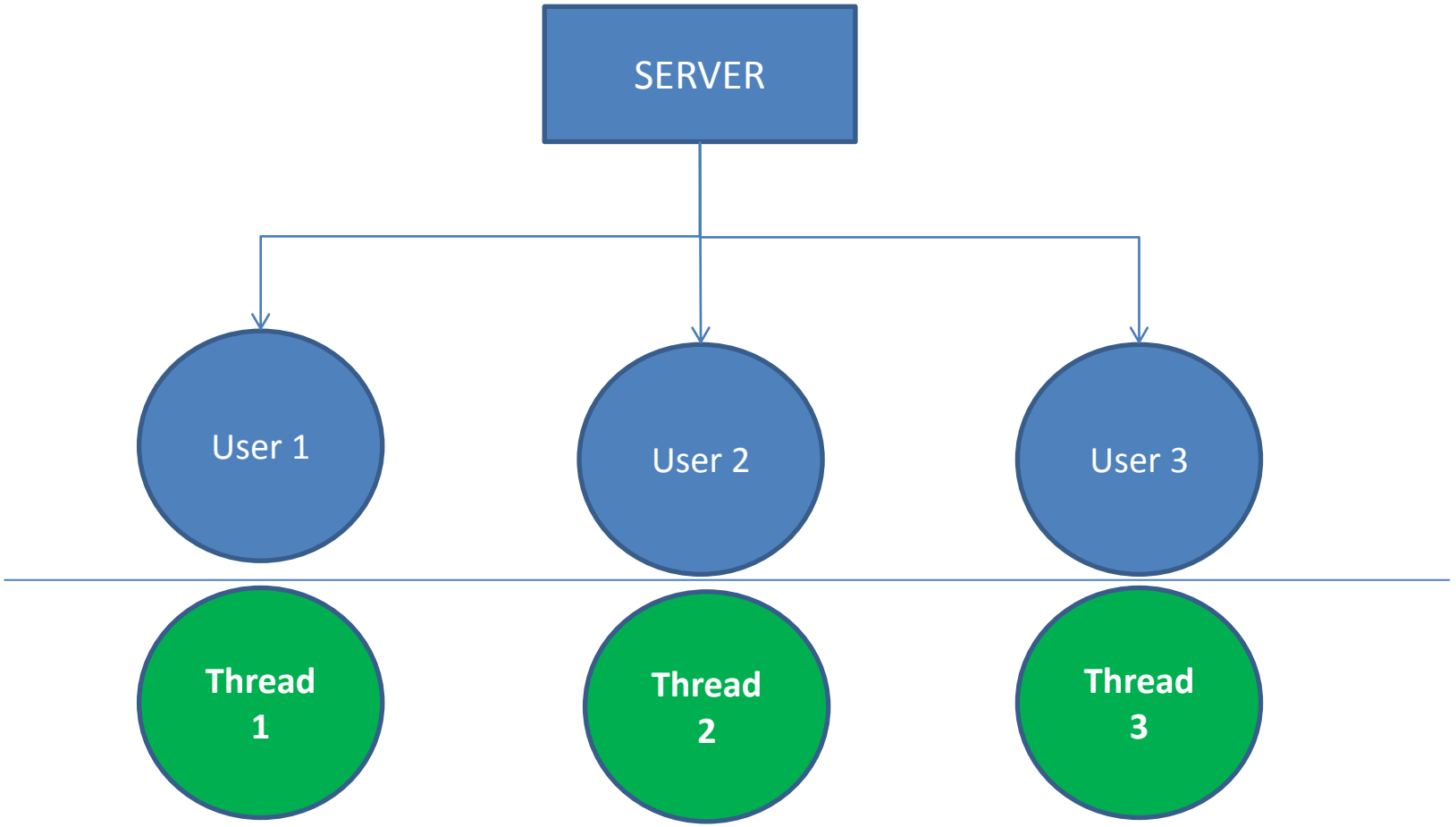

9. Non-Blocking/Asynchronicity

- Blocking Webservers have one thread per user
  - Java, PHP, Ruby on Rails, ...
  - 1000 users = 1000 threads
- This allows them to run blocking code in each thread
- Threads run **simultaneously**

```
openBigFile(); // takes 15 s
sendResponse(); // other users do not experience
                // wait time
```

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  -
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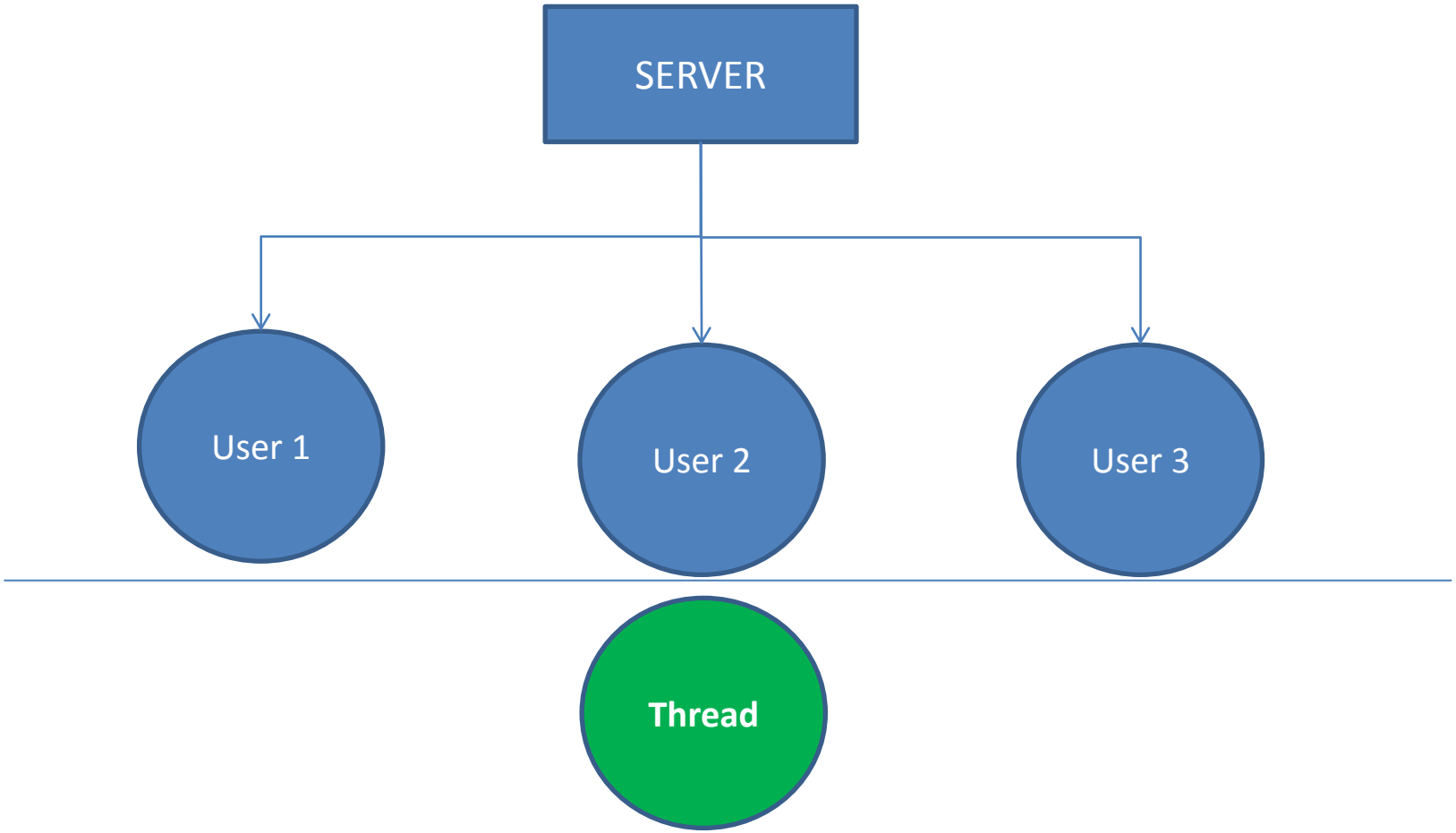
  op

  sendResponse(); // other users do not experience
  // wait time

PROBLEM:
MEMORY USAGE
CPU USAGE
SPEED

9. Non-Blocking/Asynchronicity

- NodeJS ...



9. Non-Blocking/Asynchronicity

- Non-Blcking Webservers have
  one thread per N users
- Made possible by Asynchronicity.

```
openBigFile(); // other users would have to
                        // wait for current user
sendResponse();
```

9. Non-Blocking/Asynchronicity

- Non-Blcking Webservers have
  one thread per N users
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```
openBigFileASYNC( function() {
        sendResponse();
});

 doSomethingElse(); // This line will be executed,
                                // no matter if file is ready or not
```