AGENDA

- What is NodeJS?
- How does Node Work?
- Why NodeJS?
- Architecture Diagram
- NodeJS vs Other Similar frameworks
- What is v8 ?
- Installing Node.js and NPM
- Blocking(Synchronous) vs Non-Blocking(Async)
- Event Loop
- NPM and commands

AGENDA Conti...

- Node-modules
- Package.json
- REPL (Read-Eval-Print-Loop)
- Node Fundamentals
- Modules
- Callbacks
- Events
- Streams
- Buffers
- File System
- Error handling

AGENDA Conti...

- Creating a server with the HTTP module
- Building Command Line Apps
- Assignments

What is Node JS?

- Open-source platform =Application + Server
- Built on Chrome's JavaScript engine V8 to execute code
- Event-driven and non-blocking I/O.
- Coding in Javascript.
- Single Threaded .
- DIRTY(Data Intensive RealTime) Applications
- Used by IBM,Microsoft,Yahoo!,Walmart,Groupon, SAP,LinkedIn, PayPal,and GoDaddy

How does Node JS works ?

Use-Case Problem

1Restaurants Problem

Use-Case Solution 1

l Serve on the Basis of order completion till that time wait in restuarent .

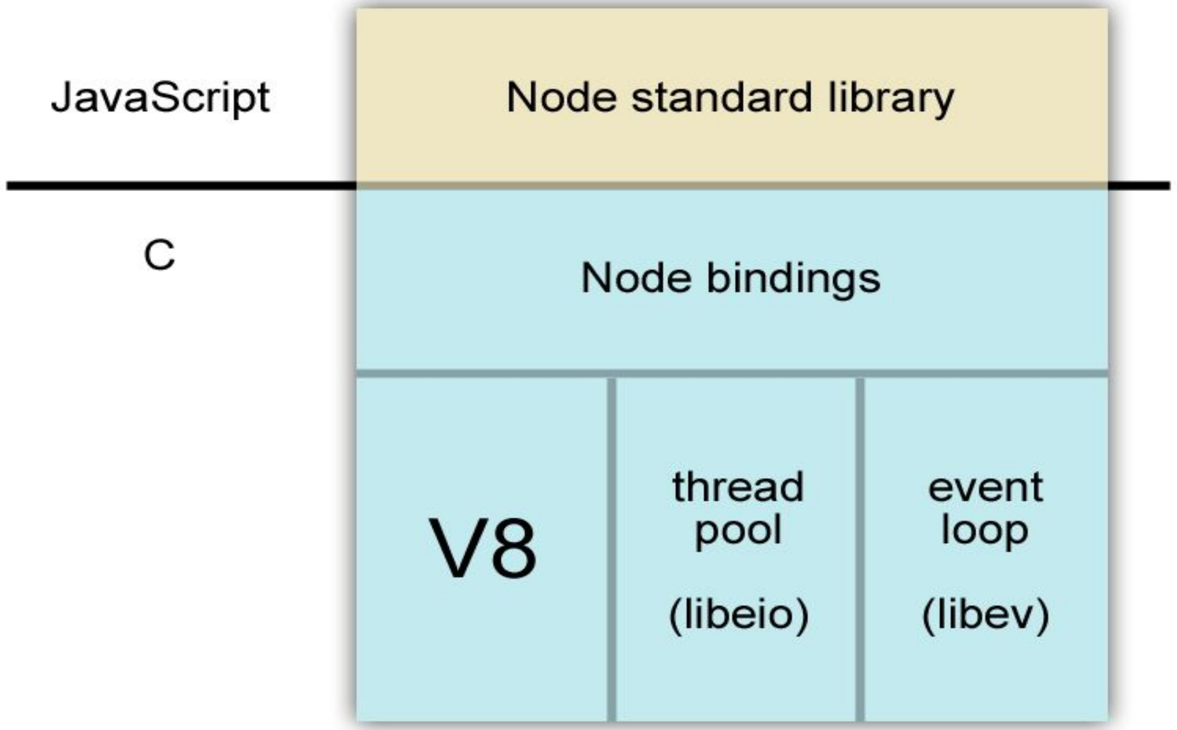
Use-Case Solution 2

l Opening Many Restaurents

Why Node JS ?

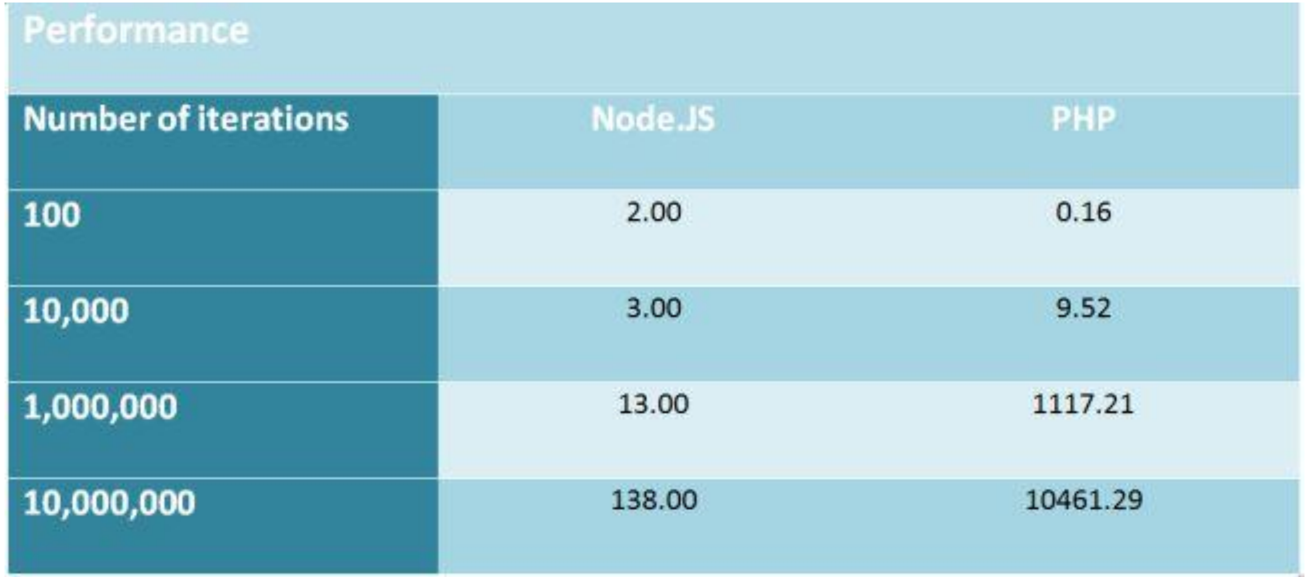
- Same coding standard at client and server side i.e jS .
- Code Reuse .
- It's Fast .
- Real-time .
- Streaming data .

Architecture Diagram



NodeJS vs others servers

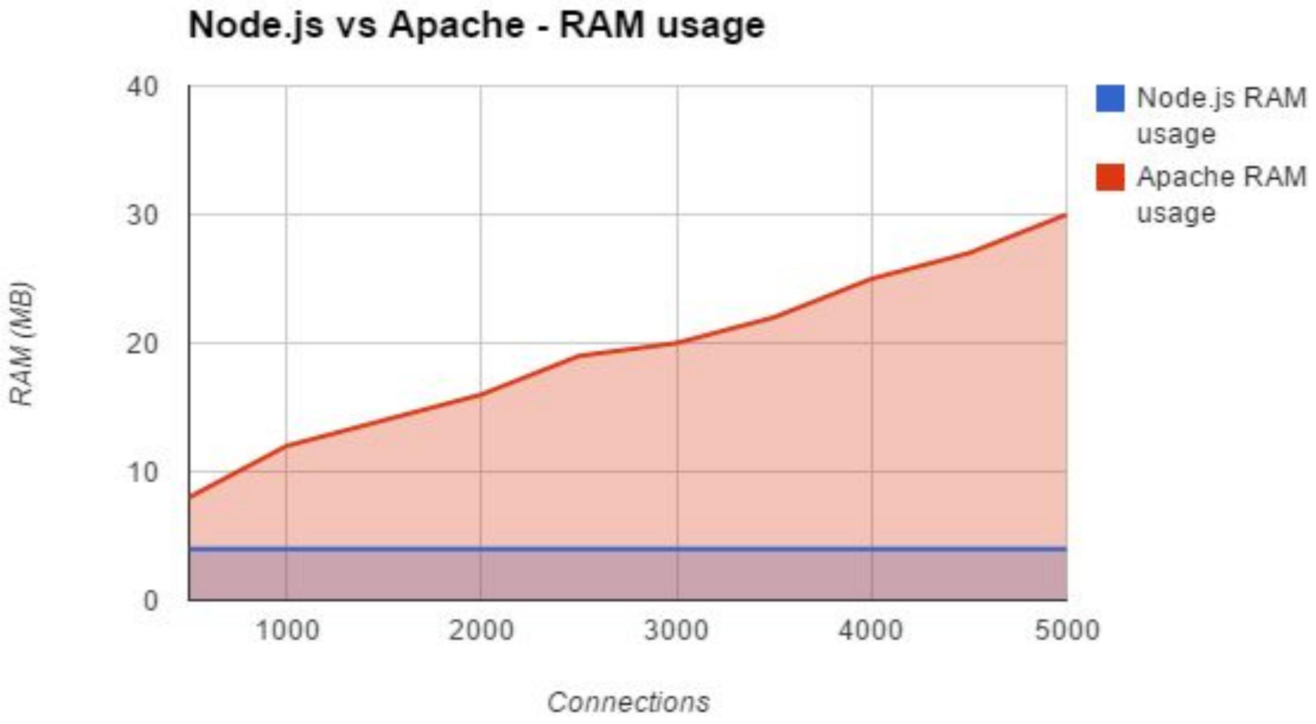
lPerformance



Performance		
Number of iterations	Node.JS	PHP
100	2.00	0.16
10,000	3.00	9.52
1,000,000	13.00	1117.21
10,000,000	138.00	10461.29

NodeJS vs others servers

lMemory Usage

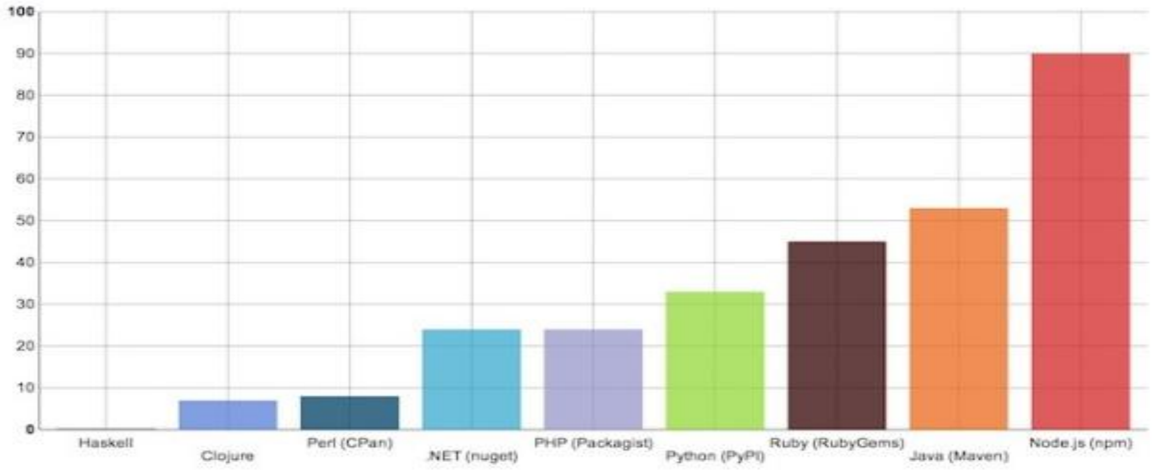


NodeJS vs others servers

- No of modules (library)

node.js sec: npm modules

Comparison to other langs (mods/day):



Maciej Lasyk, node.js security

What is v8 ?

- Google's open source high-performance JavaScript engine .
- Written in C++ .
- Used in Google Chrome .
- Implements ECMAScript .
- Executes javascript code .
- https://developers.google.com/v8/?hl=en

Installing Node & npm

Blocking vs Non-Blocking IO

Blocking Use Case

lBlocking IO is something like "you waiting for your someone to join you on a date, you wait for her indefinitely"

Blocking vs Non-Blocking IO

Non-Blocking Use Case

Non-blocking IO is like "you have asked someone to join you on a date, but you are not sure if she turns up so early, so you decide to do other works pending, or sometimes you get bored and may try asking another girl for a date".

Blocking vs Non-Blocking IO

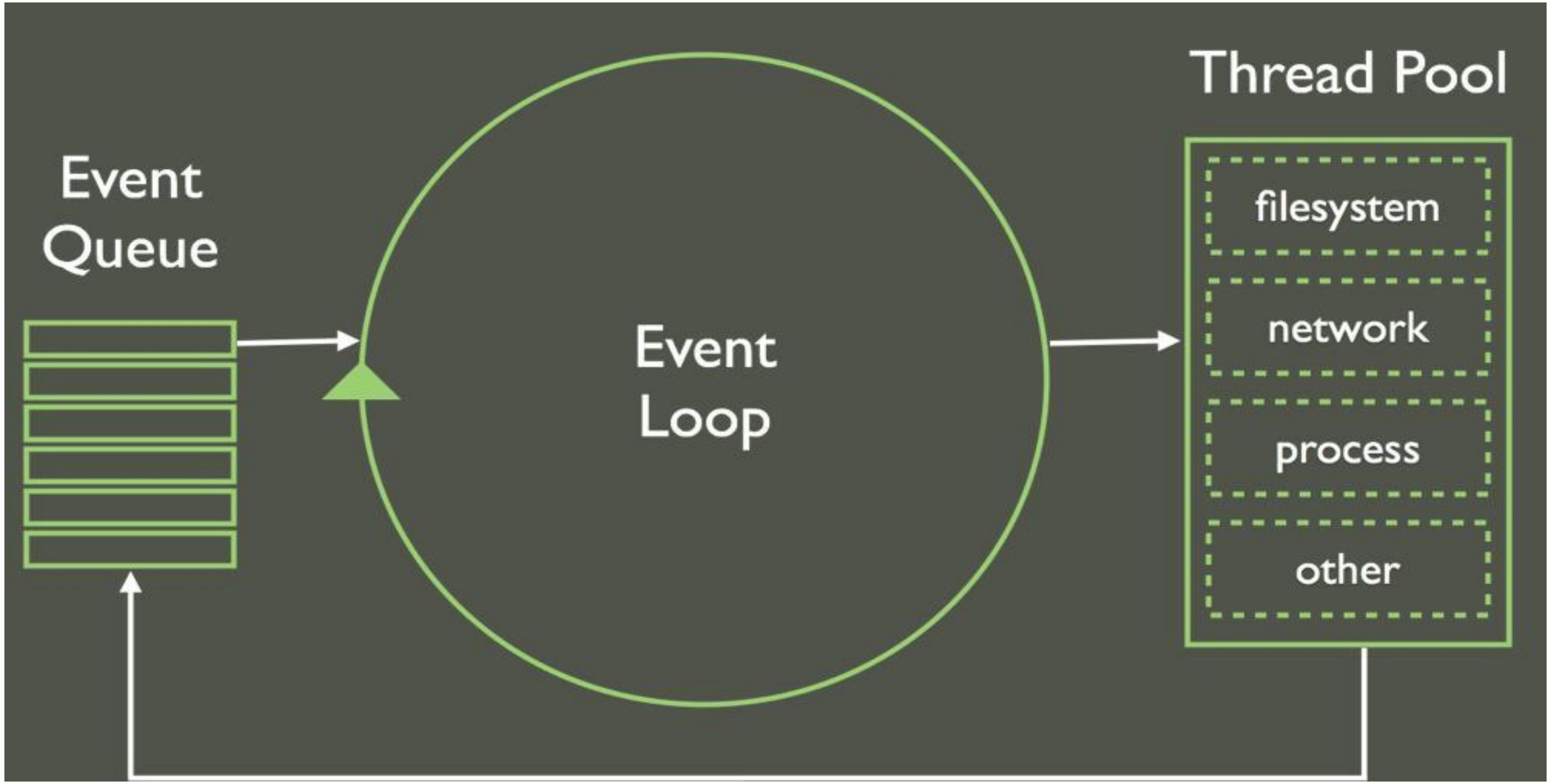
```
var fs = require('fs');
var contents =
fs.readFileSync('users','utf8');
console.log(contents);
console.log("Hello Node\n");
```

```
var fs = require('fs');
var contents = fs.readFile('./users','utf8',
function(err,contents){
   console.log(contents);
});
console.log("Hello Node\n");
```

Event Loop

- Event loop is single-threaded .
- Event loops is core of javascript , all events , requests are handled by event loop.
- Works on event driver framework.
- Handle highly concurrent requests .
- Blocking the event loop can have catastrophic effects on the Node application.

Event Loop


Thread Pool
Event Queue
Event Loop
filesystem
network
process
other

Event Loop

http://latentflip.com/loupe/

NPM commands

- NPM is an online registry for open-source node.js projects, modules, resources, etc
- Provides a command line interface (CLI) for interacting with the registry.
- NodeJS package manager : install , update all node module (3rd party libraries)
- Getting help: **npm help**
- Installing stuff: **npm install [-g] [package-name]**
- Showing all node modules : **npm ls**
- Updating packages : **npm update [-g] [package-name]**
- Making a package.json file**.**
- Use **npm init [--force]** to generate package.json

Node modules

- The core modules are defined within Node.js's source and are located in the lib/ folder.
- Core modules are always preferentially loaded
- Few core node-modules:

1) Cluster
2) Console
3) Crypto
4) DNS
5) Errors
6) Events
7) File System
8) Globals
9) HTTP

Package.json

- All npm packages contain a file, usually in the project root, called package.json
- Holds various metadata relevant to the project

```
{
  "name" : "underscore",
  "description" : "JavaScript's functional programming helper library.",
  "author" : "Jeremy Ashkenas <jeremy@documentcloud.org>",
  "dependencies" : [],
  “devDependencies” : [],
  "repository" : {"type": "git", "url": "git://github.com/documentcloud/underscore.git"},
  "main" : "underscore.js",
  "version" : "1.1.6"
}
```

REPL

- Read-Eval-Print-Loop (REPL) is available both as a standalone program and easily includable in other programs
- The REPL provides a way to interactively run JavaScript and see the results .
- Type “node” in your terminal. Try following code now

1)1+2
2)console.log(“hello world”);
3)var name='vishnu';
4)console.log(name);

Node Fundamentals -Modules

- **Modules**
- Building block of a node application
- Seprate our components based on business logic.
- Modules can be single files or directories containing one or more file.
- Three types of modules
- 1 . Core node modules (installed using npm cmd)
- 2. Thirdy party node modules(available in node core libraries i.e default module)
- 3. Custom modules. (we make these modules).

Node Fundamentals-Modules

l**How to make a custom modules .**

lUse these steps

1)Create a file named “demo-module.js”

2)Write these lines into this file :

```
lexports.myFun = function() {
l     console.log(“demo-module data”);
l}
```

3)Create a new file name “main.js” :

1)Write these lines in it :

2)**var demoModule=require(“./demo-module”);**

3)**demoModule.myFun();**

Node Fundamentals-Modules

- **Exports vs module.exports**
- **Exports :** if you want to expose more than one function or variable, then we car set property of object called **"exports".**
- **Module.exports :** if you want to return single function/variable/object.

- **KEY POINT TO NOTE :**

1) node perform syncronous lookup in order to locate file contents of module.
2) When you use require("filename.js") , extention ".js"is optional .
3) If you create module that populates both **"exports"** and **"module.exports"**
4),then **"module.exports"** will be returned and exports will be ignored

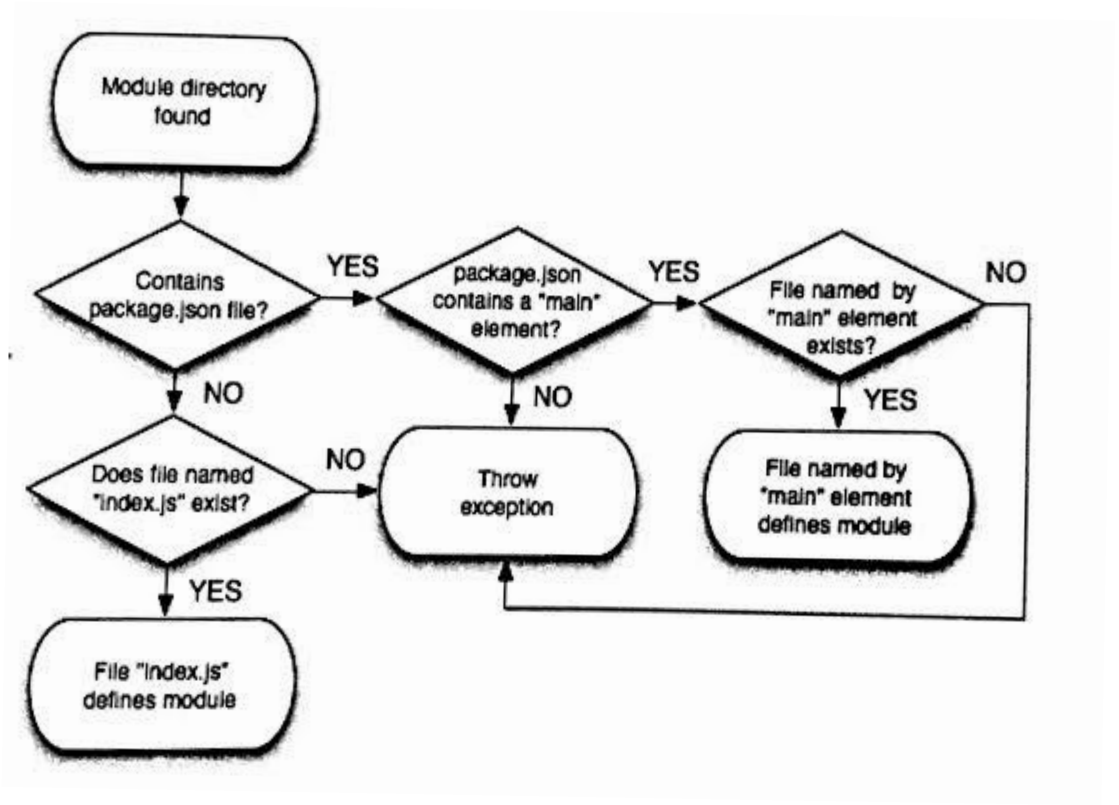
Node Fundamentals-Modules

- Exports is only set on object/functions not on class .
- **For eg :**

```
var Currency=function(dollar){
this.dollar=dollar;
}
Currency.prototoype.roundTwoDecimals=function(amount){
return Math.round(amount*100)/100;
}
exports=Currency  //This line will give you error instead of this use “module.exports”
```

Node Fundamentals-Modules

Steps to find a module :



Module directory found
Contains package.json file?
YES
package.json contains a "main" element?
YES
File named by "main" element exists?
NO
NO
NO
YES
Does file named "index.js" exist?
NO
Throw exception
File named by "main" element defines module
YES
File "index.js" defines module

Node Fundamentals-Callbacks

- **Callbacks :** a function which is passed as an argument to a async function.
- It is main concept behind asyncronous programming.
- For example :

```
function myFun(name, cb){
      console.log("myfun");
      cb();
}

myFun("vishnu",function(){
      console.log('Callback called');
})
```

Node Fundamentals-Callbacks

- In Node file handling :

```
var fs=require('fs');
fs.readFile('filename',myFun);
function myFun(err, content){
    if(err)
    console.log(err);
    console.log(content);
}
```

Node Fundamentals-Events

- **Events :** change in state of an object.
- **At Node Side : Event Module**

```
// Import events module
var events = require('events');
// Create an eventEmitter object
var eventEmitter = new events.EventEmitter();
// Bind the connection event with the listner1 function
eventEmitter.addListener('connection', listner1);
// Bind the connection event with the listner2 function
eventEmitter.on('connection', listner2);
// Fire the connection event
eventEmitter.emit('connection');
```

Node Fundamentals-Events

Event module Methods :

1)addListener(event, listener)
2)on(event, listener)
3)once(event, listener)
4)removeListener(event, listener)
5)removeAllListeners([event])
6)emit(event, [arg1], [arg2], [...])

Node Fundamentals-Streams

Streams are objects that let you read data from a source or write data to a destination in continous fashion.

In Node.js, there are four types of streams.

1)**Readable -** Stream which is used for read operation.
2)**Writable -** Stream which is used for write operation.
3)**Duplex -** Stream which can be used for both read and write operation.
4)**Transform -** A type of duplex stream where the output is computed based on input.

Node Fundamentals-Streams

Readable stream :

```
var fs=require('fs');
// Create a readable stream
      var readerStream = fs.createReadStream('input.txt');
      // Set the encoding to be utf8.
      readerStream.setEncoding('UTF8');
      // Handle stream events --> data, end
      var data="";
      readerStream.on('data', function(chunk) {
            data += chunk;
      });
      readerStream.on('end',function(){
        console.log(data);
      });
```

Node Fundamentals-Streams

Writable stream :

```
var fs = require("fs");
var data = 'Simply Easy Learning';
// Create a writable stream
var writerStream = fs.createWriteStream('output.txt');
// Write the data to stream with encoding to be utf8
writerStream.write(data,'UTF8');
// Mark the end of file
writerStream.end();
```

Node Fundamentals-Buffer

- **Buffer :** similar to an array of integers but corresponds to a raw memory allocation outsi
  the V8 heap.
- Buffer class is a **global class** and can be accessed in application without
- importing buffer module.
- **Creating Buffers :**

```
var buf = new Buffer(100);
//writing into a buffer
len = buf.write("Simply Easy Learning");
console.log("Octets written : "+  len);
   //reading from a buffer
   buf.toString([encoding][, start][, end])
```

Node Fundamentals-File handling

- Node File System (fs) module can be imported using following syntax:
- var fs = require("fs")
- Few methods of fs
- fs.open(path, flags[, mode], callback) .
- fs.stat(path, callback)
- stats.isFile() Returns true if file type of a simple file.
- stats.isDirectory() Returns true if file type of a directory.
- stats.isBlockDevice() Returns true if file type of a block device.
- stats.isCharacterDevice() Returns true if file type of a character device.
- stats.isSymbolicLink() Returns true if file type of a symbolic link.
- stats.isFIFO() Returns true if file type of a FIFO.
- stats.isSocket() Returns true if file type of asocket.
- fs.writeFile(filename, data[, options], callback).
- fs.read(fd, buffer, offset, length, position, callback)
- fs.close(fd, callback)

Node Fundamentals-Error handling

- Error handling is a pain .
- Easy to get by for a long time in Node.js without dealing with many errors correctly .
- Building robust Node.js apps requires dealing properly with errors
  - Use **try catch** block: to handle errors.
  - **Throw** error : to throw customise error
- process.on('uncaughtException')-To handle unhandled exception which stops your node server.

Node Fundamentals-HTTP SERVER

- http://www.sitepoint.com/creating-a-http-server-in-node-js/

Thank you