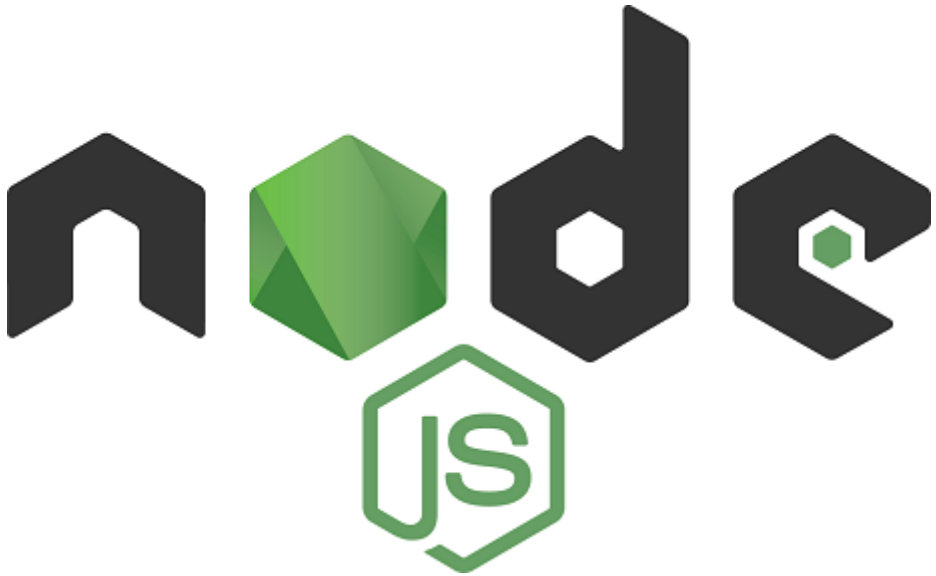

node
JS

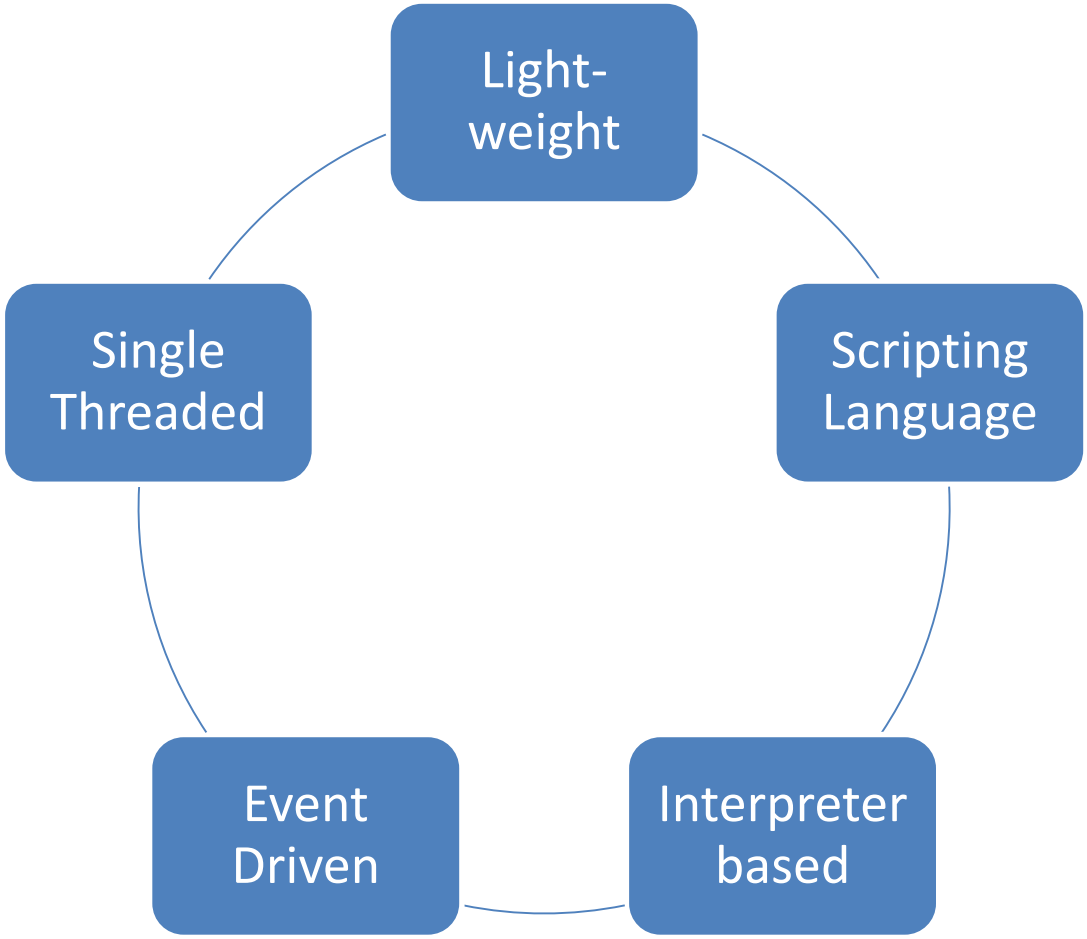
Training Agenda

- ❑JavaScript Overview
- ❑NodeJS Overview
- ❑Modules System
- ❑File System
- ❑Buffers & Streams
- ❑Event System
- ❑Express
- ❑View Engines
- ❑NodeJS Securities

Prerequisites:

- Basic knowledge of HTML, CSS & JavaScript
- Interest to Learn

JavaScript Overview



JavaScript Building Blocks

Functions

- Function Expressions
- HOF
- Nested Functions
- IIFE

Objects Creation Methods

- Literal
- Constructor
- Instance

Prototyping

- Object Blueprint

Common Design Patterns

Module Design

Observer Design

Prototype Design

Singleton Design

NodeJS

“Node.js is a platform built on Chrome's JavaScript runtime for easily building fast and scalable network applications. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices.”

NodeJS : Features

Extremely fast

I/O is Asynchronous and Event Driven

Single threaded

Highly Scalable

Open source

NodeJS Process Model

Node.js runs in a single process and the application code runs in a single thread.

All the user requests to web application will be handled by a single thread and all the I/O work or long running job is performed asynchronously for a particular request.

An event loop is constantly watching for the events to be raised for an asynchronous job and executing callback function when the job completes.

Internally, Node.js uses *libuv* for the event loop which in turn uses internal C++ thread pool to provide asynchronous I/O.

Module System

Use of imports/exports for importing and exporting the modules in application.

Following are a few salient points of the module system:

- Each file is its own module.
- Each file has access to the current module definition using the module variable.
- The export of the current module is determined by the module.exports variable.
- To import a module, use the globally available require function.

Require Function

The Node.js *require* function is the main way of importing a module.

The require function blocks further code execution until the module has been loaded.

Call *`require()`* based on some condition and therefore load the module on-demand

After the first time a require call is made to a particular file, the `module.exports` is cached.

Module allows you to share in-memory objects between modules.

Treats module as an object factory.

Module System

If something is a core module, return it.

If something is a relative path (starts with ‘./’ , ‘../’) return that file OR folder.

If not, look for node_modules/filename or node_modules/foldername each level up until you find a file OR folder that matches something.

If it matched a file name, return it.

If it matched a folder name and it has package.json with main, return that file.

If it matched a folder name and it has an index file, return it.

Few Core Modules

path

os

fs

events

http

utils

Important Globals

Console	the console plays an important part in quickly showing what is happening in your application when you need to debug it.
Timers	setTimeout only executes the callback function once after the specified duration. But setInterval calls the callback repeatedly after every passing of the specified duration.
__filename and __dirname	These variables are available in each file and give you the full path to the file and directory for the current module.
Process	Use the process object to access the command line arguments. Used to put the callback into the next cycle of the Node.js event loop.
Buffer	Native and fast support to handle binary data.
Global	The variable global is our handle to the global namespace in Node

Node Package Manager

NPM is the eco-system to manage the project dependencies

Few NPM Commands

npm install	Install the packages/ dependencies
npm uninstall	Uninstall the packages/dependencies
npm config get/set	Gest /set the npm eco-system
npm update	Update the project dependencies
npm ls	List down the dependencies
npm search	Search the listed package on npm registry
npm init	Generates package.json file in local project directory
npm outdated	List down the outdated package

File System

Node.js includes **fs** module to access physical file system.

The **fs** module is responsible for all the asynchronous or synchronous file I/O operations.

Important Methods

Method	Description
`fs.readFile(filename, callback)`	Reads existing file.
`fs.writeFile(filename, callback)`	Writes to the file. If file exists then overwrite the content otherwise creates new file.
`fs.open(path, callback)`	Opens file for reading or writing.
`fs.rename(oldPath, newPath, callback)`	Renames an existing file.
`fs.rmdir(path, callback)`	Renames an existing directory.
`fs.mkdir(path, callback)`	Creates a new directory.
`fs.readdir(path, callback)`	Reads the content of the specified directory.
`fs.exists(path, callback)`	Determines whether the specified file exists or not.
`fs.appendFile(file, callback)`	Appends new content to the existing file.

Event System

EventEmitter is a class designed to make it easy to emit events (no surprise there) and subscribe to raised events.

Subscribing : *built-in support* for multiple subscribers is one of the advantages of using events.

Unsubscribing : EventEmitter has a removeListener function that takes an event name followed by a function object to remove from the listening queue.

EventEmitter provides a function `**once**` that calls the registered listener only once.

EventEmitter has a member function, **listeners**, that takes an event name and returns all the listeners subscribed to that event.

Memory Leak : A common cause of memory leak is forgetting to unsubscribe for the event.

Creating your own EventHandler (Custom Events)

A number of classes inside core Node.js inherit from EventEmitter.

Buffers & Streams

Streams play an important role in creating performant web applications.

Improvement in user experience and better utilization of server resources is the main motivation behind steams.

All of the stream classes inherit from a base abstract Stream class which in turn inherits from EventEmitter.

All the streams support a pipe operation that can be done using the pipe member function.

Buffer & Typed Array

Typed arrays are array-like objects and provide a mechanism for accessing raw binary data.

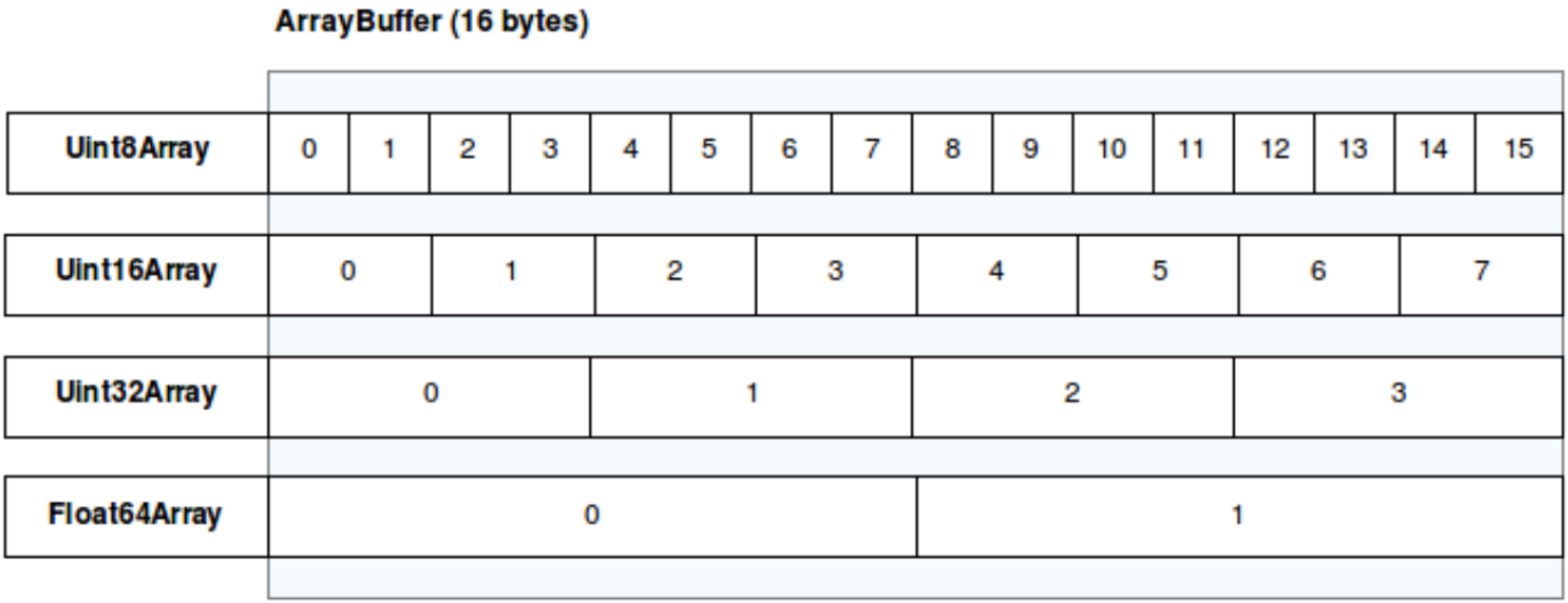
Typed arrays split the implementation into buffers and views

In order to access the memory contained in a buffer, you need to use a view.

The DataView is a low-level interface that provides a getter/setter API to read and write data to the buffer.

A view provides a context — i.e, a data type, starting offset, and the number of elements — that turns the data into a typed array.

Typed Array Representation (16 Bytes)



Streams (Cntd…)

Readable	A readable stream is one that you can read data from but not write to.
	Process. stdin, which can be used to stream data from the standard input.
Writable	A writable stream is one that you can write to but not read from.
	Process.stdout, which can be used to stream data to the standard output.
Duplex	A duplex stream is one that you can both read from and write to.
	Network socket. You can write data to the network socket as well as read data from it.
Transform	A transform stream is a special case of a duplex stream where the output of the stream is in some way computed from the input.
	Encryption and compression streams.

Express

Web application framework for Node apps.

To create an express app, make a call require('express')

Express can accept middleware using the 'use' function which can be registered with http.createServer.

Express Request / Response objects are derived from standard NodeJS http Request / Response

Request object can handle URL : Route Parameter & Querystrings

Express Router is used to mount middlewares and access all REST APIs

View Engines

Jade	uses whitespace and indentation as a part of the syntax.
Handlebar	developers *can't write* a lot of JavaScript logic inside the templates.
EJS	Follows JavaScript-ish syntax. Embed JavaScript code in template. Commonly used.
Vash	Vash is a template view engine that uses Razor Syntax.Look familiar to people who have experience in ASP.Net MVC.

Debugging

Console Object

Debugger statement

Node-inspect

Data Persistence

- Why NoSQL ?
  - Scalability
  - Ease of Development
- NoSQL servers can be placed into four broad categories:
  - Document databases (for example, MongoDB)
  - Key-value databases (for example, Redis)
  - Column-family databases (for example, Cassandra)
  - Graph databases (for example, Neo4J)

MongoDB

- A MongoDB deployment consists of multiple databases.
- Each database can contain multiple collections.
  - A *collection* is simply a name that you give to a *collection of documents*.
- Each collection can contain multiple documents.
  - A document is effectively a JSON document

```
npm install mongodb
```

Socket Programming

Bi-directional
Full duplex
communication

Continuous
channel of
communication

NodeJS Securities

A JSON Web Token (JWT), defines an explicit, compact, and self-containing secured protocol for transmitting restricted information.

The JWT Claims Set represents a compact URL-safe JSON object, that is base64url encoded and digitally signed and/or encrypted.

The JSON object consists of zero or more name/ value pairs, where the names are strings and the values are arbitrary JSON values.

References

Books :

- NodeJS by Basarat Ali Syed
- Node.JS Web Development by David Herron

Web :

- https://nodejs.org
- https://stackoverflow.com