nodejs

logicstudio
INNOVATION | SERVICES | SOLUTIONS

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Agenda

- Introducción
  - npm/node
  - scripts
  - modules
  - event loop
- fs
  - streams
- http
  - http server

Agenda(2)

- ExpressJS
  - routes
  - router
  - controller
- EJS
  - config
  - views

Agenda(3)

- Test
  - mocha
  - chai
  - nyc

INTRODUCCION

https://v8.dev/

- Convierte JavaScript en código de máquina
- Quién lo usa? Chrome, NodeJS, ...
- Sistema Operativo: Windows 7+, macOS 10.12+, Linux systems
- Arquitectura: x64, IA-32, ARM*, MIPS*
- Esta escrito en C++
- Standalone o Embebidas en otras aplicaciones C++

Qué es NodeJS?

JavaScript Runtime

- Esta escrito en C++
- Usa la V8
- Provee librerías que pueden ser utilizadas durante la ejecución de código JavaScript

Instalar NodeJS

1. https://nodejs.org/en/download/ + next..next..next
2. https://github.com/nvm-sh/nvm + nvm install node latest

Comandos

```
node
node -v
node index.js
```

Comandos (2)

```
npm -v
npm init
npm install
npm uninstall
```

Comandos (3)

```
npm start
npm test
npm build
npm run script
```

Comandos (4)

```
npm list
npm audit
npm publish
...
```

Hola Mundo

```
// index.js
console.log('Hello World!');
```

```
node index.js
```

Hola Mundo --http

```
const http = require('http');
const server = http.createServer((req, res) => {
    res.writeHead(200);
    res.write('Hello World!');
    res.end();
});
server.listen(3000, () => {
    console.log('http://localhost:3000');
});
```

Eventos en el Cliente

```
const btn = document.getElementById('action');
btn.addEventListener('click', event => { ... }):
```

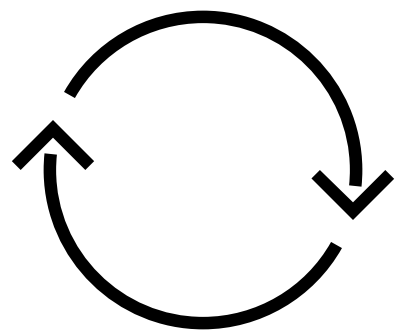
Eventos en el Servidor

```
const http = require('http');

const server = http.createServer();

server.on('request', (req, res) => {
    res.writeHead(200);
    res.write('Hola Mundo');
    res.end();
});

server.on('listening', () => {
    console.log('http://localhost:3000');
});

server.listen(3000);
```

Paradigma

- Event-driven - Asynchronous
- Non-blocking IO model - ***event loop***

Event loop



- **timers**: `setTimeout()` `setInterval()`
- **pending** callbacks: IO Callbacks
- **idle**: prepare - internal
- **poll**: new IO events
- **check**: `setImmediate()`
- **close callbacks**: `socket.on('close', ...)`

libuv

- Asynchronous IO!!!
- Asynchronous:
  - TCP/UDP, DNS resolution
  - fs, sockets
  - child process, signal handling
  - thread pool, high resolution clock
- http://docs.libuv.org/en/v1.x/design.html

Módulos

- Cada archivo es un módulo independiente
- Wrapper

```
(function(exports, require, module, __filename, __dirname) {
// Module code actually lives in here
});
```

require/exports

```
// logger.js
function info(message) {...}
module.exports = { info };
```

```
// app.js
const logger = require('./logger');
logger.info('module system...')
```

npm package

- package.json ✅
- new project ✅

```
mkdir node-app-fs
cd node-app-fs
npm init
npm init -y
```

FILE SYSTEM (fs)

Leer un archivo

```
const fs = require('fs');

fs.readFile('./data.txt', (err, data) => {
    if (err) throw err;
    console.log(data);
});
```

Escribir un archivo

```
fs.write('./message.txt', 'Hello', err => {
    if (err) throw err;
    console.log('done!');
});
```

Stream

- Writable, Readable, Transform
- Instance of ***EventEmitter***

```
const {
    Readable,
    Writable,
    Transform,
} = require('stream');
```

fs.createReadStream

```
const fs = require('fs');
const rs = fs.createReadStream('./data.txt');
rs.on('data', chunk => {...});
rs.on('readable', () => {...});
rs.on('error', err => {...});
rs.on('pause', () => {...});
rs.on('resume', () => {...});
rs.on('end', () => {...});
rs.on('close', () => {...});
```

fs.createReadStream (2)

```
const fs = require('fs');
const rs = fs.createReadStream('./data.txt',
    { highWaterMark: 16 * 1024});
rs.on('data', chunk => {
    console.log(chunk.toString());
});
rs.on('end', () => {
    console.log('----END')
});
```

fs.createWriteStream

```
const fs = require('fs');
const ws = fs.createWriteStream('./copy.txt');
ws.on('error', err => {...});
ws.on('drain', () => {...});
ws.on('pipe', () => {...});
ws.on('unpipe', () => {...});
ws.on('finish', () => {...});
ws.on('close', () => {...});
```

fs.createWriteStream (2)

```
const fs = require('fs');
const rs = fs.createWriteStream('./example.txt');
file.write('Hello World!');
// Writing more now is allowed!
file.end();
// Writing more now is NOT allowed!
```

Ejercicio 1

- ***data.txt -> copy.txt***
- Readable Stream
- Writable Stream

HTTP

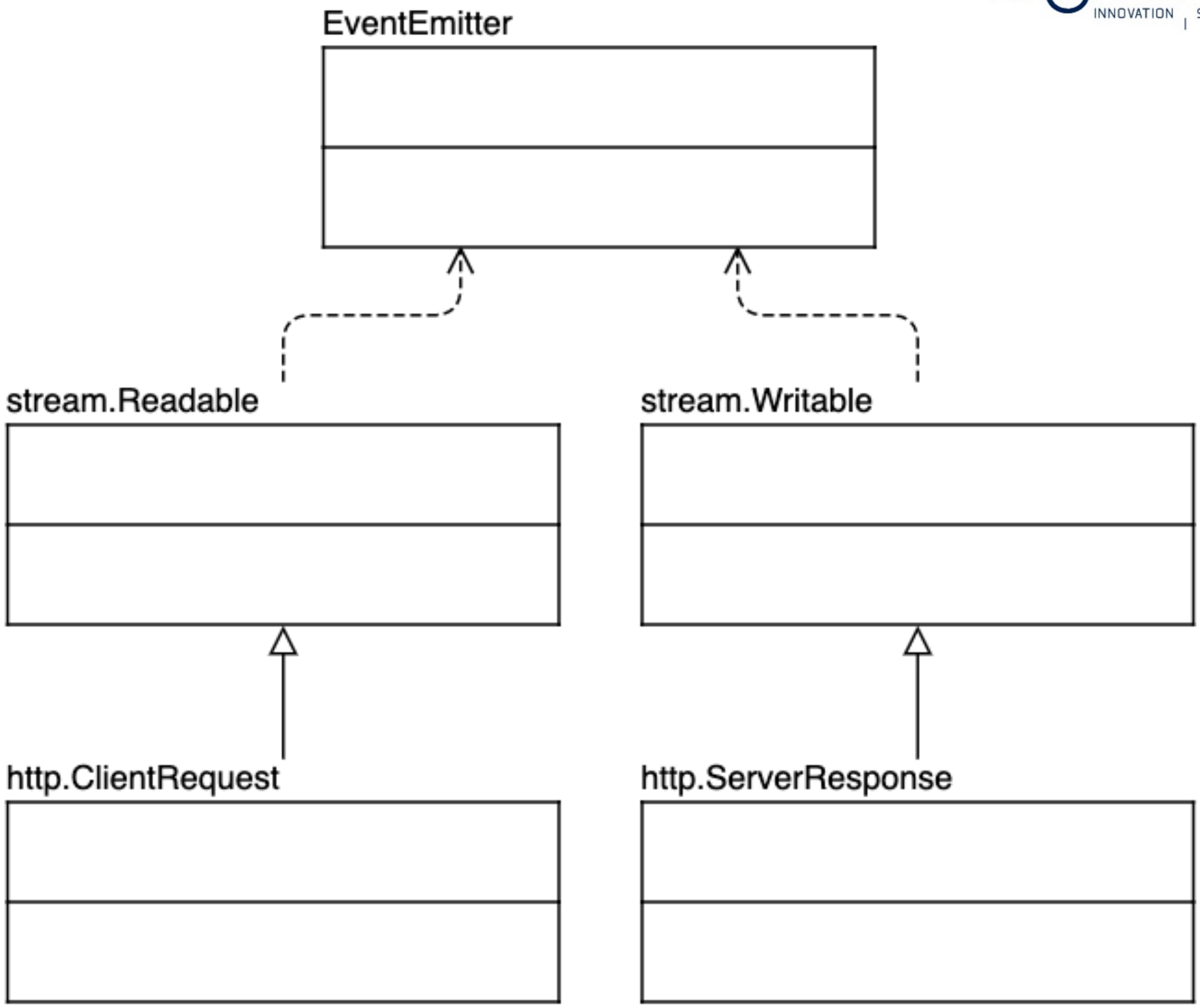
New Project

```
mkdir node-app-http
cd node-app-http
npm init
```

Hello world

```
const http = require('http');
const server = http.createServer((req, res) => {
    res.writeHead(200);
    res.write('Hello World!');
    res.end();
});
server.listen(3000, () => {
    console.log('http://localhost:3000');
});
```

Http + Streams



Echo Server

```
const server = http.createServer((req, res) => {
    res.writeHead(200);
    req.on('data', chunk => {
        res.write(chunk);
    });
    req.on('end', () => {
        res.end();
    })
});
```

Echo Server (2)

```
curl -d 'Streams' http://localhost:8080
curl --upload-file nodejs.txt http://localhost:8080
```

Echo Server --pipe

```
const server = http.createServer((req, res) => {
    res.writeHead(200);
    req.pipe(res);
});
```

Ejercicio 2

- ***data.txt -> copy.txt***
- pipe

Ejercicio 3

- http server
- carga de archivo
- progreso %

```
const contentLength = req.headers['content-length'];
```

Lectura

- backpressure
- https://nodejs.org/es/docs/guides/backpressuring-in-streams/

index.html

```
const http = require('http');
const fs = require('fs');
http.createServer((req, res) => {
    res.writeHead(200);
    const index = fs.createReadStream('./public/index.html');
    index.pipe(res);
});
```

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EXPRESSJS

Introducción

- Framework para desarrollar aplicaciones web
- Basado en Rutas (URL + Callback)

```
mdir node-app-express
cd node-app-express
npm init
npm install --save express
```

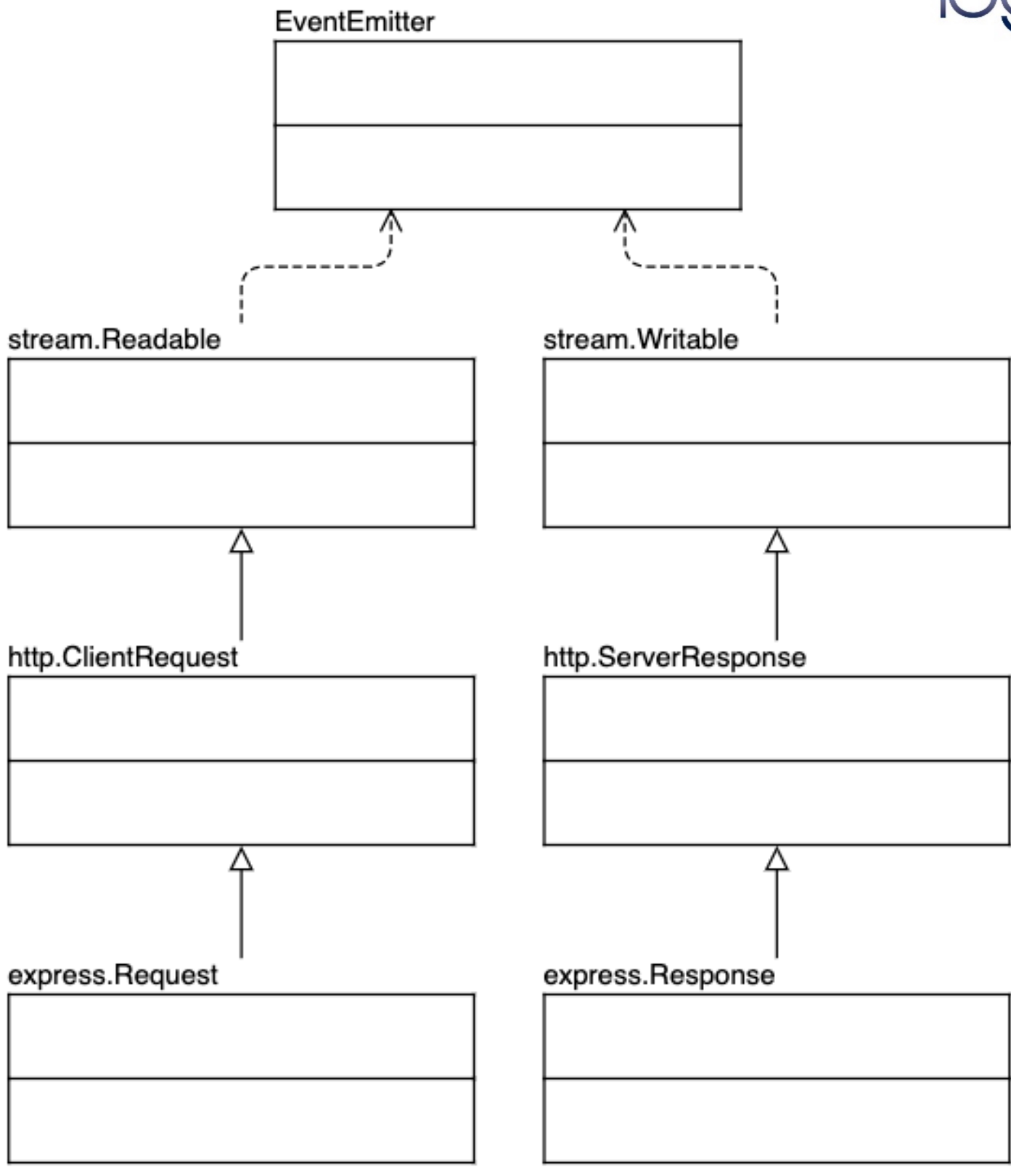
Hello World

```
//index.js
const express = require('express');
const app = express();

app.get('/', (req, res) => {
    res.writeHead(200);
    res.write('Hello World! --express');
    res.end();
});

app.listen(3000, () => {
    console.log('http://localhost:3000');
})
```

Express + Streams



response.send

```
app.get('/', (req, res) => {
    res.writeHead(200);
    res.write('Hello World! --express');
    res.end();
});
```

response.send (2)

```
app.get('/', (req, res) => {
    res.send('Hello World! --express');
});
```

response.sendFile

```
app.get('/', (req, res) => {
    res.writeHead(200);
    const index = fs.createReadStream('./public/index.html');
    index.pipe(res);
});
```

response.sendFile (2)

```
app.get('/', (req, res) => {
    res.sendFile('./public/index.html');
});
```

response.send --JSON

```
app.get('/keywords', (req, res) => {
    const keywords = ['nodejs', 'express'];
    res.send(keywords);
});
```

response.send --JSON (2)

```
curl -i http://localhost:3000/keywords

HTTP/1.1 200 OK
X-Powered-By: Express
Content-Type: application/json; charset=utf-8
Content-Length: 20
...

["nodejs","express"]
```

static

```
app.get('/', (req, res) => {
    res.writeHead(200);
    const index = fs.createReadStream('./public/index.html');
    index.pipe(res);
});
...
app.get('/', (req, res) => {
    res.sendFile('./public/index.html');
});
```

static + middleware

```
app.use(express.static('public'));
```

middleware

- Funciones que tienen acceso a los objetos **req**, **res**, y la función **next**
- Pueden realizar las siguientes tareas:
  - Ejecutar cualquier código antes y despues de la ejecución del ciclo *request-response*
  - Modificar los objetos **req** y **res**
  - Terminar la ejecución del ciclo *request-response*

tipos de middleware

- Application-level middleware
- Router-level middleware
- Error-handling middleware
- Built-in middleware
- Thrid-party middleware

Application-level middleware

```
//logger.js
function logger(req, res, next) {
    next();
}

//index.js
const express = require('express');
const logger = require('./logger');

const app = express();
app.use(logger);
```

Ejercicio 4

- Application-level middleware **logger.js**
  - Mensaje de inicio
  - Mensaje de fin con tiempo total
  - Identificar el mensaje de inicio y fin con un ID único.
  - TIP: Eventos de un Writable Stream

```
`INICIO: ${id}: ${message}`
`FIN: ${id}: ${message}, ${duration}`
```

```
ws.on('error', err => {...});
ws.on('drain', () => {...});
ws.on('pipe', () => {...});
ws.on('unpipe', () => {...});
ws.on('finish', () => {...});
ws.on('close', () => {...});
```

Query Params

- http://localhost:3000/keywords?limit=2

```
app.get('/keywords', (req, res) => {
    const limit = req.query.limit;
    // use the limit query parameter!
    const keywords = ['nodejs', 'express'];
    res.send(keywords);
});
```

Keywords

```
[
    {
        id: 'javascript',
        desc: 'Lenguaje de Programación',
        url: 'http://javascript.com'
    },
    {
        id: 'javascript',
        desc: 'Lenguaje de Programación',
        url: 'http://javascript.com'
    },
    {
        id: 'javascript',
        desc: 'Lenguaje de Programación',
        url: 'http://javascript.com'
    }
]
```

Rutas Dinámicas

- http://localhost:3000/keywords/javascript
  - {...}
- http://localhost:3000/keywords/nodejs
  - {...}
- http://localhost:3000/keywords/express
  - {...}

Rutas Dinámicas (2)

```
app.get('/keywords/:id', (req, res) => {
    const id = req.params.id;
    // use the name url parameter
});
```

404 Not Found

```
app.get('/keywords/:id', (req, res) => {
    const id = req.params.id;
    const desc = ...;
    if (!desc) {
        return res.status(404).send(`${name} not found`);
    }
    return res.send(desc);
});
```

Built-in middleware

- express.static
- express.json
- express.urlencoded

Ejercicio 6

- Usar los siguiente métodos HTTP
- GET/POST/PUT/DELETE/PATCH
- CRUD de keywords

CRUD

```
app.get('/keywords', (req, res) => {...}));
app.get('/keywords/:id', (req, res) => {...}));
app.post('/keywords', (req, res) => {...}));
app.put('/keywords/:id', (req, res) => {...}));
app.delete('/keywords/:id', (req, res) => {...}));
```

app.param

```
app.param('id', () => {
    const id = req.params.id;
    req.keywordId = name.toLowerCase();
    next();
});
...
app.get('/keywords/:id', function (req, res) {
    const desc = ...req.keywordId...;
    ...
});
```

Routes

```
app.route('/keywords')
    .get((req, res) => {...})
    .post((req, res) => {...});

app.route('/keywords/:id')
    .get((req, res) => {...})
    .put((req, res) => {...})
    .delete((req, res) => {...});
```

Router

```
//keywords.js
const express = require('express');
const router = express.Router();

...

module.exports = router;
```

Router (2)

```
//keywords.js
router.route('/')
    .get((req, res) => {...})
    .post((req, res) => {...});

router.route('/:id')
    .get((req, res) => {...})
    .put((req, res) => {...})
    .delete((req, res) => {...});
```

Router (3)

```
//index.js
var express = require('express');
var keywords = require('./keywords');
var app = express();
...
app.use('/keywords', keywords);
```

route('...').all

```
router.route('/:id')
    .all(function (req, res, next) {
        var id = req.params.id;
        req.keywordId = id.toLowerCase();
        next();
    })
    .get(function (req, res) {...})
    .put(function (req, res) {...})
    .delete(function (req, res) {...});
```

file structure

- middleware.js
- routes.js
- api/
  - keywords/
    - controller.js
    - index.js
- index.js

middleware.js

```
const express = require('express');
function middleware(app) {
    app.use(express.static('public'));
    app.use(express.json());
    app.use(express.urlencoded({ extended: true }));
}
module.exports = middleware;
```

routes.js

```
const keywords = require('./api/keywords');
function routes(app) {
    app.use('/api/keywords');
}
module.exports = routes;
```

index.js

```
const express = require('express');
const middleware = require('./middleware');
const routes = require('./routes');
const app = express();

middleware(app);
routes(app);

app.listen(3000, () => {...});
```

api/keywords/controller.js

```
function create(req, res) {...}
function update(req, res) {...}
function remove(req, res) {...}
function search(req, res) {...}
function readById(req, res) {...}

module.exports = { create, update, search, readById };
```

api/keywords/index.js

```
const express = require('express');
const controller = require('./controller');
const router = express.Router();

router.route('/')
    .get(controller.search)
    .post(controller.create);

router.route('/:id')
    .get(controller.readById)
    .put(controller.update)
    .delete(controller.remove);

module.exports = router;
```

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MONGOOSE

start db

```
mongod --dbpath=./mongodb-data
```

install

```
npm install --save mongoose
```

database.js

```
const mongoose = require('mongoose');
function connect() {
    mongoose.connect(
        'mongodb://localhost:27017/nodeapp',
        { useNewUrlParser: true, poolSize: 10 }
    );
}

module.exports = { connect };
```

database - error handling

```
const conn = mongoose.connection;
conn.on('error', error => {
    console.log('Error trying to connect to the db...');
});
conn.on('open', error => {
    console.log('Db connection is ready...');
});
```

schema - model

```
//api/keywords/model.js
const mongoose = require('mongoose');
const schema = new mongoose.Schema({
    name: String,
    desc: String,
    url: String,
});
const Keyword = mongoose.model('Keyword', schema);
module.exports = Keyword;
```

Validation - built-ins

```
const schema = new mongoose.Schema({
    name: { type: String, required: true },
    email: { type: String, required: true,
        unique: [true, 'Email already exists']},
    password: { type: String, required: true,
        select: false },
});
```

Validation - custom

```
const schema = new mongoose.Schema({
    phone: {
        type: String,
        validate: {
            validator: function(v) {
                return /\d{3}-\d{3}-\d{4}/.test(v);
            },
            message: props =>
                `${props.value} is not a valid phone number!`
        },
        required: [true, 'User phone number required']
    }
});
```

hooks

```
schema.pre('save', function(next) {...});
schema.pre('remove', function(next) {...});
schema.pre('find', function(next) {...});
...
schema.post(...);
```

hooks example

```
// api/users/model.js
schema.pre('save', function(next) {
    const user = this;
    if (!user.isModified('password'))  return next();
    const hashedPassword = hash(user.password, 10);
    user.password = hashedPassword;
    next();
});
```

Temas pendientes

- Subdocuments
- Populate
- Discriminators
- Plugins
- Aggregate
- ...

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JSON Web Tokens

Dependencies

```
npm install --save jsonwebtoken bcryptjs
```

Tokens

```
jwt.sign(payload, SECRET_KEY, { expiresIn: '2h' });
jwt.verify(token, SECRET_KEY);
```

Hash

```
await bcrypt.hash(text, 10);
await bcrypt.compare(hash1, hash2);
```