# Node.JS > INTRODUCTION

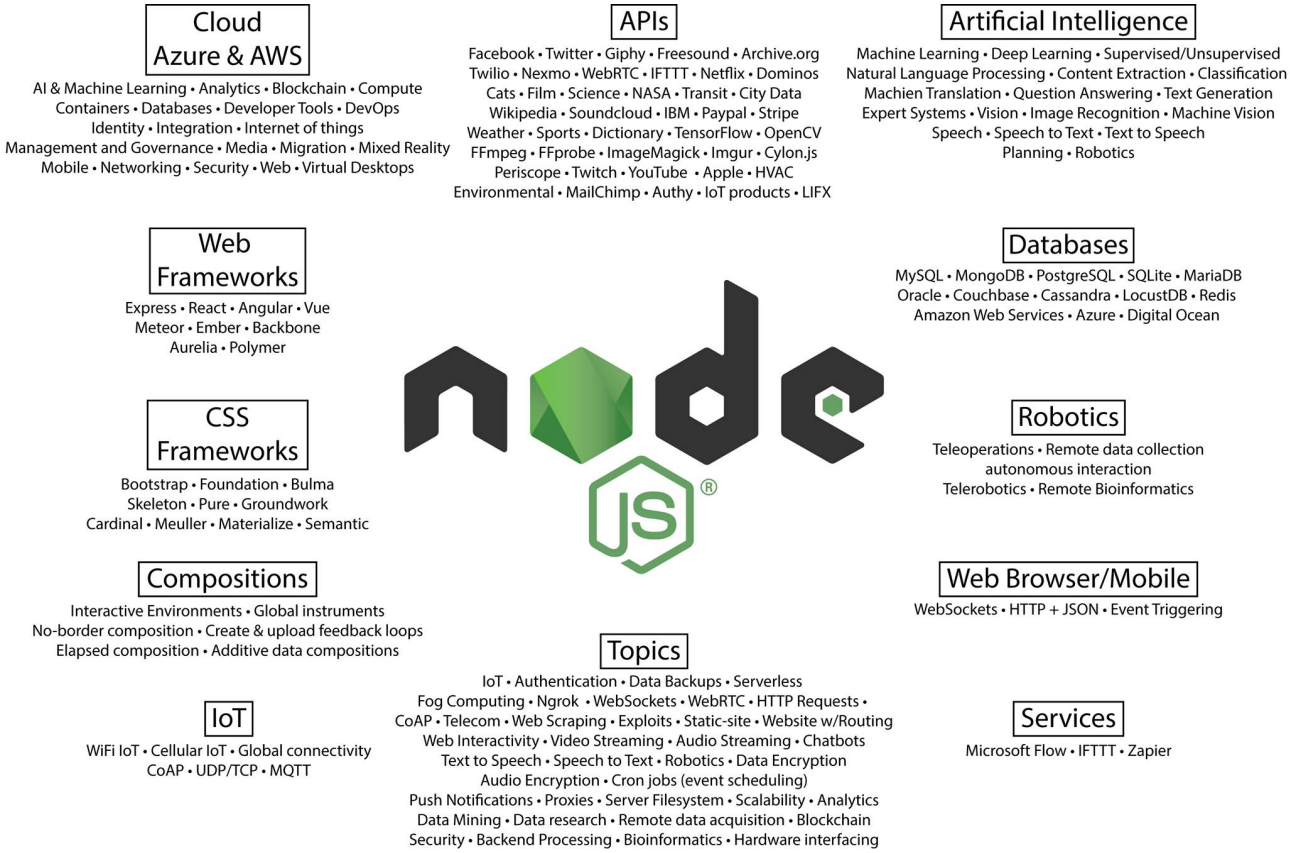
## TUTORIAL

In this tutorial we will build an Multi-Touch Interface which can be used to control Ableton Live.

We will
- get an overview about the possibilities with node.js
- learn the basics of Javascript
- learn how to implement a node.js script in Max for Live
- create a UI with p5.js
- implement a Webserver via node.js
- use Websocket communication protocol to communicate exchange data from client to server

## Possibilities of Node.JS

NODE.JS -> Max for Live Showreel -> https://www.youtube.com/watch?v=qEtONnWOGyo



## Gettings Started:

- https://cycling74.com/articles/node-for-max-intro-–-let's-get-started
- Node for Max Documentation -> https://docs.cycling74.com/nodeformax/api/index.html

About Node:
- https://nodejs.org/en/
- https://www.npmjs.com

EXAMPLES:
- face API connection with Max-> https://www.youtube.com/watch?v=Ud_XvmPlavU
- How to track human skeleton
  - https://mediapipe.dev
    Skeletontracking example – p5.js -> https://editor.p5js.org/lingdong/sketches/ef6FB-uNq
    Handtracking example – p5.js -> https://editor.p5js.org/lingdong/sketches/1viPqbRMv

## Node for Max Resources

- Gettings Started - https://cycling74.com/articles/node-for-max-intro-–-let's-get-started
- Node Max – Showreel - https://www.youtube.com/watch?v=qEtONnWOGyo
- Node for Max: An Introduction - https://www.youtube.com/watch?v=qSZH6fjOcXE
- Getting Started - https://www.youtube.com/watch?v=QulcEHJSwz8
- Node For Max Core Examples - https://github.com/Cycling74/n4m-core-examples/
- Node For Max Examples - https://github.com/cycling74/n4m-examples

## Recommended EDITOR`S

- Visual Studio Code - https://code.visualstudio.com
- Sublime - https://www.sublimetext.com
- atom.io - https://atom.io

## How to add a node.js script in Max for Live

1. new Object -> node.script hello.js
2. Connect message Box -> script start
3. Create new js file hello.js at harddisk (same directory as M4L device)
4. Add following lines into the hello.js file

```
// include max-api -> is the connection to Max
const maxAPI = require('max-api');
// print Message -> "Hello from Node.js" to Max-Console
maxAPI.post("Hello from Node.js");
```

5. Trigger message Box "script start"
6. Check if you get a message at Max Console

# Node.js – Basics

**Add a handler:**

```
// a handler for receiving a message with a value e.g. “slider 60”
maxAPI.addHandler('slider', (value) => {
    //print value
    maxAPI.post(value);
});

// a handler for receiving a message without a value
maxAPI.addHandler(‘generateRandomNumber', () => {
    let rand_value = Math.random()
    maxAPI.post(rand_value);
});
```

**Create a connection to the outside:**

```
// send a message “random_value 0.234”  to the outlet
maxAPI.outlet(‘random_value’, 0.234);

// print “Hello” to Max Console
maxAPI.post(“Hello”);
```

**Create a function:**

```
function calc() {
        //do some calculations
}
```

**Creating a variable:**

```
let value = 10;
```

**Debugging:**

- use node.debug Object and connect it to the most right outlet of

EXERCISE: create a new node.js script which receives 2 values and multiply these values when one value will be received. Output the result as a message  “result 6” if the input was 2 and 3

Javascript Cheatsheet
http://www.developer-cheatsheets.com/es6

## INTRO P5.JS

Projectpage https://p5js.org

**Recommended tutorials:**

- https://thecodingtrain.com/beginners/p5js/

**P5.js Getting started:**

- https://p5js.org/get-started/

**Create UI:**

BASIC -> https://p5js.org/examples/dom-slider.html
MULTITOUCH .> https://github.com/L05/p5.touchgui

## WEBSERVER

Definition: https://en.wikipedia.org/wiki/Web_server

If you need a Webserver for experiments you can use python.

To start a webserver run the command below:

**python3 -m http.server**

That will open a webserver on port 8080. You can then open your browser at http://127.0.0.1:8080/ The webserver is also accessible over the network using your 192.168.-.- address. This is a default server that you can use to download files from the machine.

In class:

- Get access to p5 files from the Webserver
- get acces to files via smartphone

# CREATING a NODE.JS WEBSERVER WITH EXPRESS

Addaptod from Daniel Shiffman: https://www.youtube.com/watch?v=2hhEOGXcCvg

1. Install Node.JS
    1. Windows - https://nodejs.org/en/download/package-manager/#windows
    2. MAC - https://nodejs.org/en/download/package-manager/#macos

2. Check if node.js is installed
- OPEN your Terminal and type
    - node -v

3. Check if nom is installed and type
- npm -v

4. Create a folder “server”
5. Change directory to server
6. Create a file -> server.js
7. Type command -> npm init(setup a configuration file package.json)
8. npm install express —save (install express Webserver and add dependency in package.json)
9. Add following lines into server.js

```
//create webserver and listen at port 3000
var express = require('express');
var app = express();
// listen at port 3000
var server = app.listen(3000);
// make all files in directory public accessible (these files are static files, index.html. jsfiles,
media)
app.use(express.static('public'));
// print message at Terminal
console.log("socket server is running”);
```

10. Execute browser with url -> http://localhost:3000
11. Create directory “public” in directory “server”
12. Add index.html and p5.js files in public directory
13. Test with url if public content will be loaded
14. Install Websocket package socket.io
    - npm install socket.io —save
15. Add web socket code to server.js

```
//create websocket
var socket = require('socket.io');
//add server to the socket
var io = socket(server);
//deal with events - in these case "connection" and call a function when connection is
working
io.sockets.on('connection', newConnection);
```

16. Add socket client library to index.html file
    - https://socket.io/docs/v4/client-api/
    -<script src=“/socket.io/socket.io.js"></script>
17. Create the connection from the client to the server and add following lines in sketch.js
    - var socket;
    - in setup function > socket = io.connect(‘http://localhost:3000');

18. Add code that you can communicate with the server in sketch.js

```
//create socket connection
var socket;


var websocket_msg = {
  name: '',
  value: null
}
sendWebSocketMSG(websocket_msg);

function sendWebSocketMSG(data) {
  socket.emit('msg', data);
}
```

**Comment**: value could also be a complex data set like

```
mouse_data = {
    x: 0,
    y: 0
  }

mouse_data.x = 23;
mouse_data.y = 60;
```

19. Add code to your server (server.js) for receiving messages from the client

```
function newConnection(socket) {
    console.log('new connection: ' + socket.id);

    socket.on('msg', getMsg);

    function getMsg(data) {

        if (DEBUG) {
            console.log(data);
        }

        if (data.name == 'mouse_data') {

        }
        socket.broadcast.emit('msg', data);
    }
}
```

ALTERNATIV INSTRUCTION:

- https://hostadvice.com/how-to/how-to-create-a-simple-web-server-using-node-js-and-express/

## Receive values in m4l

OPEN > websocket_interface.amxd

Install dependencies > trigger following message boxes
    script npm init
    script npm install socket.io-client --save

Toggle > START

## USAGE

EXAMPLE: EXHIBITION
COMPUTER IS IN THE EXHIBITION WEBSERVER IS RUNNING ON THAT COMPUTER
SCAN QR CODE > OPENS WEBPAGE > GET CONTROLLER INTERFACE

## Further Ressources

**HOW TO ADD A NODE PACKAGE VIA NPM**
    https://docs.cycling74.com/max8/vignettes/02_n4m_usingnpm

In our case a web socket client: (We are using socket.io-client)
https://www.npmjs.com/package/socket.io-client