Node-js (for Starters) and Electronics/Robotics

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Event Topics

1. Node-js?
   a. How to install?
   b. How to use? (simple and quick way)

2. And Electronics,

3. And Robotics

4. IOT
   - Security
   - How to stay safe

5. Other tools (python, android, c, c++ etc.)
Event Topics

1. Node-js?
   a. How to install?
   b. How to use? (simple and quick way)

2. And Electronics,

3. And Robotics
Node-JS
It’s a java-script run-time built on Chrome’s V8 JavaScript Engine.

It’s lightweight plus efficient

It has own package ecosystem call npm!

“npm” depend on node-js
  - Without node It cannot work

Install > #su -c ‘dnf install nodejs npm -y’

It’s simple to use! I ❤️ DOCS! And run “user” mode If possible in “dev” mode.
Electronics/Robotics

even IOT
Relationship with NodeJS

- Connection Methods
  - SPI, I2C and Serial-port
  - Web Server and socket
  - Industrial Ways (Modbus, Bacnet(RTU, IP))

- Circuit and board types (Examples)
  - Arduino with Firmata or manual codes
  - Embedded Cards (Rs-pi, Beagleboard etc.)
    - Install node-js and communicate with them.
  - Microchip (PIC series with manual code)
  - OpenWRT devices
I2C and SPI

- Both connection depend on addresses list.
- Can be connect multiple device on same line
- Can be use as multiplexer(digital or analog)
- Each addresses need to be call and determine on libraries
- There is no general libraries for each I2C or SPI
Example device/code

- PCA9685 / I2C chip
- 16-Channel 12-bit
- PWM driver
- Possible to multiple on top of it.
  - Need soldering work!
  - Npm I use ;
  - https://www.npmjs.com/package/pca9685
  - Only works for that chip.
Some basic code...

```javascript
var i2cBus = require("i2c-bus");
var Pca9685Driver = require("pca9685").Pca9685Driver;
var options = {
    i2c: i2cBus.openSync(1),
    address: 0x40,
    frequency: 50,
    debug: false
};
pwm = new Pca9685Driver(options, function() {
    console.log("Initialization done");
});
// Set channel 0 to turn on on step 42 and off on step 255
pwm.setPulseRange(0, 42, 255);
// Set the pulse length to 1500 microseconds for channel 2
pwm.setPulseLength(2, 1500);
// Set the duty cycle to 25% for channel 8
pwm.setDutyCycle(8, 0.25);
```
It’s general way to communicate devices
All we need is know what’s the addresses of device then we connect
$ npm install --save-dev serialport  OR
$ sudo npm install -g serialport (install global)
Also we can use command line for quick check.
```javascript
var serialport = require("serialport");
var SerialPort = serialport;
var serialPort = new SerialPort("/dev/ttySX", {
  baudrate: 9600,
  parser: serialport.parsers.parsers.readline("\n")
});

- PS: Make sure you have permissions! :)
- Do not rely on “sudo” cuz USERS!
```
Web Socket/Server

- We can connect multiple devices who can talk on Ethernet.
- It’s a general way we can use on website/device.
- Internet is the way for cloud and automation infrastructures / IOT.
- E.g: built-in “http” or external library like a express..
const http = require('http');
const hostname = '127.0.0.1';
const port = 2016;
const server = http.createServer((req, res) => {
    res.statusCode = 200;
    res.setHeader('Content-Type', 'text/plain');
    res.end('Hello World
');
});
server.listen(port, hostname, () => {
    console.log('Server running at http://${hostname}:${port}/');
    console.log('Server need to run on Flock 2016 hopefully')
});
Web Server(express)

```javascript
var express = require('express')
var app = express()

app.get('/', function (req, res) {
  res.send('Hello World')
})

app.listen(3000)
```

- Express still active project and has many use too.
Industrial Ways...

- Modbus and Bacnet using on industrial automations (buildings, factories etc.)
- Bacnet and Modbus not new protocols but Bacnet is most recent and fast/easy to use it.
- Modbus is old but still using on more basics devices like:
  - Sensors, counters, converters etc.
- Bacnet protocol need more space (on small board need code effective)
Robotics (Depend on HW)

- Nodejs also meant to be on any robotics too.
- Node-Red (research needed quickly)
  - CylonJS >> Meant to be robotics
    - npm install cylon | npm install -g cylon
  - Johnny five > Arduino focus/Robotics/
  - GORT > CLI based control
    - Scan devices, Install firmware and use with others
    - Compatible with cylon and johnny-five, Gobot, Artoo etc.
Cylon-jS

- It is based on Arduino/Raspberry Pi and other embedded boards.
- You can control over 43+ devices.
- You can make your own control-algorithm.
- It’s simple to install and well documented.
- And we have small example to show up.
Cylon-Js addons

- Cylon-firmata (Arduino+Firmata needed)
- Cylon-beaglebone (I2C and SPI)
- Cylon-ble (BLE communication)
- Cylon-opencv
- Cylon-raspi
- Cylon-keyboard
- Cylon-joystick

And more...
Resources

- https://cylonjs.com/
- http://gort.io/
- http://johnny-five.io/
- http://socket.io/
- https://expressjs.com/
Demos
Hardware List (Demos)

- EMG controller
- Leap motion controller (camera and IR)
- Rs-pi/PC
- PWM controller
- External Power Adapter
- 12 Servo Motor (0-180 high torque)
  - (Always get extra back-up if you broke the servos)
Questions?

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