

# SENSORS AND ACTUATORS INDUSTRIAL IOT

Software and Services Group  
IoT Developer Relations, Intel

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# CYBER-PHYSICAL

Cyber-Physical Systems (CPS) are integrations of computation, networking, and physical processes.

Physical processes affect the computation model of the process and vice-versa.

The economic impact of cyber-physical systems is vastly greater than what has been realized. Major investments are being made worldwide to develop the technology.



# SENSORS FOR PRODUCTS THAT ENHANCE WORKER SAFETY



## [DAQRI Brings Augmented Reality to Industry](#)

The DAQRI Smart Helmet\* powered by Intel allows wearers to overlay maps, schematics, and thermal images to effectively see through walls, pipes, and other solid objects.



## [Epson Offers Augmented-Reality-Ready Smart Glasses](#)

MOVERIO\* smart glasses are powered by an Intel Atom® processor. The BT-350 is designed for multi-user, augmented reality applications, such as remote support, arts & culture, enterprise drone, and subtitling & translation.



## [Fujitsu Improves Worker Management](#)

Fujitsu's UBIQUITOUSWARE\* is an industrial worker management platform enabling data acquisition from a wide variety of sensors. An Intel® architecture-based IoT gateway gathers, filters, and applies local analytics.



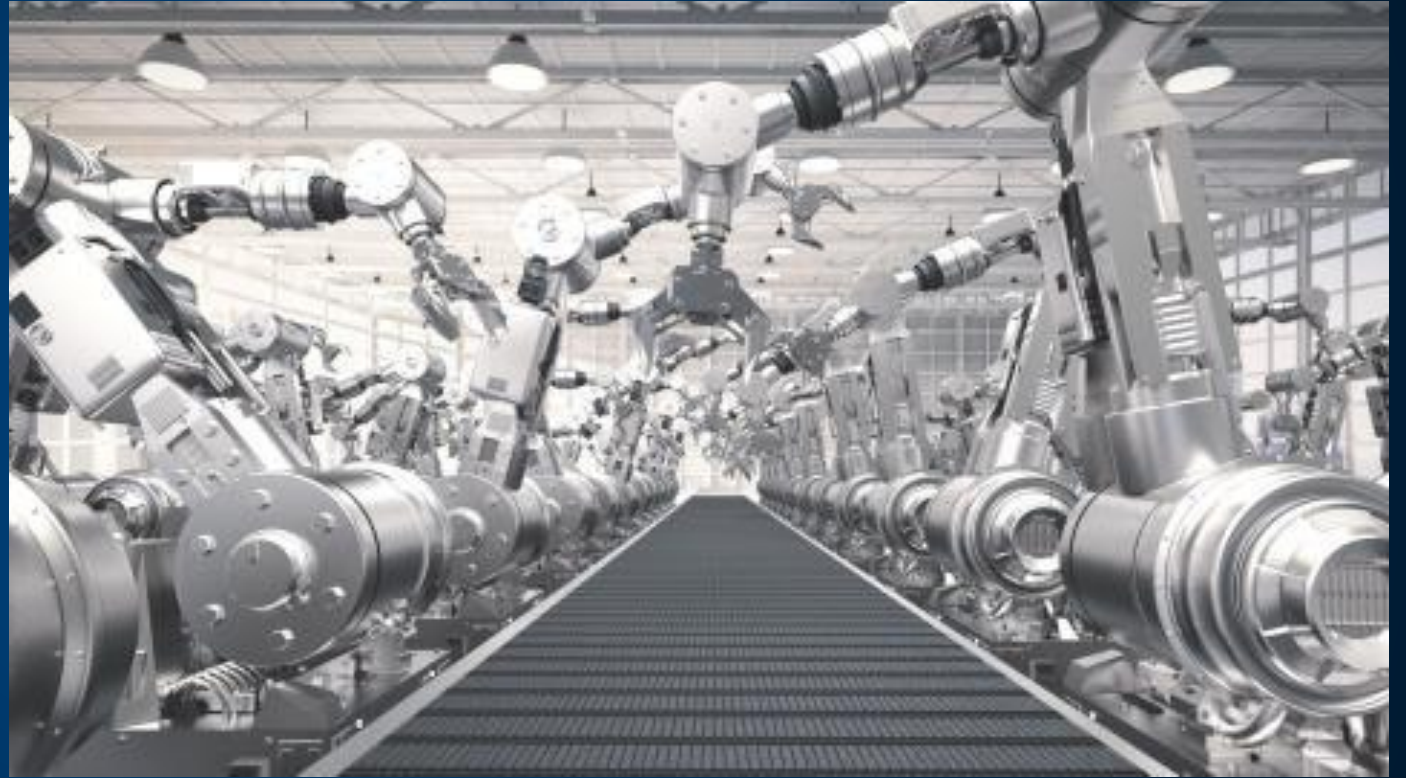
## [KNAPP Aims at Zero Defects](#)

The KNAPP IVII Headset\* is an Intel-powered wireless, smart worker wearable solution with a unique see-through display that gives workers access to both real and virtual information.



# SENSING FOR AUTOMATION AND ROBOTICS

- Intel® architecture-based connected worker solutions bring essential capabilities, including:
- Continuous environmental monitoring and alerts, both locally on the gateway, and in the remote command center
- Immediate, one-to-one “over the shoulder” coaching by remote experts
- Timely access to contextually relevant, critical information while on the job
- Contextual augmented-reality-based training on site.





# INDUSTRIAL SENSORS

# MRAA - AN I/O LIBRARY FOR THE INTERNET OF THINGS

Provides I/O abstraction across both Intel and non-Intel (community added) MCU boards, UNIX boards and IoT Gateways.

## X86

Minnowboard

NUC

UP2 Board

Intel® NUC

UP\* and UP Squared\*

Arduino\* and Genuino\*

101

## ARM

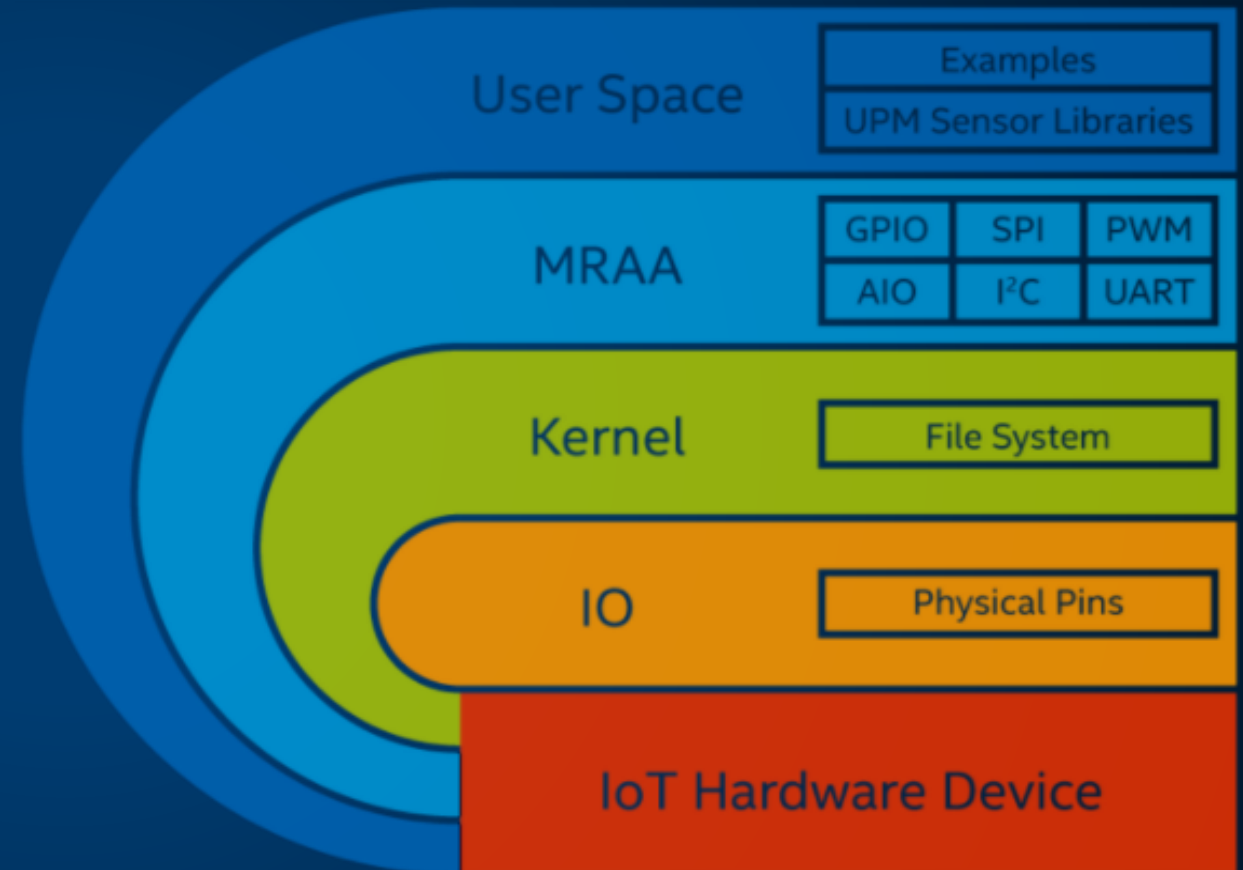
Raspberry Pi

Banana Pi

Beaglebone Black

phyBOARD-Wega

96Boards



<https://github.com/intel-iot-devkit/mraa>



# INTRODUCING INTEL IOT DEVICE LIBRARIES: MRAA AND UPM

libmraa aka “MRAA”: <https://github.com/intel-iot-devkit/mraa>

- Open Source IO Libs (UART, SPI, GPIO, I2C, AIO)
- Provides higher level abstraction making hardware IO easier to use from userspace
- Enables portability between devices
- Supports Intel® Galileo and Intel® Edison boards, MinnowBoard MAX, etc.

UPM: <https://github.com/intel-iot-devkit/upm>

- High level library repository of sensor drivers
- Sensors/Actuators using libmraa
- Making it easy to control
- Expanding support to Industrial grade sensors

***UPM and MRAA make it easy to build IoT projects!***

# MAKING SENSORS AND ACTUATORS ACCESSIBLE

Support for Multiple Operating Systems



Zephyr



Support for Multiple Languages



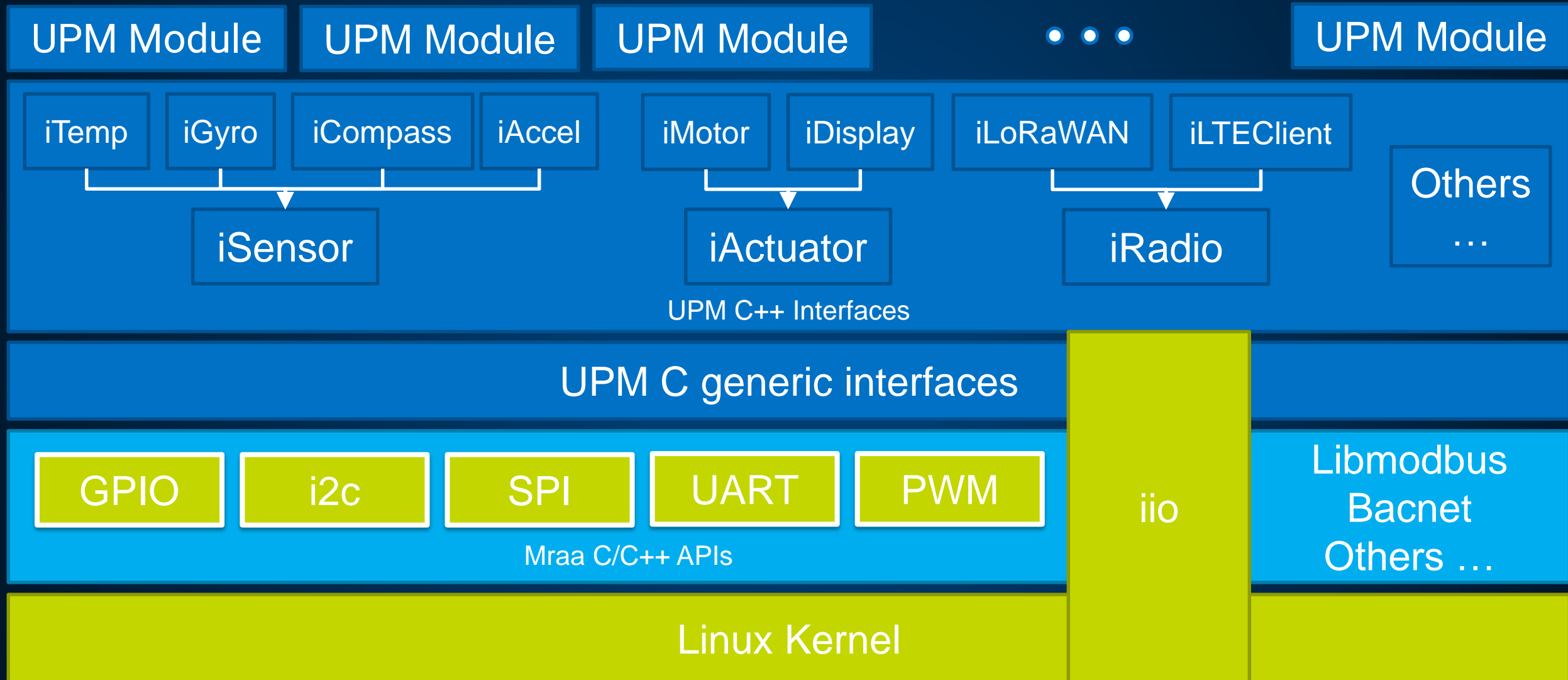
Maker Sensors



Industrial Sensors



# MRAA & UPM – ARCHITECTURE





# NODE.JS CODE FOR TEMPERATURE SENSOR

```
// Load Grove module
var groveSensor = require('jsupm_grove');

// Create the temperature sensor object using AIO pin 0
var temp = new groveSensor.GroveTemp(0);
console.log(temp.name());

// Read the temperature ten times, printing both the Celsius and
// equivalent Fahrenheit temperature, waiting one second between readings
var i = 0; var waiting = setInterval(function() {
    var celsius = temp.value();
    var fahrenheit = celsius * 9.0/5.0 + 32.0;
    console.log(celsius + " degrees Celsius, " );
    console.log(Math.round(fahrenheit) + " degrees Fahrenheit, " );
    i++;
    if (i == 10) clearInterval(waiting);
}, 1000);
```

```
// Load Grove module
var groveSensor = require('jsupm_grove');

// Create the relay switch object using GPIO pin 0
var relay = new groveSensor.GroveRelay(0);

// Close and then open the relay switch 3 times,
// waiting one second each time. The LED on the relay switch
// will light up when the switch is on (closed).
// The switch will also make a noise between transitions.
var i = 0;
var waiting = setInterval(function() {
    if ( i % 2 == 0 ) {
        relay.on();
        if ( relay.isOn() ) console.log(relay.name() + " is on");
    }
    else {
        relay.off();
        if ( relay.isOff() ) console.log(relay.name() + " is off");
    }
    i++;
    if ( i == 6) clearInterval(waiting);
}, 1000);
```



This repository

Search

Pull requests

Issues

Gist

intel-iot-devkit / upm

Unwatch

69

Star

289

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Wiki

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Graphs

UPM is a high level repository for sensors that use mraa

1,364 commits

4 branches

25 releases

46 contributors

Branch: master

New pull request

Create new file

Upload files

Find file

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jontrulson otp538u: some fixes to get working on the Arduino 101 with Firmata ...			Latest commit dc93fb1 6 days ago
cmake	cmake: Fixed builddoc flow for javascript documentation		4 months ago
docs	upm: v0.7.3		18 days ago
doxy	bosch bme280: Remove old driver in favor of new driver to be added soon		4 months ago
examples	otp538u: some fixes to get working on the Arduino 101 with Firmata		6 days ago
src	otp538u: some fixes to get working on the Arduino 101 with Firmata		6 days ago
tests	java: Added sanity checks and integrated them in CMake. Updated sampl...		7 months ago





