SENSORS AND ACTUATORS
INDUSTRIAL IOT

Software and Services Group
IoT Developer Relations, Intel

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.

SENSING FOR AUTOMATION AND ROBOTICS

Microprocessor-based controllers are regularly used to perform robot joint movements control.

Typically the controller is organized in a hierarchical fashion:

- Joint can loop-control data individually
- Supervisory controller coordinating the combined actuations of the joints according to the **loop-control of the robot program for given cycle-time**.
- Internal & External Sensors are used to monitor and control the various joints of the robot; **they form a feedback control-loop with the robot controller**.

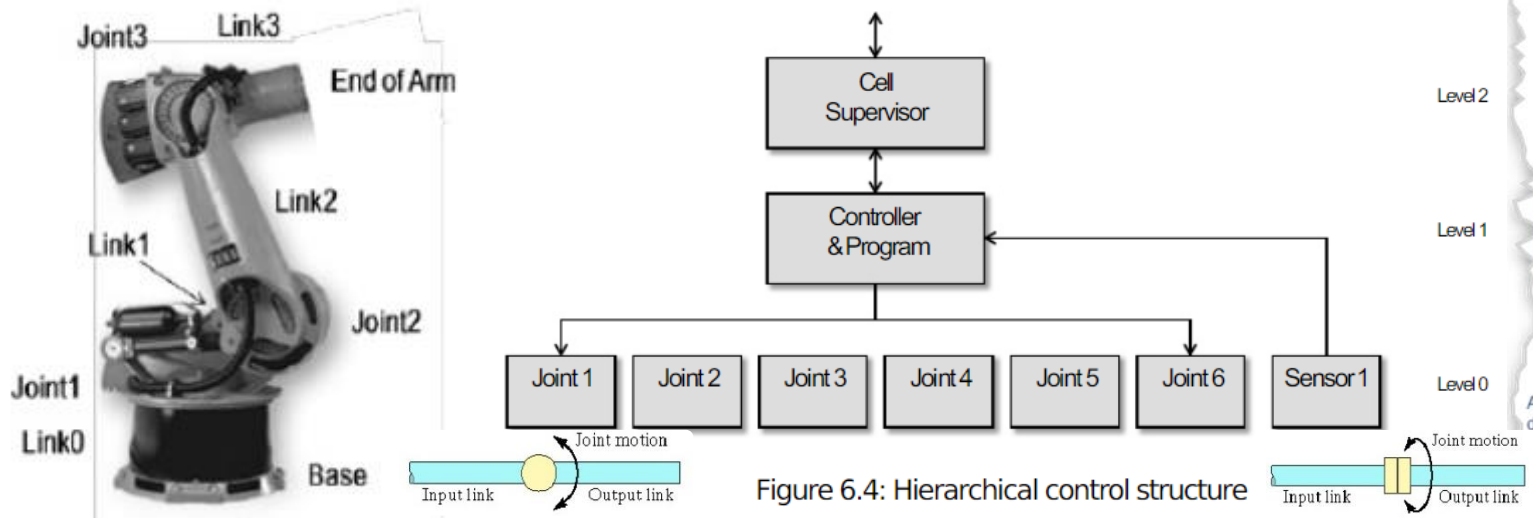
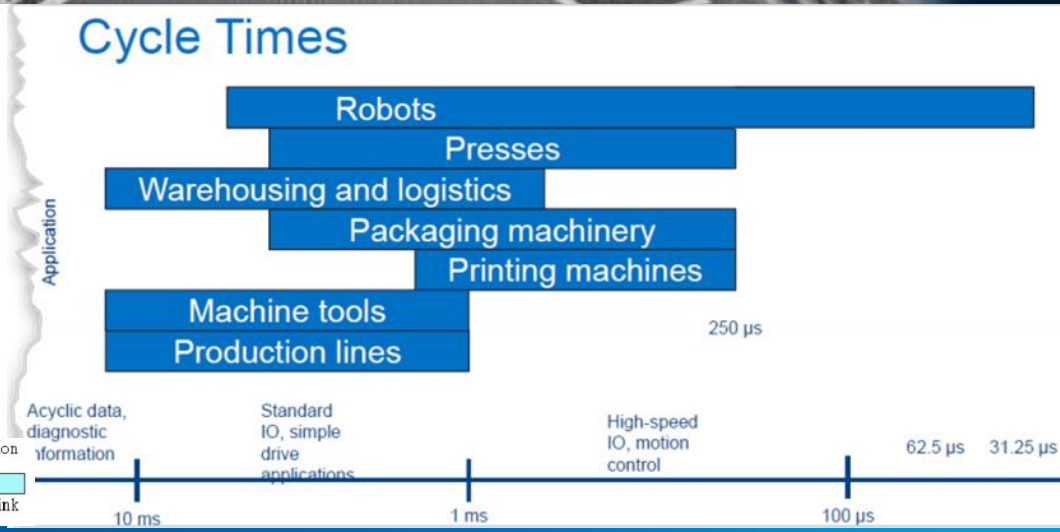


Figure 6.4: Hierarchical control structure



Groover, M. P. (2008),
Automation, Production Systems, and Computer-Integrated Manufacturing, 3rd ed., Chapter 8

PROTOTYPING WITH SENSORS AND ACTUATORS

https://software.intel.com/en-us/industrial-sensors-with-upm-support

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

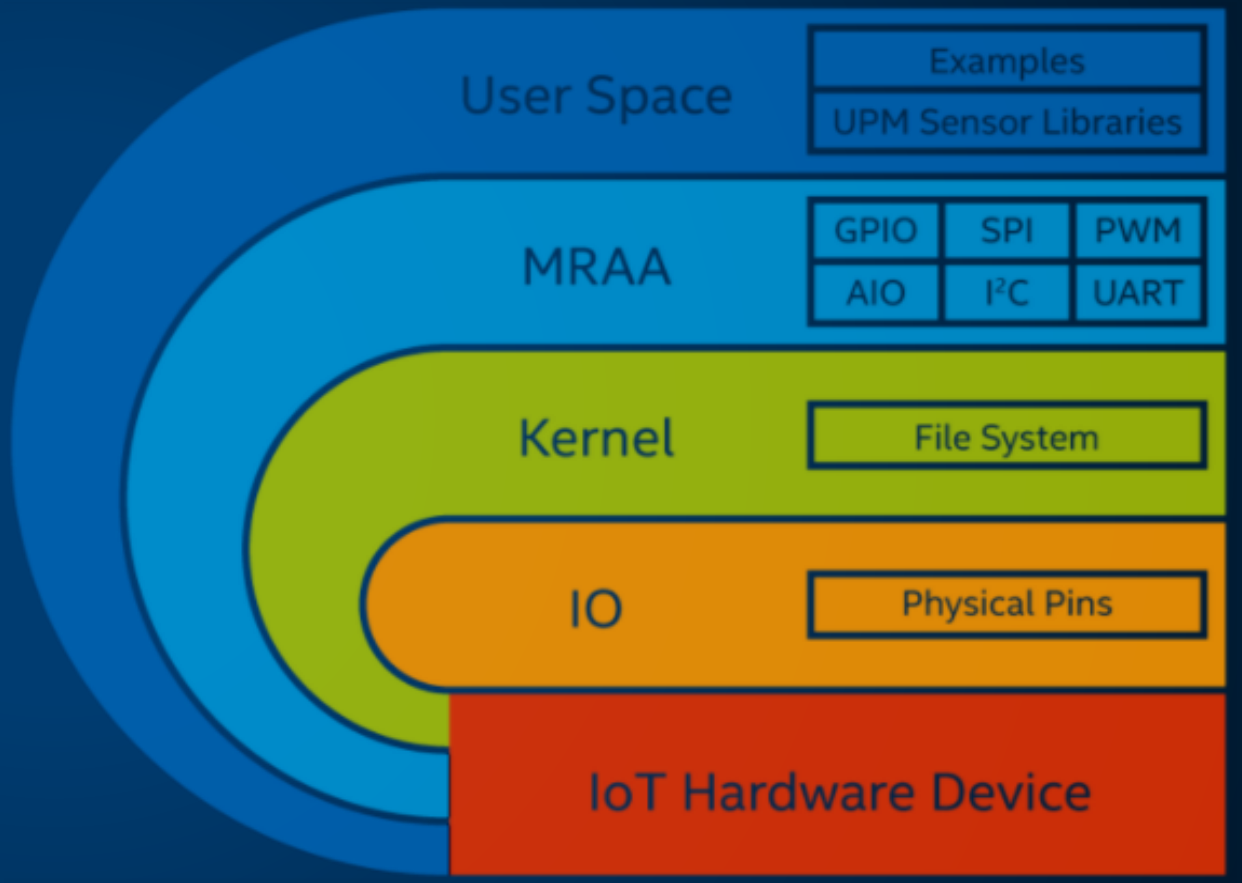
Raspberry Pi

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

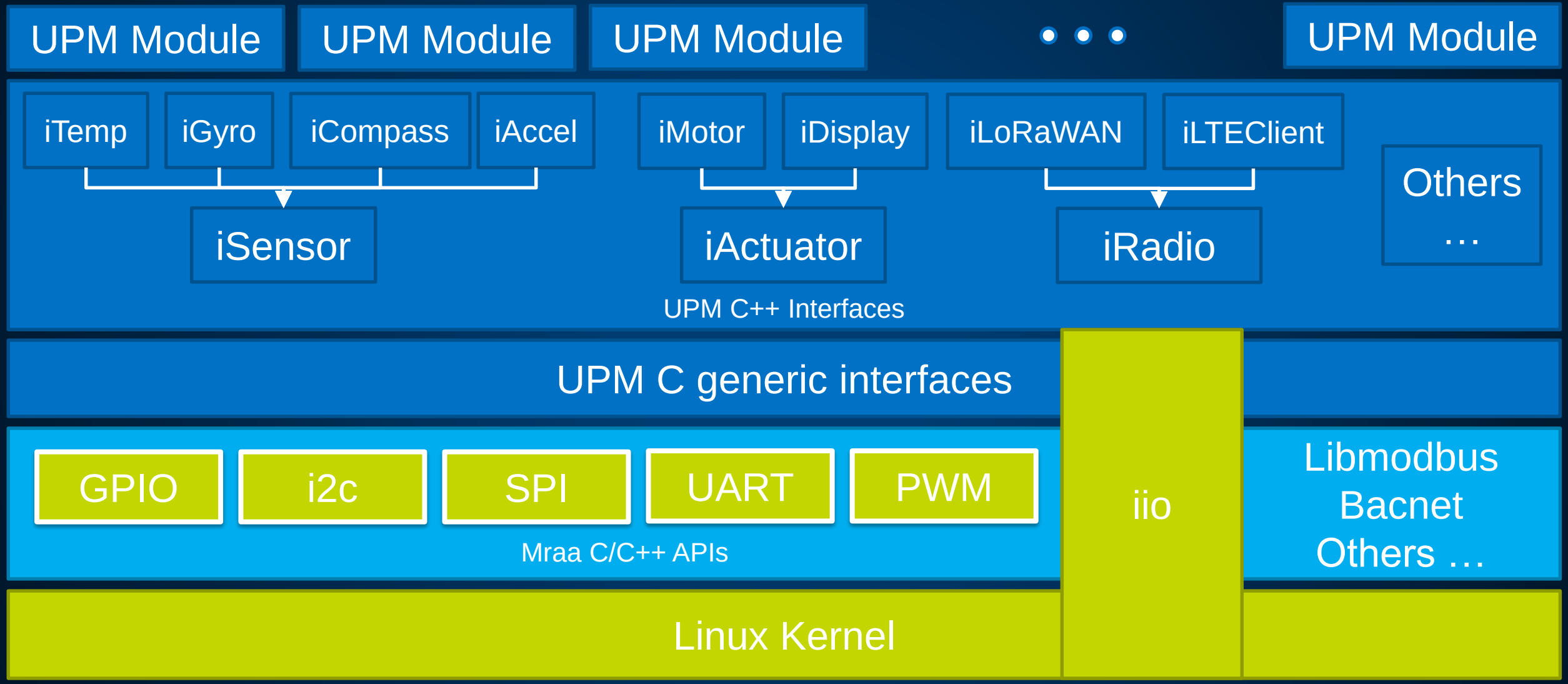
Support for Multiple Operating Systems

Support for Multiple Languages

Maker Sensors

Industrial Sensors

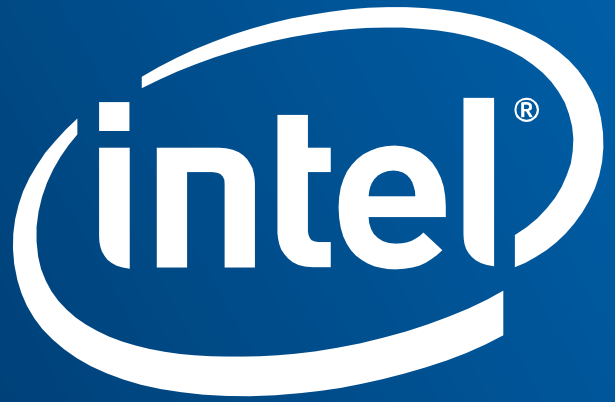
MRAA & UPM – ARCHITECTURE



MRAA AND UPM BENEFIT

Let's see what kind of advantage MRAA, UPM brings sensor software development with Ultrasound Sensor example

GOTO: https://github.com/SSG-DRD-IOT/ultrasound_sensor (https://goo.gl/cbQmcH)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