EPICS on Raspberry-Pi

2017/5/15

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The original title of this hands-on was “Install EPICS on Raspberry Pi”.

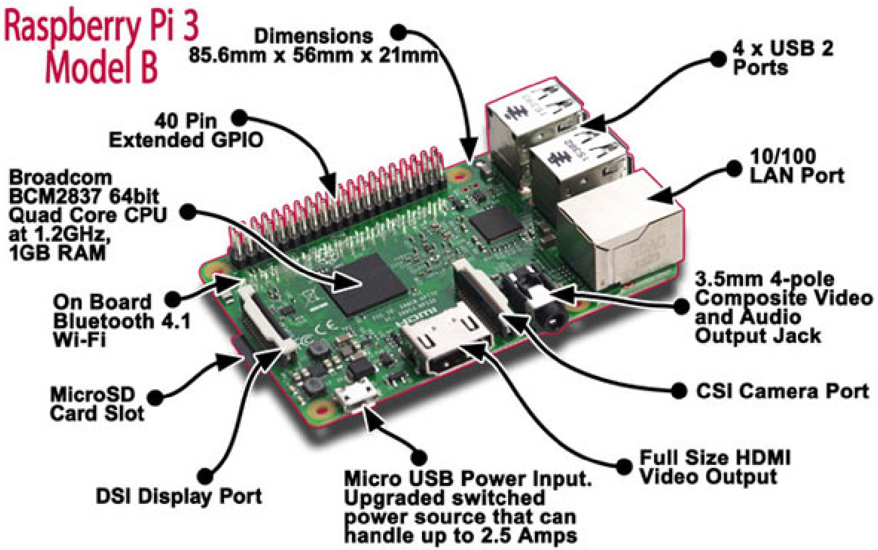
But we only have 1-1.5 hour for this hands on ,
and it is impossible to install the EPICS within this session.
(It takes ~1 hour to compile the EPICS etc on RPi.)

→ We use the EPICS-installed RPi for the hands-on.
Here you’ll
1) SSH from your note PC to RPi
2) Run the IOC shell on RPi to control the Arduino
3) caget / put / monitor from your note PC

Raspberry Pi

The Raspberry Pi (RPi) is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation

In this hands on, we use RPi3 model B (2016 Feb.)



Raspberry Pi 3 Model B

Dimensions 85.6mm x 56mm x 21mm

4 x USB 2 Ports

40 Pin Extended GPIO

10/100 LAN Port

Broadcom BCM2837 64bit Quad Core CPU at 1.2GHz, 1GB RAM

3.5mm 4-pole Composite Video and Audio Output Jack

On Board Bluetooth 4.1 Wi-Fi

CSI Camera Port

MicroSD Card Slot

Full Size HDMI Video Output

DSI Display Port

Micro USB Power Input. Upgraded switched power source that can handle up to 2.5 Amps

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In this hands on, we use RPi3 model B (2016 Feb.)

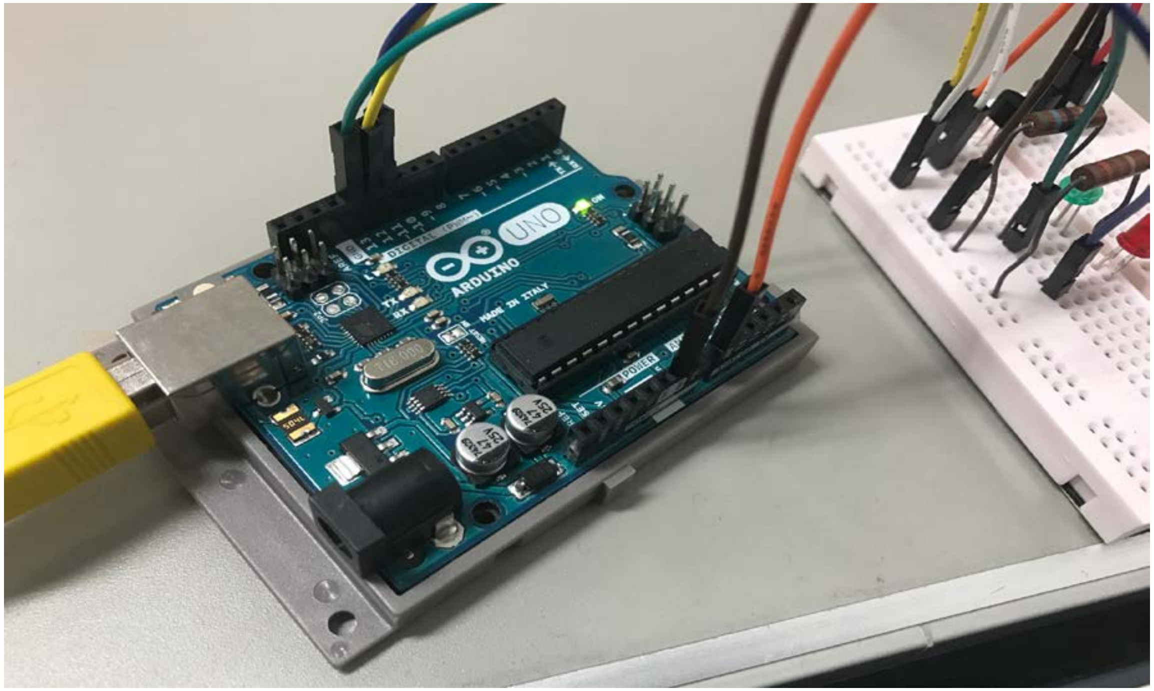
- A 1.2GHz 64-bit quad-core ARMv8 CPU
- 1GB RAM
- 802.11n Wireless LAN
- Ethernet port
- **4 USB ports**
- HDMI port
- **40 GPIO pins**, etc,,

Rpi3 controls the device via Ethernet, USB, or GPIO.

Today we use RPi as an IOC
to control the Arduino via USB.
Tomorrow, there is a talk on GPIO

Arduino

Arduino boards consist of an ATmel 8-bit AVR microcontroller with varying amounts of flash memory, pins, and features.



Arduino Uno

- ATmega328P.
- 14 Digital I/O pins
- 6 Analog inputs
- A 16 MHz quartz crystal
- 1 USB connection

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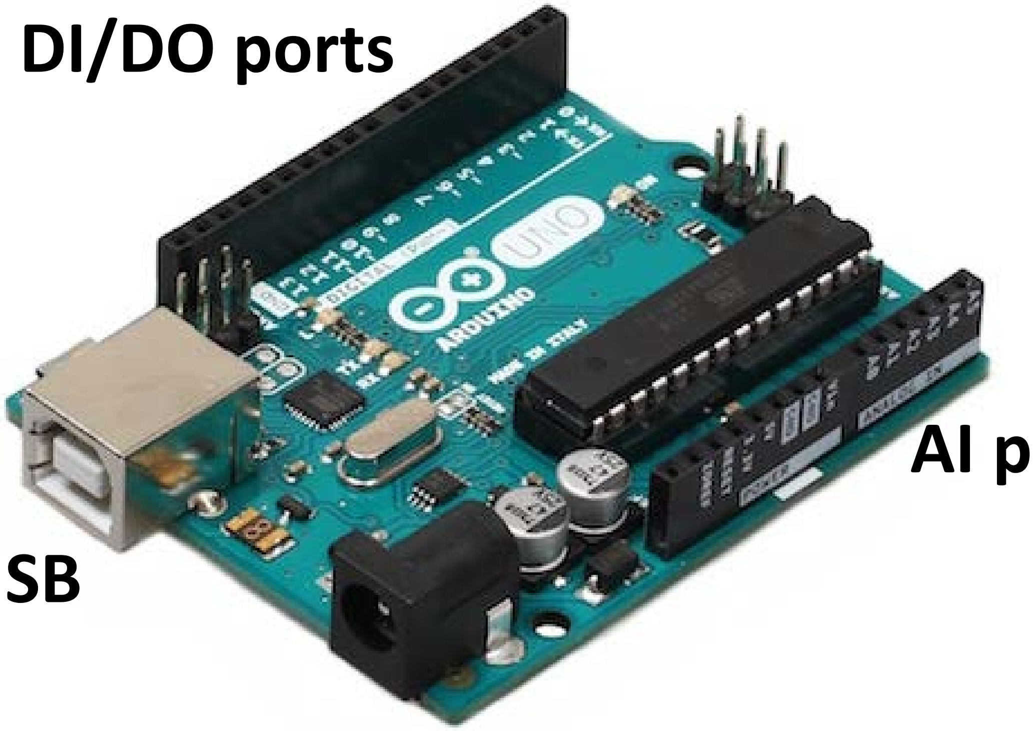

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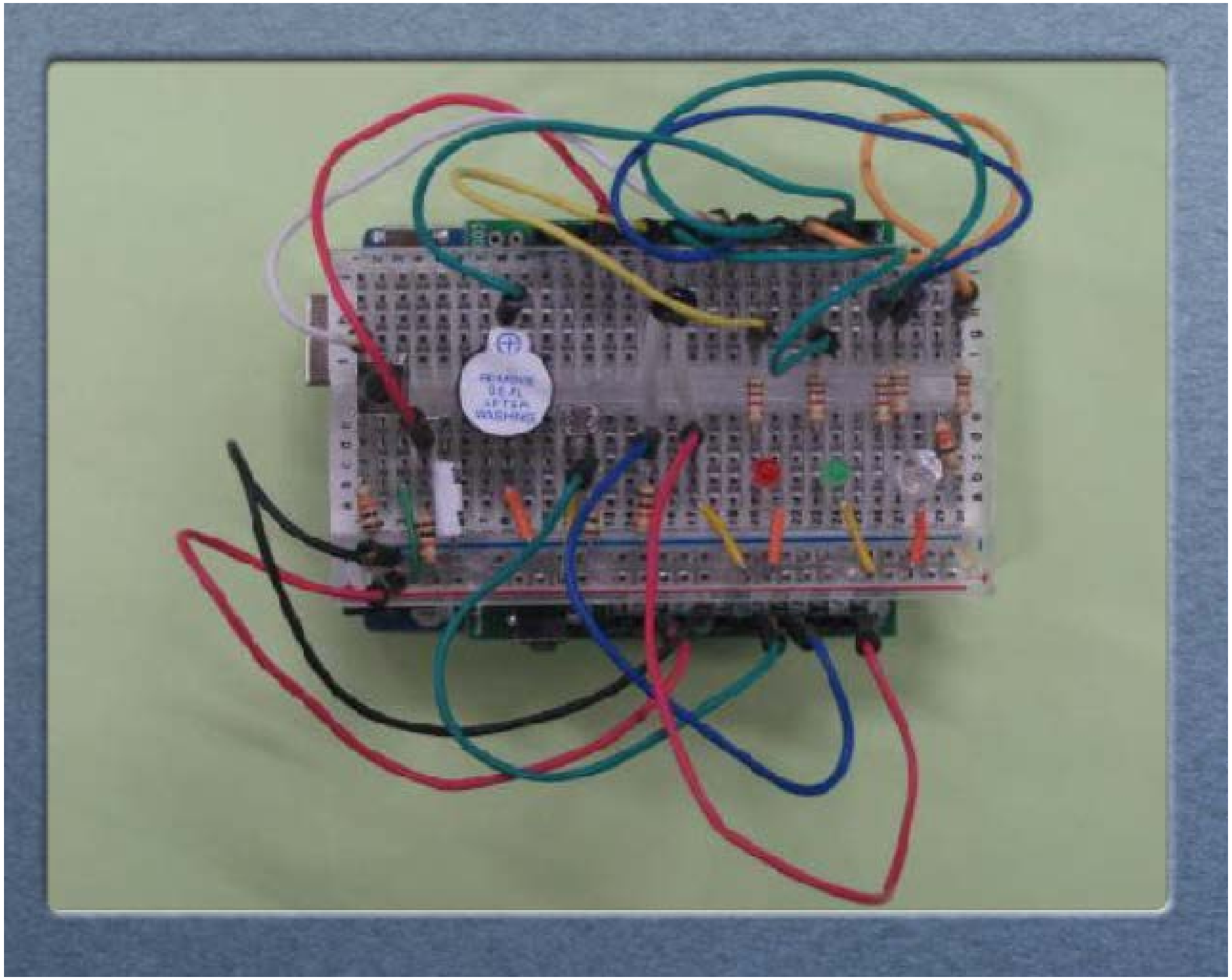
Arduino shield(ext. board) with Bread board for EPICS training

N. Yamamoto (KEK/J-PARC)



Includes

1 TriColor LED (RGB)

2 LEDs (Red, Green)

1 Buzzer

1 Push Switch

1 Thermistor

1 CdS (Luminance sensor)

1 level Switch

~5,000 JPY

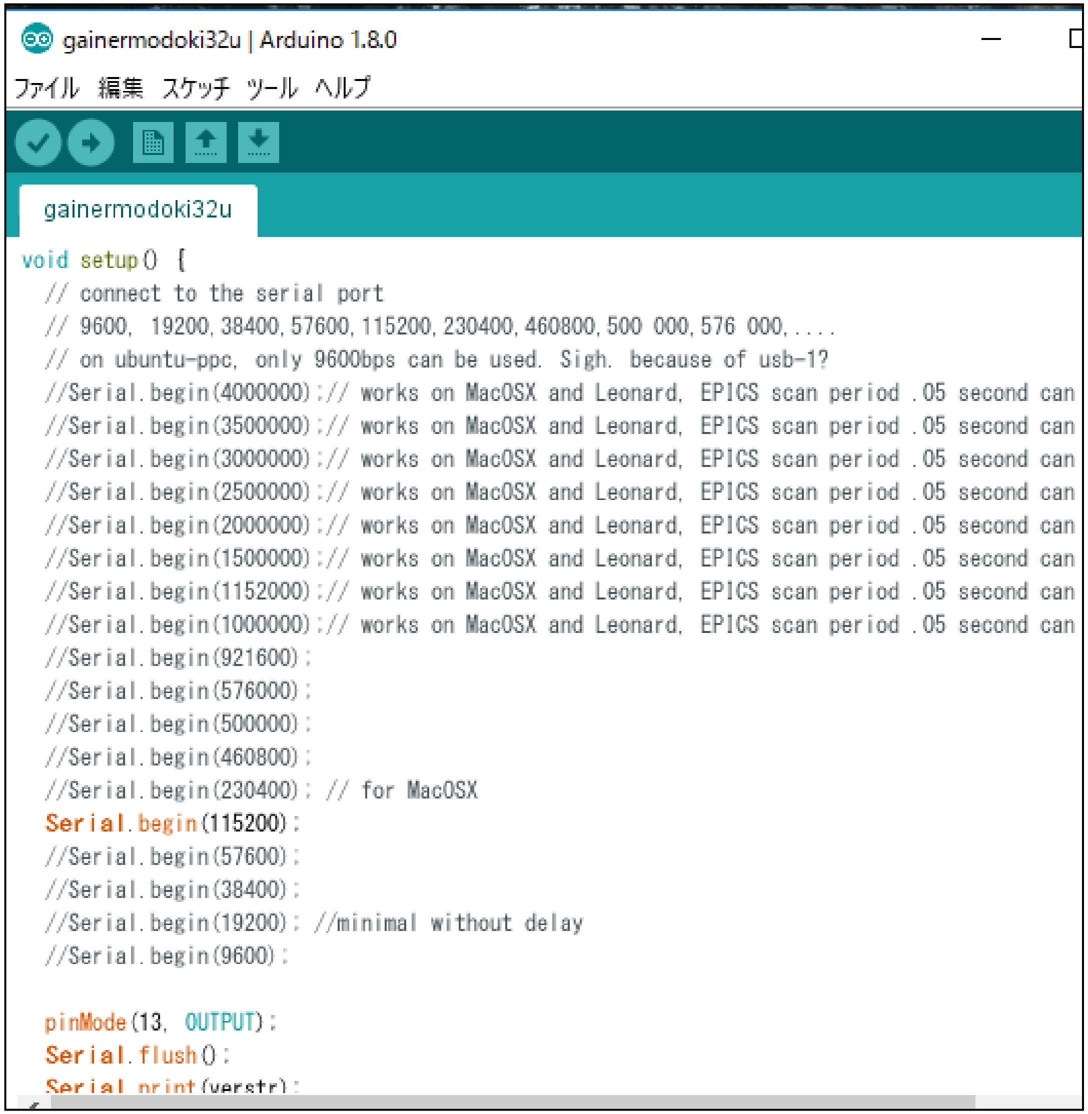
Including Arduino

Arduino sketch file

We use **Arduino IDE**
to write code (=sketch file), and
upload it to the board

- Open-source Arduino Software
- Runs on Windows, Mac OS X, Linux

This time we use
Gainermodoki.ino
= Sketch file for the Arduino shield
(in previous page) for the hands-on
by N.Yamamoto.


gainermodoki32u | Arduino 1.8.0
ファイル 編集 スケッチ ツール ヘルプ
gainermodoki32u

```
void setup() {
  // connect to the serial port
  // 9600,  19200, 38400, 57600, 115200, 230400, 460800, 500 000, 576 000, . . . .
  // on ubuntu-ppc,  only 9600bps can be used.  Sigh.  because of usb-1?
  //Serial.begin(4000000);// works on MacOSX and Leonard,  EPICS scan period .05 second can
  //Serial.begin(3500000);// works on MacOSX and Leonard,  EPICS scan period .05 second can
  //Serial.begin(3000000);// works on MacOSX and Leonard,  EPICS scan period .05 second can
  //Serial.begin(2500000);// works on MacOSX and Leonard,  EPICS scan period .05 second can
  //Serial.begin(2000000);// works on MacOSX and Leonard,  EPICS scan period .05 second can
  //Serial.begin(1500000);// works on MacOSX and Leonard,  EPICS scan period .05 second can
  //Serial.begin(1152000);// works on MacOSX and Leonard,  EPICS scan period .05 second can
  //Serial.begin(1000000);// works on MacOSX and Leonard,  EPICS scan period .05 second can
  //Serial.begin(921600);
  //Serial.begin(576000);
  //Serial.begin(500000);
  //Serial.begin(460800);
  //Serial.begin(230400);  // for MacOSX
  Serial.begin(115200);
  //Serial.begin(57600);
  //Serial.begin(38400);
  //Serial.begin(19200);  //minimal without delay
  //Serial.begin(9600);

  pinMode(13,  OUTPUT);
  Serial.flush();
  Serial.print(verstr);
```

Arduino sketch file
/opt/epics/modules/soft/StreamDevice/apps/protocols/gainermodoki/gainermodoki32u/
gainermodoki32u.ino

RPi Set Up

What we already did for this hands-on :

1. **Install OS (raspbian) into RPi**

   Download the image of 2017-04-10-raspbian-jessie
   Copy to the microSD card

2. **Install EPICS into RPi**

   EPICS base, asyn, stream device, etc. under /opt/epics
   This time, we install the files compiled by N.Yamamoto.

3. **Arduino setup**

   Install and setup by the command
   “sudo apt-get install arduino”

RPi Hands On

1. Divide into 5 (or 6) groups

2. SSH to RPi and run the IOC shell

In each group, only 1 person can edit the file and run the IOC shell.

- SSH to RPi (We'll tell the user/ password / IP address later.)
- cd ~/For_HandsOn/scripts
- For group 2-6, edit the ArduinoProto.cmd to change the record name.

```
From   P=myArduuno1,,,
To     P=myArduuno*,,,    (*=group number, 1-6)
```

← nano ArduinoProto.cmd

- Run the IOC shell

```
./ArduinoProto.cmd
```

(Directory is linked from/opt/epics/modules/soft/StreamDevice/apps/)

RPi Hands On

3. Access the EPICS records from your note PC

- caget / camonitor / caput <PV name>
- Make the MEDM window to monitor / access the PVs

myArduino*:LUM	Analog Val. From LUM sensor	
myArduino*:LED:R	Red LED	(=0 Turn On =1 Turn Off)
myArduino*:LED:G	Green LED	(=0 Turn On =1 Turn Off)
myArduino*:CLED:R	3-Col. LED Red	(=0 Turn On =1 Turn Off)
myArduino*:CLED:G	3-Col. LED Green	(=0 Turn On =1 Turn Off)
myArduino*:CLED:B	3-Col. LED Blue	(=0 Turn On =1 Turn Off)
myArduino*:buzzer	(1: beep sound on)	

(* = group number, 1-6)