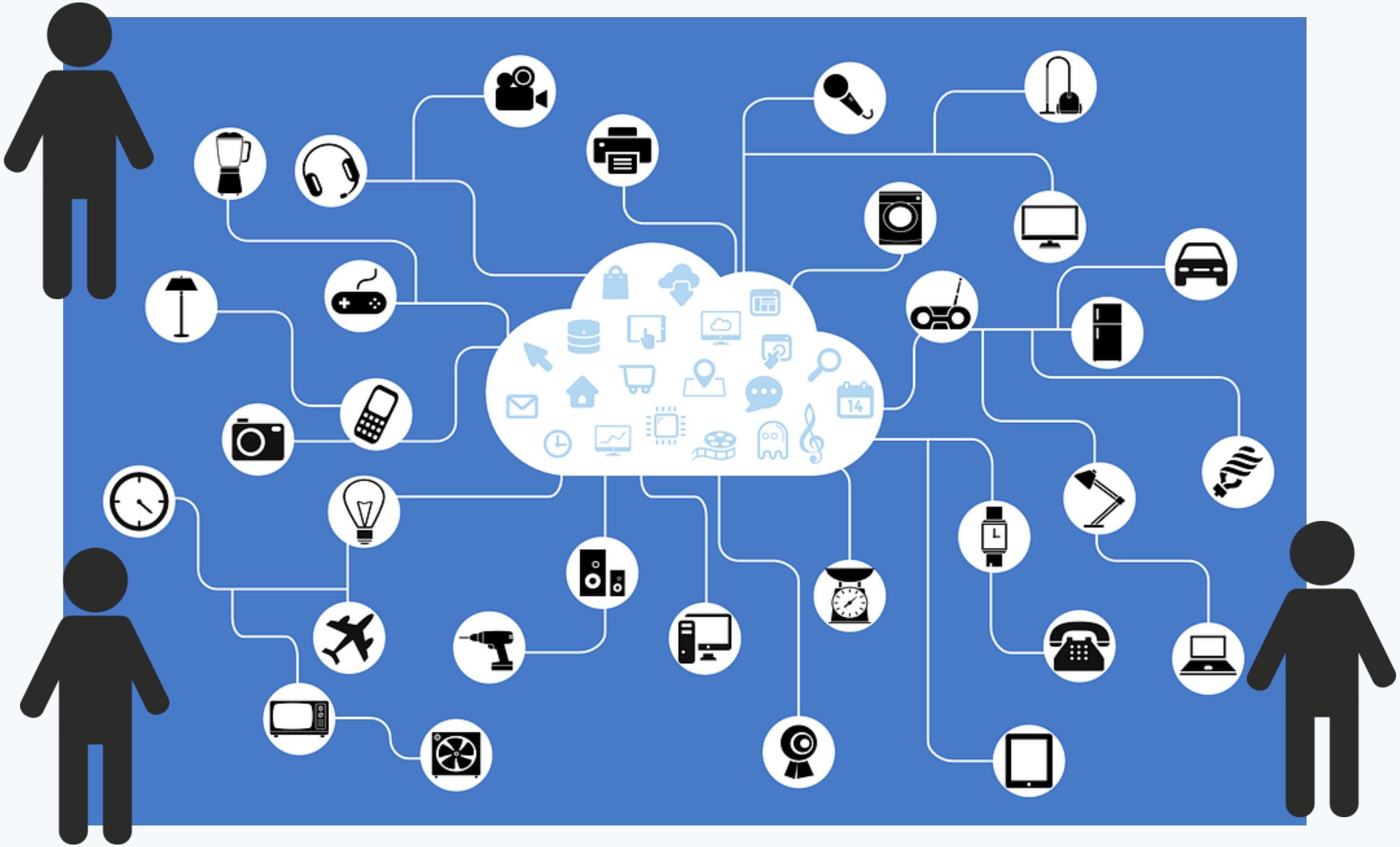
Tizen.IoTivity.Sensing

Junkyu Han

SOSCON
SAMSUNG
OPEN SOURCE
CONFERENCE

IoTivity Starts
The World in



SOSCON

Server

1. Data Gathering
2. Programmable
3. Networkable

a.k.a Things

Client

1. Request Data
2. User Interface
3. Do Useful

SOSCON

Cloud

1. Regardless of Time
2. Regardless of Space
3. Much Meaningful

Server

SOSCON

3. Networkable

Be able to Communicate with Others

Using
WiFi chipset

2. Programmable

Be able to control Data

Using
RasberryPi3

1. Data Gathering

Be able to recognize circumstance

Using
Ultra Sonic Sensor

server

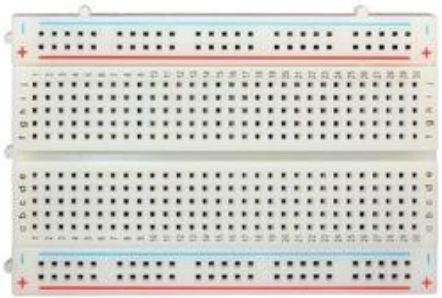
SOSCON

! Connect H/W

RasberryPi3 & Ultra Sonic Sensor & Internet Router

Preparation

Ultra Sonic Sensor
HC-SR04



Bread Board

1k 1EA
2k 1EA

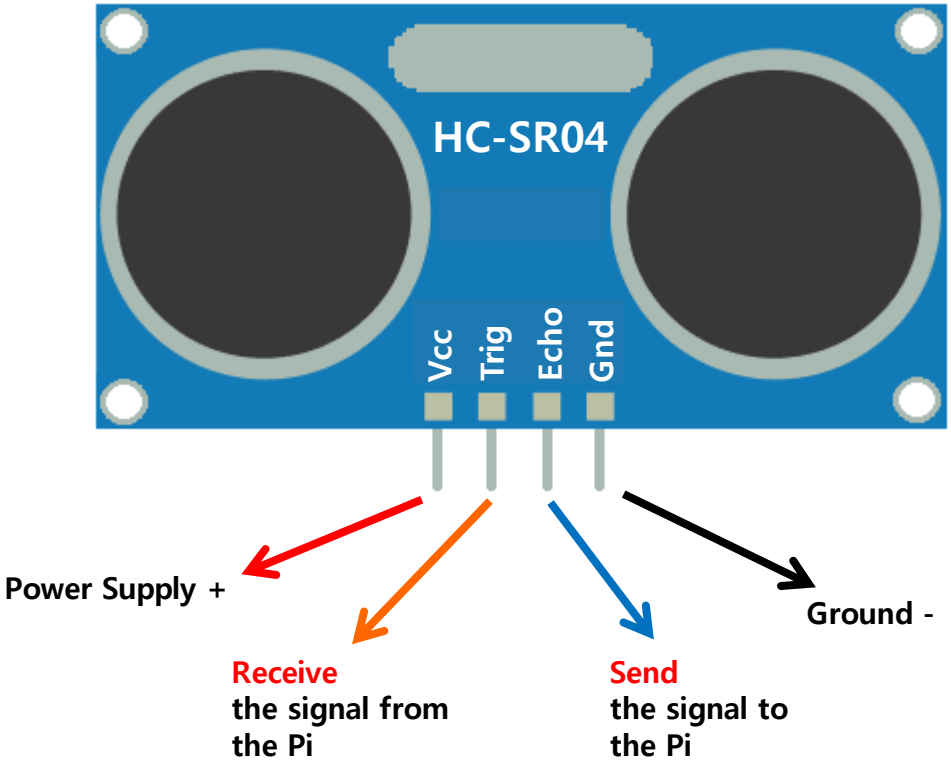
Jumper Wire
M/F x 4

Jumper Wire
M/M x 1

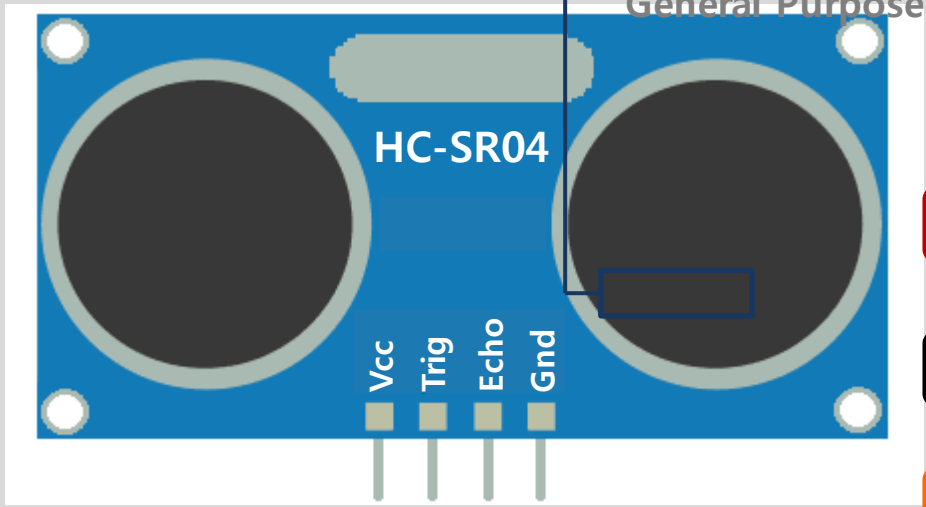
SOSCON

Ultra Sonic Sensor

HC-SR04



GPIO
General Purpose Input / Output



Power +

Ground -

Trig

Echo

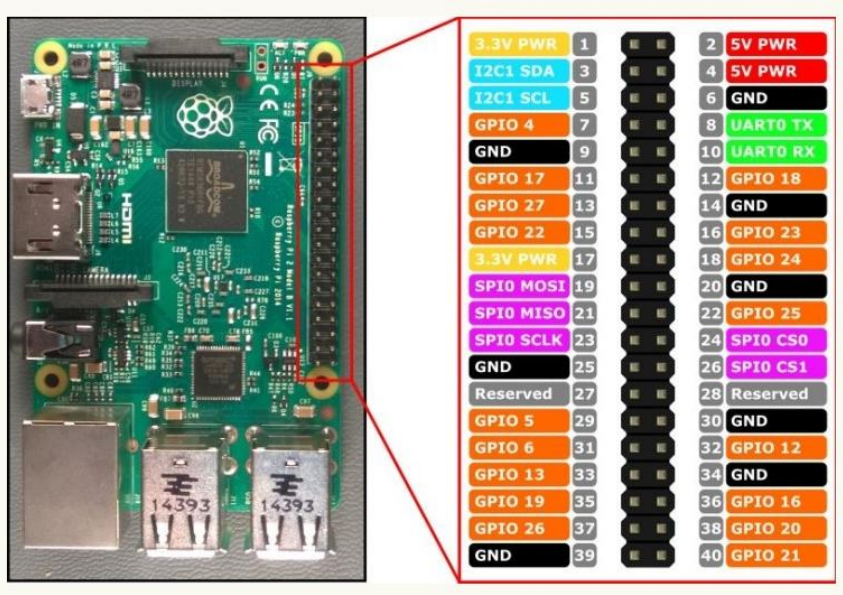
Power Supply +

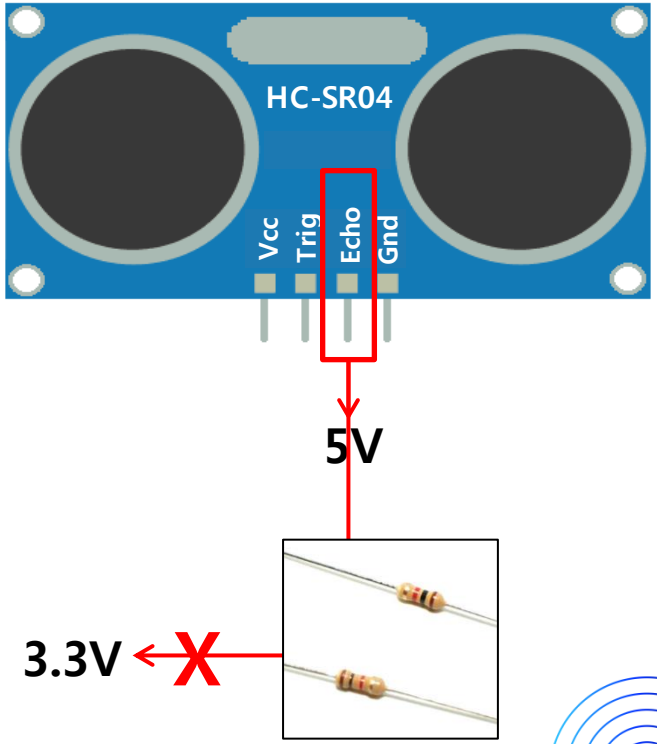
Ground -

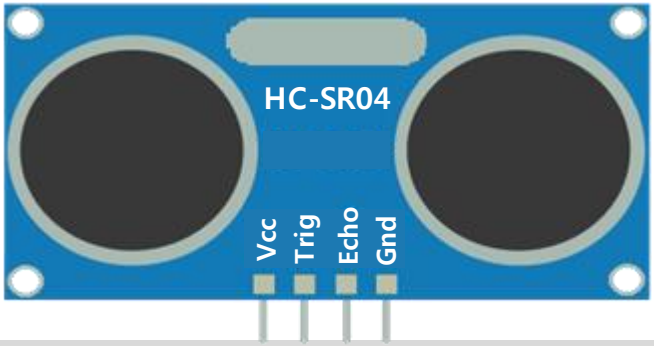
Receive
the signal from the Pi

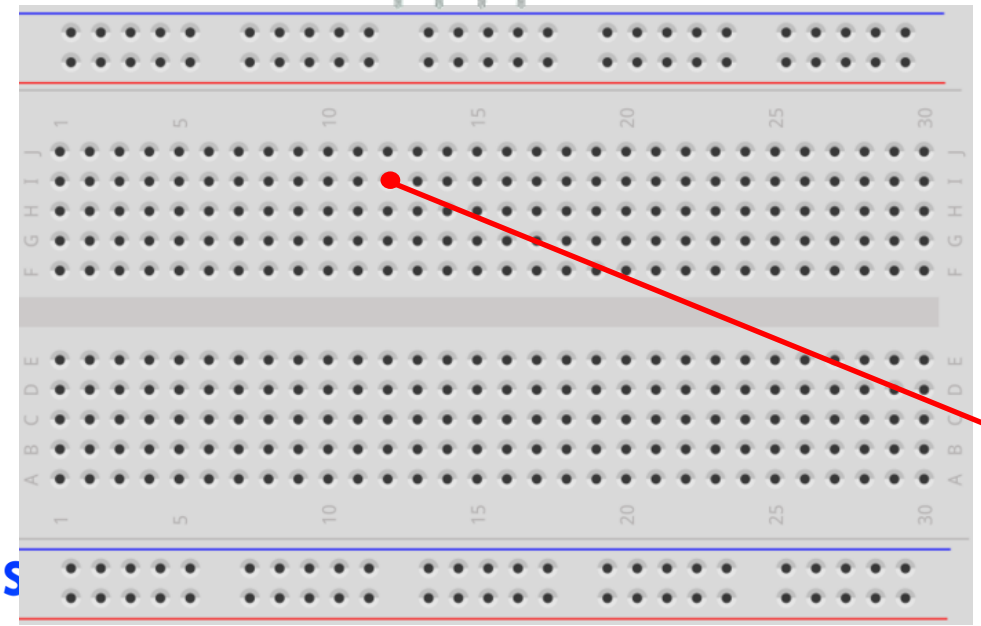
Send
the signal to the Pi

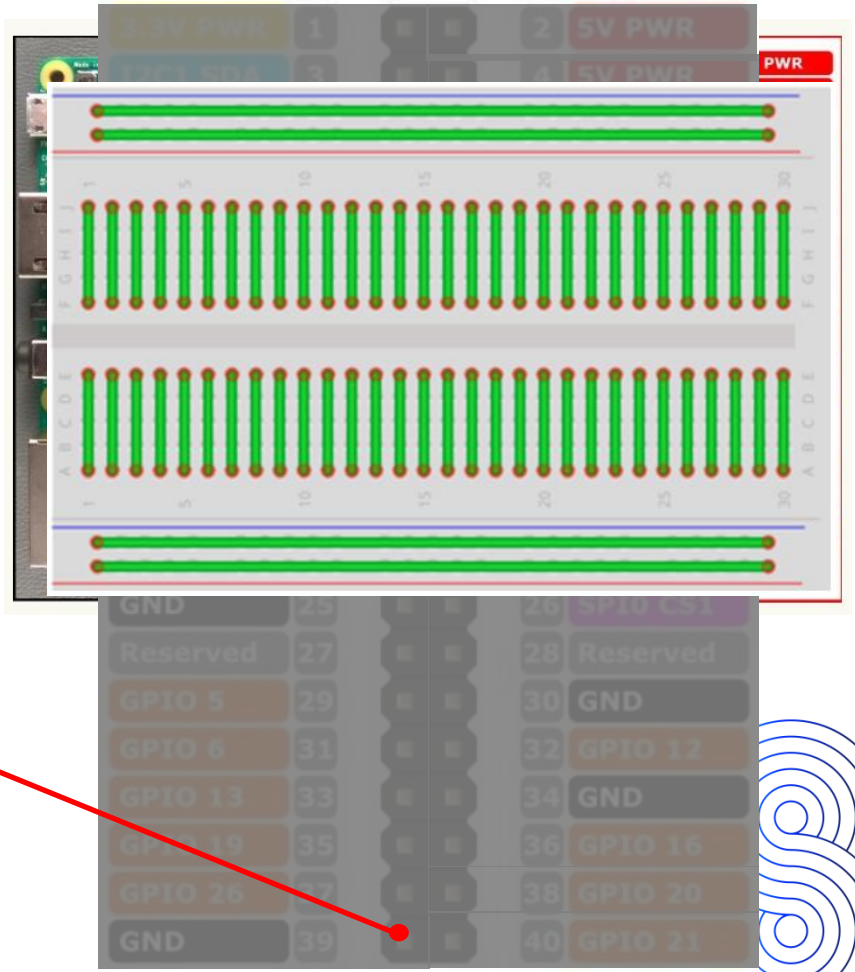
Problem


3.3V PWR 1
I2C1 SDA 3
I2C1 SCL 5
GPIO 4 7
GND 9
GPIO 17 11
GPIO 27 13
GPIO 22 15
3.3V PWR 17
SPI0 MOSI 19
SPI0 MISO 21
SPI0 SCLK 23
GND 25
Reserved 27
GPIO 5 29
GPIO 6 31
GPIO 13 33
GPIO 19 35
GPIO 26 37
GND 39
2 5V PWR
4 5V PWR
6 GND
8 UART0 TX
10 UART0 RX
12 GPIO 18
14 GND
16 GPIO 23
18 GPIO 24
20 GND
22 GPIO 25
24 SPI0 CS0
26 SPI0 CS1
28 Reserved
30 GND
32 GPIO 12
34 GND
36 GPIO 16
38 GPIO 20
40 GPIO 21

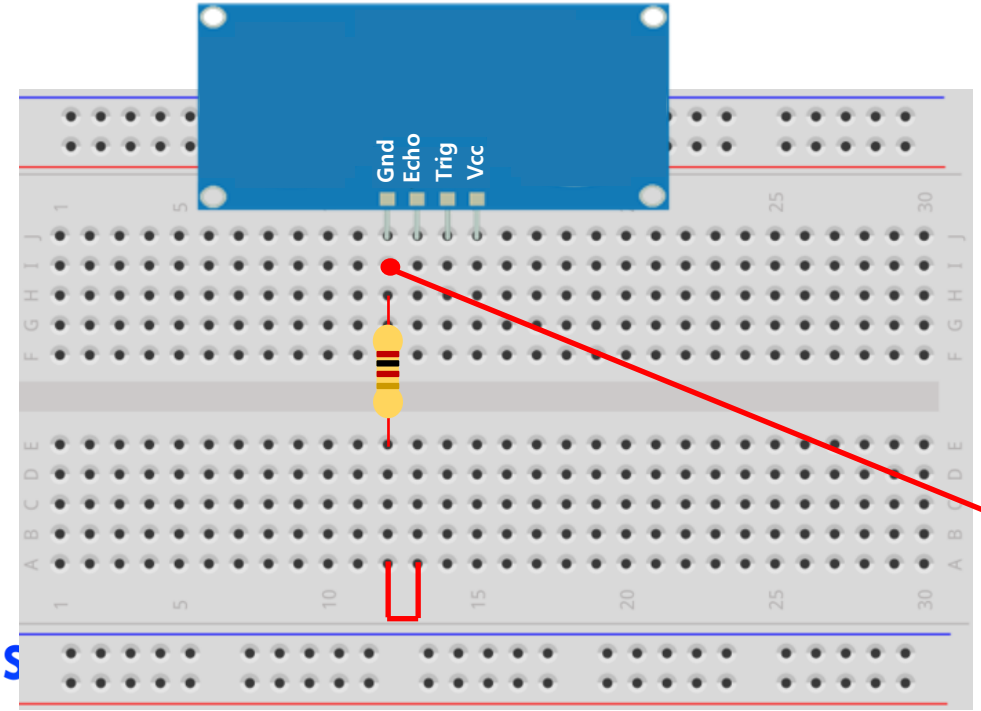

HC-SR04
Vcc
Trig
Echo
Gnd
5V
GPIO
3.3V


HC-SR04
Vcc
Trig
Echo
Gnd

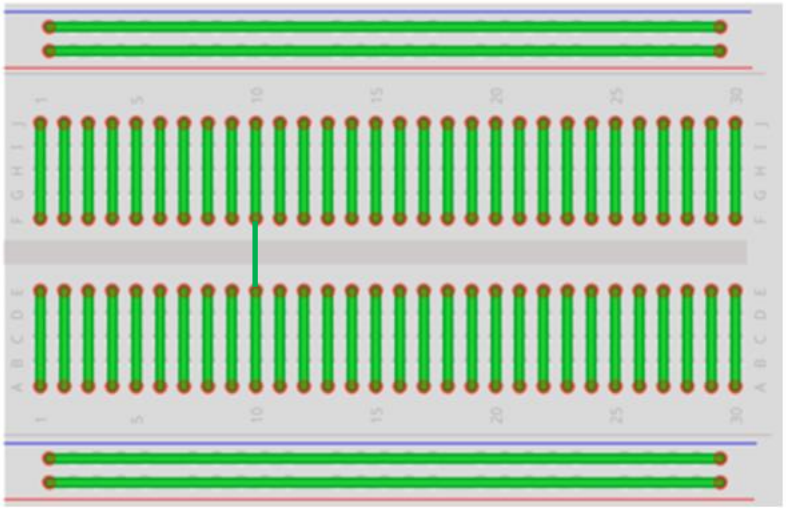



5V PWR
PWR
GND
Reserved
GPIO 5
GPIO 6
GPIO 13
GPIO 26
GND
Reserved
GND
GPIO 12
GND
GPIO 16
GPIO 20
GPIO 21

2K Ω

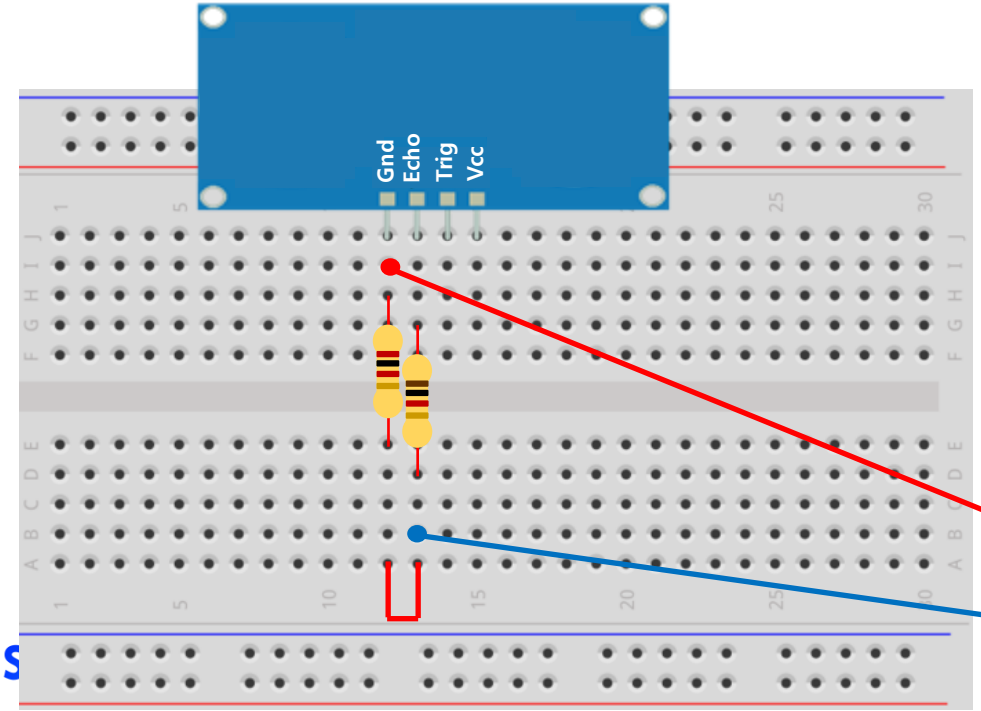

Gnd
Echo
Trig
Vcc

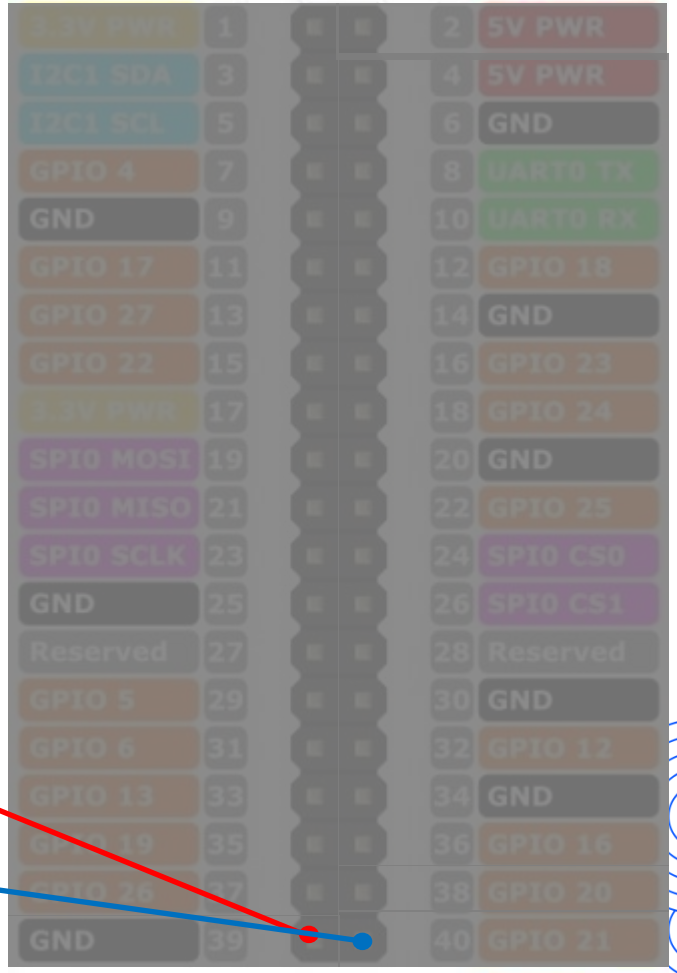

3V PWR
1
2
5V PWR
I2C1 SDA
3
4
5V PWR
I2C1 SCL
5
6
GND



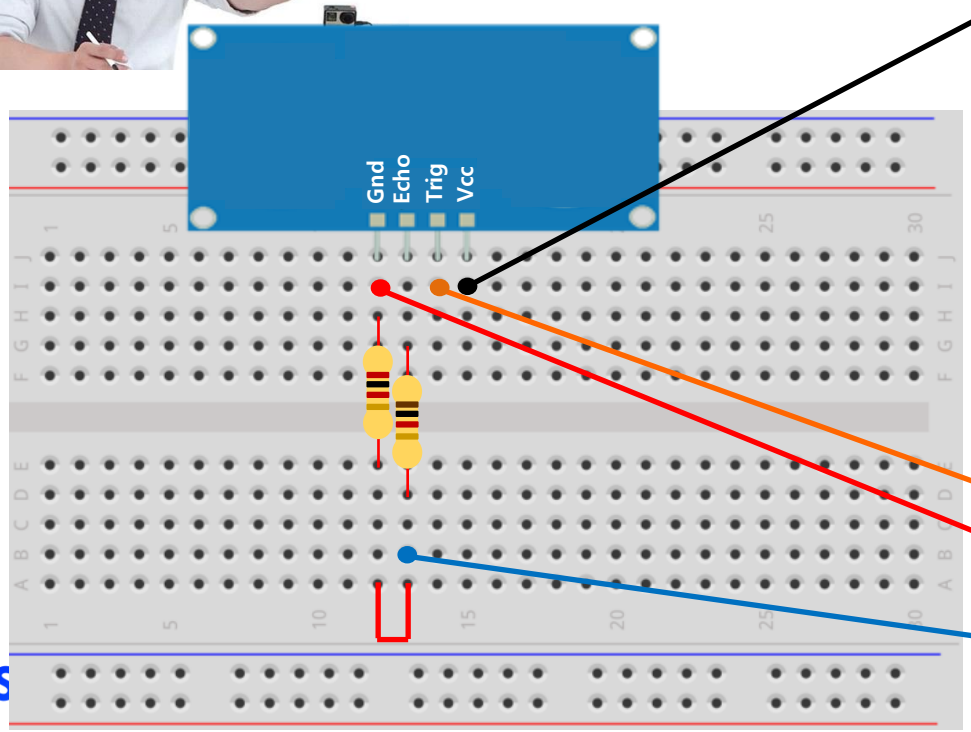

GPIO 5
29
30
GND
GPIO 6
31
32
GPIO 12
GPIO 13
33
34
GND
35
36
GPIO 16
37
38
GPIO 20
GND
39
40
GPIO 21

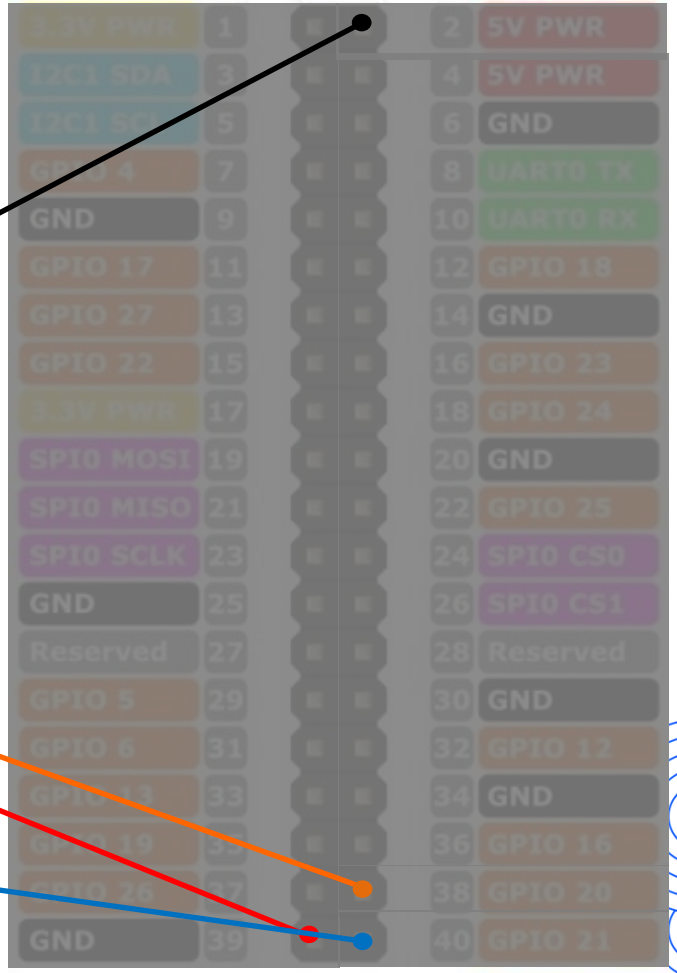
1K Ω

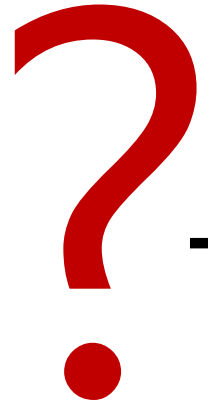

Gnd
Echo
Trig
Vcc


3V PWR 1
5V PWR 2
I2C1 SDA 3
5V PWR 4
I2C1 SCL 5
GND 6
GPIO 4 7
UART0 TX 8
GND 9
UART0 RX 10
GPIO 17 11
GPIO 18 12
GPIO 27 13
GND 14
GPIO 22 15
GPIO 23 16
3V PWR 17
GPIO 24 18
SPI0 MOSI 19
GND 20
SPI0 MISO 21
GPIO 25 22
SPI0 SCLK 23
SPI0 CS0 24
GND 25
SPI0 CS1 26
Reserved 27
Reserved 28
GPIO 5 29
GND 30
GPIO 6 31
GPIO 12 32
GPIO 13 33
GND 34
GPIO 19 35
GPIO 16 36
GPIO 26 37
GPIO 20 38
GND 39
GPIO 21 40


슈퍼
그레이


Gnd
Echo
Trig
Vcc


5V PWR
5V PWR
GND
GND
GPIO 18
GPIO 27
GND
GPIO 22
GPIO 23
GPIO 24
SPI0 MOSI
GND
SPI0 MISO
GPIO 25
SPI0 SCLK
SPI0 CS0
GND
SPI0 CS1
Reserved
Reserved
GPIO 5
GND
GPIO 6
GPIO 12
GND
GPIO 16
GPIO 20
GND
GPIO 21

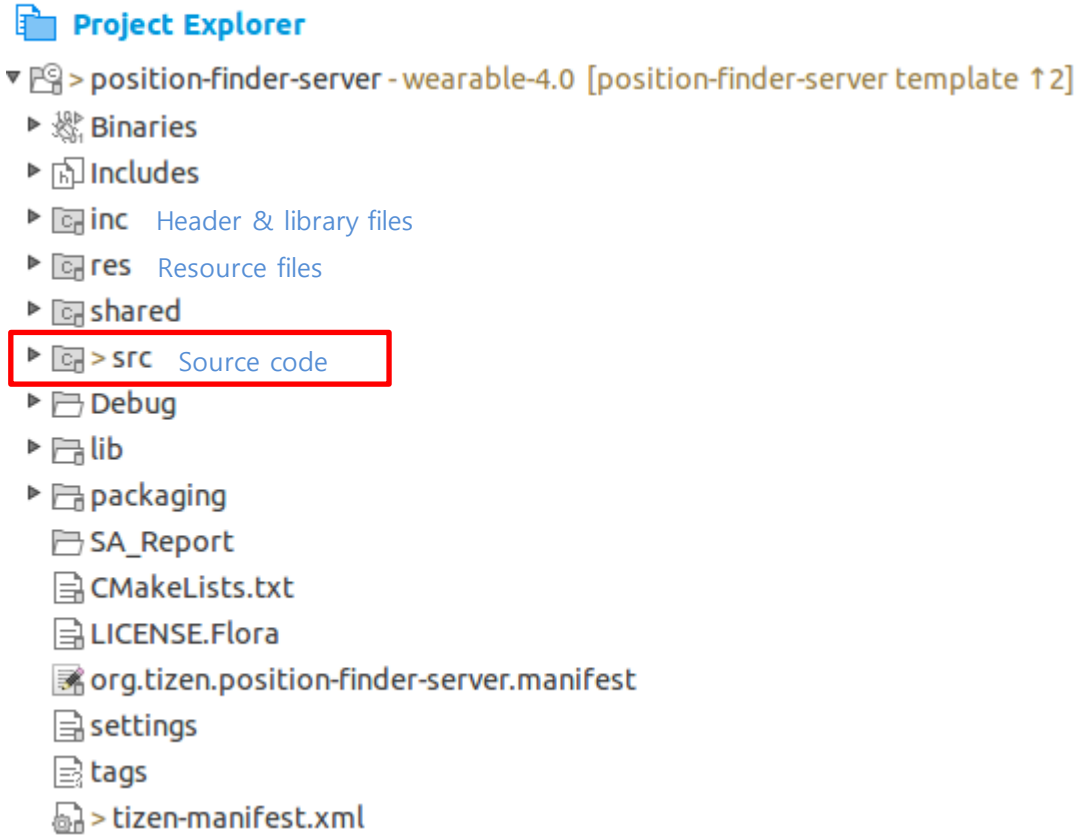


Template Structure

position-finder-server

SOSCON

position-finder-server



SOSCON

position-finder-server

resource

connectivity.c

controller_internal.c

controller.c

resource.c

controller_util.c

web_util.c

R C C

Pattern

position-finder-server

Collects data
Sensors, LED etc ...
Represents circumstance

Resource

Connectivity of devices
Local network or cloud network
Integrated into communication networks

Connectivity

Controller

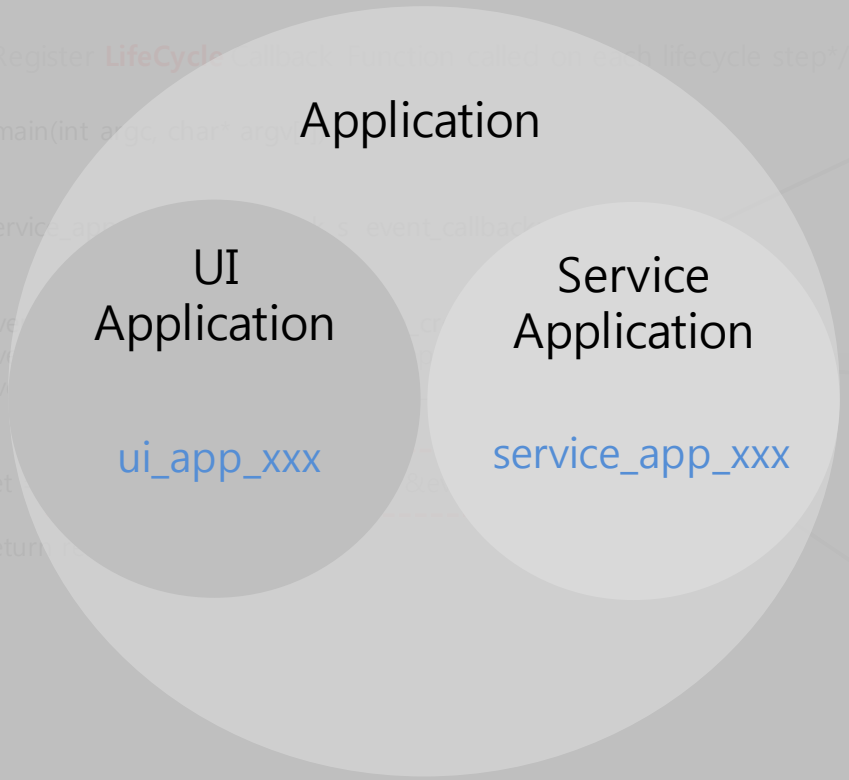
Tizen IOTivity Application Start from Here !

Controls resources and connectivity

SOSCON

position-finder-server/src/controller.c

Tizen

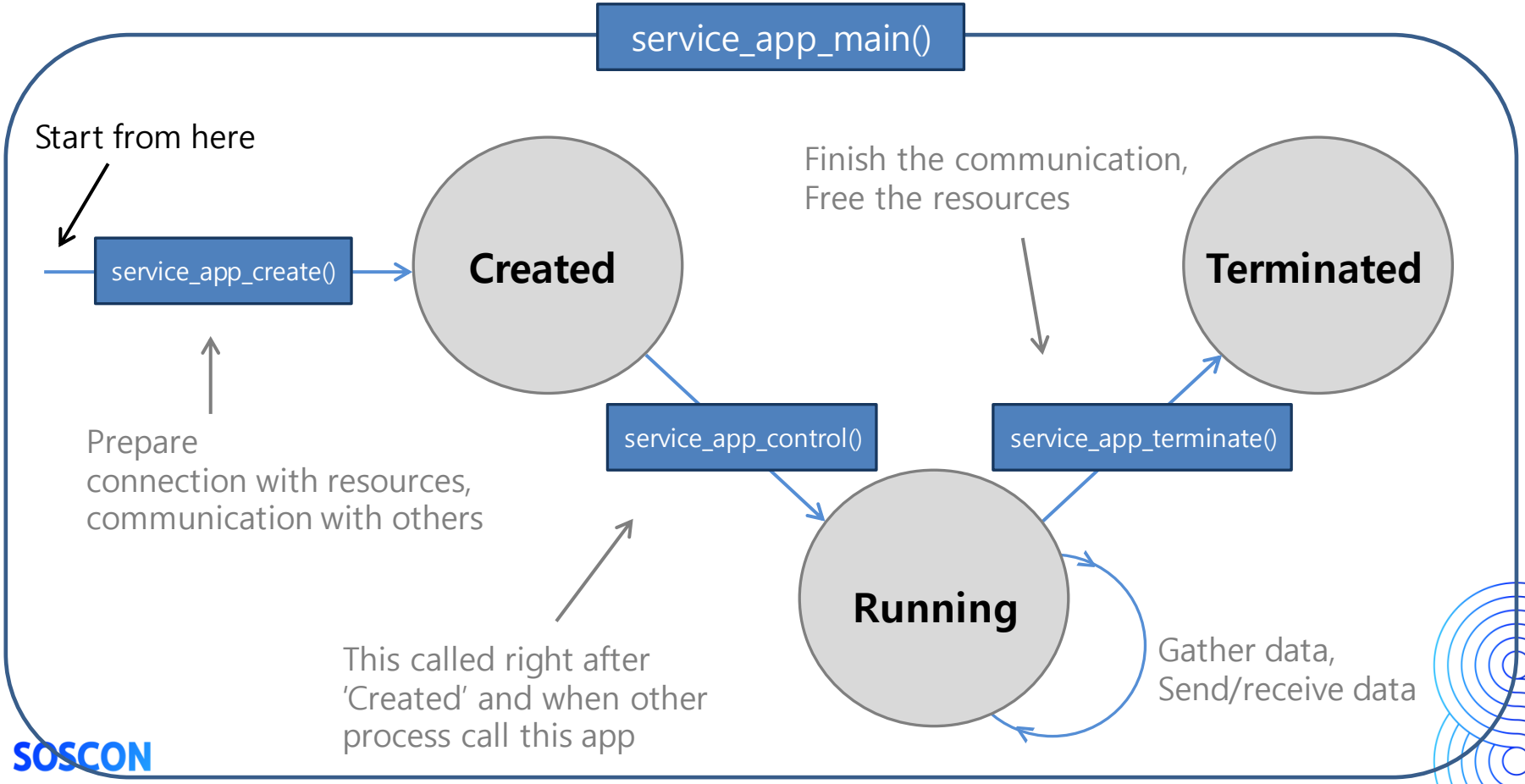



```
static bool service_app_create(void *data)
{
    ...

    return true;
}
```

```
static void service_app_terminate(void  *data)
{
    ...
}
```

```
static void service_app_control(void  *data)
{
    ...
}
```

Tizen Service Application LifeCycle



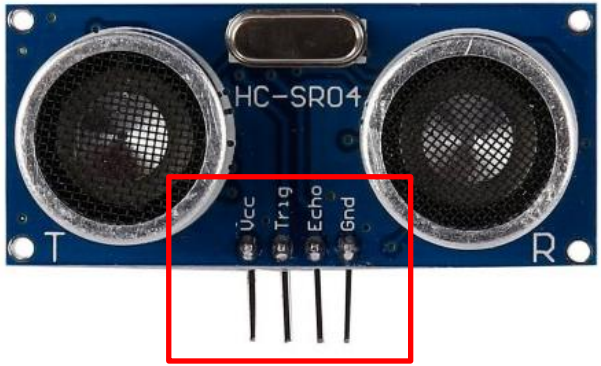
SOSCON

```
static   bool service_app_create(void  *data)
{
    ...

    /* We should prepare for the connection with resources like sensors, led .. etc.. */

    ...

    return true;
}
```

How to connect with resources ?

Is it easy ?

Ultra Sonic Sensor



VCC = +5VDC
Trig = Trigger input of Sensor
Echo = Echo output of Sensor
GND = GND

4 wires are needed
GPIO or I2C available

Input wire / Output wire are different
Set proper type(In/Out) to each wire

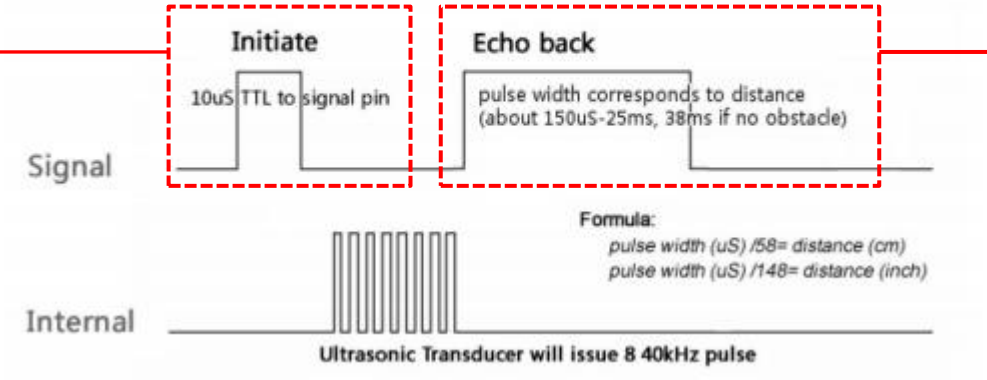
Just detect high pulse
There's no larger data more than binary

GPIO is most suitable

5.0 OPERATION

The timing diagram of HC-SR04 is shown. To start measurement, Trig of SR04 must receive a pulse of high (5V) for at least 10us, this will initiate the sensor will transmit out 8 cycle of ultrasonic burst at 40kHz and wait for the reflected ultrasonic burst. When the sensor detected ultrasonic from receiver, it will set the Echo pin to high (5V) and delay for a period (width) which proportion to distance. To obtain the distance, measure the width (Ton) of Echo pin.

Sequence chart



Receive the return signal:

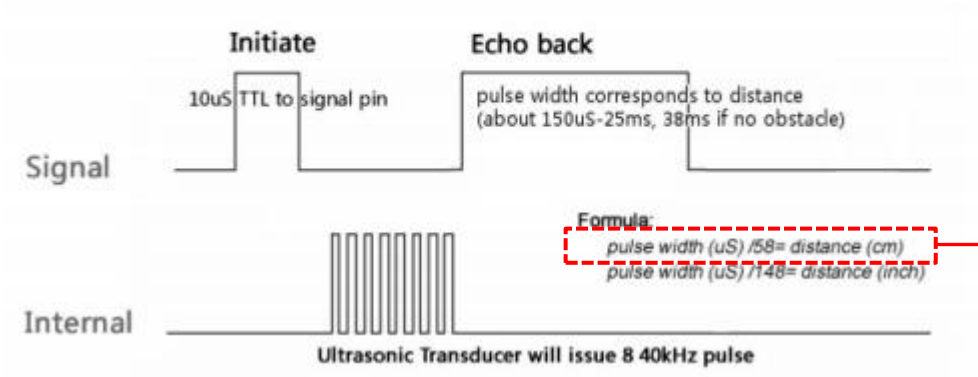
1. As soon as Trigger pin make burst, the sensor set Echo pin to high
2. If Echo pin takes the pulse that come back, sensor set Echo pin to low

To start the sensor:

1. Ensure that the Trigger pin is set low for a second
2. Set out trigger pin high for 10us to start the ranging program (8 ultrasound bursts at 40kHz)

SOSCON

Sequence chart



Do you want to know how did it become about this ?

How long does ultra sound take to move 1cm ?

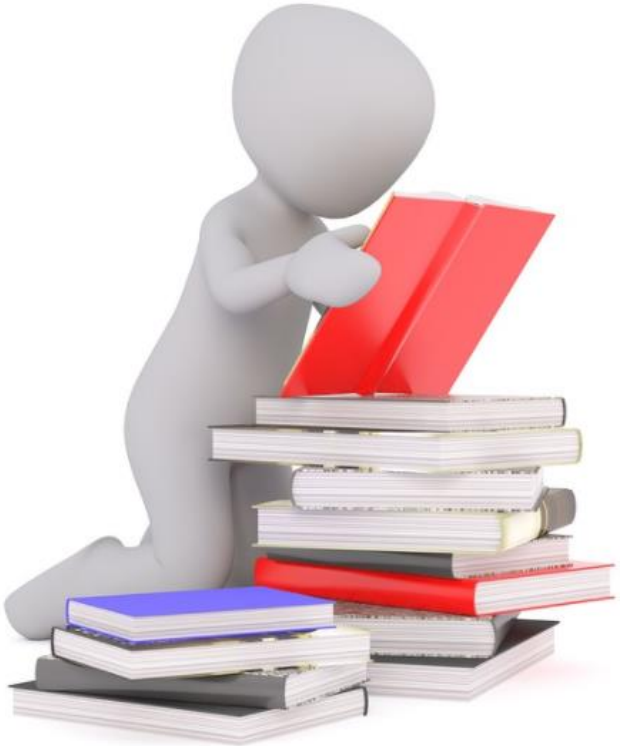
pulse width = 2 x distance (distance to object) / 340(m/s)

pulse width = 2 x 0.01 / 340 = 58.824us

SOSCON

❖ Distance(cm) = pulse width(us) / 58

Too much.....



So we prepare for you !!

SOSCON

position-finder-server

- resource
  - resource_illuminance_sensor.c 
  - resource_infrared_motion_sensor.c 
  - resource_infrared_obstacle_avoidance_sensor.c 
  - resource_led.c 
  - resource_touch_sensor.c 
  - resource_ultrasonic_sensor.c 
  - resource_sound_detection_sensor.c 
  - resource_gas_detection_sensor.c 
  - resource_rain_sensor.c 
  - resource_tilt_sensor.c 

SOSCON

Prepare for the communication with sensor

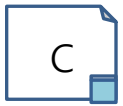
1. Check the function name with sensor name you want to use in **resource** directory

2. Decide how often you want to check the sensor

3. Read or write data from/to sensor and do useful with data

1. Check the function name with sensor name you want to use in **resource** directory

resource



resource_ultrasonic_sensor.c

resource_illuminance_sensor.c

resource_infrared_obstacle_avoidance_sensor.c

resource_led.c

resource_touch_sensor.c

resource_infrared_motion_sensor.c

2. Decide how often you want to check the sensor

```
static   bool service_app_create(void  *data)
{
    ...

    /* We should prepare for the connection  with resources like sensors, led .. etc.. */

    ad->getter_timer  = ecore_timer_add(5.0f, _sensor_control_cb, ad);
    ...
    ...

    return true;
}
```

Type: float ex) **5.0f**

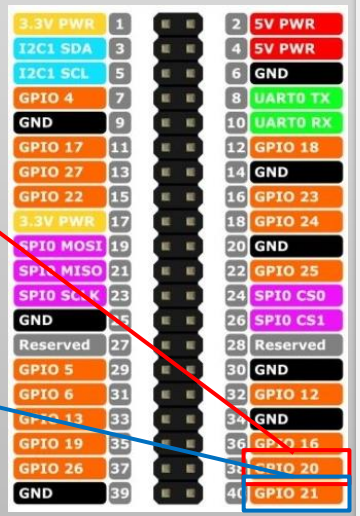
This parameter decide how often callback function will be called.

3. Read or write data from/to sensor

```
static void _ultrasonic_sensor_read_cb(float value, void *data)
{
    ...
    if (value < 0) {
        _E("OUT OF RANGE");
    } else {
        _D("Measured Distance : %0.2fcm", value);
    }
}

static Eina_Bool _control_sensors_cb(void *data)
{
    ...
    ret = resource_read_ultrasonic_sensor(TRIG_PIN_NUMBER,
                ECHO_PIN_NUMBER, _ultrasonic_sensor_read_cb, NULL);
    ...
    ...

    return ECORE_CALLBACK_RENEW;
}
```

GPIO 20

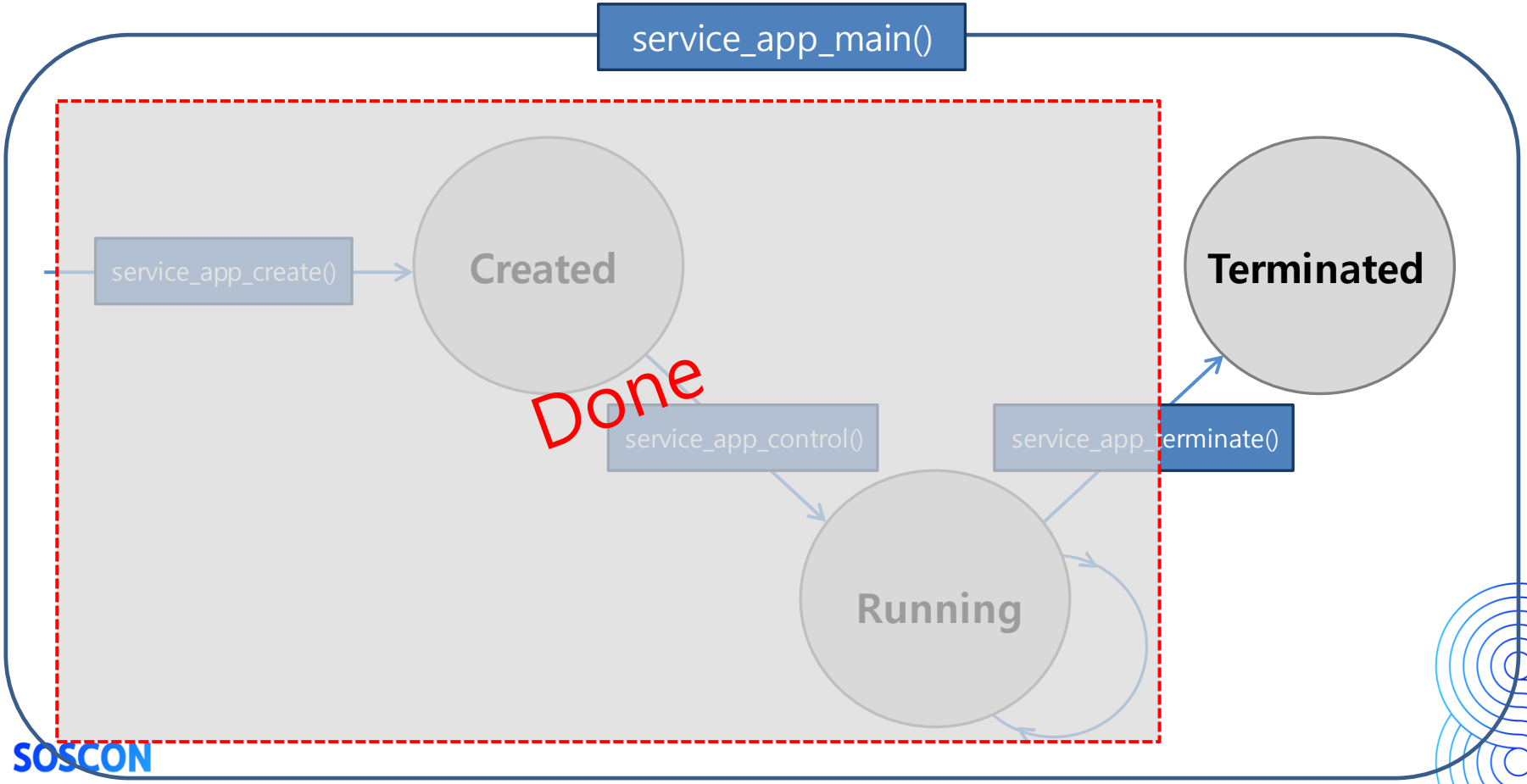
GPIO 21



resource/resource_ultrasonic_sensor.c

```
void _resource_read_ultrasonic_sensor_cb(peripheral_gpio_h gpio,
                                         peripheral_error_e error, void *user_data)
{
    ...
    ...
}

int resource_read_ultrasonic_sensor(int trig_pin_num, int echo_pin_num,
                                    resource_read_cb cb, void *data)
{
    ...
    if (!resource_get_info(trig_pin_num)->opened) {
        ...
    }

    if (!resource_get_info(echo_pin_num)->opened) {
        ...
    }

    if (resource_get_info(echo_pin_num)->sensor_h) {
        ...
    }
    ...
}
```

Tizen Service Application LifeCycle



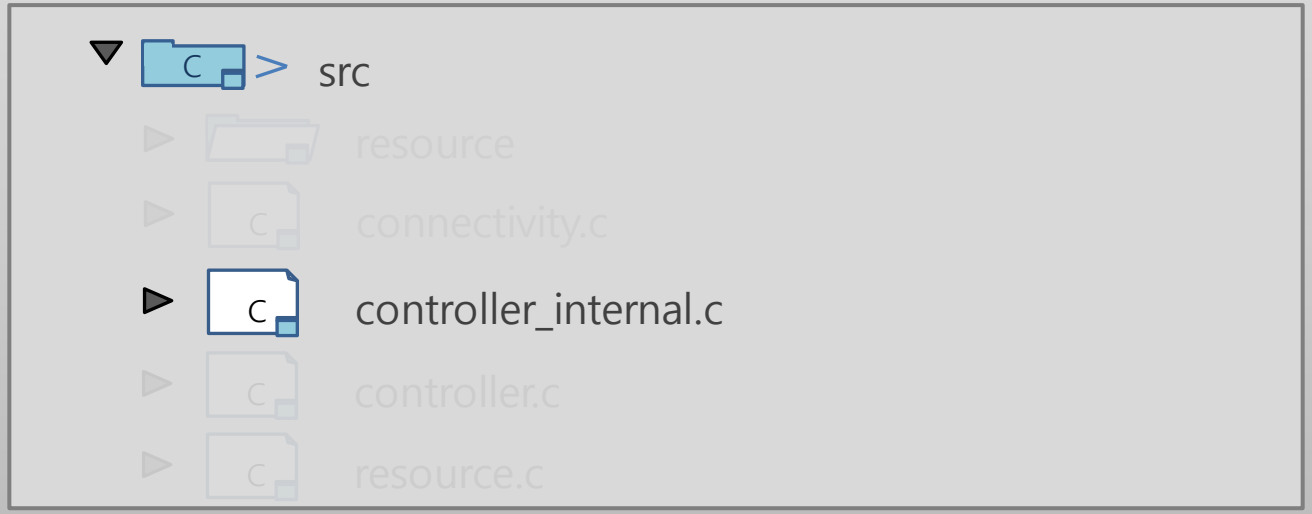
service_app_create() → Running → service_app_terminate()

```
static  void service_app_terminate(void *data)
{
    app_data *ad = (app_data *)data;

    if (ad->getter_timer)
        ecore_timer_del(ad->getter_timer);
    ...

    controller_fini_internal_function();
    ...
    ...

    free(ad);
}
```

Delete timer

All connections with resources are closed in this function

NOTHING TO DO



Problems | Console | Log

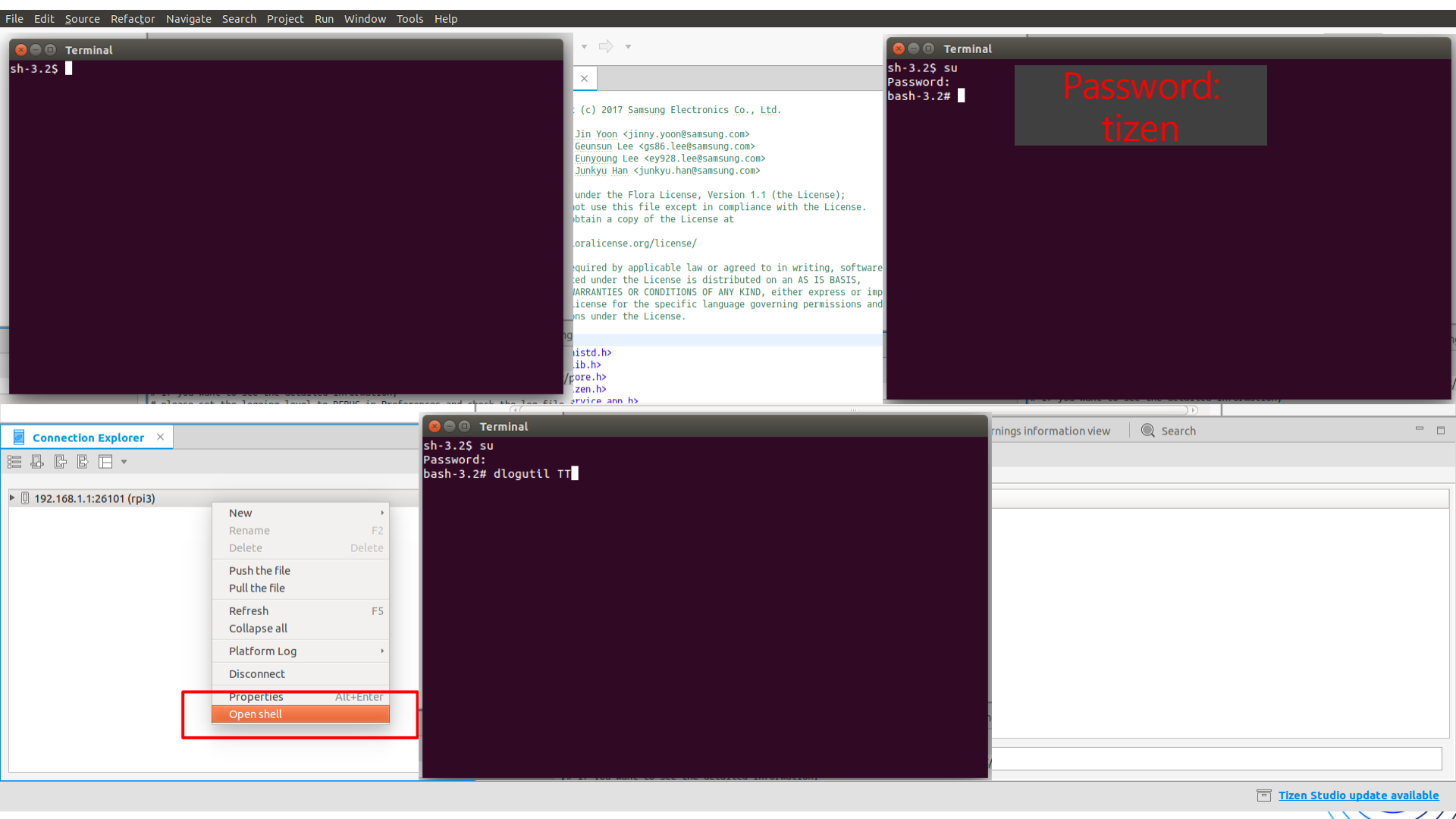
position-finder-server [Tizen Native Application] /home/junkyu/code/tizen4.0/iot/position-finder-server/Debug/position-finder-server (8/30/17 2:12 PM)

```
cmd_ret:240
[RDS] Cannot partially upload or reinstall
[Creating the package...]
    Created the package: /home/junkyu/code/tizen4.0/iot/position-finder-server/Debug/org.tizen.position-finder-server-1.0.0-arm.tpk
[Transferring the package...]
    Transferred the package: /home/junkyu/code/tizen4.0/iot/position-finder-server/Debug/org.tizen.position-finder-server-1.0.0-arm.tpk -> /home/owner/share/tmp/sdk_tools/tmp
[Installing the package...]
Removable: 1
    Uninstalling the package...
system apps     pkg_type [tpk]  pkgid [org.tizen.position-finder-server]        name [position-finder-server]   version [1.0.0] storage [internal]
start process (uninstall)

appid : org.tizen.position-finder-server
......................
end process (ok)
spend time for pkgcmd is [1610]ms
cmd_ret:0
    Uninstalled the package: Id(org.tizen.position-finder-server)
path is /home/owner/share/tmp/sdk_tools/tmp/org.tizen.position-finder-server-1.0.0-arm.tpk
start process (install)
.............................
end process (ok)
spend time for pkgcmd is [1916]ms
cmd_ret:0
    Installed the package: Id(org.tizen.position-finder-server), Version(1.0.0)
[Running the application...]
... successfully launched
Tizen application is successfully launched.
(8.814 sec)
```

mnt	2017-04-22	4,096
opt	2017-07-12	4,096
proc	1970-01-01	0
root	2016-07-25	4,096
run	2016-07-25	520
sbin	2017-07-12	8

position-finder-server

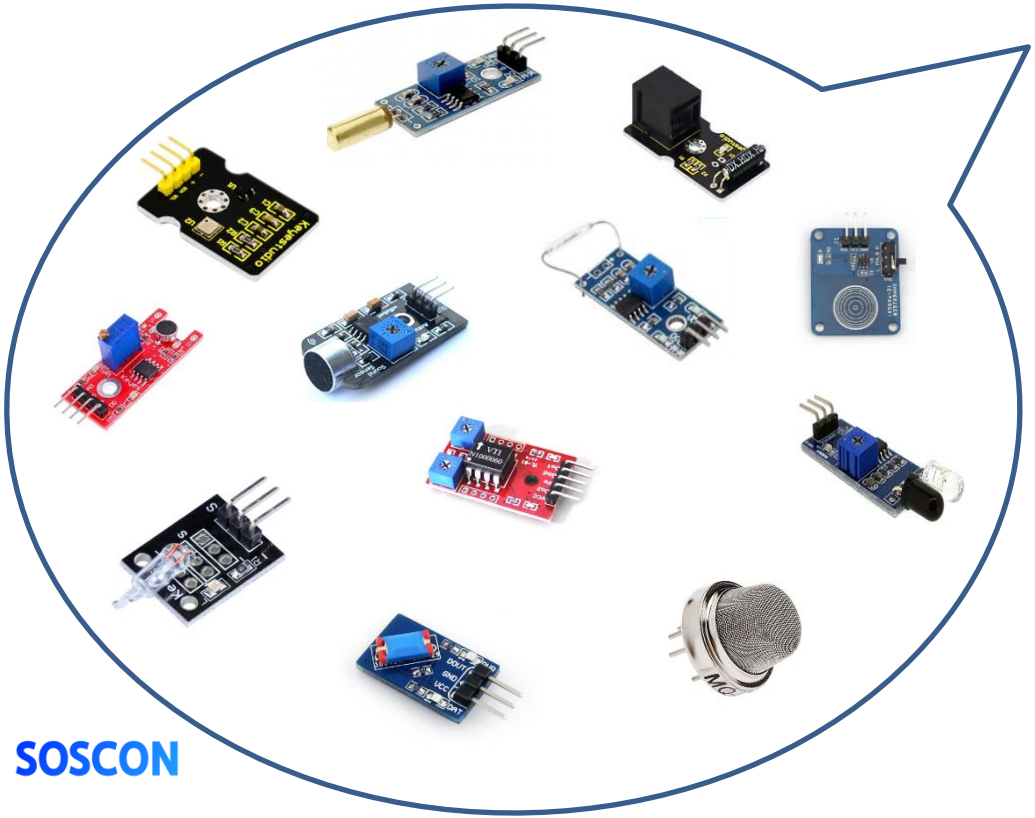
Tizen Studio update available


File Edit Source Refactor Navigate Search Project Run Window Tools Help
Terminal
sh-3.2$
(c) 2017 Samsung Electronics Co., Ltd.
Jin Yoon <jinny.yoon@samsung.com>
Geunsun Lee <gs86.lee@samsung.com>
Eunyoung Lee <ey928.lee@samsung.com>
Junkyu Han <junkyu.han@samsung.com>
under the Flora License, Version 1.1 (the License);
Terminal
sh-3.2$ su
Password:
bash-3.2#
Password:
tizen
Connection Explorer
192.168.1.1:26101 (rpi3)
New
Rename F2
Delete Delete
Push the file
Pull the file
Refresh F5
Collapse all
Platform Log
Disconnect
Properties Alt+Enter
Open shell
Terminal
sh-3.2$ su
Password:
bash-3.2# dlogutil TT
Search
Tizen Studio update available

```
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 82.70cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 63.64cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 57.73cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 57.26cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 57.97cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 66.99cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 57.44cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 57.42cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 68.82cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 57.76cm
E/TT      (  894): [_resource_read_ultrasonic_sensor_cb:78] OUT OF RANGE
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 56.72cm
E/TT      (  894): [_resource_read_ultrasonic_sensor_cb:78] OUT OF RANGE
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 54.21cm
E/TT      (  894): [_resource_read_ultrasonic_sensor_cb:78] OUT OF RANGE
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 54.37cm
E/TT      (  894): [_resource_read_ultrasonic_sensor_cb:78] OUT OF RANGE
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 56.17cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 13.46cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 8.03cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 9.42cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 10.48cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 9.95cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 8.64cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 8.76cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 8.71cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 11.11cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 8.51cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 10.15cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 10.75cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 10.96cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 11.13cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 12.13cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 9.88cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 54.02cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 8.75cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 9.90cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 10.36cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 10.39cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 10.60cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 14.10cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 12.42cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 12.71cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 11.71cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 12.47cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 12.09cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 11.18cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 12.37cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 11.52cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 11.83cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 11.78cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 11.83cm
I/TT      (  894): [_resource_read_ultrasonic_sensor_cb:81] Measured Distance : 11.40cm
```

Just do it! Tizen is behind you!

Whatever you want

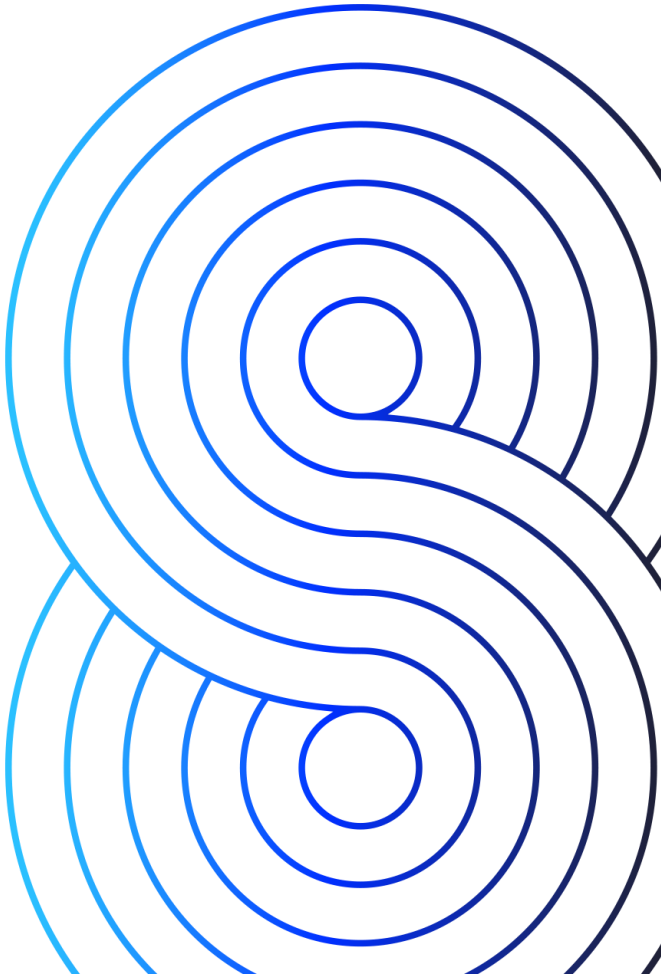


It'll be here

- resource
  - resource_illuminance_sensor.c
  - resource_infrared_motion_sensor.c
  - resource_infrared_obstacle_avoidance_sensor.c
  - resource_led.c
  - resource_touch_sensor.c
  - resource_magnet_detection_sensor.c
  - resource_water_level_detection_sensor.c
  - resource_fire_detection_sensor.c
  - resource_heartbeat_sensor.c

SOSCON

Thank you



SOSCON
SAMSUNG
OPEN SOURCE
CONFERENCE