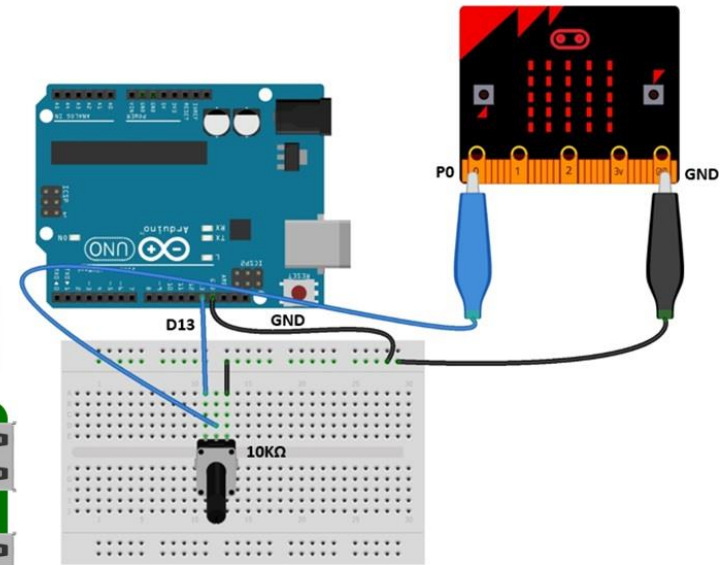
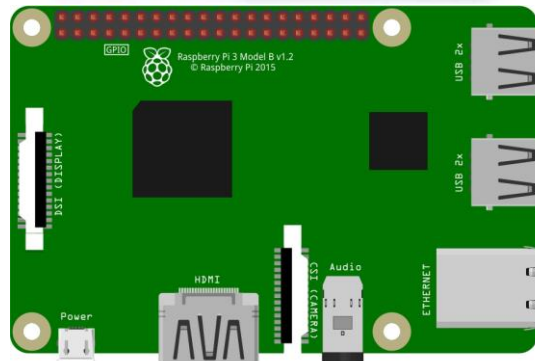
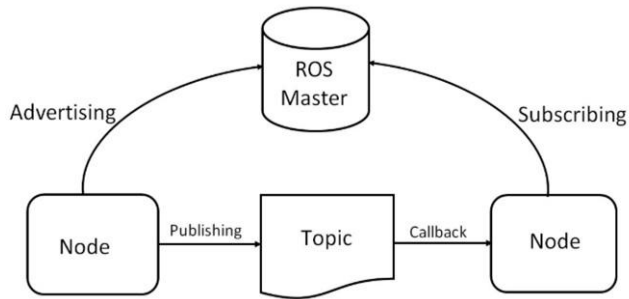


# Hands On With ROS

## Class 2: Understanding the ROS Subscriber



March 24, 2020  
Don Wilcher

# Class 3: Understanding the ROS Subscriber

```
~/ros_ws/src (~/ros_ws-desktop:1321)
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is 1GB.
started roslaunch server http://rordon-desktop:40015/
ros_core version 1.14.3

SUMMARY
-----
PARAMETERS
 * /roslaunch: roslaunch
 * /roscpp_core: 1.14.3

NODES
-----
auto-starting new master
process[roslaunch]: started with pid [2024]
ROS_MASTER_URI=http://rordon-desktop:11311/

setting /run_id to 326d8a4-9470-11e9-9758-b270b9a7583
process[roscpp_core]: started with pid [1933]
started core service [/roscpp]
```

## Agenda

- Diving into the ROS Subscriber
- Creating a LED Blink Circuit
  - a) LED Blink Electrical Wiring Diagram
  - b) LED Blink Circuit Schematic Diagram
  - c) Attaching a Raspberry Pi 3 to an Arduino Uno
- Lab Project: Blinking a LED with ROS

# Diving into a ROS Subscriber

```
* rosdev@jordan-desktop:1131/
└─$ cd ~; vim search_terminal.rviz
Done checking log file disk usage. Usage is -1GB.
started roslaunch server http://jordan-desktop:40015/
ros_core version: 1.24.3
SUMMARY
NAME
PARAMETERS
 * /rostopic: melodic
 * /rosversion: 1.14.3
NODES
auto-starting new master
process[master]: started with pid [2000]
ROS_MASTER_URI=http://jordan-desktop:1131/
setting /run_id to 22668aa8-0478-11e9-9756-b8278bb97583
process[roscpp]: started with pid [2003]
started core service [/rosout]
```

## Definition/Explanation:

**Subscriber** – A message that is received by a node or topic within a ROS system.

Characteristics of a Subscriber include:

- a) A node that reads data from a topic
- b) Can get access to a connection header
- c) Includes debugging information like
  - i. who sent the message
  - ii. whether or not a message was latched
  - iii. Callback

# Diving into a ROS Subscriber...

```
? (roscpp:~/roscpp-desktop:11311)
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is <1GB.
started roslaunch server http://roscpp-desktop:48511/
ros_core version: 1.14.3

SUMMARY
-----
PARAMETERS
 * /roscpp_core: roscpp_core
 * /roscpp_core__name: roscpp_core
 * /roscpp_core__ns: /roscpp_core
 * /roscpp_core__type: roscpp_core

NODES
-----
auto-starting new master
process[roscpp_core]: started with pid [2024]
ROS_MASTER_URI=http://roscpp-desktop:11311/

setting /run_id to 320d8a8-947b-11e9-9758-b278b9a7583
process[roscpp_core]: started with pid [2033]
started core service [/roscpp]
```

## Definition/Explanation:

**Connection Header** – A Transfer/Transmission Control Protocol (TCP) method of sending and receiving multiple requests/responses through a single connection.

# Diving into a ROS Subscriber...

## How Do We Subscribe to a Topic?

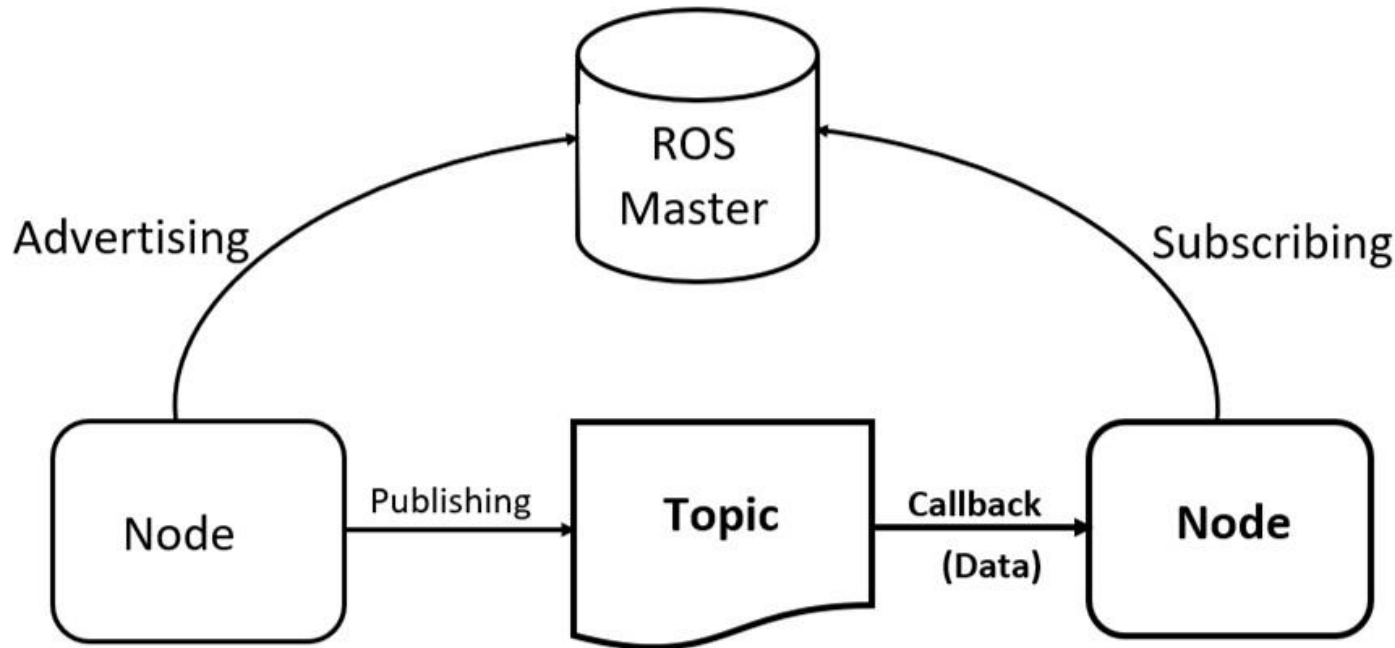
```
~/ros_ws/src/roscpp_tutorials/roscpp_tutorials$ catkin_make
Done checking log file disk usage. Usage is 11GB.
started roslaunch server http://mrdon-desktop:4001/
ros_core version 1.14.3

SUMMARY
=====
PARAMETERS
 * /roscpp_tutorial: roscpp_tutorial
 * /roscpp_tutorial__ns: /roscpp_tutorial__ns

NODES
auto-starting new master
process[roscpp_tutorial]: started with pid [2024]
ROS_MASTER_URI=http://mrdon-desktop:11311/

setting /run_id to 320d8aa1-947b-11e5-975b-b277b09a7563
process[roscpp_tutorial-1]: started with pid [2033]
started core service [/roscpp_tutorial]
```

Toggleing an Output State



message:  
Toggle

Debugging Information:  
a) who sent the message  
b) whether or not a message was latched

Wilcher, D. (2019). *ROS 101: An intro to the robot operating system*. Retrieved from <https://www.designnews.com/gadget-freak/ros-101-intro-robot-operating-system/107053141061075>

# Question 1



**Define Subscriber.**

# Diving into a ROS Subscriber...

```
~/ros_ws/src/roscpp_tutorials/roscpp_tutorials$ catkin_make
Done checking log file disk usage. Usage is 11GB.
started roslaunch server http://mrdon-desktop:4001/
ros_core version 1.14.3

SUMMARY
=====
PARAMETERS
 * /roscpp_tutorial: melodic
 * /roscpp_tutorial__ros_core: 1.14.3

NODES
auto-starting new master
pidmaster[1]: started with pid [2024]
ROS_MASTER_URI=http://mrdon-desktop:11311/

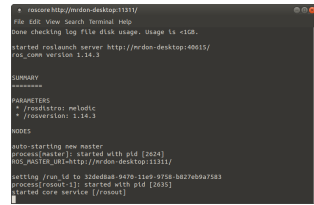
setting /run_id to 32d6d8a1-947b-11e9-9758-b278b0a7563
pidmaster[2]: started with pid [2033]
started core service [/roscpp]
```

## How Do We Subscribe to a Topic?

The *Blink* rosserial sketch provides the messages using a header file.

```
#include<std_msgs/Empty.h>
```

# Dividing into a ROS Subscriber... How Do We Subscribe to a Topic?



## Empty.h

Go to the documentation of this file.

```
00001 /* Auto-generated by genmsg_cpp for file /tmp/buildd/ros-electric-ros-comm-1.6.7/debian/ros-electric-ros-comm/opt/ros/electric/stacks/ros_comm/messages/std_msgs/msg/Empty.msg */
00002 #ifndef STD_MSGS_MESSAGE_EMPTY_H
00003 #define STD_MSGS_MESSAGE_EMPTY_H
00004 #include <string>
00005 #include <vector>
00006 #include <map>
00007 #include <ostream>
00008 #include "ros/serialization.h"
00009 #include "ros/builtin_message_traits.h"
00010 #include "ros/message_operations.h"
00011 #include "ros/time.h"
00012
00013 #include "ros/macros.h"
00014
00015 #include "ros/assert.h"
00016
00017
00018 namespace std_msgs
00019 {
00020     template <class ContainerAllocator>
00021     struct Empty_ {
00022         typedef Empty_<ContainerAllocator> Type;
00023
00024         Empty_()
00025         {
00026         }
00027
00028         Empty_(const ContainerAllocator& _alloc)
00029         {
00030         }
00031
00032
00033     private:
00034         static const char* __s_getDataType_() { return "std_msgs/Empty"; }
00035     public:
00036         ROS_DEPRECATED static const std::string __s_getDataType_() { return __s_getDataType_(); }
00037
00038         ROS_DEPRECATED const std::string __getDataType_() const { return __s_getDataType_(); }
00039
00040     private:
00041         static const char* __s_getMD5Sum_() { return "d41d8cd98f00b204e9800998ecf8427e"; }
00042     public:
00043         ROS_DEPRECATED static const std::string __s_getMD5Sum_() { return __s_getMD5Sum_(); }
00044
00045         ROS_DEPRECATED const std::string __getMD5Sum_() const { return __s_getMD5Sum_(); }
00046     };
00047 }
```

[http://docs.ros.org/electric/api/std\\_msgs/html/Empty\\_8h\\_source.html](http://docs.ros.org/electric/api/std_msgs/html/Empty_8h_source.html)

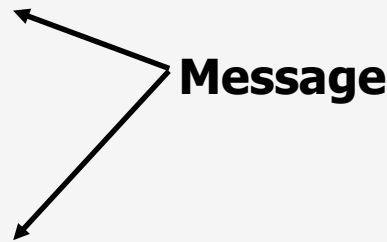


# Diving into a ROS Subscriber...

## How Do We Subscribe to a Topic?

```
#include<std_msgs/Empty.h>
```

```
00017
00018 namespace std_msgs
00019 {
00020 template <class ContainerAllocator>
00021 struct Empty_ {
00022     typedef Empty_<ContainerAllocator> Type;
00023
00024     Empty_()
00025     {
00026     }
00027
00028     Empty_(const ContainerAllocator& _alloc)
00029     {
00030     }
```



```
~/ros_ws/src/roscpp/roscpp
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is 11GB.
started roslaunch server http://nrdon-desktop:40011/
ros core version 1.14.3

SUMMARY
-----
PARAMETERS
 * /roscpp:roscpp: roslib
 * /roscpp:roscpp: 1.14.3

NODES
  auto-starting new master
  process[roscpp]: started with pid [2024]
  ROS_MASTER_URI=http://nrdon-desktop:11311/

setting /run_id to 320d8a8-9476-11e5-9758-ba2780a7553
process[roscpp-1]: started with pid [2033]
started core service [/roscpp]
```

# Diving into a ROS Subscriber...

## Empty.h Dependency Graph

```
~/ros_ws/src/roscpp/roscpp/roscpp
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is 11GB.
started roslaunch server http://mrdon-desktop-48011/
ros_core version 1.14.3

SUMMARY
-----
PARAMETERS
 * /roscpp: roscpp
 * /roscpp: 1.14.3

NODES
  auto-starting new master
  process[roscpp]: started with pid [2024]
  ROS_MASTER_URI=http://mrdon-desktop-11311/

setting /run_id to 320d8a4-947b-11e5-9758-ba27a0a7563
process[roscpp-1]: started with pid [2033]
started core service [/roscpp]
```



[http://docs.ros.org/electric/api/std\\_msgs/html/Empty\\_8h\\_source.html](http://docs.ros.org/electric/api/std_msgs/html/Empty_8h_source.html)



## Question 2

**Empty.h Dependency Graph connects with 9 header files?**

- a) False**
- b) True**

# Creating a LED Blink Circuit

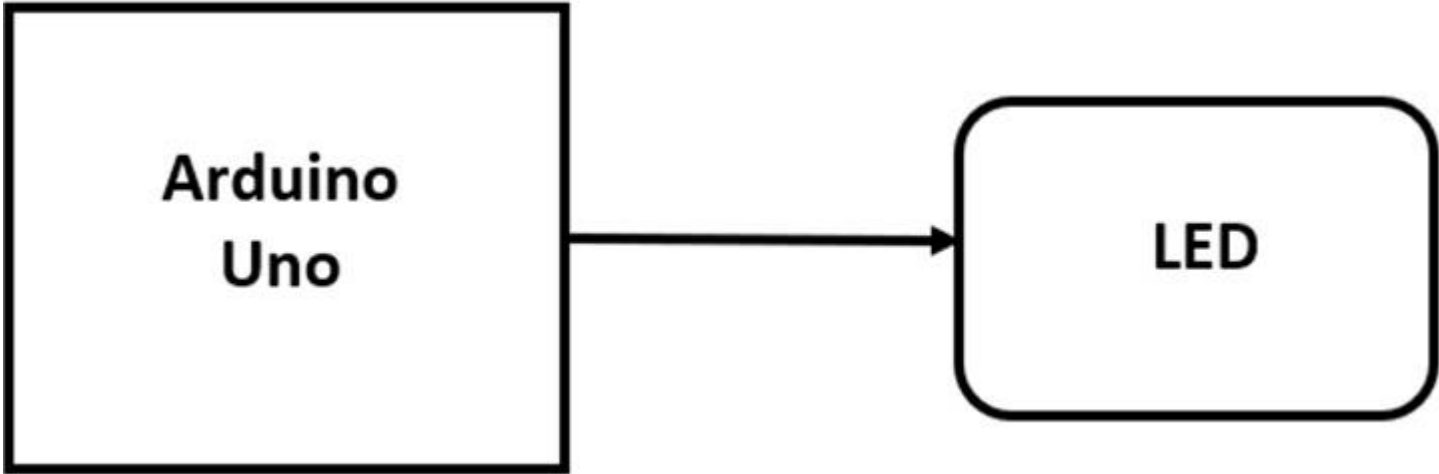
```
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is 41GB.
started re-launch server http://nrdon-desktop-48011/
rsg.com version 3.14.3

SUMMARY
-----
PARAMETERS
  / /rosdistro: melodic
  / /rosversion: 1.14.3

NODES
-----
auto-starting new master
process[roscore]: started with pid [2024]
ROS_MASTER_URI=http://nrdon-desktop-11311/

setting /run_id to 320d8a4-947b-11e9-9758-b278b0a7563
process[roscpp]: started with pid [2033]
started core service [/roscpp]
```

## Concept



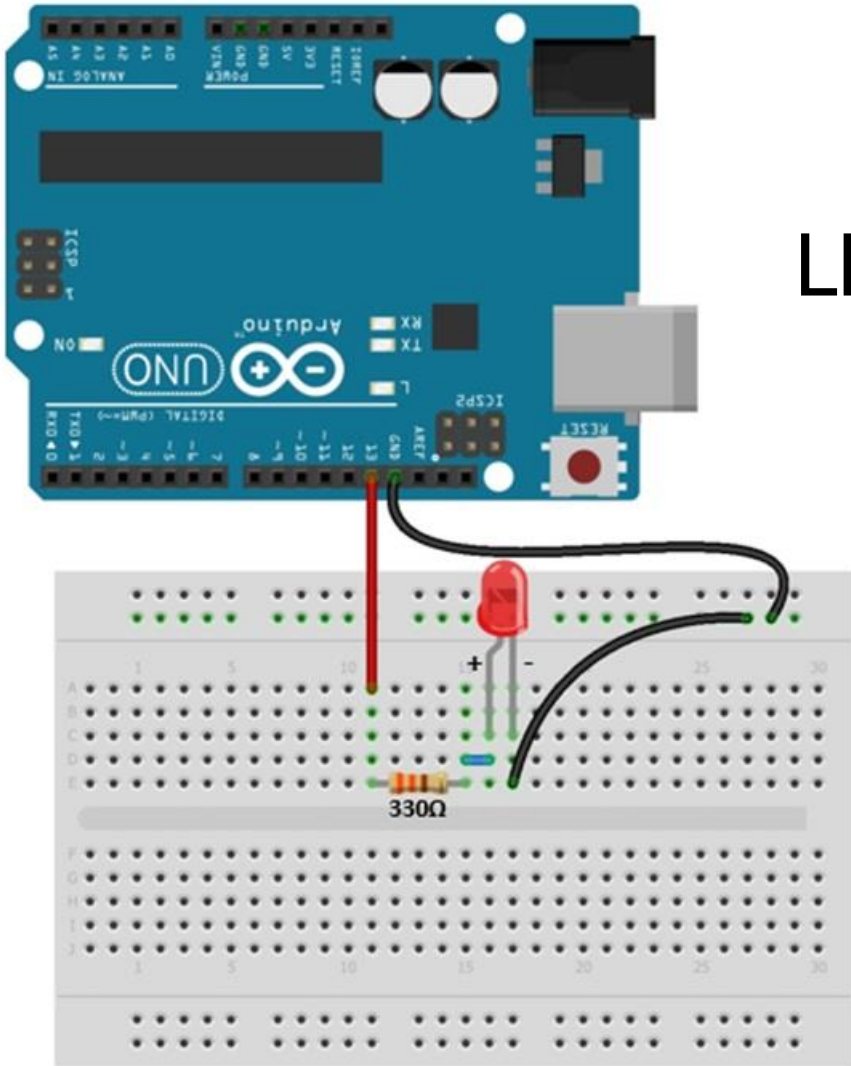
## LED Blink Circuit Block Diagram

# Creating a LED Blink Circuit

```
~/Downloads/rndon-desktop-11311/
File Edit View Search Terminal Help
Done checking log file disk usage. usage is <1GB.
started re-launch server http://rndon-desktop-48611/
rndom version 3.14.3

SUMMARY
-----
PARAMETERS
  / /robotrio: robotrio
  / /robotrio: 3.14.3

NODES
auto-starting new master
process[master]: started with pid [2024]
ROS_MASTER_URI=http://rndon-desktop-11311/
setting /run_id to 32d6d8a-947b-11e9-9758-b278b9a7563
ipnetns[ns0-21]: started with pid [2033]
started core service [/rostop]
```



## LED Blink Electrical Wiring Diagram

# Creating a LED Blink Circuit

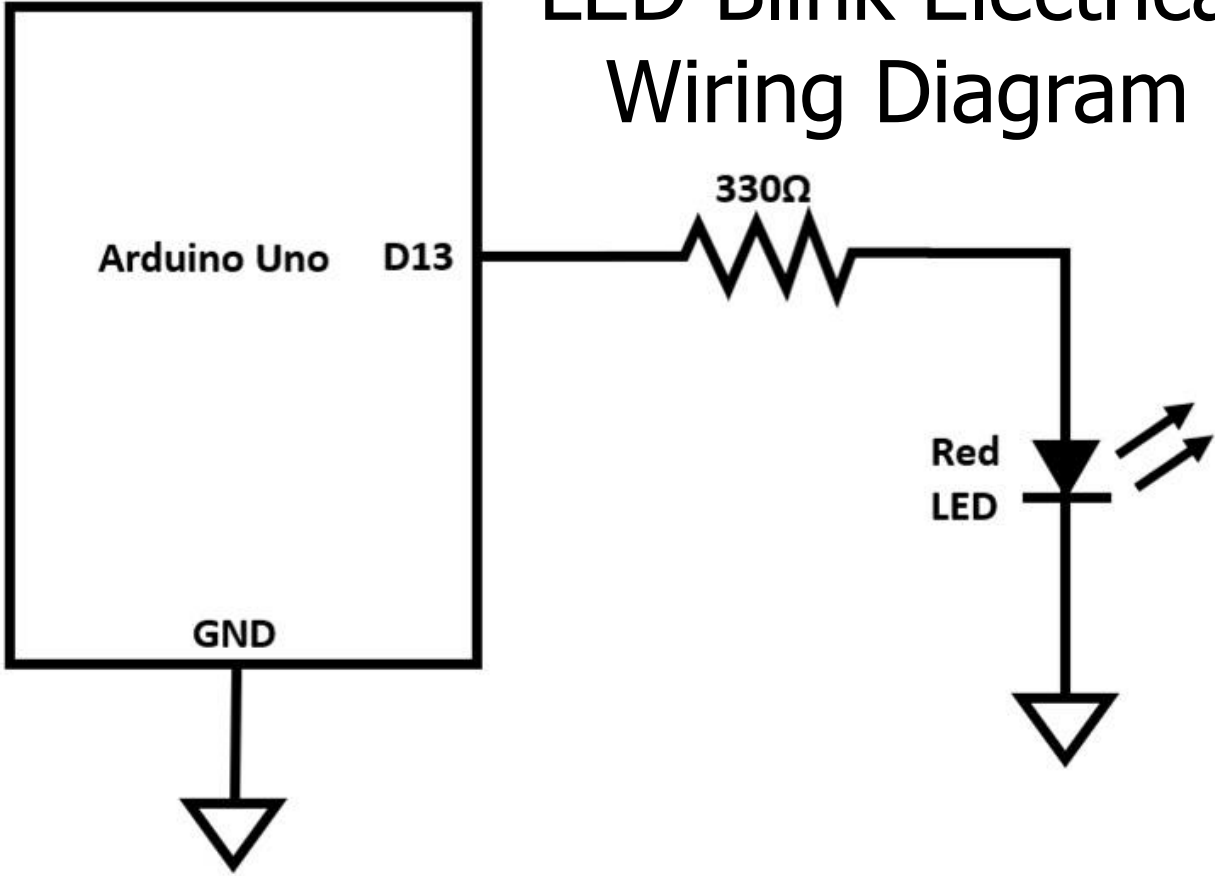
```
~/Downloads/rndon-desktop-11311/
File Edit View Search Terminal Help
Done checking log file disk usage. usage is <1GB.
started reload server http://rndon-desktop-48011/
rno.com version 3.14.3

SUMMARY
-----
PARAMETERS
  / /rosdistro: melodic
  / /rosversion: 1.14.3

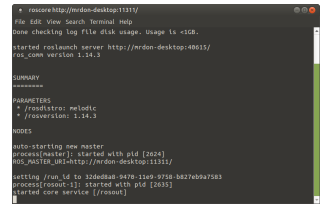
NODES
-----
auto-starting new master
process[roscpp]: started with pid [2024]
ROS_MASTER_URI=http://rndon-desktop-11311/

setting /run_id to 32d6d8a-947b-11e9-9758-b278b9a7563
process[roscpp-2]: started with pid [2033]
started core service [/roscpp]
```

## LED Blink Electrical Wiring Diagram



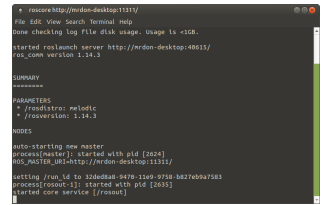
# Creating a LED Blink Circuit



```
Blink | Arduino 1.8.12
File Edit Sketch Tools Help
Blink
18 by Colby Newman
19
20 This example code is in the public domain.
21
22 http://www.arduino.cc/en/Tutorial/Blink
23 */
24
25 // the setup function runs once when you press reset or power
26 void setup() {
27   // initialize digital pin LED_BUILTIN as an output.
28   pinMode(LED_BUILTIN, OUTPUT);
29 }
30
31 // the loop function runs over and over again forever
32 void loop() {
33   digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH :
34   delay(1000); // wait for a second
35   digitalWrite(LED_BUILTIN, LOW); // turn the LED off by ma
36   delay(1000); // wait for a second
37 }
```

Use the Blink Code to test circuit!

# Creating a LED Blink Circuit



```
root@raspberrypi:~/python3#  
File Edit View Search Terminal Help  
Done checking log file disk usage. Usage is 11GB.  
started re-launch server http://raspberrypi:4001/  
ras.com version 3.14.3  
  
SUMMARY  
-----  
PARAMETERS  
* /rootstro: melodic  
* /rootversion: 3.14.3  
  
NODES  
-----  
auto-starting new master  
process[2680]: started with pid [2624]  
PID_MASTER_URL=http://raspberrypi:4001/  
setting /run/id to 320d8aa-947b-11e5-9758-b278b0a7563  
process[2680-21]: started with pid [2633]  
started core service [/rootstro]
```

## Section of Code that controls the flash rate of the LED

```
// the loop function runs over and over again forever  
void loop() {  
  digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)  
  delay(1000); // wait for a second  
  digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW  
  delay(1000); // wait for a second  
}
```



# Question 3



**In slide 16, rewrite the code to invert the flash rate of the LED.**

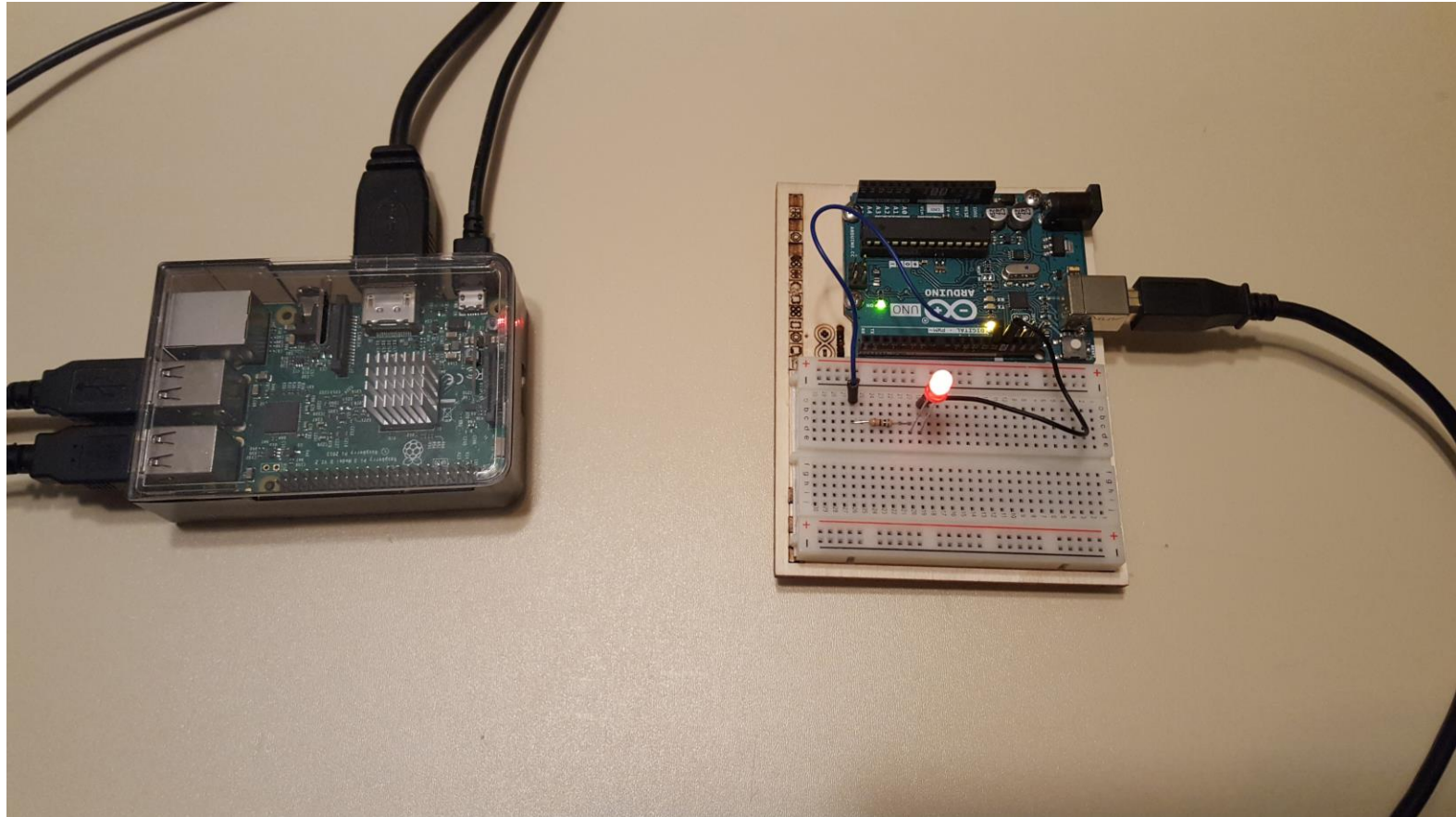
# Lab Project: Blinking a LED with ROS

```
~/ros_ws/src/roscpp_tutorials/blink_led$ catkin_make
Done checking log file disk usage. Usage is 1GB.
started roslaunch server http://mrdon-desktop:4001/
ros_core version 1.14.3

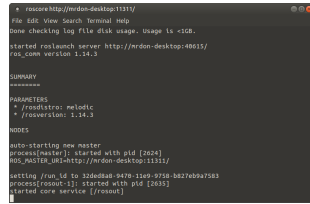
SUMMARY
-----
PARAMETERS
 * /roscpp_tutorials/blink_led
 * /roscpp_tutorials/blink_led

NODES
-----
auto-starting new master
process[master]: started with pid [2024]
ROS_MASTER_URI=http://mrdon-desktop:11311/

setting /run_id to 320d8aa-947b-11e9-9758-ba2780a975e3
process[roscpp_tutorials-1]: started with pid [2033]
started core service [/roscpp]
```



# Lab Project: Monitoring External Trigger Devices with ROS



```
* rosrun http://mrdon-desktop:11311/
File Edit View Search Terminal Help
Now checking log file disk usage. Usage is <1GB.
started roslaunch server: http://mrdon-desktop:40051/
ros_core version 1.14.3

=====
SUMMARY
=====
PARAMETERS
 * /rosclock: melodic
 * /rosversion: 1.14.3

NODES
-----
auto-starting new master
process[master]: started with pid [2024]
ROS_MASTER_URI=http://localhost:11311

setting /run_id to 3260d8a1-9476-11e9-9750-ba270ba975e3
process[roscpp-1]: started with pid [2033]
started core service [/roscpp]
```

## Lab Objectives:

- Learn how attach a Raspberry Pi to an Arduino.
- Learn how to communicate with a ROS node.
- Learn how to subscribe a Toggle message from a topic to blink a LED.
- Learn how to blink a LED the binary message using the ROS *pub std\_msgs/Empty* topic command.

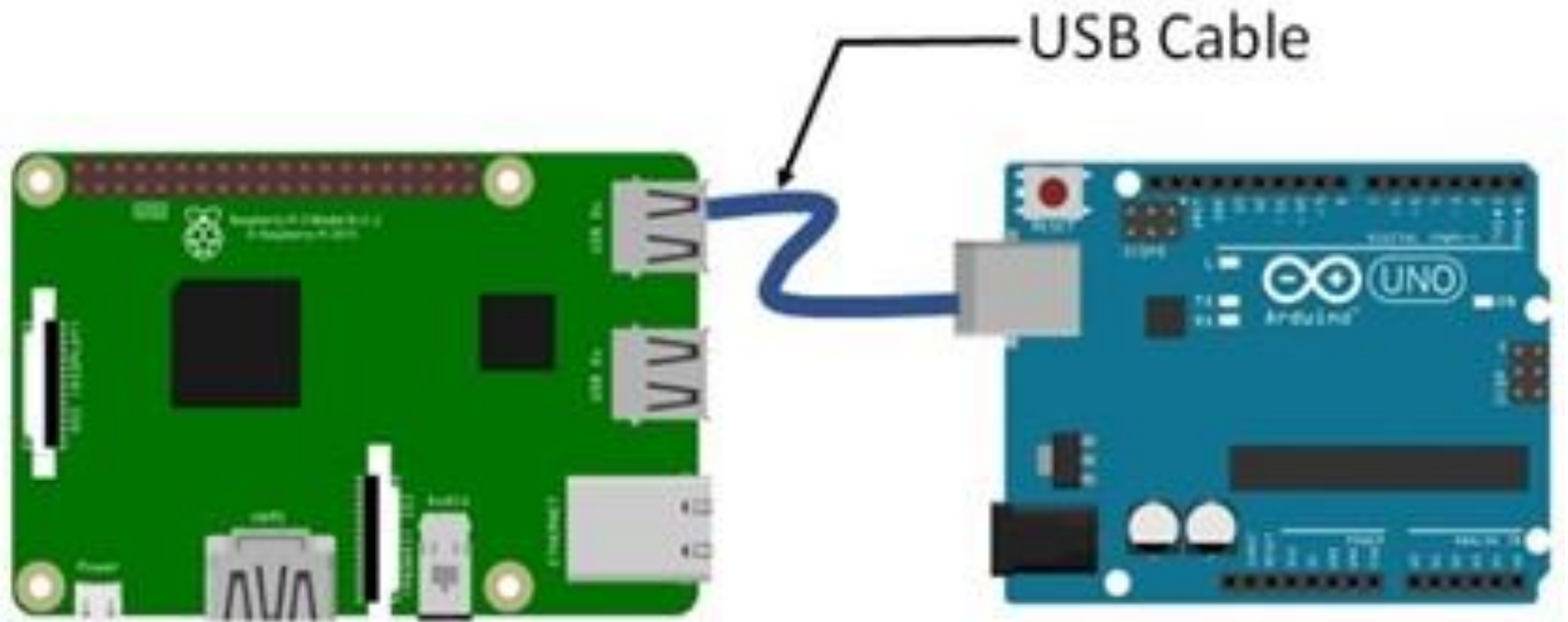
# Creating a LED Blink Circuit

## Attaching a Raspberry Pi 3 to an Arduino Uno

```
~/Downloads/rpi3@rpi3:~/Downloads/rpi3$ sudo systemctl start rpi3-serial
Done checking log file disk usage. Usage is 11GB.
started reload server http://rpi3-desktop:8081/
rpi3.com version 3.14.3

SUMMARY
=====
PARAMETERS
  / rpi3serial: rpi3serial
  / rpi3serial: 3.14.3

NODES
auto-starting new master
process(2000): started with pid (2004)
RDS_MASTER_UNIQ=http://rpi3-desktop:11311/
setting /run/ld to 320d8a4-9476-11e5-9758-b270b97563
process(2000-21): started with pid (2003)
started core service (/root)
```



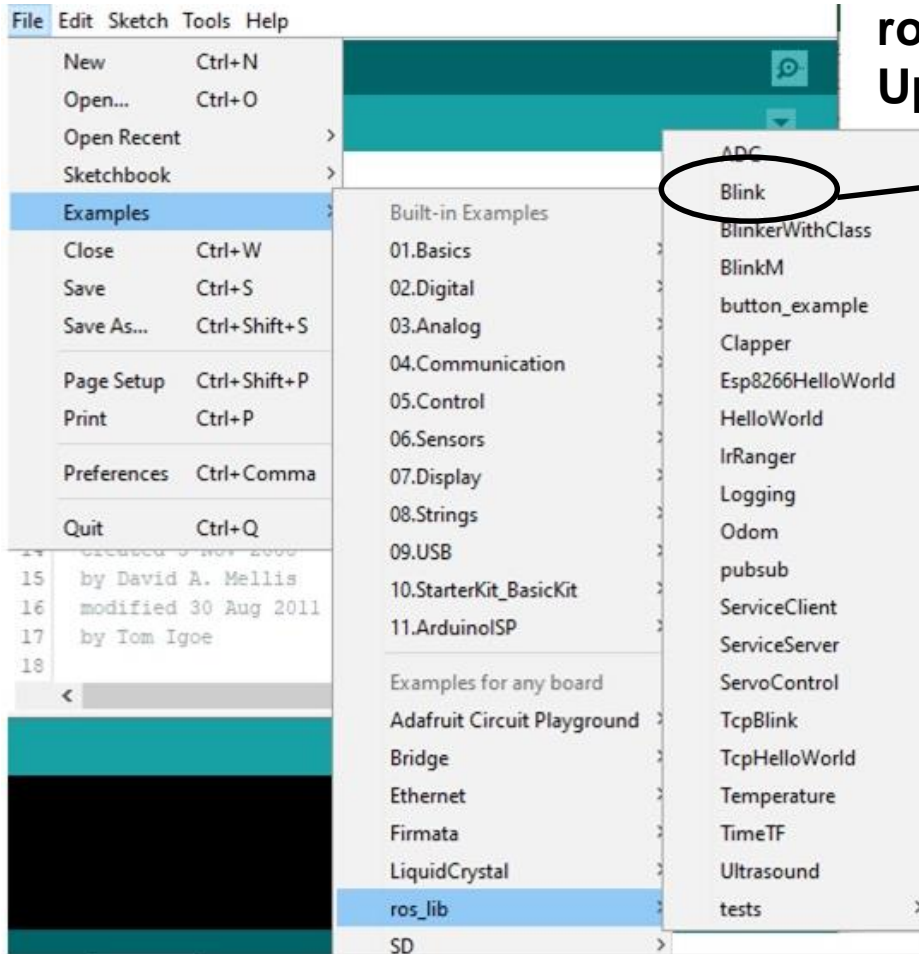
*Serial communication between the RPi3 and an Arduino Uno.*

# How to attach a Raspberry Pi to an Arduino?...

```
* ros@http://mrdon-desktop:1311/
File Edit View Search Terminal Help
Now checking log file disk usage: usage is <1GB.
started roslaunch server: http://mrdon-desktop:40011/
ros_core version 1.14.3

SUMMARY
-----
PARAMETERS
 * /rostopic: melodic
 * /rosversion: 1.14.3

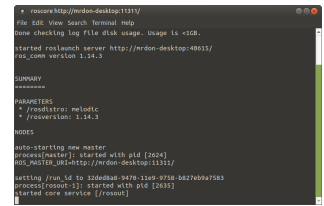
NODES
-----
auto-starting new master
process[master]: started with pid [2024]
ros_core[roscpp_core]: started with pid [2032]
setting /run_id to 3260d8a8-9476-11e9-9750-ba270a97583
process[rostop-1]: started with pid [2033]
started core service [/rostop]
```



ros\_lib:  
Upload the *Blink* Sketch

ros\_lib:  
The *Blink* Sketch  
provides the toggle  
topic for subscribing!

# How to attach a Raspberry Pi to an Arduino?



Open a linux terminal: At the prompt type: `roscore`.

```
roscore http://mrdon-desktop:11311/
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is <1GB.
started roslaunch server http://mrdon-desktop:40615/
ros_comm version 1.14.3

SUMMARY
=====

PARAMETERS
* /rostdistro: melodic
* /rosversion: 1.14.3

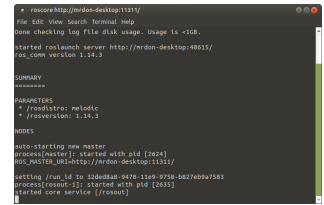
NODES

auto-starting new master
process[roscout-1]: started with pid [2635]
ROS_MASTER_URI=http://mrdon-desktop:11311/

setting /run_id to 32ded8a8-9470-11e9-9758-b827eb9a7583
process[roscout-1]: started with pid [2635]
started core service [/roscout]
```

*roscore running in an active window*

# How to communicate with a ROS node?...



```
~/ros_ws/src/roscpp_tutorials$ rosrun roscpp_tutorials talker.py
started roslaunch server http://rondon-desktop:4001/
ros_core version 1.14.3

SUMMARY
=====
PARAMETERS
 * /roscpp_tutorials/talker
 * /roscpp_tutorials/talker__ns

NODES
-----
auto-starting new master
process[talker]: started with pid [2024]
ROS_MASTER_URI=http://rondon-desktop:11311/

setting /run_id to 32d6d8d-947b-11e5-9758-ba2780b97583
process[roscpp_core-1]: started with pid [2033]
started core service [/roscpp]
```

To run the roserial client application for communicating with the attached Arduino Uno, open a new window and type the following *ros\_lib* command after the prompt.

\$ rosrun roserial\_python serial\_node.py /dev/***serial port***.

**Note:** *serial port* is the communication port used on the Arduino Uno to talk to the Raspberry Pi.

**For example:** ttyACM0 is the Arduino Uno's serial port to communicate with the Raspberry Pi.

# How to communicate with a ROS node?

```
~/ros_ws/src/mrdon-desktop11311/
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is 1GB.
started roslaunch server http://mrdon-desktop:40011/
ros_core version 1.14.3

SUMMARY
-----
PARAMETERS
 * /roslaunch: roslaunch
 * /roslaunch: 1.14.3

NODES
-----
auto-starting new master
process[master]: started with pid [2024]
ROS_MASTER_URI=http://mrdon-desktop:11311/

setting /run_id to 32d0d8a1-9476-11e5-9758-b270b9a7563
process[roscpp]: started with pid [2033]
started core service [/roscpp]
```

Open linux terminal: `roslaunch roserial_python` running

```
mrdon@mrdon-desktop: ~
File Edit View Search Terminal Help

mrdon@mrdon-desktop:~$ roslaunch roserial_python serial_node.py /dev/ttyACM1
[INFO] [1583625252.488821]: ROS Serial Python Node
[INFO] [1583625252.515678]: Connecting to /dev/ttyACM1 at 57600 baud
[INFO] [1583625254.634167]: Requesting topics...
[INFO] [1583625254.682725]: Note: subscribe buffer size is 280 bytes
[INFO] [1583625254.688213]: Setup subscriber on toggle_led [std_msgs/Empty]
```



# Question 4



**Reviewing slide 24, at what connection speed is used with the Arduino Uno?**

# How to Blink a LED?

```
? Home http://mendon-desktop:11311/
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is <1GB.
started roslaunch server http://mendon-desktop:40011/
ros_core version 1.14.3

SUMMARY
-----
PARAMETERS
 * /rostopic: melodic
 * /rosversion: 1.14.3

NODES
-----
auto-starting new master
process[roscpp]: started with pid [2024]
ROS_MASTER_URI=http://mendon-desktop:11311/

setting /run_id to 32d08aa-947b-11e9-975a-b278b9a75e3
process[roscpp-2]: started with pid [2033]
started core service [/roscpp]
```

To watch the LED blink, open a new terminal window and type the following *ros\_lib* command after the prompt.

**\$ rostopic pub toggle\_led std\_msgs/Empty --once**

# How to Blink a LED?

```
~/roscat@mrdon-desktop:11311/
File Edit View Search Terminal Help
Done checking log file disk usage. usage is <1GB.
started roslaunch server http://mrdon-desktop:40011/
ros_core version 1.14.3

SUMMARY
-----
PARAMETERS
 * /rostopic: rostopic
 * /rosworkon: 1.14.3

NODES
-----
auto-starting new master
process[roscat]: started with pid [1024]
ROS_MASTER_URI=http://mrdon-desktop:11311/

setting /run_id to 320d8a8-947b-11e5-9758-ba27809a7563
process[roscat-1]: started with pid [1033]
started core service [/roscat]
```

```
mrdon@mrdon-desktop:~
File Edit View Search Terminal Help
mrdon@mrdon-desktop:~$ rostopic pub toggle_led std_msgs/Empty --once
publishing and latching message for 3.0 seconds
mrdon@mrdon-desktop:~$ rostopic pub toggle_led std_msgs/Empty --once
publishing and latching message for 3.0 seconds
mrdon@mrdon-desktop:~$ rostopic pub toggle_led std_msgs/Empty --once
publishing and latching message for 3.0 seconds
mrdon@mrdon-desktop:~$ rostopic pub toggle_led std_msgs/Empty --once
publishing and latching message for 3.0 seconds
mrdon@mrdon-desktop:~$
```

*rostopic* running in an active window

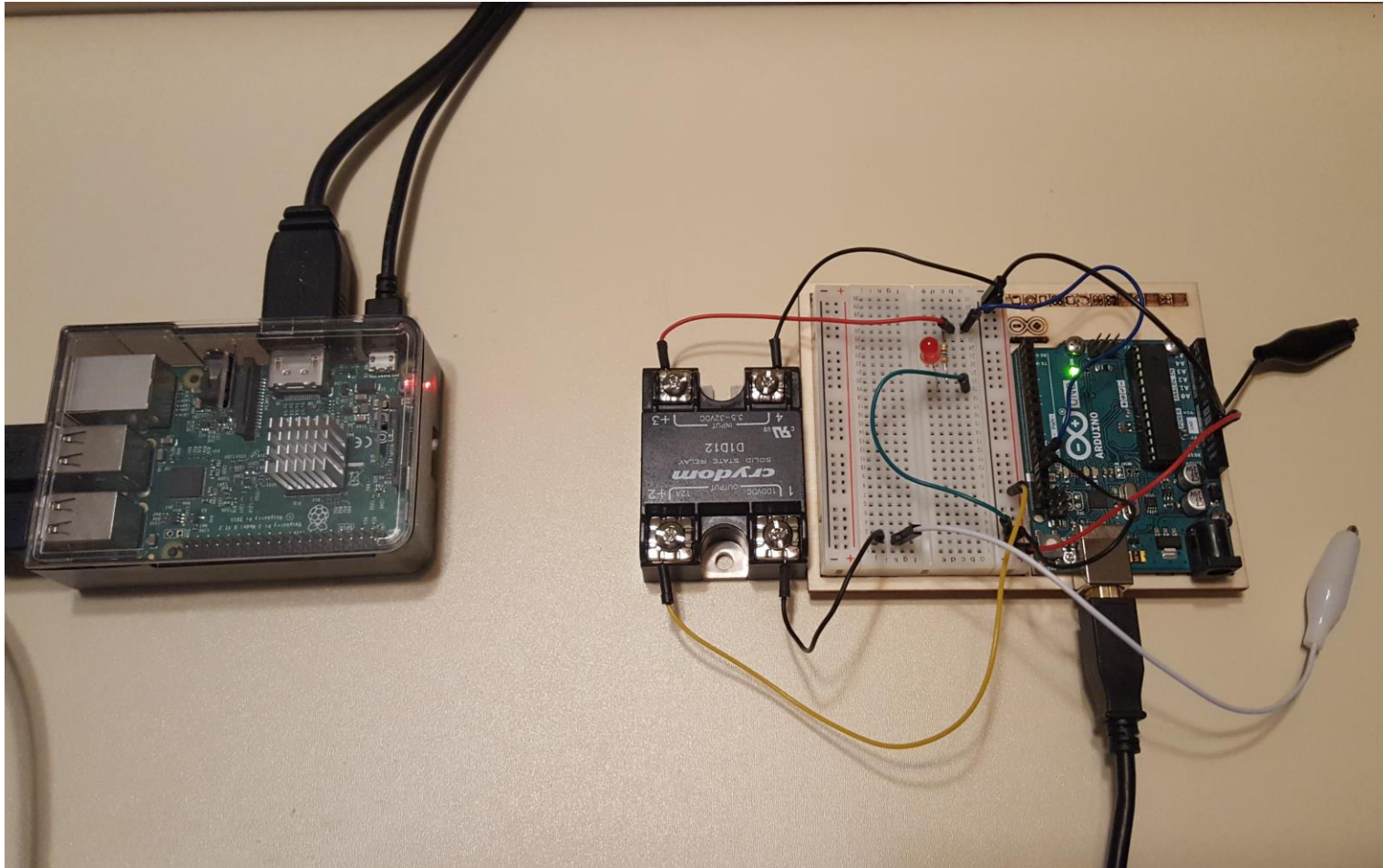
# How to drive a Solid State Relay (SSR) with ROS?

```
~/ros_ws/src/roscpp/roscpp$ catkin_make
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is 11GB.
started roslaunch server http://mrdon-desktop:4001/
ros_core version 1.14.3

SUMMARY
-----
PARAMETERS
 * /roscpp:roscpp:
   * /roscpp:roscpp:
     * /roscpp:roscpp:

NODES
-----
auto-starting new master
process[roscpp]: started with pid [2024]
ROS_MASTER_URI=http://mrdon-desktop:11311/

setting /run_id to 320d0ba8-9476-11e9-9758-ba2780a97563
process[roscpp-1]: started with pid [2033]
started core service [/roscpp]
```





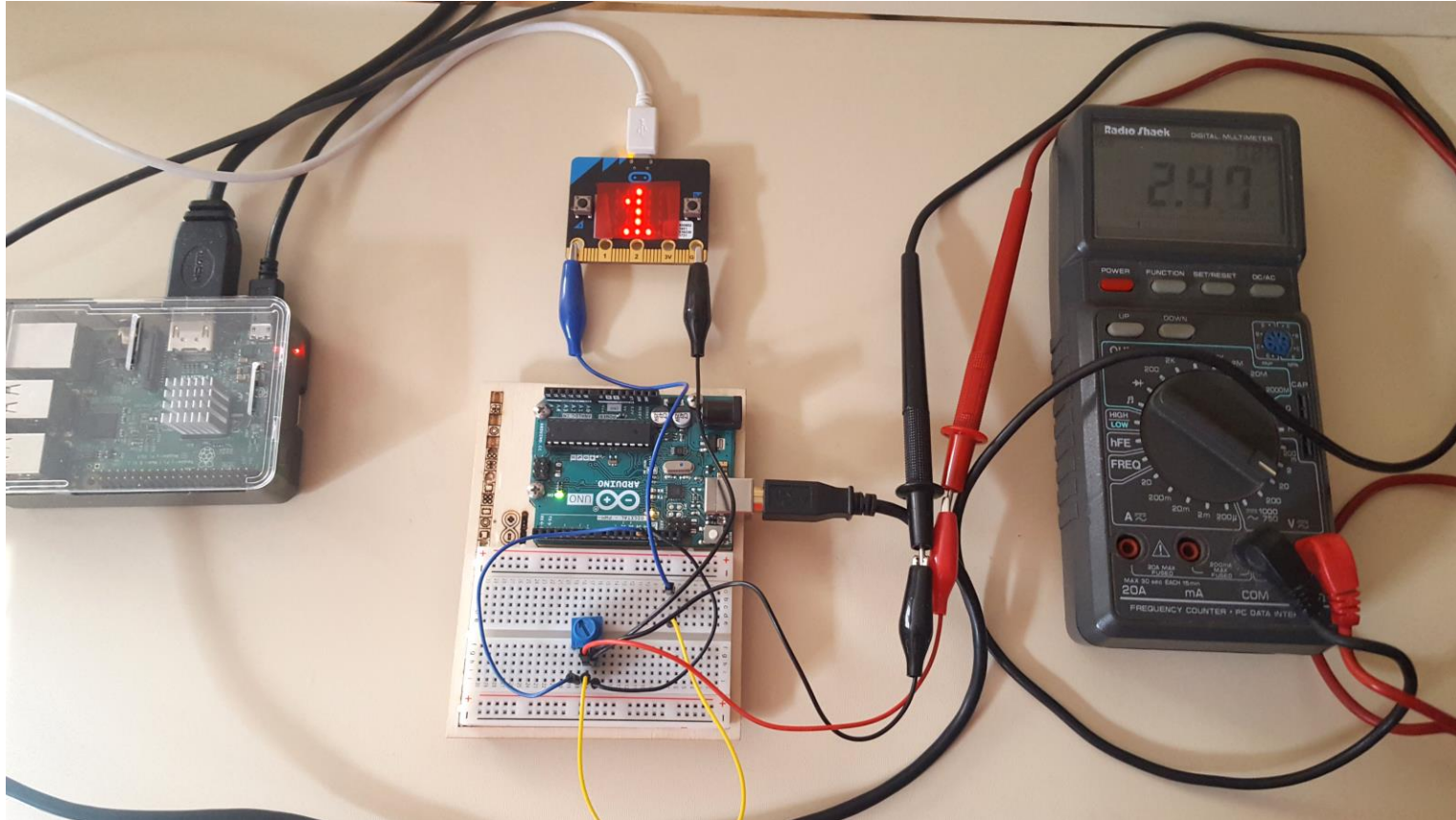
# How to blink a BBC micro:bit with ROS?...

```
~/ros_ws/src/roscpp/roscpp$ catkin_make
Done checking log file disk usage. Usage is 11GB.
started roslaunch server http://mrdon-desktop:4001/
ros_core version 1.14.3

SUMMARY
=====
PARAMETERS
 * /roscpp/roscpp: melodic
 * /roscpp/roscpp: 1.14.3

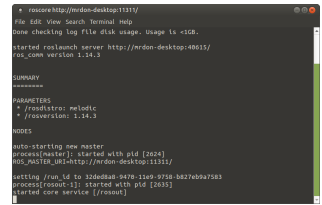
NODES
-----
auto-starting new master
process[master]: started with pid [2024]
ROS_MASTER_URI=http://mrdon-desktop:11311/

setting /run_id to 320d8a8-9476-11e9-975e-ba27809a7563
process[roscpp-1]: started with pid [2033]
started core service [/roscpp]
```



Adjusting the output voltage of the Potentiometer to be in compliant with the BBC micro:bit

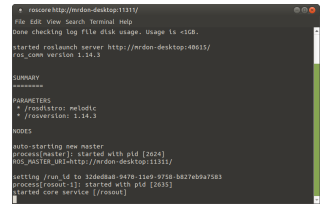
# How to blink a BBC micro:bit with ROS?...



## Blink MicroPython Code built on Mu

```
1 # Import libraries
2 from microbit import *
3
4 binary1 = '1' #set binary1 to 1
5 binary2 = '0' #set binary2 to 0
6
7
8 # Polling Loop
9 while True:
10     if button_a.is_pressed(): #read the value of button_a switch
11         display.show(binary1) #if true, display binary 1
12         pin0.write_digital(1) #turn on p0 pin of the microbit
13     else:
14         display.show(binary2) #if value of button_a switch is false, display binary 0
15         pin0.write_digital(0) # turn off p0 pin of the microbit
```

# How to blink a BBC micro:bit with ROS?...



Flasher MicroPython Code built on Mu

```
from microbit import *

binary1 = '1'
binary2 = '0'
input = pin0.read_digital()

while True:
    if pin0.read_digital():
        display.show(binary1)
        sleep(500)
        display.show(binary2)
        sleep(500)
    else:
        display.show(binary2)
```

**Code turns microbit into an electronic flasher**



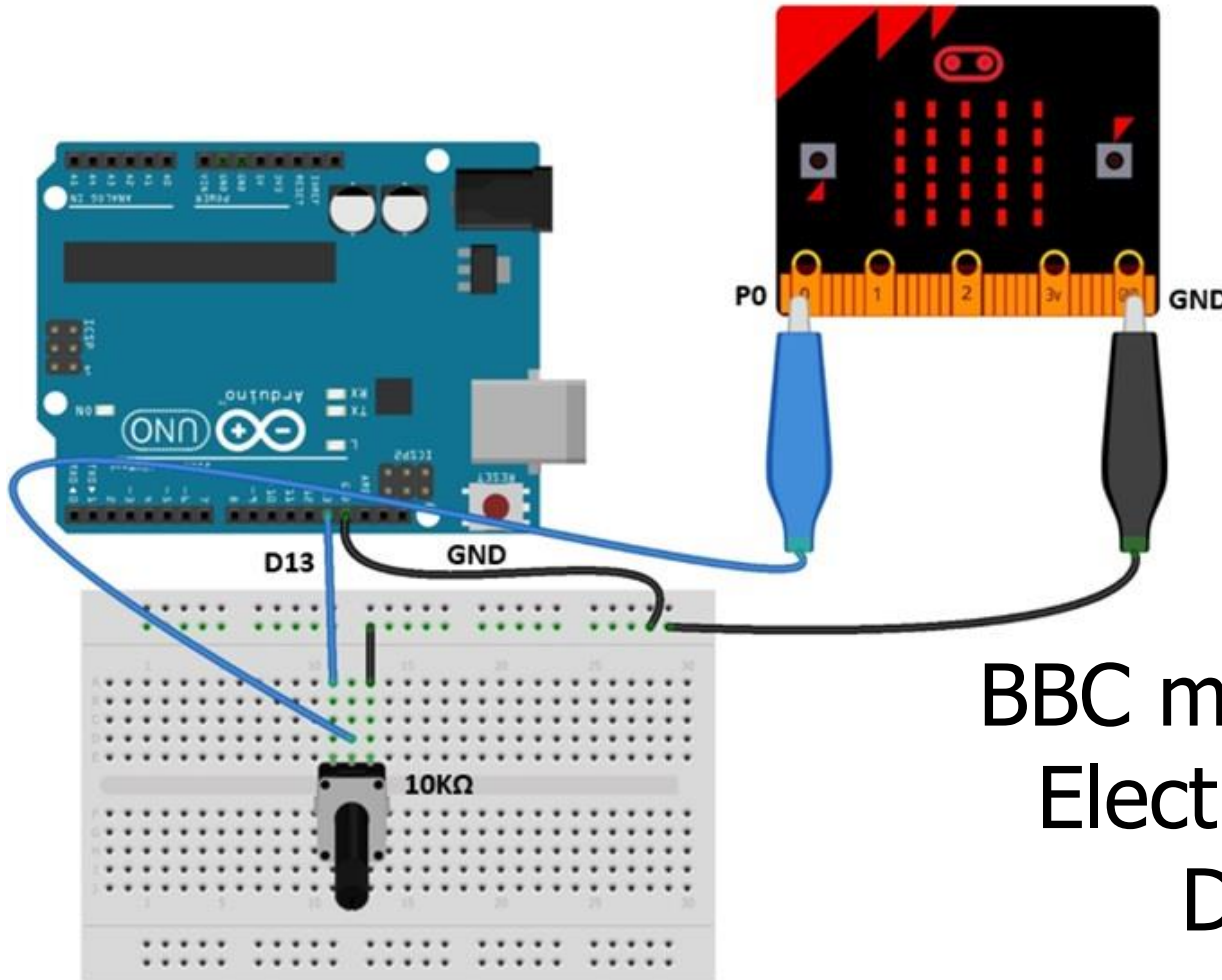
# How to blink a BBC micro:bit with ROS?...

```
~/ros_ws/src/roscpp_tutorials/roscpp_tutorials$ catkin_make
Done checking log file disk usage. Usage is 11GB.
started roslaunch server http://mrdon-desktop:4001/
ros_core version 1.14.3

SUMMARY
-----
PARAMETERS
 * /roscpp_tutorials/roscpp_tutorials
 * /roscpp_tutorials/roscpp_tutorials

NODES
-----
auto-starting new master
process[master]: started with pid [2024]
ROS_MASTER_URI=http://mrdon-desktop:11311/

setting /run_id to 32d6d8a1-9476-11e5-9758-ba2780b47563
process[roscpp_tutorials-1]: started with pid [2033]
started core service [/roscpp_tutorials]
```



## BBC micro:bit Blink Electrical Wiring Diagram

# How to blink a BBC micro:bit with ROS?...

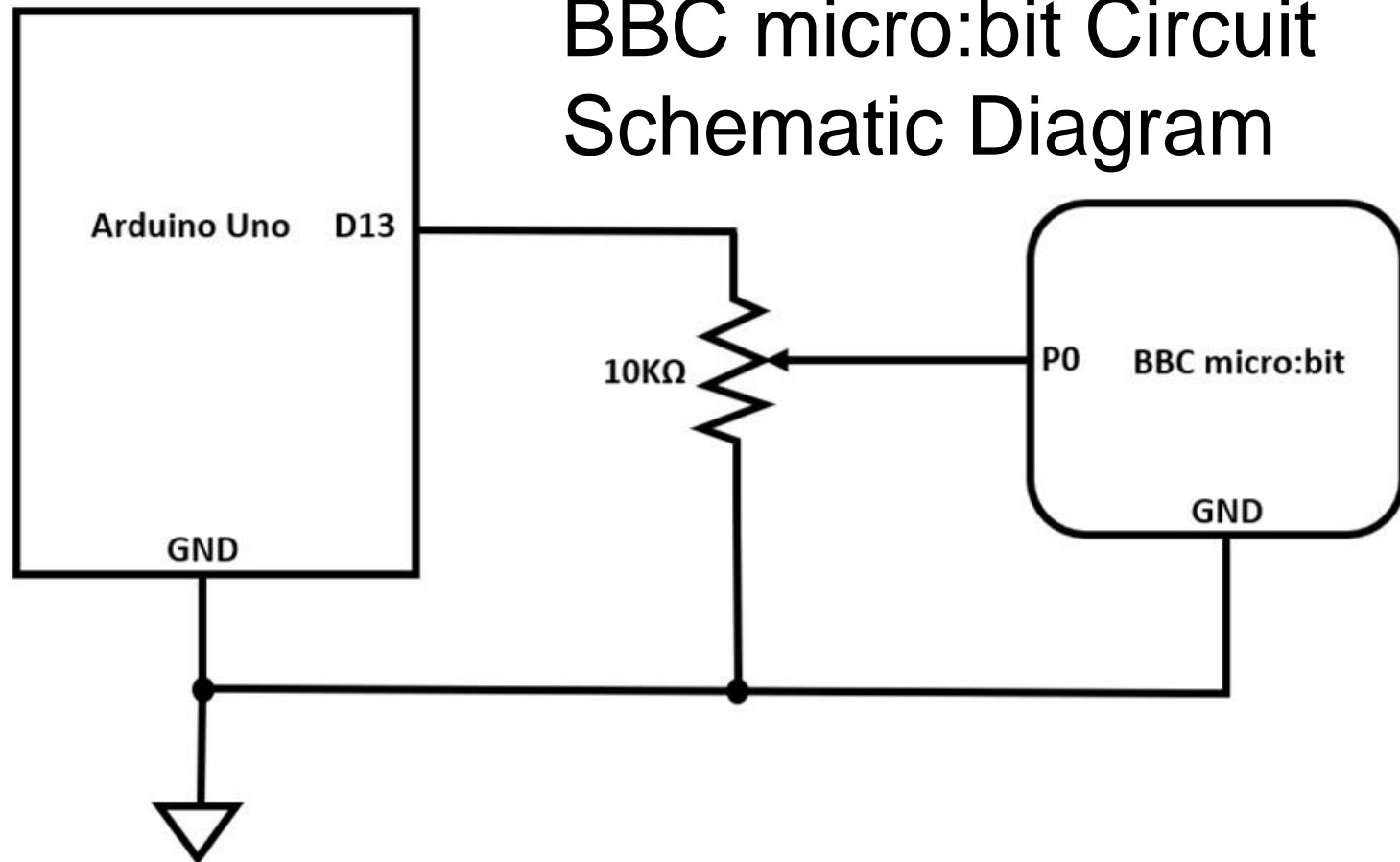
```
~/ros_ws/src/~/rclone-desktop-11311/
File Edit View Search Terminal Help
Done checking log file disk usage. Usage is 11GB.
started roslaunch server http://rondon-desktop-48011/
ros_core service 3.14.3

SUMMARY
-----
PARAMETERS
 * /roslaunch: roslaunch
 * /roslaunch: 3.14.3

NODES
-----
auto-starting new master
process[roslaunch]: started with pid [2024]
ROS_MASTER_URI=http://rondon-desktop-11311/

setting /run_id to 326d8a4-9476-11e9-9758-b278b9a75e3
process[roslaunch-2]: started with pid [2033]
started core service [/roslaunch]
```

## BBC micro:bit Circuit Schematic Diagram



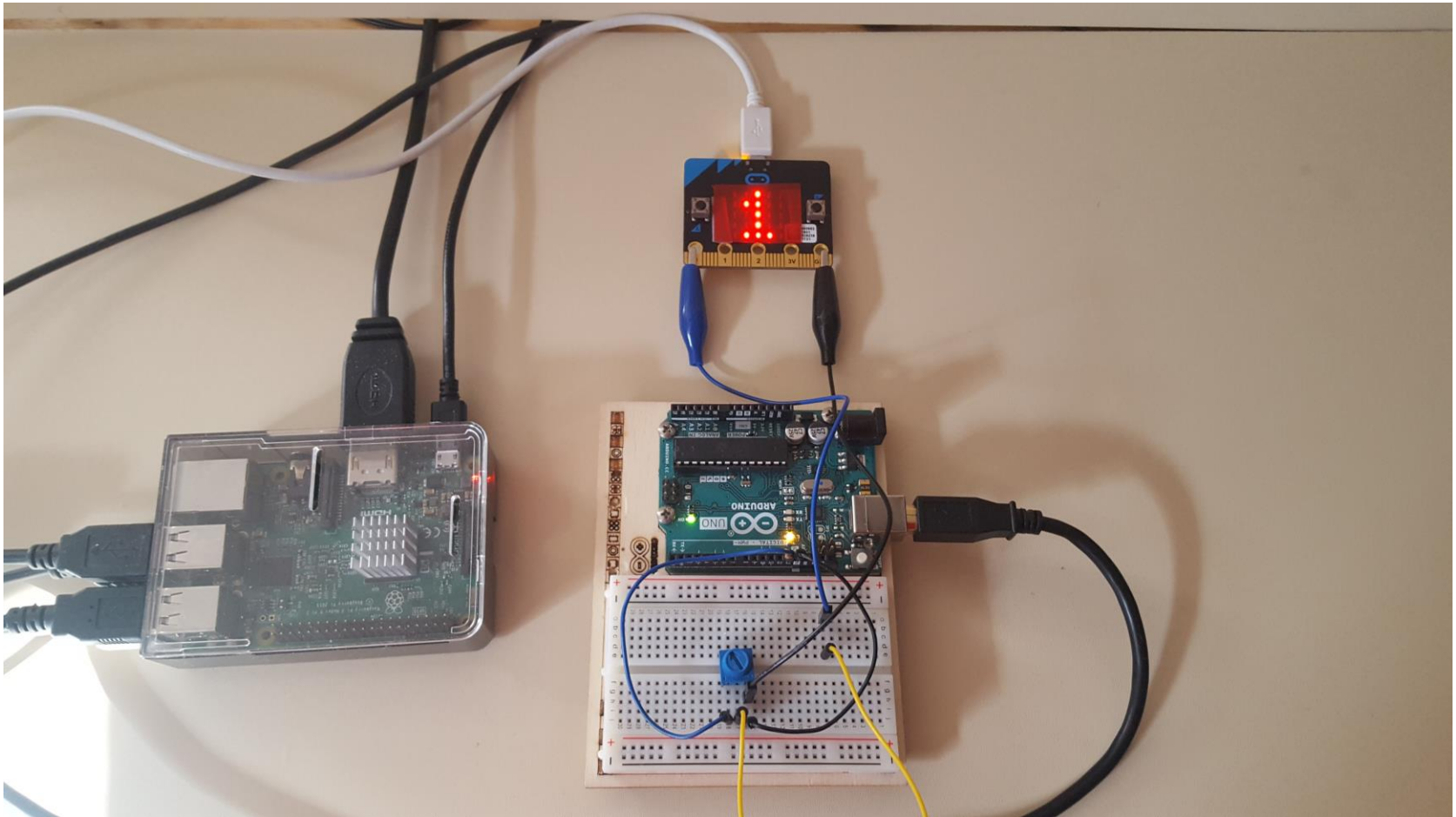
# How to blink a BBC micro:bit with ROS?...

```
~/ros_ws/src/rasberry$ cd ..
~/ros_ws$ catkin_make
Done checking log file disk usage. Usage is 1GB.
started roslaunch server http://rondon-desktop:4001/
ros_core version 1.14.3

SUMMARY
=====
PARAMETERS
 * /roslaunch: roslaunch
 * /rosversion: 1.14.3

NODES
-----
auto-starting new master
process[roscpp]: started with pid [2024]
ROS_MASTER_URI=http://rondon-desktop:11311/

setting /run_id to 32d6db4e-947b-11e9-9758-b278b9a75e3
process[roscpp-1]: started with pid [2033]
started core service [/roscpp]
```



Presented by:

# Question 5



**What electronic component can be used to make the Arduino Uno's output compliant with the BBC micro:bit's inputs?**