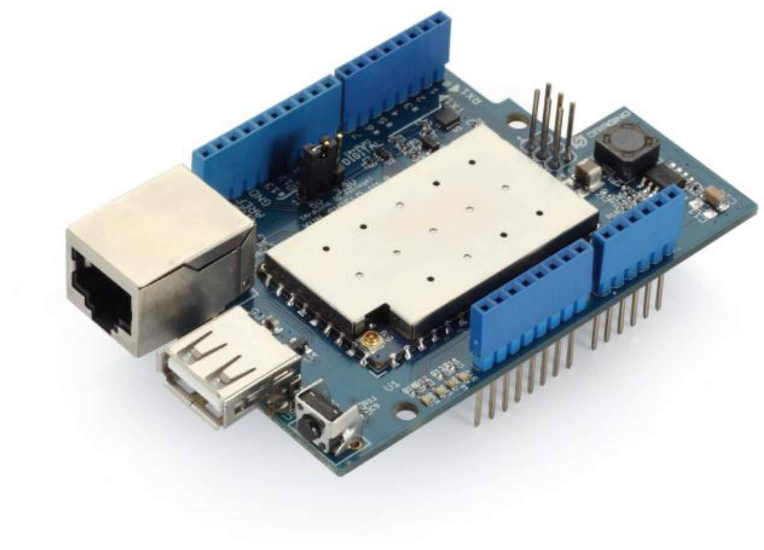


# Yun Shield User Manual

VERSION: 1.1

| Version | Description | Date |
|---|---|---|
| 0.1 | Initiate | 2014-Jun-21 |
| 1.0 | Release | 2014-Jul-08 |
| 1.1 | Add USB mount description Add LEDs description, change default password to dragino | 2014-Aug-02 |

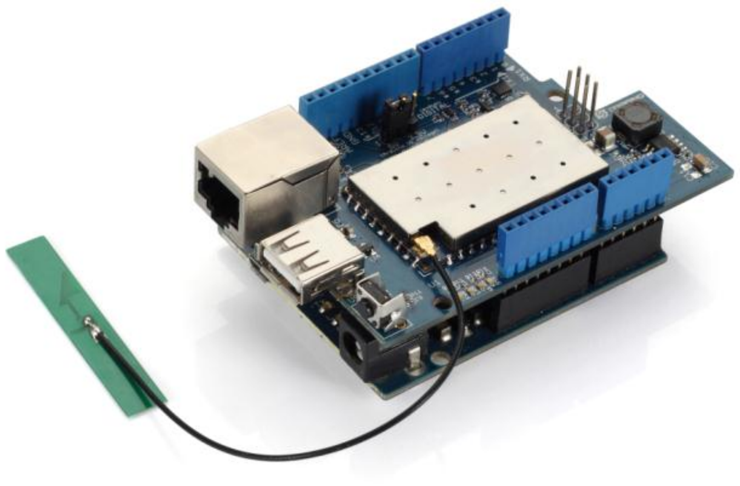
**Index:**

# 1 INTRODUCTION

## 1.1 What is Yun Shield

Yun Shield is one of the most powerful shields for Arduino Board. Yun Shield is designed to solve the Internet connectivity and storage issue for Arduino Board.

Yun Shield runs Open Source OpenWrt system (Same system as runs in Arduino Yun) and it is fully compatible with Arduino IDE v1.5.4 or later. Yun Shield is the ideally choice for Arduino Projects which require various internet connections and more storage.



Basically, Yun Shield + Leonardo equally to the official Arduino Yun, but Yun Shield is more flexible because it can work with other Arduino board such as Uno, Duemilanove, Mega etc. And Yun Shield uses external wifi antenna which provides stability and possibility for various environments.

## 1.2 Specifications

- Processor: 400MHz, 24K MIPS
- Flash: 16MBytes
- RAM: 64MBytes
- Power Input: 4.75v ~ 23v via Arduino VIN pin
- 1 x 10M/100M RJ45 connector
- 150M WiFi 802.11 b/g/n
- External Antenna via I-Pex connector
- 1 x USB 2.0 host connector, used for USB storage or 3G connection
- 1 x Reset button
- Compatible with 3.3v or 5v I/O Arduino.

## 1.3 Features

- ✓ Open source Linux (OpenWrt) inside

- ✓ Low power consumption
- ✓ Compatible with Arduino IDE 1.5.4 or later, user can program, debug or upload sketch to Arduino board via Arduino IDE.
- ✓ Managed by Web GUI, SSH via LAN or WiFi
- ✓ Software upgradable via network
- ✓ Built-in web server
- ✓ Support internet connection via LAN port, WiFi or 3G dongle.
- ✓ Support USB flash to provide storage for Arduino projects.
- ✓ Failsafe design provides robustly system.
- ✓ Compatible with Arduino Leonardo, Uno , Duemilanove, Diecimila, Mega

## 1.4 LEDs

There are four LEDs on the Yun Shield. The functions of these LEDs are:

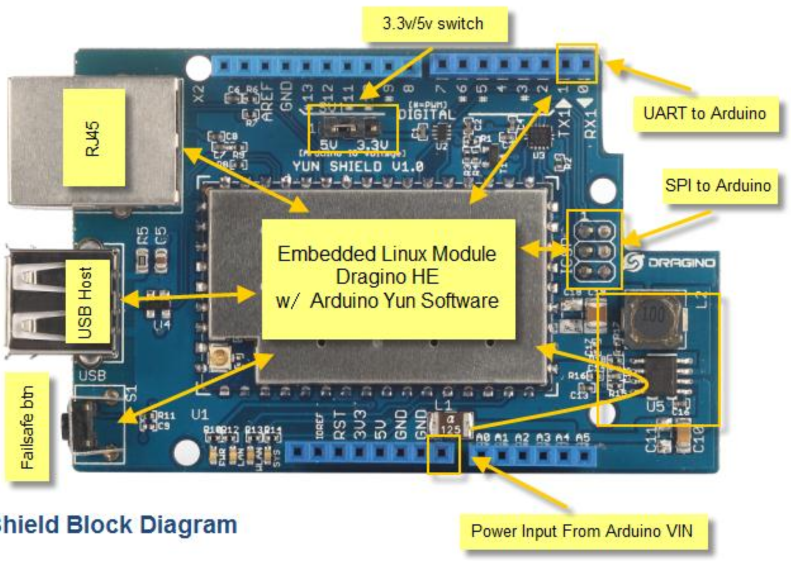
**PWR:** Power Indicate LED. Turn on once there is power.

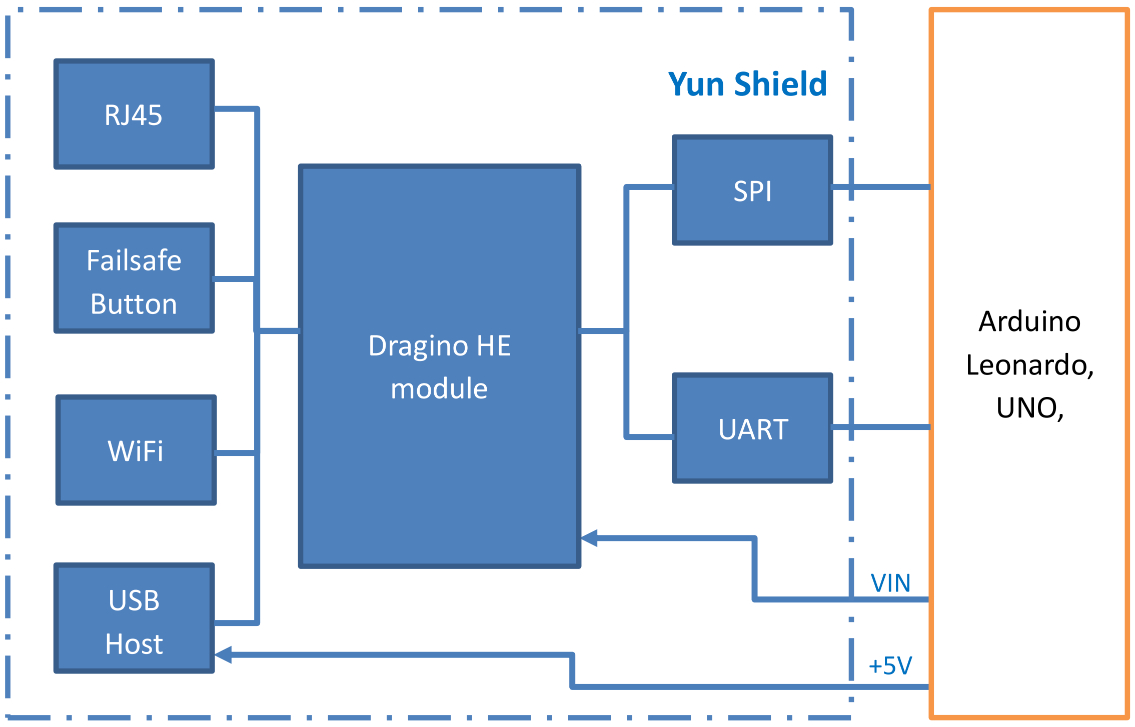
**LAN:** Indicate there is LAN connection when it is on or blinking.

**WLAN:** Indicate WiFi status.

**SYS:** LED for USB storage. It is on if the USB flash are link to Arduino Yun default SD directory /mnt/sd and /www/sd

## 1.5 System Structure





**POWER:**

The Dragino HE is the core module of Yun Shield. The HE module requires around 200ma current when in full load, so it is powered by the Arduino **VIN** pins to avoid overheated in the Arduino onboard 5v LDO. So when Yun shield is in used, the Arduino board should be powered by DC port instead of USB port. The DC input can be **7v ~ 15v.**

The USB Host of Yun Shield gets power from the Arduino **+5v** pin, since the +5v from Arduino comes from the +5V LDO, to avoid overheated on the Arduino Board, when the USB host is in used, it is recommended to use **+7v DC**.

## Interface:

The RJ45, WiFi, USB Host and Failsafe are connected to the Dragino HE module directly. And the Dragino HE module use SPI and UART to communicate with Arduino Board. Yun Shield is compatible with 3.3v and 5v Arduino board. The **on board jumper SV1** is used to set the SPI and UART to 3.3v or 5v level.

The SPI interface is used to upload the sketches comes from the Arduino IDE. SPI interface only connects to Dragino HE during uploading so the Arduino SPI can still be used to connect to other SPI slave devices.

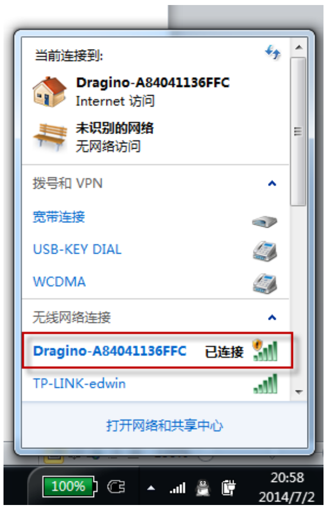
The UART interface is used for the Bridge class in Arduino, there are lots of examples explain how to use the bridge class in the Arduino IDE. It is the core of Yun solution. We must make sure the serial Interface of Arduino is not used by other hardware.

# 2 CONFIGURE YUN SHIELD

## 2.1 Find the ip addresses

The Yun Shield has a WiFi interface and a LAN port. Either of them has IP address, can be used for internet connection and device management.

### Factory IP of WiFi port



当前连接到:

Dragino-A84041136FFC
Internet 访问

未识别的网络
无网络访问

拨号和 VPN
宽带连接
USB-KEY DIAL
WCDMA

无线网络连接
Dragino-A84041136FFC 已连接
TP-LINK-edwin

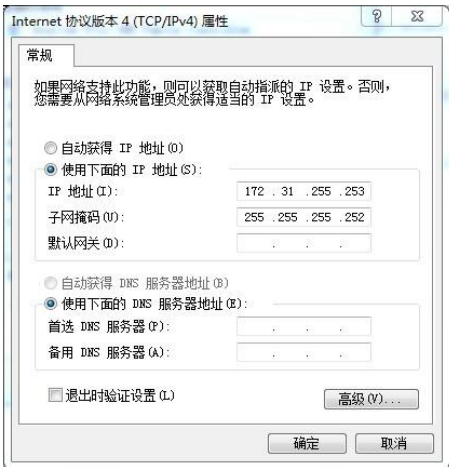
打开网络和共享中心

100% 20:58 2014/7/2

At the first boot of Yun Shield, it will auto generate an unsecure WiFi network call *Dragino2-xxxxxx*

User can use their laptop to connect to this WiFi network. The laptop will get an IP 192.168.240.xxx and the Yun Shield has the default IP 192.168.240.1

### Fall Back IP



Internet 协议版本 4 (TCP/IPv4) 属性

常规

如果网络支持此功能，则可以获取自动指派的 IP 设置。否则，您需要从网络系统管理员处获得适当的 IP 设置。

自动获得 IP 地址(O)
[✓ 使用下面的 IP 地址(S):]

| | |
|---|---|
| IP 地址(I): | 172 . 31 . 255 . 253 |
| 子网掩码(U): | 255 . 255 . 255 . 252 |
| 默认网关(D): | . . . |

自动获得 DNS 服务器地址(B)
[✓ 使用下面的 DNS 服务器地址(E):]

| | |
|---|---|
| 首选 DNS 服务器(P): | . . . |
| 备用 DNS 服务器(A): | . . . |

☐ 退出时验证设置(L)

A fall back IP 172.31.255.254/255.255.255.252 is assigned to Yun Shield's LAN port so user can always access Yun Shield with this ip if their laptop has the IP 172.31.255.253/255.255.255.252.

### Detect IP from Arduino IDE

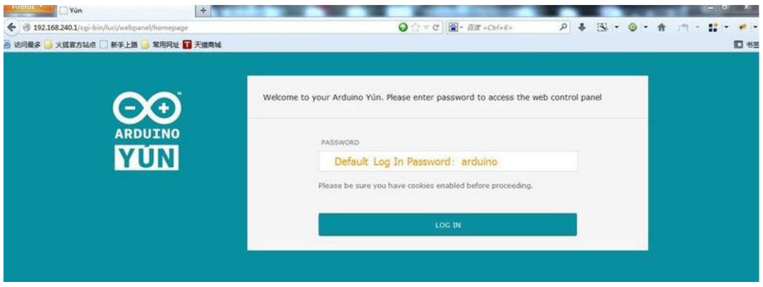
If Yun Shield's Ethernet port is connected to the uplink router or the WiFi interface is associated to the WiFi router. The PC in the same network can use Arduino IDE to detect Yun Shield's IP address as described in Detected Yun Shield.

## 2.2 Configure Method

The Yun Shield runs Open Source Linux system. If user has a PC at the same network as Yun Shield, user can access its system via either **Web Interface** or **Secure Shell (SSH)**.

### 2.2.1 Access via web interface

The recommended browsers to configure Yun Shield are **Firefox** and **Chrome**. Simply type the IP address into your browser and you will see the log in page of Yun Shield.


192.168.240.1/cgi-bin/luci/webpanel/homepage

Welcome to your Arduino Yún. Please enter password to access the web control panel

PASSWORD

Default Log In Password: arduino

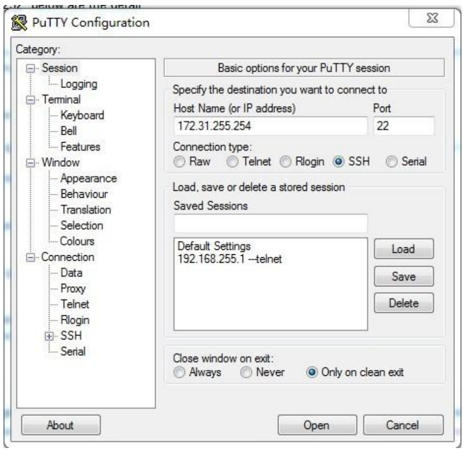
Please be sure you have cookies enabled before proceeding.

LOG IN

Default User name and Password for Yun Shield is root/dragino.

### 2.2.2 Access via SSH

Via SSH access, user can access to the Linux system directly and customized the system to support more features and applications.


PuTTY Configuration

Basic options for your PuTTY session

Specify the destination you want to connect to

Host Name (or IP address): 172.31.255.254  Port: 22

Connection type: Raw Telnet Rlogin [✓ SSH] Serial

Load, save or delete a stored session

Saved Sessions: Default Settings, 192.168.255.1 --telnet

Close window on exit: Always Never [✓ Only on clean exit]

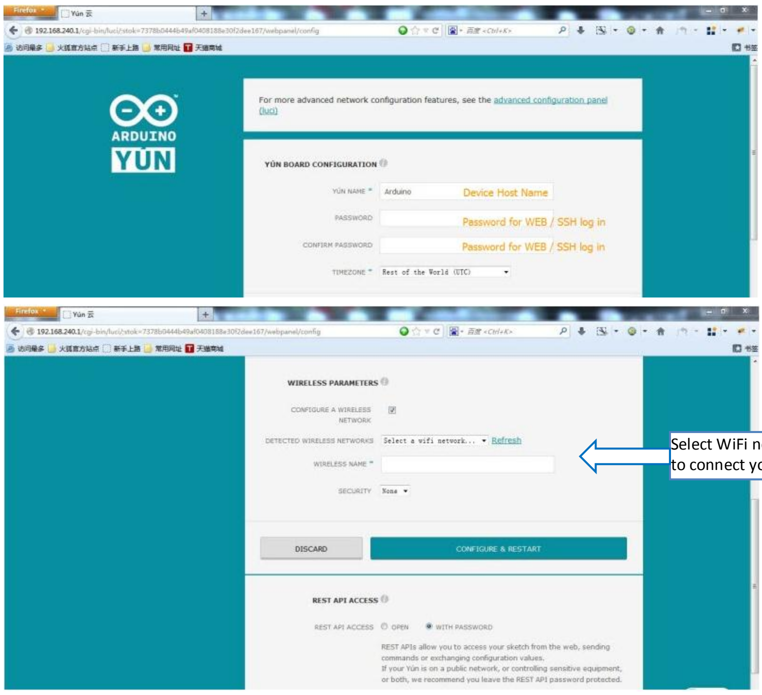
SSH Access:

| | |
|---|---|
| IP address: | IP Address of Yun Shield |
| Port: | 22 |
| User Name: | root |
| Password: | dragino (default) |

## 2.3 Web Configure Pages

### 2.3.1 General Set Up

After log in, the GUI will show the WIFI / ETH interface status. Click the Configure button and now user can configure the device password and network parameters.



For more advanced network configuration features, see the advanced configuration panel (luci)

YÚN BOARD CONFIGURATION

| | | |
|---|---|---|
| YÚN NAME * | Arduino | Device Host Name |
| PASSWORD | | Password for WEB / SSH log in |
| CONFIRM PASSWORD | | Password for WEB / SSH log in |
| TIMEZONE * | Rest of the World (UTC) | |

WIRELESS PARAMETERS

| | |
|---|---|
| CONFIGURE A WIRELESS NETWORK | ☑ |
| DETECTED WIRELESS NETWORKS | Select a wifi network... Refresh |
| WIRELESS NAME * | |
| SECURITY | None |

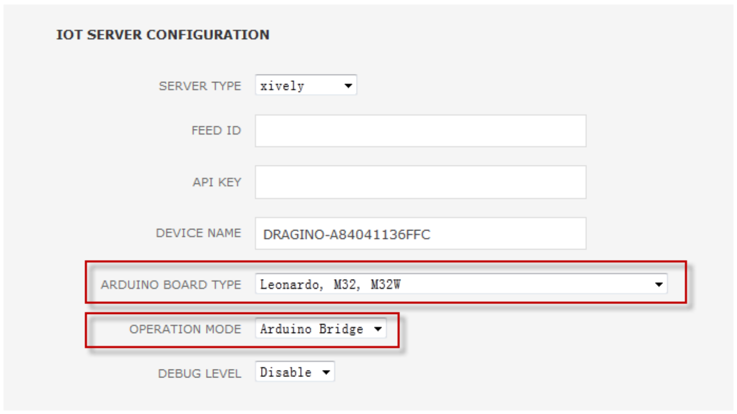
Select WiFi network and key in the password to connect your wifi router

REST API ACCESS

REST API ACCESS: OPEN [✓ WITH PASSWORD]

REST APIs allow you to access your sketch from the web, sending commands or exchanging configuration values.
If your Yún is on a public network, or controlling sensitive equipment, or both, we recommend you leave the REST API password protected.

### 2.3.2 Arduino related set up



IOT SERVER CONFIGURATION

| | |
|---|---|
| SERVER TYPE | xively |
| FEED ID | |
| API KEY | |
| DEVICE NAME | DRAGINO-A84041136FFC |
| ARDUINO BOARD TYPE | Leonardo, M32, M32W |
| OPERATION MODE | Arduino Bridge |
| DEBUG LEVEL | Disable |

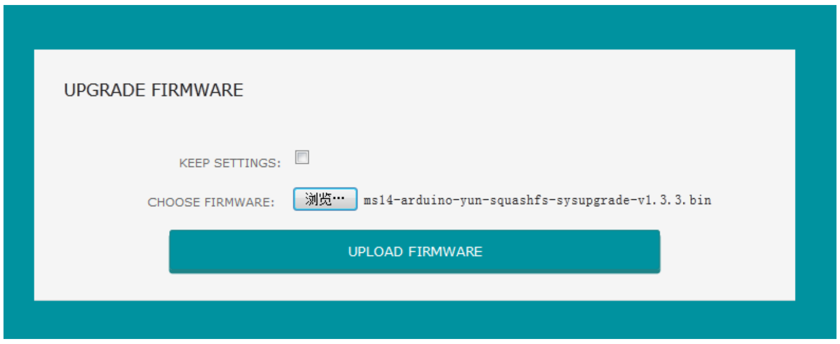
**Arduino Board Type**: Define the bootloarder/mcu type/ fuse setting during Sketch upload.

**Operation Mode:** make sure it is in Arduino Bridge mode so the Bridge class for Arduino Yun works.

### 2.3.3 Upgrade

Yun Shield firmware can be upgraded via the GUI for bug fixes / system improvement or new features.

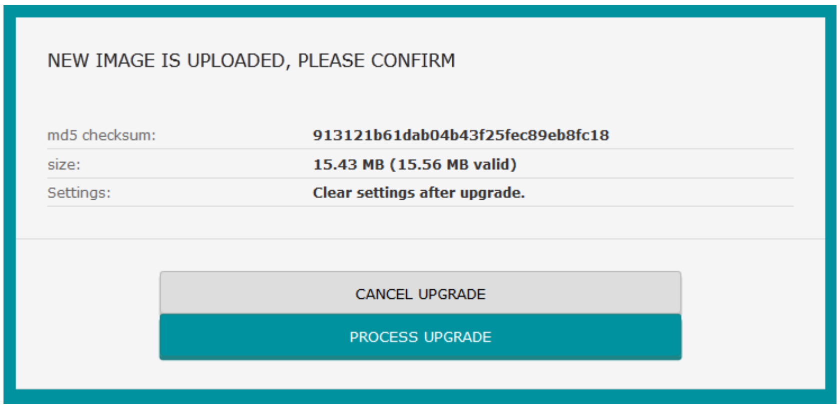
Go to **GUI → Upgrade** page and select the correct firmware to upgrade. The firmware used for web upgrade should be a **sysupgrade** type firmware, user can choose if keep settings or not after upgrade.



UPGRADE FIRMWARE

KEEP SETTINGS: ☐

CHOOSE FIRMWARE: 浏览… ms14-arduino-yun-squashfs-sysupgrade-v1.3.3.bin



NEW IMAGE IS UPLOADED, PLEASE CONFIRM

| | |
|---|---|
| md5 checksum: | 913121b61dab04b43f25fec89eb8fc18 |
| size: | 15.43 MB (15.56 MB valid) |
| Settings: | Clear settings after upgrade. |

Normally it will take about 2 minutes to flash the new firmware. Then all the LEDS will blink together which indicates that the system reboot with the new firmware.

The firmware version info can be check from this link: [Yun Firmware Change log]

## 3 USE WITH ARDUINO BOARDS

The Yun Shield use SPI for uploading sketch and use UART port for Bridge class to talk to the AVR. While connects Yun Shield to Arduino Board, below points should be checked:

- Whether the Arduino Board is power by DC jack
- If the board type setting is correct in Yun Shield. ()
- If the board type setting is correct in Arduino IDE
- Whether the Arduino SPI and UART is not influenced by other hardware
- Make sure the UART mode is in Arduino Bridge mode.

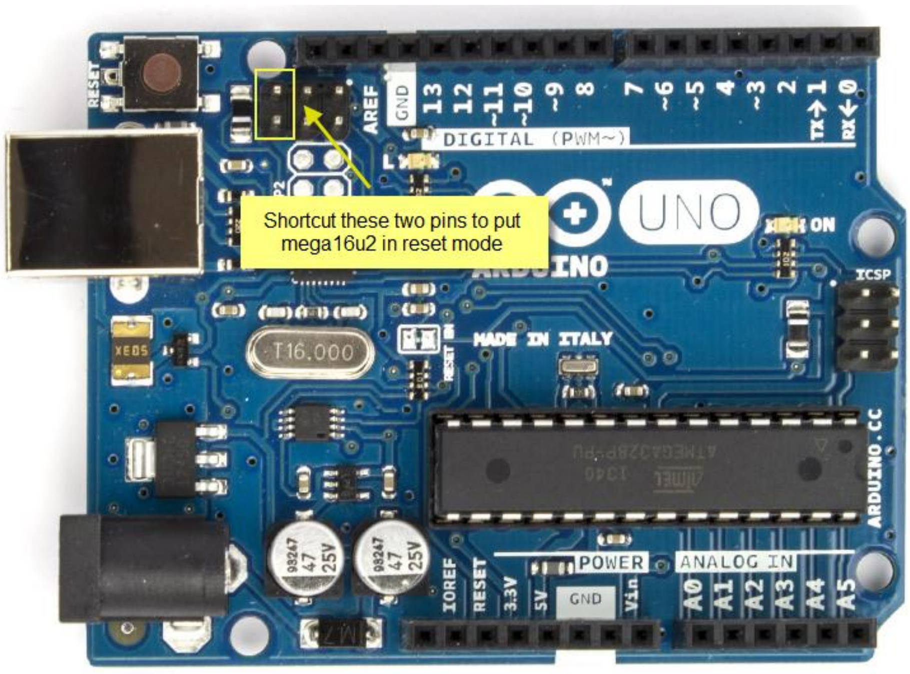
## 3.1 Connects to Arduino Boards

### 3.1.1 Connect to Leonardo

Simply plug the Yun Shield on top of the Leonardo, and power the Leonardo via DC jack.
In Arduino IDE, the **board type** should select **Arduino Yun.**

### 3.1.2 Connect to Arduino Uno

1) In UNO, the uart connection between mega328P and mega16u2 will influence the bridge feature with Yun Shield. So we have to disconnect it by set the mega16u2 into reset mode. As below:



Note: USB upgrade/debug won’t work after this change, User will have to upgrade sketch and debug via Arduino IDE via WiFi (see examples)

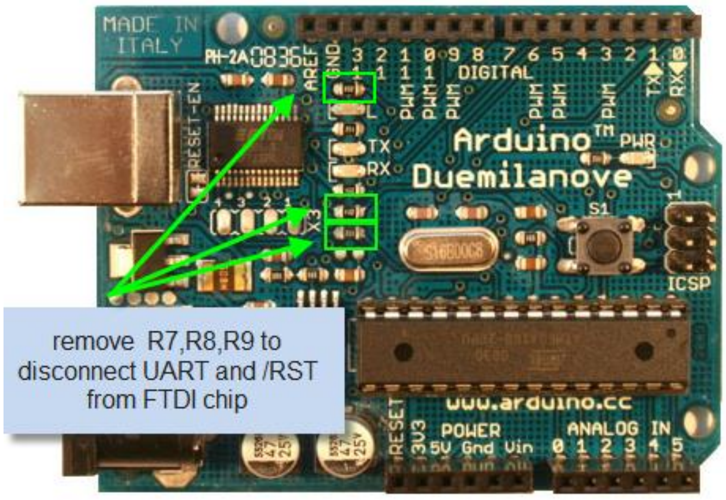
2) Add a “**Uno Yun**” board type in the file: Arduino\hardware\arduino\avr\board.txt. as below and reopen the Arduino IDE:

```
##############################################################
unoyun.name=Arduino Uno -- Dragino Yún
unoyun.upload.via_ssh=true

unoyun.vid.0=0x2341
unoyun.pid.0=0x0043
unoyun.vid.1=0x2341
unoyun.pid.1=0x0001
unoyun.upload.tool=avrdude
unoyun.upload.protocol=arduino
unoyun.upload.maximum_size=32256
unoyun.upload.maximum_data_size=2048
unoyun.upload.speed=57600
unoyun.upload.disable_flushing=true
unoyun.upload.use_1200bps_touch=true
unoyun.upload.wait_for_upload_port=true

unoyun.bootloader.tool=avrdude
unoyun.bootloader.low_fuses=0xff
unoyun.bootloader.high_fuses=0xde
unoyun.bootloader.extended_fuses=0x05
unoyun.bootloader.file=optiboot/optiboot_atmega328.hex
unoyun.bootloader.unlock_bits=0x3F
unoyun.bootloader.lock_bits=0x0F

unoyun.build.mcu=atmega328p
unoyun.build.f_cpu=16000000L
unoyun.build.board=AVR_YUN
unoyun.build.core=arduino
unoyun.build.variant=standard
##############################################################
```

3) Put the Yun Shield on top of Uno and power it via DC jack.

### 3.1.3 Connect to Arduino Duemilanove/Diecimila

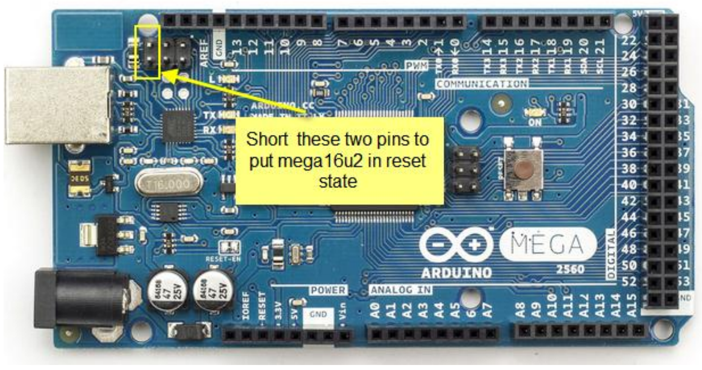
1) In Duemilanove/Diecimila, the mega avr uart interface is connected to the FTDI chip, we have to disconnect them as shown in below picture:



2) Add a "Duemilanove Yun" board type in the file: Arduino\hardware\arduino\avr\board.txt. user can use the UnoYun board type if they has mega328p. for mega328/mega168/mega168p, they can modify the upload.maximum_data_size/ upload.maximum_size and build.mcu accordingly.
3) Put the Yun Shield on top of Duemilanove and power it via DC jack.

### 3.1.4 Connect to Arduino Mega2560

1) In Mega2560, the uart connection between mega2560 and mega16u2 will influence the bridge feature with Yun Shield. So we have to disconnect it by set the mega16u2 into reset mode. As below:



2) Add a "**Mega2560 Yun**" board type in the file: Arduino\hardware\arduino\avr\board.txt. as below and reopen the Arduino IDE:

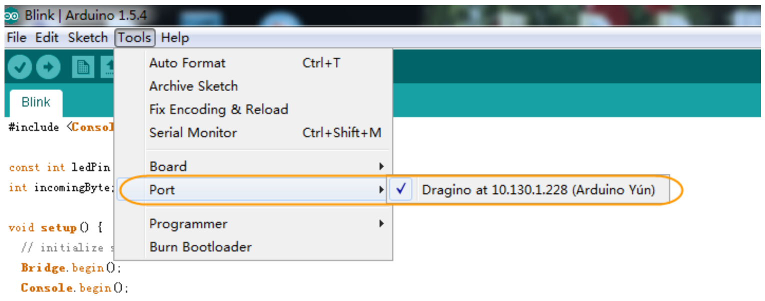
##################################################################

```
mega2560Yun.name=Arduino Mega 2560 -- Dragino Yún
mega2560Yun.upload.via_ssh=true

mega2560Yun.vid.0=0x2341
mega2560Yun.pid.0=0x0044
mega2560Yun.vid.1=0x2341
mega2560Yun.pid.1=0x003f
mega2560Yun.upload.tool=avrdude
mega2560Yun.upload.protocol=arduino
mega2560Yun.upload.maximum_size=258048
mega2560Yun.upload.maximum_data_size=8192
mega2560Yun.upload.speed=57600
mega2560Yun.upload.disable_flushing=true
mega2560Yun.upload.use_1200bps_touch=true
mega2560Yun.upload.wait_for_upload_port=true

mega2560Yun.bootloader.tool=avrdude
mega2560Yun.bootloader.low_fuses=0xff
mega2560Yun.bootloader.high_fuses=0xd8
mega2560Yun.bootloader.extended_fuses=0xfd
mega2560Yun.bootloader.file=stk500v2/stk500boot_v2_mega2560.hex
mega2560Yun.bootloader.unlock_bits=0x3F
mega2560Yun.bootloader.lock_bits=0x0F

mega2560Yun.build.mcu=atmega2560
mega2560Yun.build.f_cpu=16000000L
mega2560Yun.build.board=AVR_MEGA2560
mega2560Yun.build.core=arduino
mega2560Yun.build.variant=mega
##############################################################
```

3) Put the Yun Shield on top of Mega2560 and power it via DC jack.

## 3.2 Detect Yun Shield

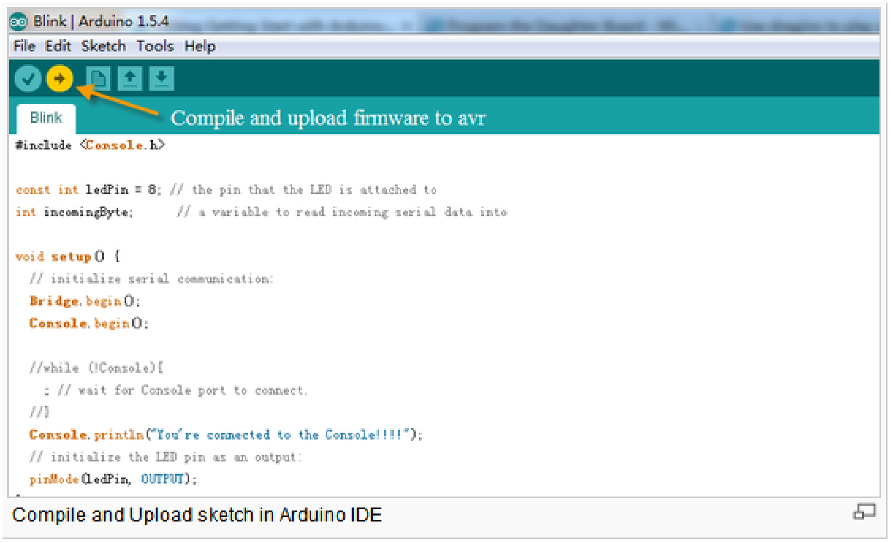
Make sure your laptop and Yun Shield are in the same network. The Yun Shield will broadcast data in this network and the Arduino IDE will receive this data and show the Yun Shield in ***Tools→Port.***



```
#include <Consol
const int ledPin
int incomingByte;
void setup() {
  // initialize
  Bridge.begin();
  Console.begin();
```

## 3.3 Upload Sketch

1) In the Arduino IDE, choose the correct board type for the AVR module.
2) In Arduino IDE → port, choose the correct port. (should be Arduino Yun port with an ip address)
3) In the Yun Shield GUI → Sensor page, choose the correct board type for upload.
4) Compile the sketch and upload it to the Arduino Board. During upload, The Yun Shield will ask you to key in the password, by default, the password is **dragino**.


Blink | Arduino 1.5.4
File Edit Sketch Tools Help
Blink
Compile and upload firmware to avr

```
#include <Console.h>

const int ledPin = 8; // the pin that the LED is attached to
int incomingByte;      // a variable to read incoming serial data into

void setup() {
  // initialize serial communication:
  Bridge.begin();
  Console.begin();

  //while (!Console){
    ; // wait for Console port to connect.
  //}
  Console.println("You're connected to the Console!!!!");
  // initialize the LED pin as an output:
  pinMode(ledPin, OUTPUT);
```

Compile and Upload sketch in Arduino IDE

## 3.4 Bridge Library

The Bridge Library simplifies the communication between the Arduino Board and Yun Shield.

Bridge commands from the AVR (Arduino Board) are interpreted by Python on the Yun Shield. Its role is to execute programs on the GNU/Linux side when asked by Arduino, provide a shared storage space for sharing data like sensor readings between the Arduino and the Internet, and receiving commands from the Internet and passing them directly to the Arduino.

There are detail explain and lots of example to show how to use Bridge in the Arduino Official Website. Reference link is: [http://arduino.cc/en/Reference/YunBridgeLibrary](http://arduino.cc/en/Reference/YunBridgeLibrary)

# 4 EXAMPLES

## 4.1 Example 1: Say hello to Linux

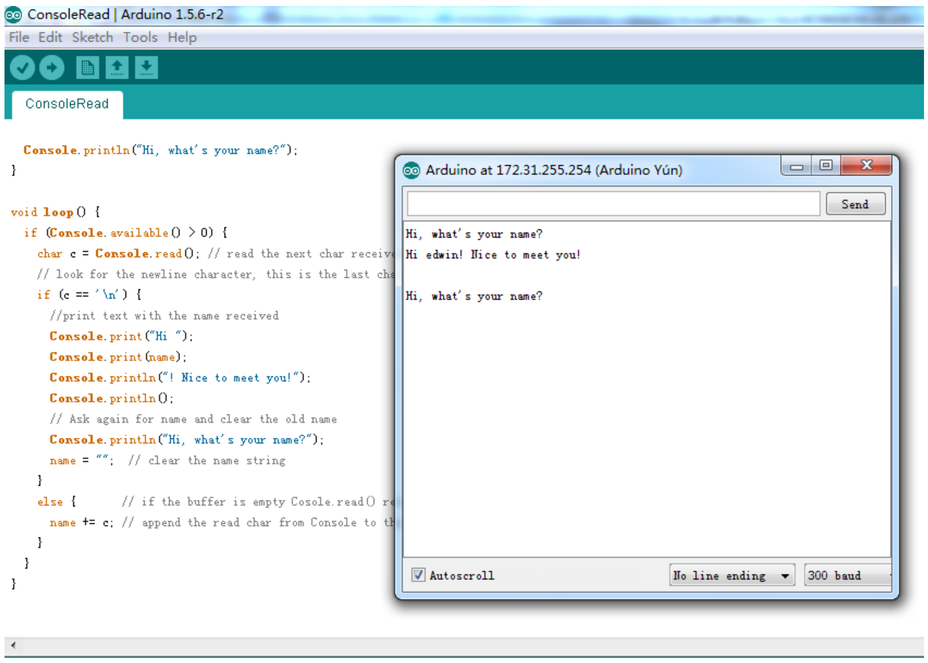
### Introduction:

This example is a hello test between the Arduino and Yun Shield. The example can be found on the Arduino IDE--> File --> Examples --> Bridge --> ConsoleRead. Tutorial of this example can be found on http://arduino.cc/en/Tutorial/ConsoleRead. Below listing the code and add some detail to understand it with the Yun Shield:

### Code:

```
#include <Console.h> //use Console class for Arduino IDE debug over WiFi, similar to Serial class,
String name;

void setup() {
  // Initialize Console and wait for port to open:
  Bridge.begin();
  Console.begin();

  // Wait for Console port to connect
  while (!Console);

  Console.println("Hi, what's your name?"); //Data flow: Arduino --> Yun Shield --> Arduino IDE
}

void loop() {
  if (Console.available() > 0) {
    char c = Console.read(); //read the next char received, data flow: IDE --> Yun Shield--> Arduino
    // look for the newline character, this is the last character in the string
    if (c == '\n') {
      //print text with the name received
      Console.print("Hi ");
      Console.print(name);
      Console.println("! Nice to meet you!");
      Console.println();
      // Ask again for name and clear the old name
      Console.println("Hi, what's your name?");
      name = "";    // clear the name string
    }
    else {              // if the buffer is empty Cosole.read() returns -1
      name += c; // append the read char from Console to the name string
    }
  }
}
```

### Screen Shot:


ConsoleRead | Arduino 1.5.6-r2
File Edit Sketch Tools Help
ConsoleRead
Arduino at 172.31.255.254 (Arduino Yún)
Send
Autoscroll
No line ending
300 baud

```
  Console.println("Hi, what's your name?");
}

void loop() {
  if (Console.available() > 0) {
    char c = Console.read(); // read the next char receive
    // look for the newline character, this is the last cha
    if (c == '\n') {
      //print text with the name received
      Console.print("Hi ");
      Console.print(name);
      Console.println("! Nice to meet you!");
      Console.println();
      // Ask again for name and clear the old name
      Console.println("Hi, what's your name?");
      name = "";  // clear the name string
    }
    else {       // if the buffer is empty Cosole.read() re
      name += c; // append the read char from Console to th
    }
  }
}
```

```
Hi, what's your name?
Hi edwin! Nice to meet you!

Hi, what's your name?
```

## 4.2 Example 2: Upload data to IoT Server

### Introduction:

This example shows how to log data to the public IoT server "**Xively**". The example is a modified version(change Serial to Console to fit for different Arduino Board and debug over WiFi) from Arduino IDE--> File --> Examples --> Bridge --> XivelyClient. Tutorial of this example can refer http://arduino.cc/en/Tutorial/YunXivelyClient.

Before upload the sketch, make sure:

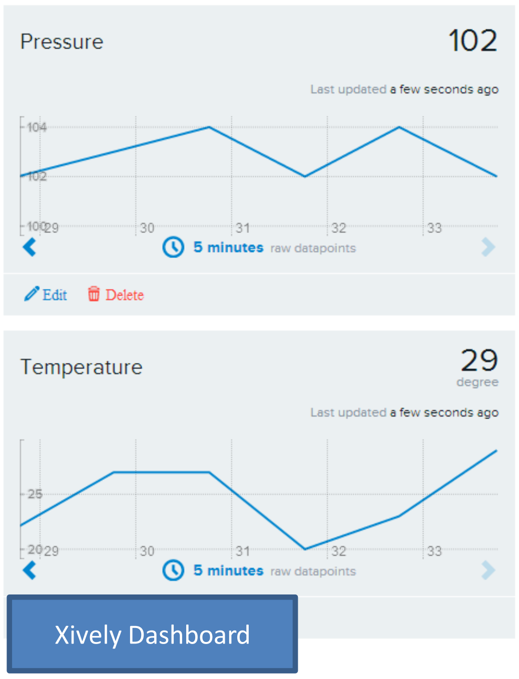
- ✓ The Yun Shield already has internet access
- ✓ Input your FEED ID and API KEY according to the Tutorial. Note, The FEED ID should be within double quotation marks "".
- ✓ Change Serial Class to Console class to fit for different AVRs.

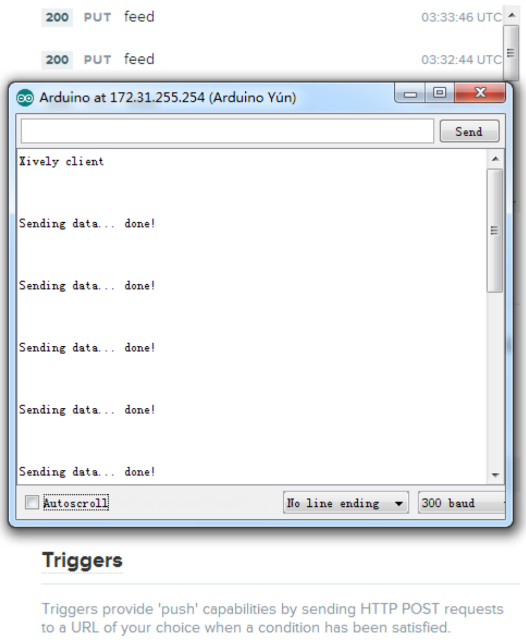
Below listing the code and add some detail to understand it with the Yun Shield:

### Code:

```
// include all Libraries needed:
#include <Process.h>           //Process lib use to call Linux Commands in Yun Shield
#include <Console.h>           //Console lib, used to show debug info in Arduino IDE
#include "passwords.h"          // contains my passwords, see below

/*
   NOTE: passwords.h is not included with this repo because it contains my passwords.
  You need to create it for your own version of this application.    To do so, make
  a new tab in Arduino, call it passwords.h, and include the following variables and constants:

  #define APIKEY          "foo"                    // replace your pachube api key here
  #define FEEDID          "0000"                     // replace your feed ID
  #define USERAGENT        "my-project"              // user agent is the project name
  */


// set up net client info:
const unsigned long postingInterval = 60000;    //delay between updates to xively.com
unsigned long lastRequest = 0;          // when you last made a request
String dataString = "";

void setup() {
   // start console:
   Bridge.begin();
   Console.begin();

   while (!Console);      // wait for Network Serial to open
   Console.println("Xively client");

   // Do a first update immediately
   updateData();
   sendData();
   lastRequest = millis();
}

void loop() {
   // get a timestamp so you can calculate reading and sending intervals:
   long now = millis();

   // if the sending interval has passed since your
   // last connection, then connect again and send data:
   if (now - lastRequest >= postingInterval) {
     updateData();
     sendData();
     lastRequest = now;
   }
}

void updateData() {
   // convert the readings to a String to send it:
   dataString = "Temperature,";
   dataString += random(10) + 20;
   // add pressure:
   dataString += "\nPressure,";
   dataString += random(5) + 100;
}

// this method makes a HTTP connection to the server:
void sendData() {
   // form the string for the API header parameter:
   String apiString = "X-ApiKey: ";
   apiString += APIKEY;

   // form the string for the URL parameter:
   String url = "https://api.xively.com/v2/feeds/";
   url += FEEDID;
   url += ".csv";

   // Send the HTTP PUT request, form the linux command and use Process Class to send this command to Yun
Shield

   // Is better to declare the Process here, so when the
   // sendData function finishes the resources are immediately
   // released. Declaring it global works too, BTW.
   Process xively;
   Console.print("\n\nSending data... ");
   xively.begin("curl");
   xively.addParameter("-k");
   xively.addParameter("--request");
   xively.addParameter("PUT");
   xively.addParameter("--data");
   xively.addParameter(dataString);
   xively.addParameter("--header");
   xively.addParameter(apiString);
   xively.addParameter(url);
   xively.run();
   Console.println("done!");

   // If there's incoming data from the net connection,
   // send it out the Console:
   while (xively.available() > 0) {
     char c = xively.read();
     Console.write(c);
   }

}
```

## Screen Shot:




200 PUT feed 03:33:46 UTC
200 PUT feed 03:32:44 UTC
Arduino at 172.31.255.254 (Arduino Yún)
Send
Autoscroll
No line ending
300 baud
Triggers

```
Xively client


Sending data... done!


Sending data... done!


Sending data... done!


Sending data... done!


Sending data... done!
```

Triggers provide 'push' capabilities by sending HTTP POST requests to a URL of your choice when a condition has been satisfied.

## 4.3 Example 3: Log Data to USB flash

**Introduction:**

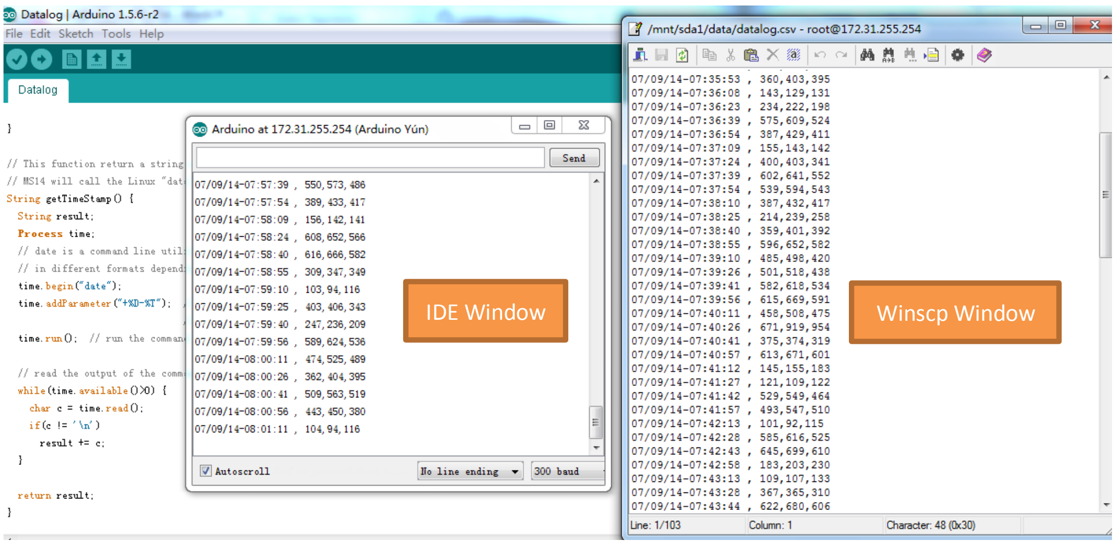
This example shows how to log data to a USB flash. The sketch used in this example is same as http://wiki.dragino.com/index.php?title=Arduino_Yun_examples#Log_sensor_data_to_USB_flash. And the source code is in this link.

The Yun Shield will auto mount the USB flash to directory /mnt/sda1. And the sketch will append the sensor data to the file /mnt/sda1/data/datalog.csv. So **make sure** there is such file in the USB flash before running the sketch

**Code:**

```
#include <FileIO.h>       //FileIO class allow user to operate Linux file system
#include <Console.h>      //Console class provide the interactive between IDE and Yun Shield


void setup() {
  // Initialize the Console
  Bridge.begin();
  Console.begin();
  FileSystem.begin();

  while(!Console);   // wait for Serial port to connect.
  Console.println("Filesystem datalogger\n");
}


void loop () {
  // make a string that start with a timestamp for assembling the data to log:
  String dataString;
  dataString += getTimeStamp();
  dataString += " , ";

  // read three sensors and append to the string:
  for (int analogPin = 0; analogPin < 3; analogPin++) {
    int sensor = analogRead(analogPin);
    dataString += String(sensor);
    if (analogPin < 2) {
      dataString += ",";   // separate the values with a comma
    }
  }

  // open the file. note that only one file can be open at a time,
  // so you have to close this one before opening another.
  // The USB flash card is mounted at "/mnt/sda1" by default
  File dataFile = FileSystem.open("/mnt/sda1/data/datalog.csv", FILE_APPEND);

  // if the file is available, write to it:
  if (dataFile) {
    dataFile.println(dataString);
    dataFile.close();
    // print to the serial port too:
    Console.println(dataString);
  }
  // if the file isn't open, pop up an error:
  else {
    Console.println("error opening datalog.csv");
  }

  delay(15000);    //Write every 15 seconds

}

// getTimeStamp function return a string with the time stamp
// Yun Shield will call the Linux "date" command and get the time stamp
String getTimeStamp() {
  String result;
  Process time;
  // date is a command line utility to get the date and the time
  // in different formats depending on the additional parameter
  time.begin("date");
  time.addParameter("+%D-%T");    // parameters: D for the complete date mm/dd/yy
                                   //                       T for the time hh:mm:ss
  time.run();    // run the command

  // read the output of the command
  while(time.available()>0) {
    char c = time.read();
    if(c != '\n')
      result += c;
  }

  return result;
}
```

## Screen Shot:


Datalog | Arduino 1.5.6-r2
File Edit Sketch Tools Help
Datalog
Arduino at 172.31.255.254 (Arduino Yún)
Send
Autoscroll
No line ending
300 baud
IDE Window
Winscp Window

```
}

// This function return a string
// MS14 will call the Linux "dat
String getTimeStamp() {
  String result;
  Process time;
  // date is a command line util
  // in different formats depend
  time.begin("date");
  time.addParameter("+%D-%T");

  time.run();  // run the comman

  // read the output of the comm
  while(time.available()>0) {
    char c = time.read();
    if(c != '\n')
      result += c;
  }

  return result;
}
```

```
07/09/14-07:57:39 ,  550, 573, 486
07/09/14-07:57:54 ,  389, 433, 417
07/09/14-07:58:09 ,  156, 142, 141
07/09/14-07:58:24 ,  608, 652, 566
07/09/14-07:58:40 ,  616, 666, 582
07/09/14-07:58:55 ,  309, 347, 349
07/09/14-07:59:10 ,  103, 94, 116
07/09/14-07:59:25 ,  403, 406, 343
07/09/14-07:59:40 ,  247, 236, 209
07/09/14-07:59:56 ,  589, 624, 536
07/09/14-08:00:11 ,  474, 525, 489
07/09/14-08:00:26 ,  362, 404, 395
07/09/14-08:00:41 ,  509, 563, 519
07/09/14-08:00:56 ,  443, 450, 380
07/09/14-08:01:11 ,  104, 94, 116
```

/mnt/sda1/data/datalog.csv - root@172.31.255.254

```
07/09/14-07:35:53 , 360,403,395
07/09/14-07:36:08 , 143,129,131
07/09/14-07:36:23 , 234,222,198
07/09/14-07:36:39 , 575,609,524
07/09/14-07:36:54 , 387,429,411
07/09/14-07:37:09 , 155,143,142
07/09/14-07:37:24 , 400,403,341
07/09/14-07:37:39 , 602,641,552
07/09/14-07:37:54 , 539,594,543
07/09/14-07:38:10 , 387,432,417
07/09/14-07:38:25 , 214,239,258
07/09/14-07:38:40 , 359,401,392
07/09/14-07:38:55 , 596,652,582
07/09/14-07:39:10 , 485,498,420
07/09/14-07:39:26 , 501,518,438
07/09/14-07:39:41 , 582,618,534
07/09/14-07:39:56 , 615,669,591
07/09/14-07:40:11 , 458,508,475
07/09/14-07:40:26 , 671,919,954
07/09/14-07:40:41 , 375,374,319
07/09/14-07:40:57 , 613,671,601
07/09/14-07:41:12 , 145,155,183
07/09/14-07:41:27 , 121,109,122
07/09/14-07:41:42 , 529,549,464
07/09/14-07:41:57 , 493,547,510
07/09/14-07:42:13 , 101,92,115
07/09/14-07:42:28 , 585,616,525
07/09/14-07:42:43 , 645,699,610
07/09/14-07:42:58 , 183,203,230
07/09/14-07:43:13 , 109,107,133
07/09/14-07:43:28 , 367,365,310
07/09/14-07:43:44 , 622,680,606
```

Line: 1/103    Column: 1    Character: 48 (0x30)

## 4.4 Example 4: Use MQTT

### Introduction:

MQTT is a machine-to-machine (M2M)/"Internet of Things" connectivity protocol. It was designed as an extremely lightweight publish/subscribe messaging transport. It is useful for connections with remote locations where a small code footprint is required and/or network bandwidth is at a premium. For example, it has been used in sensors communicating to a broker via satellite link, over occasional dial-up connections with healthcare providers, and in a range of home automation and small device scenarios. It is also ideal for mobile applications because of its small size, low power usage, minimised data packets, and efficient distribution of information to one or many receivers.

This example shows how to use Yun Shield with SSL MQTT protocol.

### Install required packages

Install below packages for MQTT:

```
root@Arduino:~# opkg update
root@Arduino:~# opkg install libcares
root@Arduino:~# opkg install libopenssl
root@Arduino:~# opkg install libmosquitto
root@Arduino:~# opkg install mosquitto-client
```

### Test with public MQTT test server:

test.mosquitto.org is a hosts a publicly available Mosquitto MQTT server/broker. User can post and subscribe to this MQTT server for testing. To test this server with SSL connection, user has to download the certificate authority file mosquitto.org.crt to verify the server connection.

Open two SSH windows. In the first window, we subscribe to a topic with below command:

```
mosquitto_sub -h test.mosquitto.org -p 8883 --cafile mosquitto.org.crt -t dragino/device0/temperature
```

This command will listen to this topic and display any change on the server.

And in the other window, we publish the change by another command:

```
mosquitto_pub -h test.mosquitto.org -p 8883 --cafile mosquitto.org.crt -t dragino/device0/temperature -m 31
```

Once the publish command is issued, we can see the result will display in the subscribe command.

# 5 FAQ

## 5.1 What is the difference between the official Arduino Yun and Yun Shield?

In Hardware Aspect

Both Arduino Yun and Yun Shield have the same CPU, Memory size and RAM size for the Linux system. The Arduino Yun is an integrated of Linux Part and MCU part, Yun Shield is designed as a shield which can be used with exist Arduino boards.

Basically, The Yun Shield + Arduino Leonardo equally to an Arduino Yun, but Yun Shield is more flexible because it can be used with other Arduino boards such as Arduino Uno, Duemilanove, Diecimila etc.

Yun Shield is duplicable and producible: The design of Yun Shield is open and the most complicate and difficult parts are done in the Dragino HE module. User can purchase the Dragino HE module separately to customized their IoT project and release their variant Yun Solution.

Stable and Flexible WiFi performance: Arduino Yun use chip antenna design, if there is a shield on top of the Arduino Yun, the wifi will be greatly shielded and lead to a poor wifi performance. Instead, Yun Shield use external Antenna design, user can connect different type of antennas to the i-pex connector of Yun Shield, this make the installation is more flexible and possible to transfer the signal to several km distance.

In Software Aspect

The Yun Shield software is derived from Arduino Yun with some bugs fixed; feature added and support more board types.

## 5.2 Is Yun Shield compatible with a variant Arduino Board?

If the Arduino board is a variant from the boards described in Support Board Type, then it should be compatible. Below is the check list for the compatibility.

- ✓ The variant has 7~15v power in the VIN pin to power the Yun Shield.
- ✓ The variant has same definition and position of SPI pins in the ICSP header as the official board.
- ✓ The variant has same definition and position of D0 and D1 pins in the ICSP header in the official board.
- ✓ Check whether there are ICs connected to the SPI and UART of the AVR and evaluate if they will influence the communication between Yun Shield and the AVR MCU.

The system structure section well explains the working principle of Yun Shield, if user still not sure if Yun Shield is compatible with their board or having trouble in the compatibility. Then can send the board info to support@dragino.com and our support team will review and check it.

## 5.3 How to set up /www/sd and /mnt/sd?

To use the /www/sd and /mnt/sd as the same as Arduino Yun, user can prepare a USB flash and create directory /arduino and /arduino/www at the root of USB flash. Then input the USB flash into the Yun Shield and it will automatically create /www/sd and /mnt/sd and link to /arduino and /arduino/www

## 5.4 Arduino IDE doesn't detect Yun Shield

Check below points if this issue happens:

- ✓ The Arduino IDE version is 1.5.4 or later
- ✓ Your PC and Yun Shield are in the same network.
- ✓ If Yun Shield boot in advance than Arduino IDE, this may happen. So try to power off/on the Yun Shield and check again.

## 5.5 Where can I find the source code of Yun Shield?

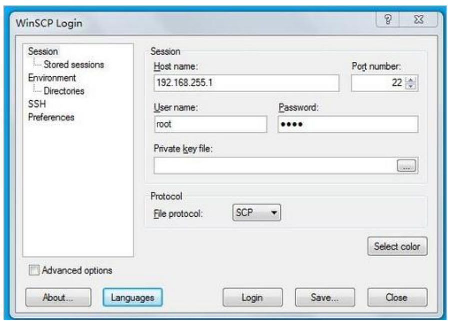
The Yun Shield source can be found at: https://github.com/dragino/linino

## 5.6 How to Upload, Download or Edit files in Yun Shield

Yun Shield has a built-in Linux system and support SCP protocol. User can upload, download or edit the Linux files using SCP tools.

In windows OS, the scp tool is winscp. Install it and log into Yun Shield as below:

- ✧ Host Name: Yun Shield IP address
- ✧ User Name: root
- ✧ Password: arduino (default)
- ✧ Protocol: SCP

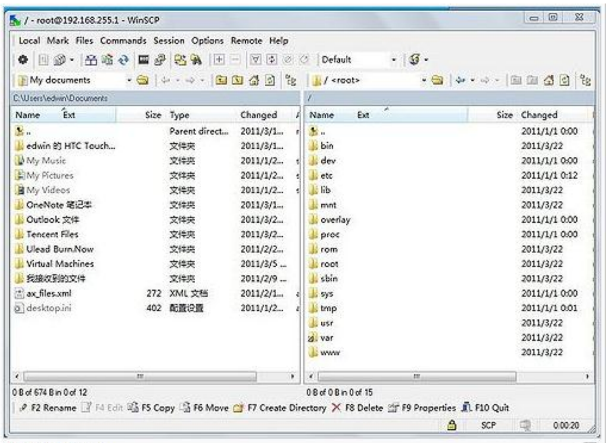


WinSCP Login

Session
- Host name: 192.168.255.1
- Port number: 22
- User name: root
- Password: ••••
- Private key file:

Protocol
- File protocol: SCP

The log in process will alter two warning, just ignore it. After log in, a management panel will appear. The left part of this panel is your PC's directories and the right part shows the directories of Yun Shield, you can upload/download files by dragging, or double click the files to modify its content.


/ - root@192.168.255.1 - WinSCP
Local Mark Files Commands Session Options Remote Help
Default
My documents
/ <root>
F2 Rename F4 Edit F5 Copy F6 Move F7 Create Directory F8 Delete F9 Properties F10 Quit
SCP
0:00:20

C:\Users\edwin\Documents

| Name | Ext | Size | Type | Changed |
|---|---|---|---|---|
| .. | | | Parent direct... | 2011/3/1... |
| edwin 的 HTC Touch... | | | 文件夹 | 2011/3/1... |
| My Music | | | 文件夹 | 2011/1/2... |
| My Pictures | | | 文件夹 | 2011/1/2... |
| My Videos | | | 文件夹 | 2011/1/2... |
| OneNote 笔记本 | | | 文件夹 | 2011/3/1... |
| Outlook 文件 | | | 文件夹 | 2011/3/2... |
| Tencent Files | | | 文件夹 | 2011/3/2... |
| Ulead Burn.Now | | | 文件夹 | 2011/2/2... |
| Virtual Machines | | | 文件夹 | 2011/3/5 ... |
| 我接收到的文件 | | | 文件夹 | 2011/2/9 ... |
| ax_files.xml | | 272 | XML 文档 | 2011/2/1... |
| desktop.ini | | 402 | 配置设置 | 2011/1/2... |

0 B of 674 B in 0 of 12

/

| Name | Ext | Size | Changed |
|---|---|---|---|
| .. | | | 2011/1/1 0:00 |
| bin | | | 2011/3/22 |
| dev | | | 2011/1/1 0:00 |
| etc | | | 2011/1/1 0:12 |
| lib | | | 2011/3/22 |
| mnt | | | 2011/3/22 |
| overlay | | | 2011/1/1 0:00 |
| proc | | | 2011/1/1 0:00 |
| rom | | | 2011/3/22 |
| root | | | 2011/3/22 |
| sbin | | | 2011/3/22 |
| sys | | | 2011/1/1 0:00 |
| tmp | | | 2011/1/1 0:01 |
| usr | | | 2011/3/22 |
| var | | | 2011/3/22 |
| www | | | 2011/3/22 |

0 B of 0 B in 0 of 15

WinSCP Panel

## 5.7 How to reset the Yun Shield?

Yun Shield has a toggle button which can be used for reset. When the system of Yun Shield is running, user can press the toggle button to reset the device.

- If pressing the toggle button and release after **5 seconds**, it will reset the WiFi setting and other settings will be kept.
- If pressing the toggle button and release after **30 seconds**, it will reset ALL the setting to factory default.

## 5.8 How to recover the Yun Shield in case firmware crash

There are some cases that the Yun Shield fails to boot , for example upgrade an improper firmware or lost power during upgrade.
User is still able to recover the Yun Shield system by using the Failsafe u-boot of Yun Shield.

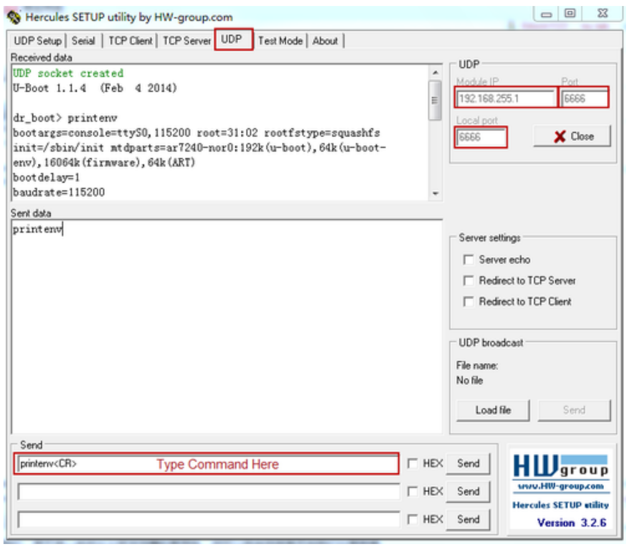
### An instruction in Windows is as below:

**Set up TFTP server**

Download the tftp server (recommend tftp32d.exe). And download the latest Yun firmware from http://www.dragino.com/downloads/index.php?dir=motherboards/ms14/Firmware/Yun/. The firmware we need is the ***kernel*** and ***rootfs-squashfs*** files. Put these firmware files and tftp32d at the same directory. Start the tftp server.

**Download Hercules utility**

Download Hercules, this is the tool we use to transfer commands to Yun Shield in Failsafe mode. Run Hercules and input correct parameters as below:



```
UDP socket created
U-Boot 1.1.4  (Feb  4 2014)

dr_boot> printenv
bootargs=console=ttyS0,115200 root=31:02 rootfstype=squashfs
init=/sbin/init mtdparts=ar7240-nor0:192k(u-boot),64k(u-boot-
env),16064k(firmware),64k(ART)
bootdelay=1
baudrate=115200
```

Sent data: printenv

Module IP: 192.168.255.1 Port: 6666 Local port: 6666

printenv<CR>

| | |
|---|---|
| Protocol: | UDP |
| Module IP: | 192.168.255.1 |
| Port: | 6666 |
| Local port: | 6666 |

**Connect your PC to Yun Shield**

Connect the PC and Yun Shield via an Ethernet cable. Set up PC with below LAN IP **192.168.255.2** and netmask **255.255.255.0**. Disable PC's firewall.

**Power up Yun Shield to Failsafe mode**

Press the Failsafe button and power up Yun Shield; user will see all the LEDs blink together, release the button after 10 seconds and there are some messages will pop up in the **Hercules** panel, which means the Yun Shield has been in Failsafe Netconsole mode and ready to access commands.

User can type the commands in Hercules to transfer and upgrade Yun Shield to the latest firmware with factory settings.

The update commands are as below, replace the xxx with the actually version.
**Note when typing command in Hercules**: user must add **<CR>** at the end of each command; **$** is a special char in Hercules, user should double it (key two $$) when typing.

**Upgrade Kernel**

```
tftpboot 0x81000000 ms14-arduino-yun-kernel-xxx.bin
erase 0x9fea0000 +0x140000
cp.b 0x81000000 0x9fea0000 $filesize
```

**Upgrade rootfs**

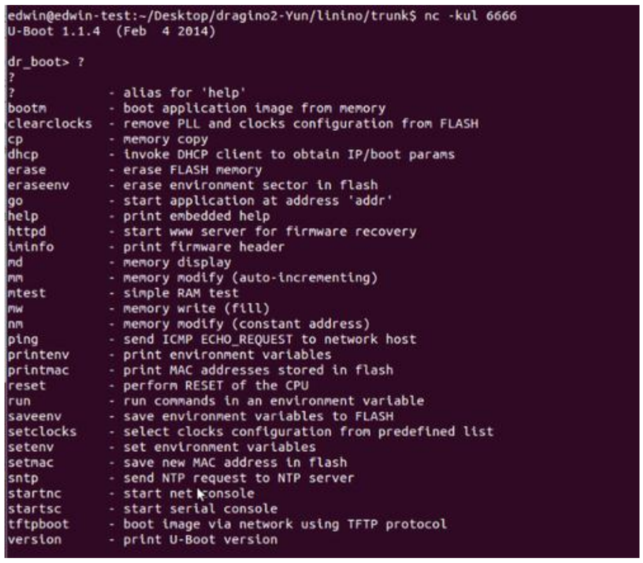
```
tftpboot 0x81000000 ms14-arduino-yun--rootfs-squashfs-xxx.bin
erase 0x9f050000 +0xe50000
cp.b 0x81000000 0x9f050000 $filesize
```

**Reset to the new firmware**

```
reset
```

**Warning**: User should use exactly address number in the erase and cp.b shows, wrong address number may properly destroy the boot-loader of Yun Shield and the device won't boot anymore. Or destroy the radio data of Yun Shield which may lead to a poor wifi performance or incorrect MAC addresses.

**Recover in Linux is similar with Windows,** the mail different is that the tool use in Linux is **nc** and runs with **nc -kul 6666.** Below shows that the Yun Shield has been in Failsafe Netconsole mode and detected by nc.



```
edwin@edwin-test:~/Desktop/dragino2-Yun/linino/trunk$ nc -kul 6666
U-Boot 1.1.4  (Feb  4 2014)

dr_boot> ?
?
?             - alias for 'help'
bootm         - boot application image from memory
clearclocks   - remove PLL and clocks configuration from FLASH
cp            - memory copy
dhcp          - invoke DHCP client to obtain IP/boot params
erase         - erase FLASH memory
eraseenv      - erase environment sector in flash
go            - start application at address 'addr'
help          - print embedded help
httpd         - start www server for firmware recovery
iminfo        - print firmware header
md            - memory display
mm            - memory modify (auto-incrementing)
mtest         - simple RAM test
mw            - memory write (fill)
nm            - memory modify (constant address)
ping          - send ICMP ECHO_REQUEST to network host
printenv      - print environment variables
printmac      - print MAC addresses stored in flash
reset         - perform RESET of the CPU
run           - run commands in an environment variable
saveenv       - save environment variables to FLASH
setclocks     - select clocks configuration from predefined list
setenv        - set environment variables
setmac        - save new MAC address in flash
sntp          - send NTP request to NTP server
startnc       - start net console
startsc       - start serial console
tftpboot      - boot image via network using TFTP protocol
version       - print U-Boot version
```

## 6 REFERENCE

- ✧ Yun Shield hardware source
  https://github.com/dragino/modules/tree/master/hardware/YunShield

- ✧ Yun Shield software source code
  https://github.com/dragino/linino

- ✧ Arduino Yun Bridge Official page
  http://arduino.cc/en/Reference/YunBridgeLibrary

- ✧ Arduino Yun Official Forum
  http://forum.arduino.cc/index.php?board=93.0