Setup Guide for WfS RaspberryPi
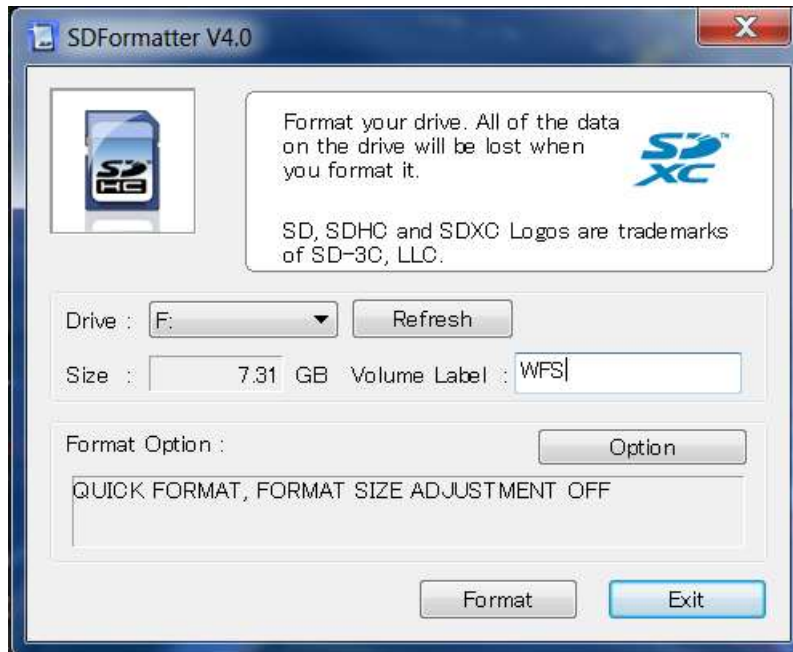
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Wiping an SD Card:

Windows/Mac:

Step 1: Download SD Card Formatter (from SD Association)

https://www.sdcard.org/downloads/formatter_4/

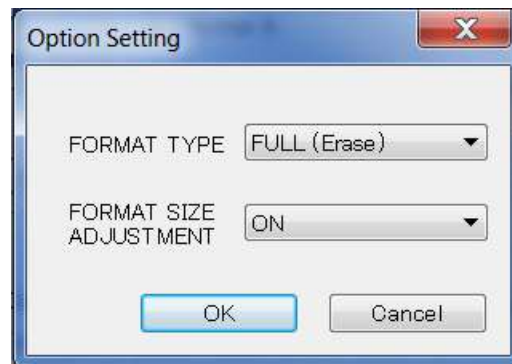Step 2: Run program as administrator

Step 3: Select SD card to format and label if desired.

Step 4: Under Options, select following options, and click "OK."

FORMAT TYPE = FULL (Erase)

FORMAT SIZE ADJUSTMENT = ON

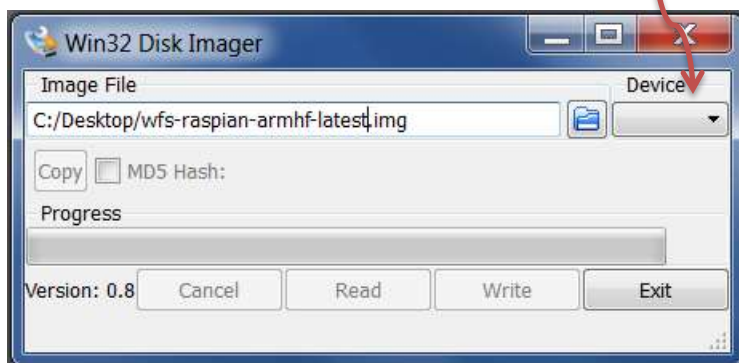Step 5: Click "Format" and confirm. The SD card will be completely wiped of all partitions.

(It is okay if message says "Flash Erase has been canceled for not being supported". It still worked)

Blank SD Card:

Step 1: Copy the disk image from http://wind.ece.ksu.edu/rpi-images/wfs-raspian-armhf-latest.img.zip

Step 2: Write the image to the SD card

    a. Unzip the .img file downloaded from the website

    b. Download "Win 32 Disk Imager" (This software can be found:
   http://sourceforge.net/projects/win32diskimager/files/latest/download)

    c. Locate or type the image location into the search bar and make sure that the device
   selected matches the SD card's location (i.e. D: or G:)

    d. Once the device and file are selected, click **Write**

Connect the Raspberry Pi

Insert SD card into slot located on the bottom of the RaspberryPi.

Plug in your RaspberryPi to the network using an Ethernet cable (make sure internet is working beforehand!).

Initial connection to the RaspberryPi is crucial for turbine configuration.

Connect to the RaspberryPi EITHER with monitor (HDMI cable), mouse and keyboard (both USB) OR thru remote Connection over Network.

NOTE: Although mouse and keyboard can be used for initial setup, remote connection is pre-installed and highly recommended for access to reboot the RaspberryPi in some cases.

Monitor, Mouse, and Keyboard (RaspberryPi Computer)

Step 1: Connect Mouse (USB), Keyboard (USB), and Monitor (HDMI) to the RaspberryPi.

Step 2: Plug in the RaspberryPi to the micro-USB power adapter to boot the device.

Step 3: Once the device is booted, the IP address should be visible on the home screen.

Connection over Network

Windows computer must be on the same network or via VPN connection.

RaspberryPi must be turned on and connected to the network.

The RaspberryPi can be connected to an existing network, or directly to a laptop with Internet Connection Sharing enabled. (See your Operating Systems documentation for Internet Connection Sharing - ICS)

The RaspberryPi will acquire an IP address automatically via DHCP.

Finding the device's IP address has the potential to be very complicated.

For network connections, the device's IP may be found using upstream networking equipment such as routers.

For direct ICS connections the IP may be found by:

> Windows: **Start → Run →** '**cmd**'.
> On the command line enter '**ipconfig /displaydns**'.
> Scroll through the printed text for the IP of the Raspberry Pi.

You may also try to connect with VNC using the address 'raspberrypi.mshome.net'

Linux/Unix: In Terminal type 'arp -a', it will show the IP of connected devices. Ex. 10.42.0.42 on eth0

Log On to the Raspberry Pi

Once you have the IP address of the RaspberryPi, if you do not have a mouse, keyboard, and monitor hooked up, then you can remotely login to the computer.

Step 1: From another computer, download a VNC client. We use TightVNC's Java Viewer found at:
http://www.tightvnc.com/download.php
   a. Choose **TightVNC Java Viewer JAR in a ZIP archive** (Any from this site work, depends on computer)
   b. Download and Unzip the program
   c. Launch the program, **tightvnc-jviewer.jar**

Step 2: Using the VNC client, enter the RaspberryPi's IP address in the **Remote Host** action bar.

Step 3: Enter **Port** as 5900 and click **Connect**

Step 4: The program will prompt for a password to connect to the remote host (RaspberryPi), enter

WAC07WfS and hit **Login**

Step 5 (Optional): Change the VNC Password
   a. Double click **LXTerminal** to open a new terminal window
   b. Enter "**vncpasswd**"
   c. Enter the new password and verify it. (Text will be hidden as you type, hit enter after you type)
   d. Enter '**n**' when asked to enter a view-only password.

Configuring the RaspberryPi

Once the IP address for the RaspberryPi has been located, you will need to configure the computer in order to access and send out the data from the wind turbine.

In order to properly configure the RaspberryPi, you will need the following information:
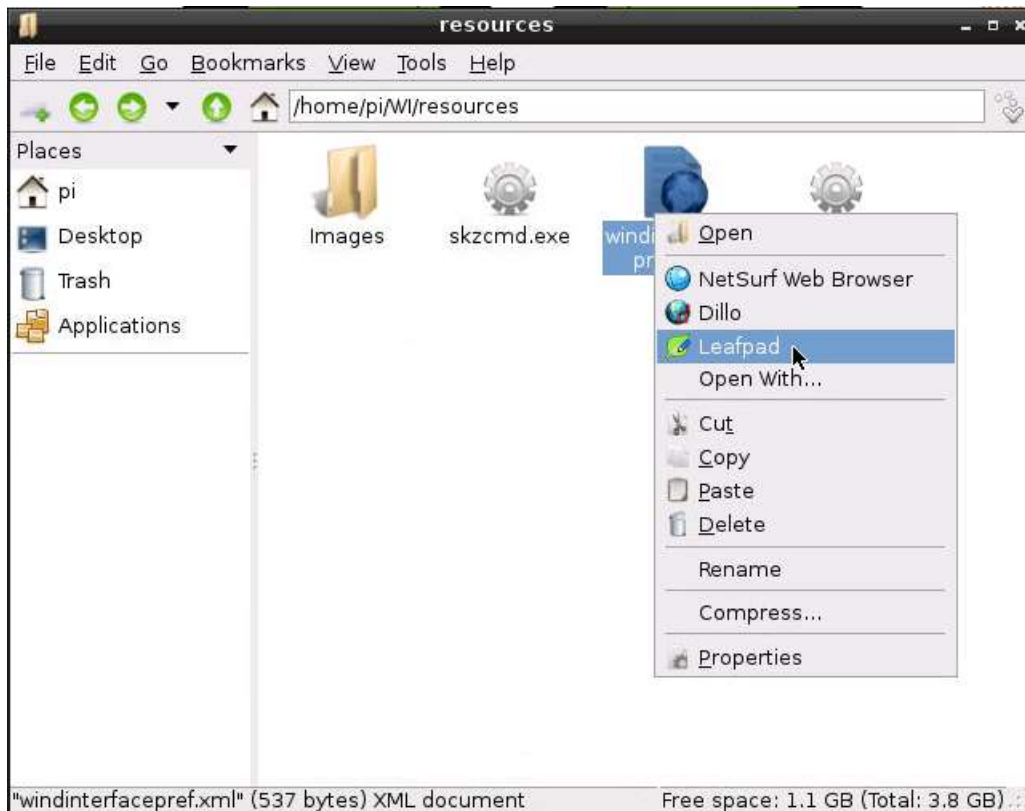   - System Title: Turbine's name (i.e. Kansas State University)
   - System ID: Zigbee's number (i.e. 403c1c3f)
       o NOTE: If you do not know this number please follow "Scanning for Turbines / Finding Turbine ID and Serial Number" instructions below
   - Serial Number: Turbine's Serial Number (i.e. 1010-1193)
   - API Key: OpenEI-assigned API key
       o Note: If you do not have an API Key yet, go to
         http://en.openei.org/services/api/2/WFS/key/ and type in your 8-digit turbine serial number to receive this key. It is important to note that the key will be matched with a 6 digit turbine ID (which is usually just the last 8 digits of your turbine serial number) which is used for OpenEI. If confused about the uses and differences of these two numbers:
           ▪ 8-digit: Comes with turbine (Referred to as the Turbine Serial Number)
               • Used in formatting Pi on windinterfacepref (So Pi can communicate with turbine)
               • Used to get API Key (Also formatted on Pi)
           ▪ 6-digit: Used on OpenEI (Referred to as the Turbine ID Number)
               • Tends to be the last 6 digits of the turbine serial number

➢ ex. 1010-3778 (Serial number) becomes 103778 (ID number)

Step 1: Boot up and connect to the RaspberryPi

Step 2: Configuring WindInterface for your Skystream

    a. Click "**File Manager**" [icon] on the bottom taskbar. This will open the /home/pi directory

    b. Navigate to **WI > resources**

    c. Right click "**windinterfacepref.xml**" and open with **Leafpad**

    d. Change the following information:

- Replace 'System Title' with your system name. <sys_title>YourSystemTitle</sys_title>
- Replace 'System ID' with your turbine's system id. <sys_id>y0ur551d</sys_id>
- Replace 'Turbine Serial Num' with your turbine's serial number. Use all 8 digits! <serial_num>1010-1010</serial_num>
- The lines dbURL, mysqlURL, mysqlUser and mysqlPass may be used if you wish to collect data at a local or state database. If you or your WAC wishes to collect your data locally as well as at OpenEI, you may use dbURL to send data using http protocol, and/or mysqlURL to send data directly to the mysql database. Please contact your state WAC if you are unsure what is appropriate for these fields :

    o <dbURL>http://localdatabaseURL/httpInput.php</dbURL>
    o <sys_name>yoursystemshortname</sys_name>
    o <mysqlURL>jdbc:mysql:// localmysqldatabaseIP:portnumber/yoursystemshortname </mysqlURL>
    o <mysqlUser>windadmin</mysqlUser>

o <mysqlPass>p@ssw0rd</mysqlPass>

If no local database, please replace the contents thus or erase completely:
  o <dbURL>none</dbURL>
  o <sys_name>yoursystemshortname</sys_name>
  o <mysqlURL>none</mysqlURL>
  o <mysqlUser>none</mysqlUser>
  o <mysqlPass>none</mysqlPass>

- Replace 'Shortname' with the short name assigned to you by OpenEI or your WAC
  <sys_name>Shortname</sys_name> Note this is now an optional field except for
  Kansas wind turbines.
- Replace 'APIkeyOpenEI' with the API key assigned to your turbine by Open EI.
  <api_key>ALPA-NUM3R1C-C0D3</api_key>
  NOTE: letters in the API key must be all capitals
- Replace '6.0' with your Time Zone's GMT offset. (6 is CST, 5 is EST, etc)
- If you know that your turbine's nacelle has been replaced, you may enter the previous
  nacelle's energy measurement in watt hours: <pwr_offset>23456.7<pwr_offset>

e. Save changes and close Leafpad.

Step 3 (Optional, useful to keep close tabs on your RaspberryPi): If you would like to receive an e-mail
with the RaspberryPi's IP address when it reboots or every time it is turned on, you will need to change
following:

a. Double-click the LXTerminal icon on the desktop to open a new window; type "sudo raspi-
   config" (no quotes)
b. Use the arrow keys to highlight 8: Advanced Options: hit return; scroll to A2: Hostname: hit
   return.
c. Hit return to select "ok", enter a hostname (ex: CO-Gilpin), and select ok. Use the left-right
   arrow keys to select "Finish". You can wait on rebooting until you finish the steps below.
d. Click "**File Manager**" [image] on the bottom taskbar. This will open the /home/pi directory
e. Scroll down to find "**check_ip.py**" and open with **Leafpad**
f. Scroll down to find the line "**RECEIVER['addr'] = [' ', 'KSUwind4schools@gmail.com'];**"
g. Enter your email address in the first set of apostrophes and please keep the
   'KSUwind4schools@gmail.com' as a backup.
   RECEIVER['addr'] = ['youraddress@yourweb.com ', 'KSUwind4schools@gmail.com'];
h. Save changes and close.

Step 4: Reboot the RaspberryPi.

a. Click the power icon in the bottom right corner. [image] NOTE: This may take a couple seconds
   to respond.
b. Click "**Reboot**"

Scanning for Turbines / Finding Turbine ID and Serial Number

The signal range of the Zigbee wireless communication will vary from location to location. Obstacles like
concrete and metal walls will greatly obstruct the signal. Having the Zigbee wireless device in view of the
turbine through a window or outside is recommended; however the Zigbee is NOT weather-proof!
   Ensure the Zigbee wireless device is plugged into the Raspberry Pi.
Step 1: Open a new Terminal

Choose "new window" from the File tab of **LXTerminal** to open a new terminal window.
Step 2: Type 'cd resources'; the terminal prompt should be 'pi@wfs-raspberry pi ~/WI/resources $'
Step 3: Enter the command '**./s2zcmd zls**' Don't forget the leading period. (Note you get a % prompt after this command finishes; you are "in" s2zcmd until you type "end".)

The program will return information about all nearby turbines, if any.

NOTE: If the program returns 'unable to establish comm' then the Zigbee device may not be properly connected.

If no turbines are found, see troubleshooting below.

If a turbine is found, your terminal window should look like:

Write down the following information:

Turbine System ID (Zigbee): The turbine ID is the last 8 characters of the 8-8 character set (red circle).

Turbine Serial Number: The 4-4 character set following SKY37A_ (green circle).

Step 4: Type "end" to get out of s2zcmd.

Troubleshooting

The steps below are easiest to check through a remote terminal connection to your Raspberry Pi; see above, "Logon to the Raspberry Pi." Your first step is nearly always, "reboot the Pi,"; this is best done with the power icon on the RasPi screen , rather than unplugging power, since the latter poses a risk of corrupting the SD card. Nevertheless, do not be afraid to use the unplug option if that is the best you can do.

Problem: the Raspberry Pi loses connection to the turbine.

In this case the Raspberry Pi screen will report "error: no data from turbine", and you will see that your OpenEI entry does not update.

FIRST: shut the turbine down at the breaker, wait 5-10 minutes and turn it back on. If this does not re-establish communication:

->Skyview Solution: move the Zigbee radio to a computer with Skyview installed, within sight of the turbine. Re-establish communications between the turbine and radio using Skyview and the Skyview Communications Troubleshooting Guide available on the OpenEI Wind for Schools Portal, Software and Downloads tab. Then, return the Zigbee radio to the RasPi, and it should work fine. You may need to reboot the RasPi.

-> Raspberry Pi solution: access your Raspberry Pi screen either with Remote Desktop or by directly connecting a screen (HDMI input) and keyboard (USB input.) Note if you need a mouse you'll need to switch between keyboard and mouse; don't unplug the Zigbee radio!

1. Follow Steps 1-3 above under Scanning for Turbines.
2. If the zls command returns "found 0", wait 60 seconds and try again (type "zls" at the % prompt: this is the equivalent of "disconnect/connect USB device" in Skyview)
3. If no effect, type "zb at cb 2" at the % prompt. (This is the "search for turbines" button in Skyview.) Wait 60 seconds; if it works, you should get "CB/+OK=".

4. Type "zls" again to confirm all is working.
5. If no effect, shut the turbine down at the breaker again, wait 5-10 minutes, turn the turbine back on and IMMEDIATELY repeat "zb at cb 2" in s2zcmd (% prompt) followed by "zls" to confirm all is working.
6. One reason for this problem MAY be weak signal strength. In s2zcmd, the command "zb at db" returns a hexadecimal value for signal strength. It should be 50 or less.

Problem: the Raspberry Pi loses connection to the internet or to OpenEI:

You see that your OpenEI entry does not update, and on the Raspberry Pi screen you do NOT see, "data successfully sent to OpenEI."

In this case the Raspberry Pi will wait and wait for a reply from OpenEI that its data were received, and in the meantime it will not get more data. If OpenEI was busy for the second when the Pi tried to send data, it may hang up in this infinite loop.

Solution: first check that the internet connection is in place (can you remotely access the Pi? From the Pi, can you access the internet (Midori can open a webpage)?) After that, restarting

WindInterface may be all that is needed: click File Manager , open the WI folder, and double-click **wiopenei.jar**. If that fails, reboot the Pi. If that fails, contact OpenEI (see Turbine Support tab) and ask if the problem is on that end.