

Setup Guide: runlinc on STEMSEL

Preparation:

- (Optional) Download and install the free version of ezSystem from <https://drive.google.com/file/d/0ByGZ8yxOBpN9WkZ0UnZhVDB2VFk/view>
- Download and extract the Simplex from http://runlinc.com/simplex_stemsel.zip
- Setup a Hotspot/Wi-Fi by following the details below (more information will be shown in Appendix B):

SSID (Name):	runlinc	Wi-Fi Band:	2.4GHz
V1.0 Password:	Hartley2018		
V1.1 Password:	runlinc1234		

Instructions:

1. Remove the Wi-Fi module from the STEMSEL board.
2. Connect the STEMSEL microcontroller to the computer in program mode (press and hold the on-board button whilst connecting the board to the USB port of the computer).

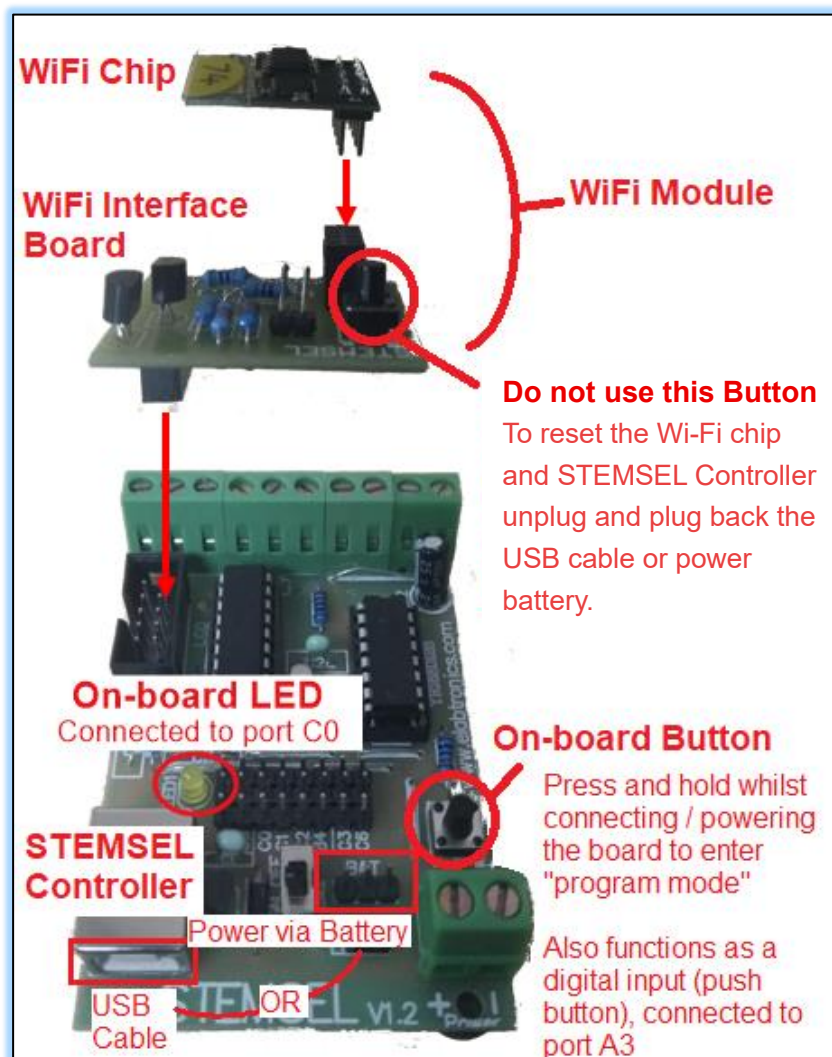


Figure 1 - Component Breakdown, Physical Setup and LED/Button Descriptions

3. To program the Simplex onto the STEMSEL board, there are two ways to implement this (the second method is preferable as it has been proven that it is more reliable than the first method):

a) If you have installed the ezSystem, you can simply open the "simplex.bst" file in the extracted simplex folder, and click "Send Program to Chip" after the STEMSEL is successfully connected to the computer.

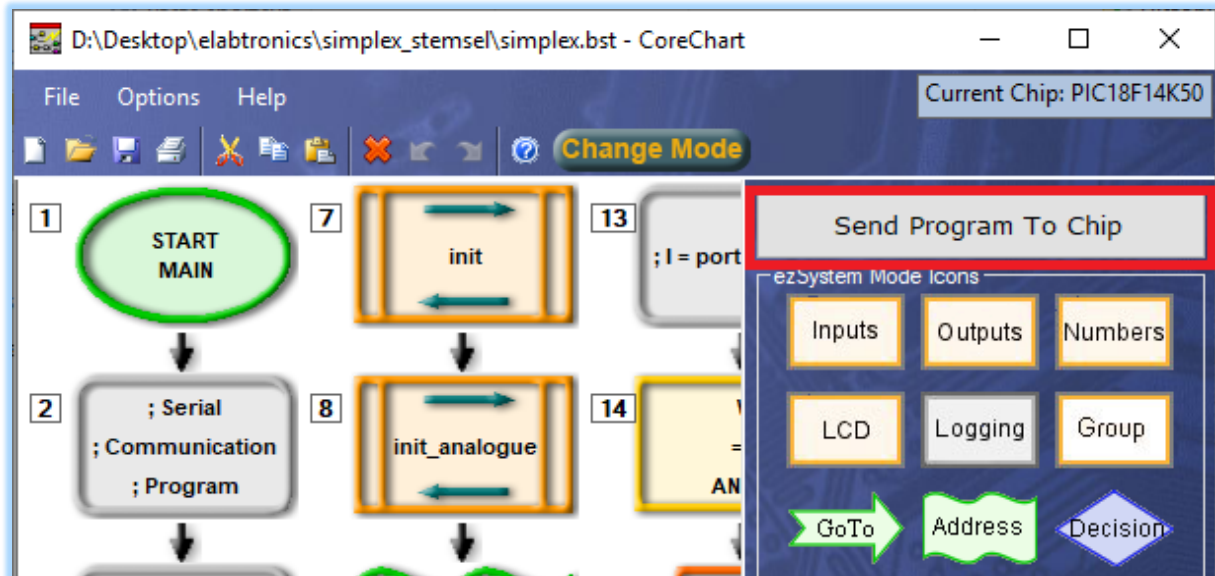


Figure 2 - Program simplex using CoreChart and the simplex.bst file

b) Alternatively, you can open "HIDBootLoader.exe" from the extracted simplex folder after connecting the microcontroller in program mode to the computer, clicking "Open Hex File" button and select the "simplex.hex" file. (Note that the "Open Hex File" button is only enabled if a device is attached whereas the other buttons will be enabled once the hex file has opened. If all the buttons remain grey while the board is connected, you can close the app window and reconnect the board in program mode to the computer before reboot the "HIDBootLoader.exe" to solve this problem). A message box should emerge after you have clicked the "Program/Verify" button, press OK, then you should see the output "Erase/Program/Verify Completed Successfully" on the screen.

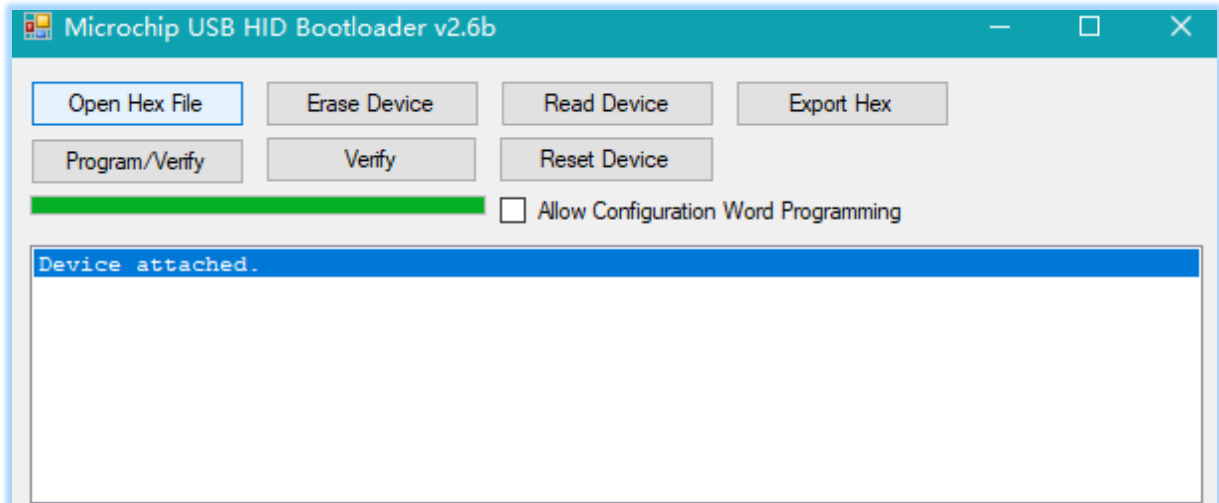


Figure 3 - Programming simplex using HIDBootLoader and the simplex.hex file

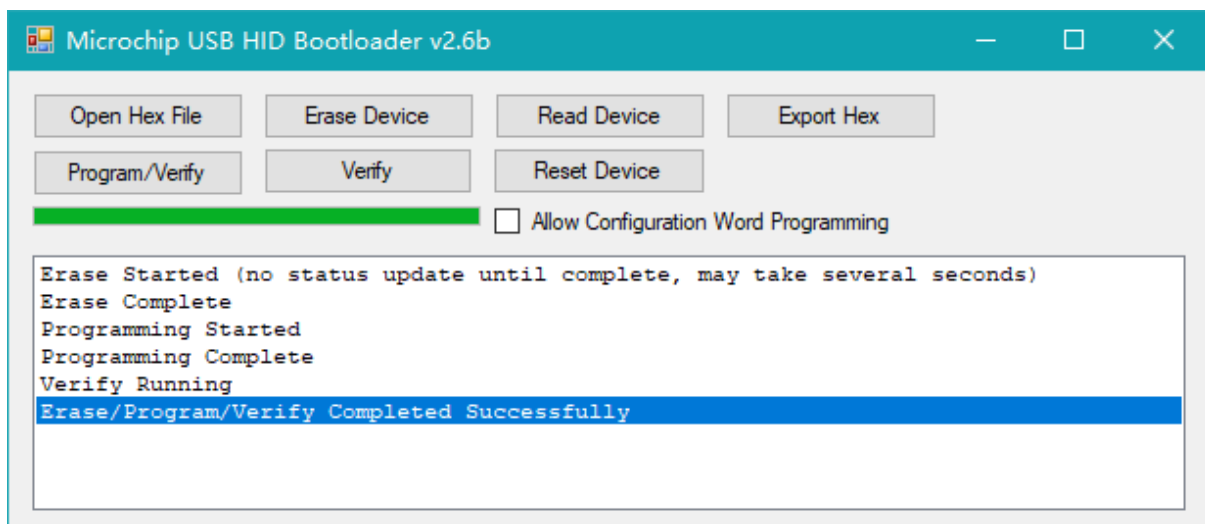
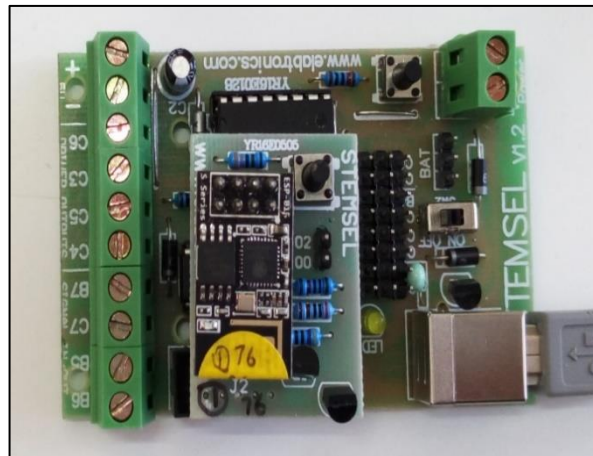
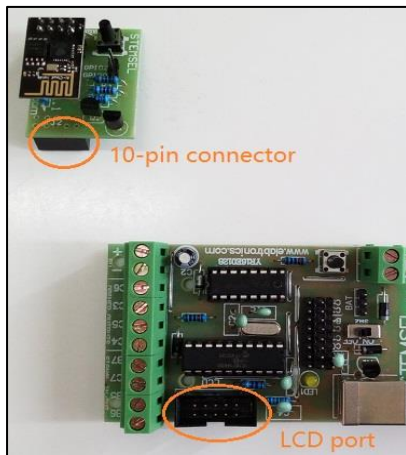


Figure 4 - Programming simplex using HIDBootLoader and the simplex.hex file (output)

4. Unplug the STEMSEL Controller.
5. Plug in the WiFi module.

IMPORTANT: Make sure you plug in the WiFi module BEFORE you power up the board. Otherwise, the program on the board will run without the chip and will not work properly when the WiFi module is inserted later.



6. Then power the board by either USB cable or battery (Recommendation: use the USB power source instead of the battery, which can save the batteries for later use) and open the runlinx webpage by entering `<ip_address>/control.html` on your preferred web browser's address bar. The IP address is `x.x.x.y`, where `x` depends on the network configuration (see the table below) and `y` is the non-circled number on the WiFi chip label.

Network Configuration	IP address
Router/Gateway	See Appendix A
Hotspot (Windows) – See Appendix B	192.168.137.y
Hotspot (Android) – See Appendix B	192.168.43.y

7. You should see the following webpage:

runlinc v1.0

File

Load File

Save

Board

Send

Get

Run Code

Stop Code

Board IP: 192.168.137.190

STEMSEL

PORT	CONFIGURATION	NAME	STATUS
A3	DISABLED		
B4	DIGITAL_OUT		OFF
B6	DIGITAL_OUT		OFF
C0	DIGITAL_OUT		OFF
C1	DIGITAL_OUT		OFF
C2	DIGITAL_OUT		OFF
C3	DIGITAL_OUT		OFF
C4	DIGITAL_OUT		OFF
C5	DIGITAL_OUT		OFF
C6	DIGITAL_OUT		OFF
C7	DIGITAL_OUT		OFF

Network Status: Active

CSS

HTML

JavaScript

Select Macro

Select Device

Add Macro

JavaScript Loop

Select Macro

Select Device

Add Macro

Figure 5 - For runlinc version 1.0, the runlinc webpage should look like this

← → ↻ 🏠 192.168.137.15/control

STEMSEL WiFi Control

Computer

Choose File

No file chosen

Save

Chip

Send

Get

Run Code

Stop Code

X View

PORT	CONFIGURATION	NAME	STATUS	NETW
A3	DISABLED			
B4	DIGITAL_OUT		OFF	
B6	DIGITAL_OUT		OFF	
C0	DIGITAL_OUT		OFF	
C1	DIGITAL_OUT		OFF	
C2	DIGITAL_OUT		OFF	
C3	DIGITAL_OUT		OFF	
C4	DIGITAL_OUT		OFF	
C5	DIGITAL_OUT		OFF	
C6	DIGITAL_OUT		OFF	
C7	DIGITAL_OUT		OFF	

New Group

Figure 6 - For runlinc version 2.0, the runlinc webpage should look like this

8. Clicking the red OFF button of C0, the onboard yellow LED should turn on, which means your WiFi module is connected successfully.

Note: Ideally, do not refresh the page or click the reset button when the network is paused due to the run code mode as it may cause network problems.

runlinc examples:

Turning on/off a LED and Buzzer: https://www.youtube.com/watch?v=s48ZcIleU_o

Voice “Intruder Alert” using Light Sensor: <https://www.youtube.com/watch?v=cb18xlOAbOc>

Appendix A: Gateway/Router IP

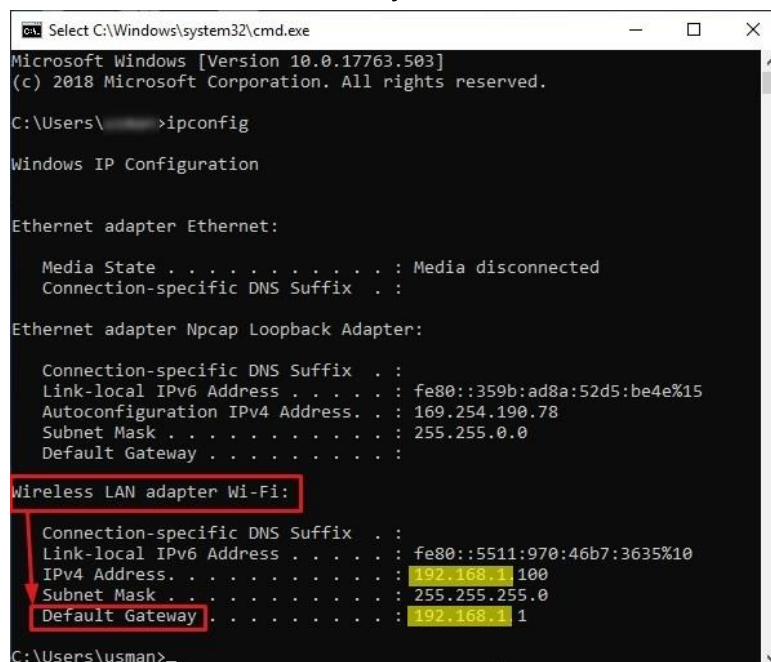
NOTE: the runlinc version of the WiFi chip is marked under the chip.

If you are connecting through a router that has been specifically configured for runlinc (with a network name of 'runlinc' and password of 'Hartley2018' for runlinc V1.0 or 'runlinc1234' for runlinc V1.1), you have to find the router IP address.

You can find the router IP address by using the following commands (Note that we only need the first three numbers of the IP address. Since we want to connect to the specific WiFi module, the last number will be your module number):

Windows

1. Open the "Command Prompt" (search for it or press Windows key + R > type "cmd.exe" > Ok)
2. Type "ipconfig" and press enter
3. Look for the **Default Gateway** or **IPv4 address** in the interface named **Wireless LAN adapter Wi-Fi**



```
Microsoft Windows [Version 10.0.17763.503]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Ethernet adapter Npcap Loopback Adapter:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::359b:ad8a:52d5:be4e%15
    Autoconfiguration IPv4 Address. . : 169.254.190.78
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::5511:970:46b7:3635%10
    IPv4 Address. . . . . : 192.168.1.100
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.1.1

C:\Users\usman>
```

Linux

1. Open the "Terminal"(search for it or by pressing Ctrl + Alt + T)
2. Type "ifconfig" and press enter
3. Look for the **inet** address in the interface starting with **wl** (may be wlanX or wlpXsX)

```

RX packets 0 bytes 0 (0.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 0 bytes 0 (0.0 B)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 604 bytes 57691 (57.6 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 604 bytes 57691 (57.6 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlp3s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.143 netmask 255.255.255.0 broadcast 192.168.1.255
    inet6 fe80::a4b1:4bc9:8145:26f9 prefixlen 64 scopeid 0x20<link>
    ether 98:3b:8f:68:f5:a6 txqueuelen 1000 (Ethernet)
    RX packets 6173 bytes 7060708 (7.0 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 3881 bytes 555416 (555.4 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

Inspiron-5770:~$
```

Mac

1. Open the "Terminal" (you can search for it by pressing cmd+space)
2. Type "ifconfig" and press enter
3. Look for the **inet** address in the interface named **en1**

```

Terminal — bash — 77x52
Last login: Sat Jan 23 16:11:10 on ttys000
iMac-de-Matthieu-Neale:~ matthieu-neale$ ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
    inet6 ::1 prefixlen 128
    inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
    inet 127.0.0.1 netmask 0xff000000
gif0: flags=8010<POINTOPOINT,MULTICAST> mtu 1280
stf0: flags=0<> mtu 1280
en0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    inet6 fe80::d69a:20ff:febe:f7d6%en0 prefixlen 64 scopeid 0x4
    inet 192.168.1.130 netmask 0xfffff00 broadcast 192.168.1.255
    ether d4:9a:20:be:f7:d6
    media: autoselect (100baseTX <full-duplex,flow-control>) status: active
ve
    supported media: none autoselect 10baseT/UTP <half-duplex> 10baseT/UTP <full-duplex> 10baseT/UTP <full-duplex,flow-control> 10baseT/UTP <full-duplex,hw-loopback> 100baseTX <half-duplex> 100baseTX <full-duplex> 100baseTX <full-duplex,flow-control> 100baseTX <full-duplex,hw-loopback> 1000baseT <full-duplex> 1000baseT <full-duplex,flow-control> 1000baseT <full-duplex,hw-loopback>
fw0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 4078
    lladdr d4:9a:20:ff:fe:be:f7:d6
    media: autoselect <full-duplex> status: inactive
    supported media: autoselect <full-duplex>
en1: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    inet6 fe80::d69a:20ff:fe5c:e659%en1 prefixlen 64 scopeid 0x6
    inet 192.168.1.129 netmask 0xfffff00 broadcast 192.168.1.255
    ether d4:9a:20:5c:e6:59
    media: autoselect status: active
    supported media: autoselect
vboxnet0: flags=8842<BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
    ether 0a:00:27:00:00:00
iMac-de-Matthieu-Neale:~ matthieu-neale$
```

Appendix B: Creating a Hotspot

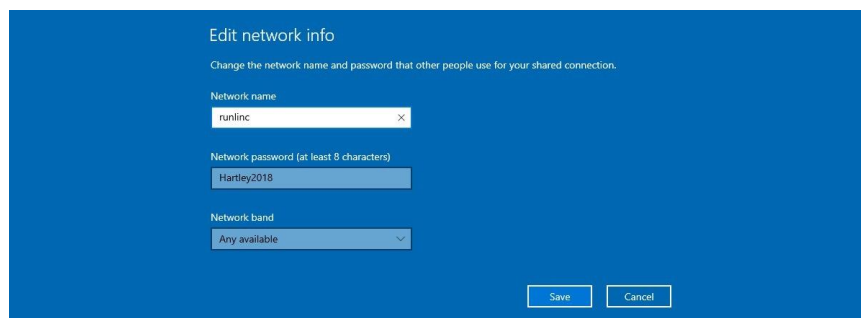
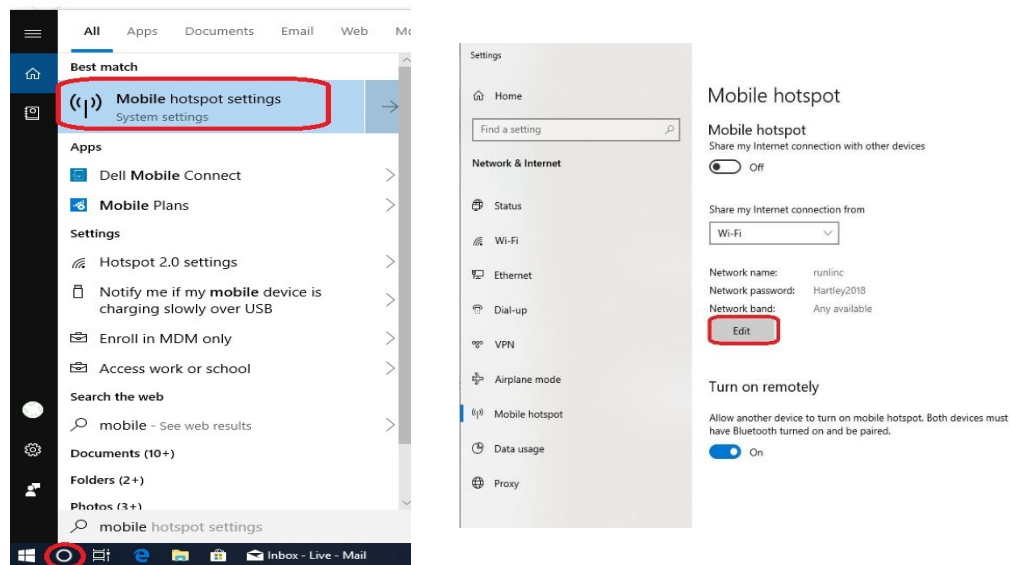
NOTE: the runlinc version of the WiFi chip is marked under the chip.

If you do not have a router configured with the network settings that match those pre-programmed onto the WiFi chips (SSID=runlinc and Password(V1.0)=Hartley2018 or Password(V1.1)=runlinc1234), you can still use runlinc by creating a hotspot with these settings:

Windows 10

1. Search for mobile hotspot

Click "Edit" and enter "runlinc" for Network name and set the Network Password to "Hartley2018" for Wi-Fi chip version 1.0 or "runlinc1234" for Wi-Fi chip version 1.1



Windows (older versions)

For earlier Windows systems, a third-party hotspot software is needed, e.g. *HostedNetworkStarter*.

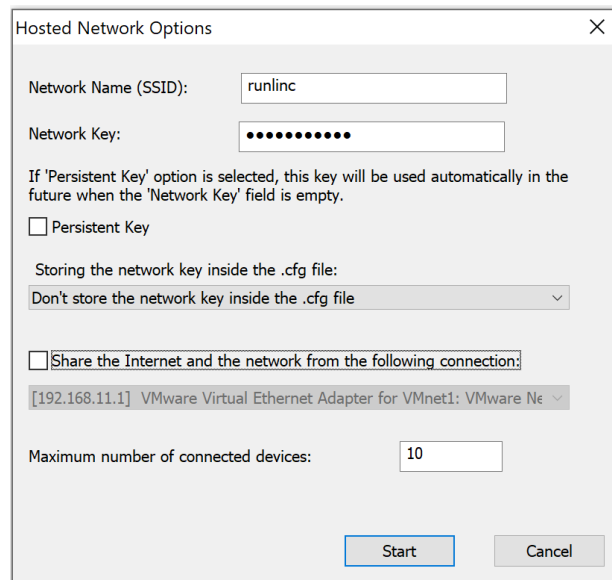
Download it from <http://www.nirsoft.net/utils/hostednetworkstarter.zip> and unzip it. Open

HostedNetworkStarter.exe. Set as follows:

Network Name: runlinc

Network Key: set the network key to "Hartley2018" for Wi-Fi chip version 1.0 or "runlinc1234" for Wi-Fi chip version 1.1

Then press *start*.



The image shows a Windows 'Hosted Network Options' dialog box. It has a title bar with a close button (X). The dialog contains several fields and options: 'Network Name (SSID):' with a text box containing 'runlinc'; 'Network Key:' with a text box containing ten dots; a note stating 'If 'Persistent Key' option is selected, this key will be used automatically in the future when the 'Network Key' field is empty.'; a checkbox for 'Persistent Key' which is unchecked; a dropdown menu for 'Storing the network key inside the .cfg file:' with the selected option being 'Don't store the network key inside the .cfg file'; a checkbox for 'Share the Internet and the network from the following connection:' which is unchecked; a dropdown menu for the connection with the selected option being '[192.168.11.1] VMware Virtual Ethernet Adapter for VMnet1: VMware Ne'; and a text box for 'Maximum number of connected devices:' containing the value '10'. At the bottom right, there are 'Start' and 'Cancel' buttons.

Android

1. Go to settings and either search for “hotspot” or go to Network & Internet > Hotspot & tethering > Wi-Fi hotspot

Change the Hotspot name to “runlinc” and set the password to “Hartley2018” for Wi-Fi chip version 1.0 or “runlinc1234” for Wi-Fi chip version 1.1

Once the hotspot is turned on, the WiFi chip will connect to it when it boots up (you will see ESP_XXXXXX in connected devices). If you cannot see anything (eg. If you had connected the board before creating the hotspot), try unplugging the USB and then replugging it with the Wi-Fi module on the board. This will reset both the board and the module.

Appendix C: Making Your Webpage International

To make your webpage international, you need to setup Pagekite on your phone or computer. Before you start, ensure that you have connected the STEMSEL board to the runlinc website. Create a pagekite account on pagekite.net website.

It can be used free for 30 days but can be reset by the account holder. Click on the 'Buy More' link under your account details. Then move the slider back to 4. In the right-hand side, there will be a text box, where it can be filled with a friendly message to the service of pagekite.com. Make sure to ensure that it is not for a work account. (Click the check box near the textbox)

Windows

Download and install Python 2.7 from <https://www.python.org/ftp/python/2.7.15/python-2.7.15.msi>

Download pagekite.py from <https://pagekite.net/pk/pagekite.py> (if the browser does not download it automatically, right-click on the webpage and select *save as*)

Open pagekite.py. The program will guide you through the process and help you set up your first kite:

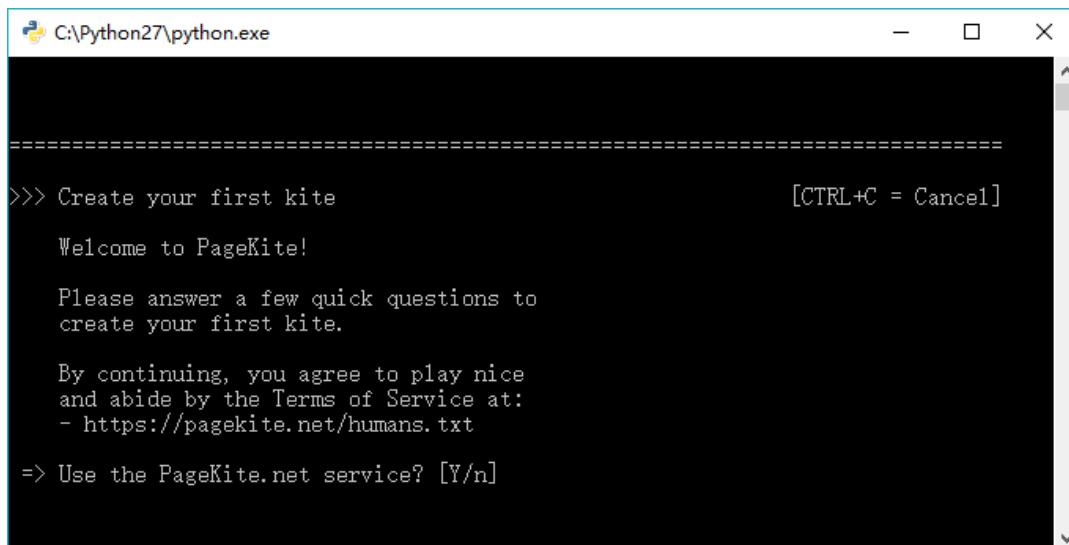
Type Y and press enter to continue

Type in your email address to create an account (Any account which you already use, a confirmation email will be sent to your account. Open the link and activate the account)

Give your kite a name. This will be the address of your webpage. E.g. if you name your kite as stemsel, your webpage's address will be stemsel.pagekite.me.

After a few seconds, it should say 'Your kite is ready to fly!'.

Close it.



```
=====  
>>> Create your first kite [CTRL+C = Cancel]  
Welcome to PageKite!  
Please answer a few quick questions to  
create your first kite.  
By continuing, you agree to play nice  
and abide by the Terms of Service at:  
- https://pagekite.net/humans.txt  
=> Use the PageKite.net service? [Y/n]
```

Search for pagekite.cfg in your computer (usually in my computer, C drive, Users, Your computer name and pagekite.py) or just find from simple search bar. Open it with Notepad. Edit the underlined text to your chip's IP address which is **localhost** change with chip's IP and save changes.

```

####[ Current settings for pagekite.py v0.5.9.3.
]#####
#
## NOTE: This file may be rewritten/reordered by
pagekite.py.
#
    Note: Use your own account details (kitename and secret) here (not these ones)

##[ Default kite and account details ]##
kitename    = stemselcurtain.pagekite.me
kitesecret  = f9xbbz9azx84ebx3c28x8xzdbkd8ze66

##[ Front-end settings: use pagekite.net defaults ]##
defaults

##[ Back-ends and local services ]##
service_on  = http:@kitename
localhost:80 : @kitesecret

##[ Miscellaneous settings ]##
savefile = C:\Users\Hang\pagekite.cfg

####[ End of pagekite.py configuration ]#####
END

```

```

1  ####[ Current settings for pagekite.py v1.5.2.201011. ]#####
2  #
3  ## NOTE: This file may be rewritten/reordered by pagekite.py.
4  #
5
6  ##[ Default kite and account details ]##
7  kitename    = chams.pagekite.me
8  kitesecret  = 7bc9f7xekkae79fezzzz4zc7kf36627e
9
10 ##[ Front-end settings: use pagekite.net defaults ]##
11 defaults
12
13 ##[ Back-ends and local services ]##
14 service_on  = http:@kitename                : localhost:80                : @kitesecret
15
16
17
18
19
20 ##[ Miscellaneous settings ]##
21 savefile = C:\Users\Amandi\pagekite.cfg
22 max_read_bytes = 16256x3.100
23
24 ####[ End of pagekite.py configuration ]#####
25 END
26

```

After opening pagekite.cfg on notepad, you should see “localhost:80”. Change it to the IP address of

your microchip. Remove 'localhost' and add the IP address instead. Follow the example bellow.

pagekite - Notepad

File Edit Format View Help

```
####[ Current settings for pagekite.py v1.5.2.200603. ]#####
#
## NOTE: This file may be rewritten/reordered by pagekite.py.
#

##[ Default kite and account details ]##
kite_name = mohsin.pagekite.me
kitesecret = 4k82eadb42k3ek8cd4778278df667848

##[ Front-end settings: use pagekite.net defaults ]##
defaults

##[ Back-ends and local services ]##
service_on = http:@kite_name : 192.168.1.112:80 : @kitesecret

##[ Miscellaneous settings ]##
savefile = C:\Users\Mohsin Khalid\pagekite.cfg
max_read_bytes = 16256x3.100

##[ End of pagekite.py configuration ]#####
```

Reopen pagekite.py where it download. It should now automatically run. When it says, for example, *Flying 192.168.137.76:80 as https://<your-account-name>.pagekite.me/*, the kite is flying.

C:\Python27\python.exe

```
>>> Hello! This is pagekite.py v1.5.2.200603. [CTRL+C = Stop]
Connecting to front-end relay 139.162.73.59:443 ...
- Relay supports 10 protocols on 19 public ports.
- Raw TCP/IP (HTTP proxied) kites are available.
- To enable more logging, add option: --logfile=/path/to/logfile
Abuse/DDOS protection: Relaying traffic for up to 5 clients per 10800s.
Quota: You have 25 days, 5.0 tunnels left.
~<> Flying 192.168.1.112:80 as https://mohsin.pagekite.me/
165.228.200.32 < http://mohsin.pagekite.me:443 (192.168.1.112:80)
Connecting to front-end relay 172.105.176.167:443 ...
Quota: You have 24 days, 5.0 tunnels left.
Connecting to front-end relay 176.58.121.52:443 ...
Connecting to front-end relay 139.162.21.42:443 ...
<< pagekite.py [flying] Kites are flying and all is well.
```

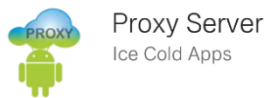
Now put your kite's name + /control in your browser's address bar, e.g. stemsel.pagekite.me/control.html. Now you can access your webpage and control the chip from anywhere!

Note: Where ever user need to run the pagekite it must open the **pagekite.py** file first otherwise the pagekite will not work and show the message on web that Temporary unavailable.

Android Phones

You need two apps:

Proxy Server. Download from GooglePlay.



PageKite (currently not available on GooglePlay. Go to

<https://pagekite.net/pk/android/PageKiteApp.apk> instead.)

Ensure that you have turned on data on your phone.

Sign up on pagekite.net if you do not have an account. Set up your kite's name and secret. If you already have an account, skip this step.

In the Proxy Server app press 'Add' -> 'Proxy Server'.

Set 'Server name' as whatever you want, such as 'robot'

Set 'Run on port' as 8084

Tick 'Forward all requests to the same host'

Set 'Forward to host' as your chip's IP address, e.g. 192.168.43.84

The settings should be like the picture below. Go back, save the settings and start the server.

Server name

Run on port

☐ Only allow access from certain IP(s)☐ Vibrate on new connection☒ Enable logging☐ Only log errors
Only log errors☒ Allow HTTPS requests

Connection timeout (seconds)

☒ Keep connection alive

When disabled requests are read and the destination host is extracted, that causes only GET, POST and CONNECT methods to work. When this option is enabled requests will be forwarded immediately and it will work for more protocols.

☒ Forward all requests to the same host

Forward to host

Forward to port

☐ Start on boot☐ Start directly when app starts clean☐ Start server when connected to selected wifi network and stop when disconnected

In the PageKite app go to 'Account Details'. Set 'Kite Name' as your registered kite name, e.g. 'curtain.stemselrover.pagekite.me'. Set 'Shared Secret' as your registered secret.

Go back and go to 'Local Server Settings'. Set 'HTTP Port' as 8084.

Go back and click 'Enable PageKite'.

Put your kite's name + /control in your browser's address bar, e.g. stemsel.pagekite.me/control (use your own kitename NOT stemsel). Now you can access your webpage and control the chip from anywhere!