Using Raspberry Pi
with Flowcode 8

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SD cards supplied with Matrix products are pre-programmed with the Raspbian image, in this case please go to the "Configuring Raspberry Pi for use with Flowcode" section.

Help can be found at https://www.raspberrypi.org/learning/software-guide/quickstart

Creating a NOOBS micro SD card
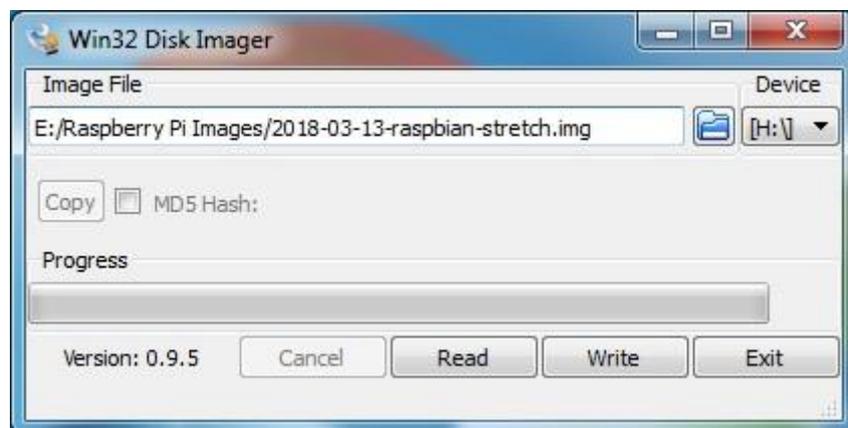
- Download the NOOBS zip (version 2.7 or later) from the Raspberry Pi website
- Format the SD card
- Unzip the contents of the NOOBS zip file and copy the contents to the SD card
- Eject the card from Windows and insert into the Raspberry Pi

Installing the Raspbian operating system from a NOOBS card

- Connect a monitor, keyboard and mouse to the Raspberry Pi and power up
- On the monitor will be wait messages until the system selection dialog appears.
- On the operating system dialog box, use the mouse to click and select "Raspbian", check the selections for language and keyboard are correct.
- Click the "Install" icon in the top left corner of the dialog box.
- The installation takes some minutes to complete, then click the OK confirmation
- The Raspberry Pi will then re-boot to a desktop screen.
- Follow the instructions "Configuring Raspberry Pi for use with Flowcode"

Creating a Raspbian image directly to a micro SD card

- Download the Raspbian Stretch zip (dated 13/3/2018 or later) from the Raspberry Pi Foundation website https://www.raspberrypi.org/downloads/raspbian/
- Unzip the image file from the zip file
- Write the image file to the card using an imager such as Win32DiskImager or Etcher
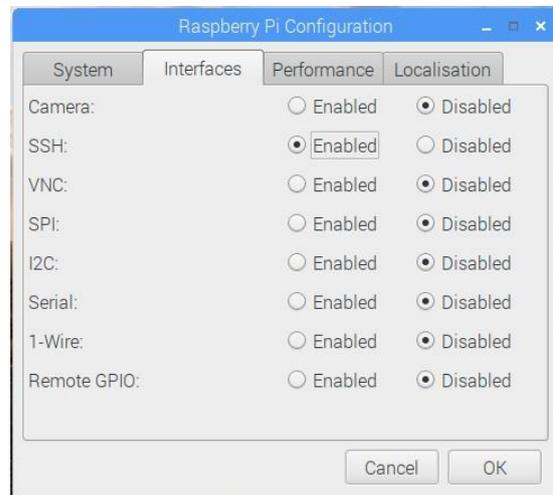
- The card writing process can take up to 20 minutes to complete
- Eject the card from Windows and insert into the Raspberry Pi

Configuring Raspberry Pi for use with Flowcode

Flowcode uses secure shell, SSH, to transfer user applications to the Raspberry Pi.
SSH is easily enabled on the Raspberry Pi from the desktop.
Alternatively, this can be done by using **raspi-config** from the terminal.
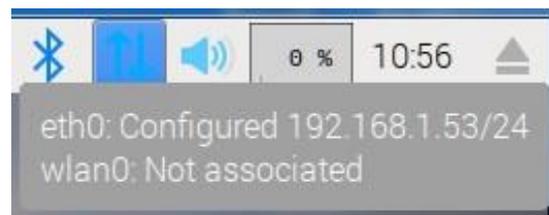
From the Raspberry Pi menu, in the top left corner of the desktop, select "Raspberry Pi Configuration" from the "Preferences" menu. In the "Interfaces" tab, select "Enabled" for SSH and click OK. With SSH remote access enabled it is recommended that you to consider changing the default pi user password (initial default is raspberry).

For wireless connections, click and set the "Set WiFi Country" in the "Localisation" tab. Click the OK button and close the dialog.

Then click on the network activity icon in the top right of the desktop and connect to your WiFi access point.
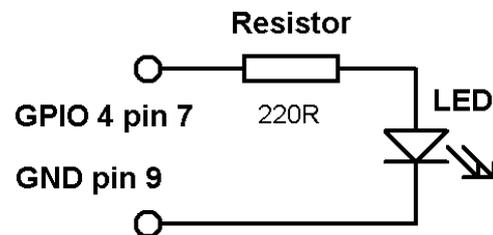
Flowcode projects require the setting of the IP address of the Raspberry Pi, as configured by your network.

Once you have your Raspberry Pi connected to your network, its IP address can be seen by hovering the mouse over the desktop network activity icon. In the example shown the IP address of this Raspberry Pi is 192.168.1.53
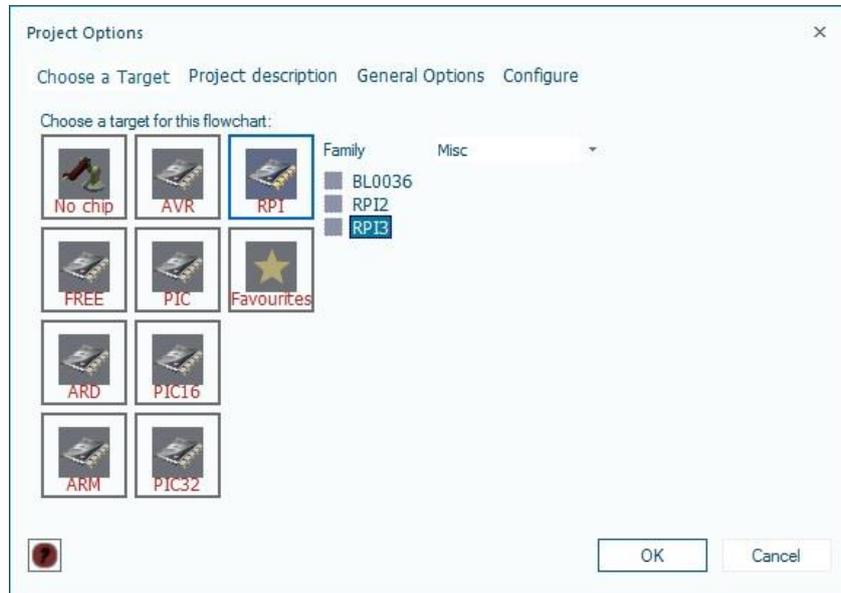
Creating your first Flowcode 8 Raspberry Pi project
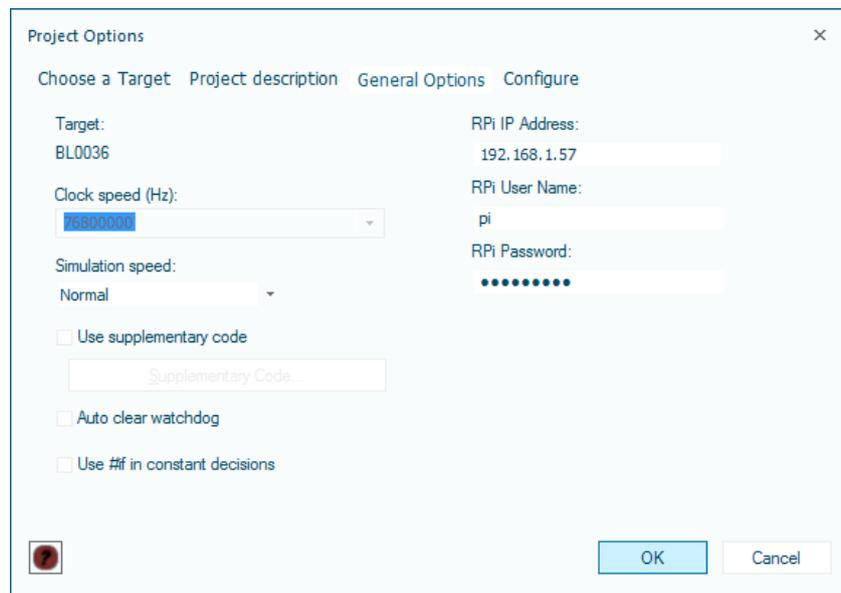
For this example project we will use a Raspberry Pi 3B+ with simply a LED and resistor attached to GPIO 4 to demonstrate digital output.

Run Flowcode 8 and select New project.
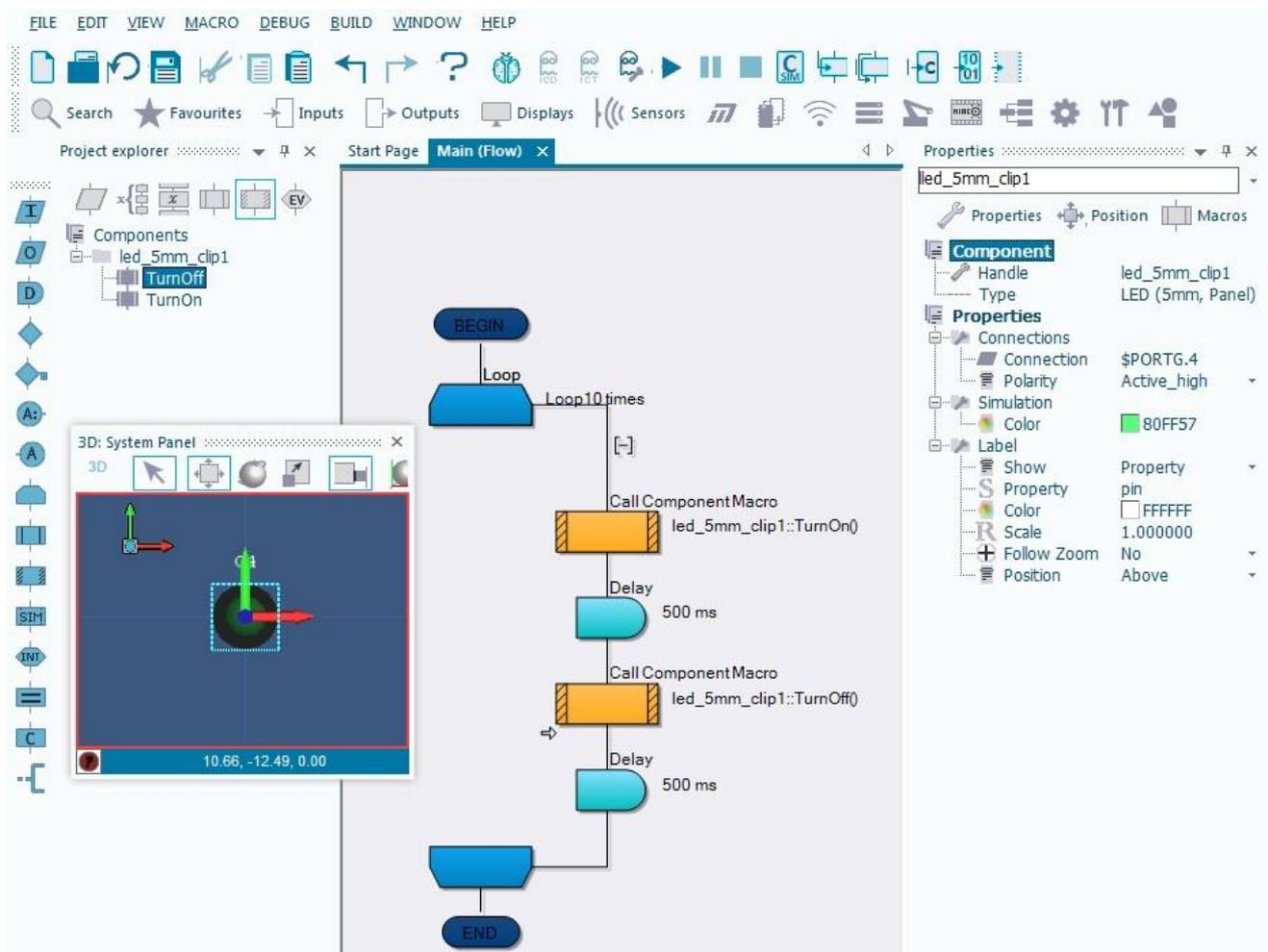
In the Project Options dialog box select RPI family and RPI3 as the target.

In the "General Options" tab enter the IP address for the Raspberry Pi together with the user name and password (usually pi and raspberry).
Note: The "sudo" checkbox only needs to be enabled if PWM is used in the project.

Add a LED component, from the Outputs menu, onto the system panel. In the component properties window set the Connection property to PORTG,4 (this represents GPIO 4).
To the main flowchart add a loop of fixed count 10, together with component icons to turn on and off the LED with 500mS delays as shown.

Save the project, and the flowchart can be simulated on screen by clicking the Run button.

To run the project on the Raspberry Pi click the "Compile to chip" button in the task bar.
The project compilation window will display followed by a console (Putty) window whilst the program runs on the Raspberry Pi and flashes the LED 10 times.
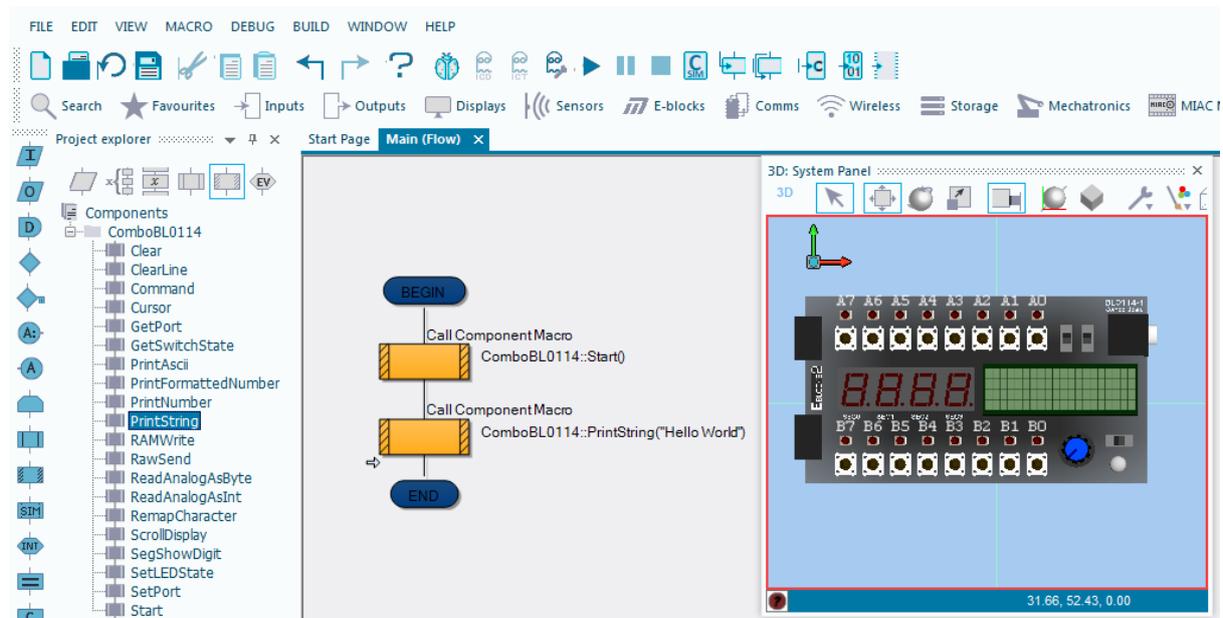
Sample Flowcode 8 project for Raspberry Pi and E-blocks

For this example we will use an E-blocks 2 Raspberry Pi upstream board (BL0036), with Raspberry Pi 3B+ installed, and a Combo board (BL0114).
As with the previous example, run Flowcode 8 and select New project.
In the Project Options dialog box select RPI family and BL0036 as the target.
In the "General Options" tab enter the IP address for the Raspberry Pi together with the user name and password (usually pi and raspberry).

Add a Combo BL0114 component, from the E-blocks menu, onto the dashboard.
From the Project Explorer window drag and drop a Start icon followed by a PrintString icon, set the text field to "Hello World".

Save the project and click the "Compile to chip" button in the task bar.
The project compilation window will run followed by a console (Putty) window whilst the program runs on the Raspberry Pi target, and "Hello World" should appear on the display. (Note: Ensure that the BL0114 "LCD" switch is set to ON)

Running programs from the Flowcode IDE

Flowcode uses secure shell to transfer and run user applications, so whilst running you will see the shell console window on the host PC. Note that in the case of programs with a continuous loop this window will remain continuously present on the host PC.
Pressing CTRL and C in the window will abort the running program on the Raspberry Pi and exit the console window.
The Flowcode DebugPrint component can be used to output text to the console window for debugging or other purposes.

The shell console window runs concurrently with Flowcode such that ICD (In Circuit Debugging) can be done with the use of the Flowcode Ghost features of the Matrix E-blocks 2 Raspberry Pi upstream board or Flowkit v2.

Running your programs independently of Flowcode

Once you have used Flowcode to create, compile and transfer your program to the Raspberry PI, it will exist in the home directory of the selected user e.g. /home/pi

From there the application can be run via a serial console such as Putty or virtual desktop such as VNC or RDP. VNC and SSH for Putty are enabled via the Raspberry Pi "Interface Configuration" dialog.
Your application can also be configured to run from start-up of the Raspberry Pi by adding a line to the /etc/rc.local file, but before the exit 0.
Editing this file must be done with root privileges, e.g. sudo nano /etc/rc.local

```
/home/pi/MyFlowcodeProject &
exit 0
```

Using Raspberry Pi hardware peripherals

Hardware peripherals on the Raspberry Pi are limited to UART, SPI, I^2C and PWM.
To use these peripherals with Flowcode they must be first be enabled via the Raspberry Pi "Interface Configuration" dialog. There is no direct support for analogue or interrupts.
Analogue inputs and outputs would be implemented via external devices.
Also note that (at the date of this document) PWM requires programs to be run with root privileges, for which Flowcode provides the option to run programs as sudo.
Flowcode provides software versions of SPI and I^2C such that devices using these protocols can be connected to any free GPIO pins. Due to the RTOS operation of Raspberry Pi, the bit rate of these can depend upon other running processes. The same is the case for delays, these can vary, the relative deviation being greater for shorter delays.

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