Setting up WIFI connection for the NeoClock

The NeoClock needs to make occasional connections to the internet to set the time and ensure it stays correct. For this you need to set the WIFI network name and password.

(1) On first powering up the NeoClock the display will be all red. This shows that there is no network configuration set.

(2) Go to WiFi settings on your phone or tablet.

(3) On the list of available networks you should see CLOCK. This is a (very) temporary network provided by the NeoClock. It only exists while the WIFI is set up. Connect to this network, no network is required. It will probably warn of no internet connection, this is good.

(4) Open your favourite web browser and, in the address box, enter:

192.168.4.1

(5) This should bring up a ‘Clock Dashboard’ with fields for the WIFI parameters.

(6) Carefully enter your correct parameters and save them. On clicking the second ‘Save’ button the display should go green.

(7) You can also set clock pattern, it will default to block. If it is changed ‘save selection’ is confirmed by blue display. This can be done before or after saving network parameters but cannot be changed once clock is running.

(8) Turn the NeoClock on and off. It will show an initial ‘busy’ display. After a few seconds the correct time should be shown. NeoClock has successfully connected to the internet and set the time. It disconnects as soon as time is set. It will briefly reconnect and reset time twice a day at 10:05 and 20:05.

This setup only needs doing once. NeoClock remembers WIFI parameters.

Should parameters be set incorrectly or the WIFI network not available NeoClock will try to connect for a while. Eventually the display will briefly go blue and then blank. On rebooting NeoClock you will be back to the red display as (1) above. Repeat the instructions to reconnect.

Currently NeoClock operates on GMT / BST which should change automatically.

NeoClock – Technical Details

NeoClock utilises a SeeedStudio XIOA ESP32 C3 development board:

- Powerful CPU: ESP32-C3, 32bit RISC-V singlecore processor that operates at up to 160 MHz
- Complete WiFi subsystem: Complies with IEEE 802.11b/g/n protocol.
- Bluetooth LE subsystem: Supports features of Bluetooth 5 and Bluetooth mesh
- 400KB of SRAM, and 4MB of on-board flash memory
- Ultra small size: As small as a thumb(20x17.5mm) – can be used as a surface mount component.
- Rich interfaces: 1xI2C, 1xSPI, 1xI2S, 2xUART, 11xGPIO(PWM), 4xADC
- USB C connection for data and power.
- Real Time Clock

The only other component is a 64 (8 x 8) RGB LED NeoPixel display. This requires only a single data line to control all LEDs, it is powered from the USB 5v which is available from the board. The setup is so simple it is wired directly to the board.

The board is running micropython, a compact Python 3 implementation optimised to run on microcontrollers. It is a full Python 3.4 implementation with some features from later 3.x versions added. It lacks many of the Cpython standard libraries but includes a rich set of features to control external components. All the interfaces mentioned above are available. A module to drive neopixels is a supplied module.

The software creates a simple web server to enable setting up WIFI parameters and clock mode. This only runs for initial setup.Time is set using an NTP server. The internal RTC clock is very accurate. Setting time twice a day is probably overkill but does no harm. When running the network the mcu is quite power hungry so it only connects when setting time.

With appropriate software, such as the Thonny IDE, the program files can be examined and edited. The main clock driving program is neotime.py. The software creating the web interface for setup is much more complex but is not project specific. The key file here is dashboard.py. It is certainly possible to run the clock and provide an ongoing web interface but this requires maintaining the network connection permanently which for something that’s just a simple clock is wasteful and unnecessary.