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Build a Weather Station with Elixir and Nerves

Visualize Your Sensor Data with Phoenix and Grafana

The Pragmatic Bookshelf

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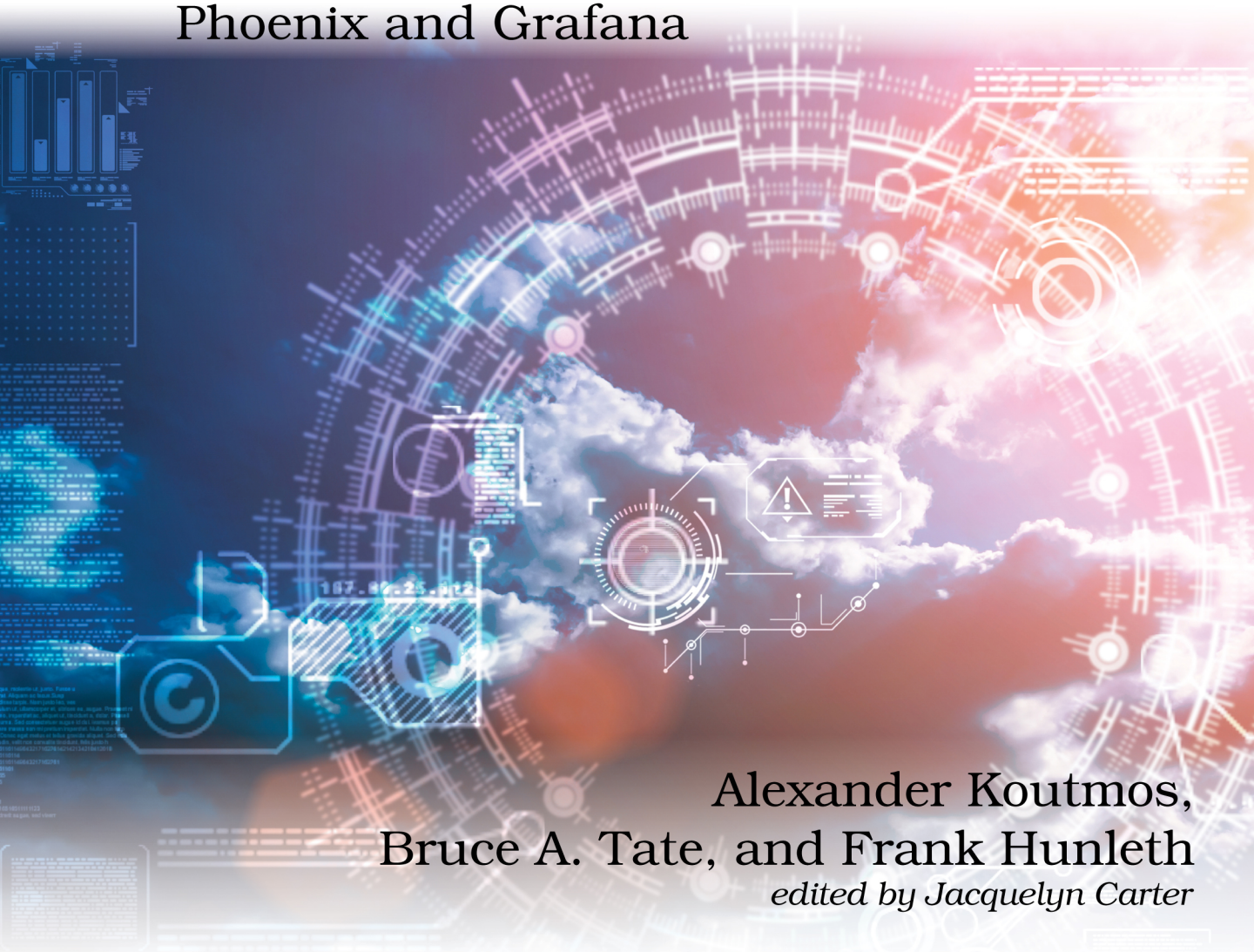

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edited by Jacquelyn Carter

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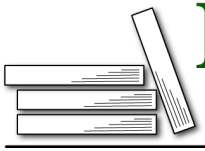

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Assembling the Weather Station

To build our IoT sensor hub, we'll need some sensors and a way to attach those sensors to the board. Typically, sensors are tiny chips that must be attached to circuit boards called breakout boards. These boards are beyond the scope of this book, but the good news is that there are plenty of interfaces and pre-built breakout boards at our disposal. We're going to use a solderless connect interface called Qwiic Connect System. Using the Qwiic Connect System, we'll be able to attach I2C[12]-compatible sensors to our Nerves IoT and get up and running in record time.

What Is I2C?

Inter-Integrated Circuit (or I2C for short) is a communication protocol that allows us to connect multiple external devices to one or more host devices. The external devices (in our case sensors) can all be daisy-chained together and communicate with the host device over the same data bus.

You can set up your Raspberry Pi to support Qwiic Connect sensors by either buying an easy to use header HAT,[13] or if you are feeling more DIY, you can also solder your own Qwiic Connect SHIM[14] onto your Raspberry Pi. You can also buy some sensors on breakout boards that already have Qwiic Connect headers available, so that you can assemble the project quickly. Let's take a look at what's needed to build the weather station.

Gathering the Hardware

A maker store called SparkFun is a good place to get sensors, so we'll build our whole project list from that site. These products come and go, and prices frequently change, so be sure to shop around for the best deal. We're going to need a Raspberry Pi along with some supporting hardware, an environment sensor, an air quality sensor, an ambient light sensor and a way to connect it all using the Qwiic interface:

Raspberry Pi Zero W with headers[15]

The computer that will serve as our IoT sensor hub. You're not limited to only the Raspberry Pi Zero W, as Nerves supports a wide array of embedded devices, but this one is the most cost-effective device out there.

12. https://learn.sparkfun.com/tutorials/i2c/all
13. https://www.sparkfun.com/products/15945
14. https://www.sparkfun.com/products/15794
15. https://www.sparkfun.com/products/15470

If you get the Raspberry Pi with the headers pre-soldered then you can easily connect your sensors to the 2x20 rows or pins.

Qwiic pHAT v2.0 for Raspberry Pi[16]

This board will allow you to easily connect Qwiic Connect breakout boards to your Raspberry Pi and communicate with other I2C devices. As previously mentioned, you can opt for the SparkFun Qwiic SHIM for Raspberry Pi instead if you're looking for something cheaper and more DIY.

VEML6030 Light Sensor (Qwiic)[17]

A device that can detect light and connect to the Raspberry Pi over a standardized interface called I2C.

BME680 Environmental Sensor[18]

A sensor to measure temperature, humidity, and barometric pressure, and connect to the Raspberry Pi over I2C.

SGP30 Air Quality Sensor[19]

A sensor to detect air quality that can be chained to other sensors and connected to the Raspberry Pi over I2C.

Qwiic Connection Cables[20]

If your sensors don't come with these cables, get a few. They are usually under a dollar.

MicroUSB connection cables[21]

You'll need to make a wired connection from your Raspberry Pi to your computer to configure the network and to power the device.

4GB+ MicroSD card[22]

You'll need a MicroSD card to store the Nerves firmware for your Raspberry Pi. Anything with 4GB of capacity or greater will do fine.

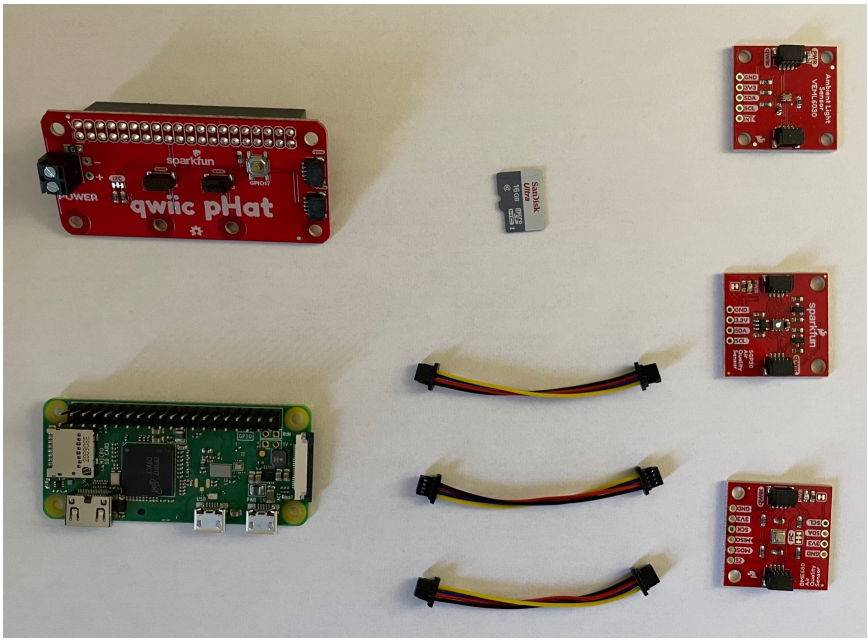
Other I2C sensors[23]

You might want to connect other sensors over I2C as well. Use a Qwiic connector, if possible, to connect to other sensors on the chain.

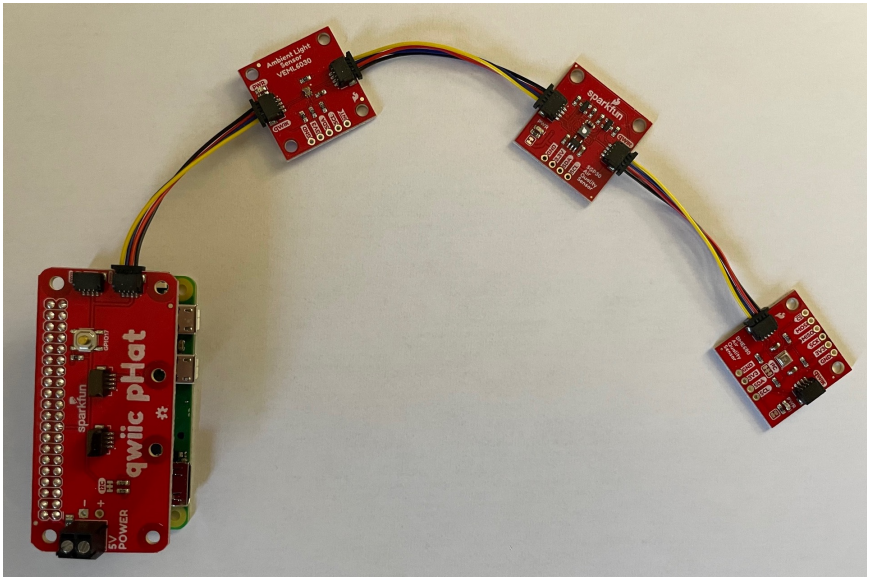
16. https://www.sparkfun.com/products/15945
17. https://www.sparkfun.com/products/15436
18. https://www.sparkfun.com/products/16466
19. https://www.sparkfun.com/products/16531
20. https://www.sparkfun.com/products/14426
21. https://www.sparkfun.com/products/10215
22. https://www.sparkfun.com/products/15051
23. https://www.sparkfun.com/qwiic

Assembling the Sensor Hub

The following picture shows all the components that we'll be working with. From breakout boards to Qwiic cables to the Raspberry Pi itself along with the Qwiic Connect HAT, this is everything that we'll need to capture environmental data.



Putting together the sensor hub should feel like putting together a collection of Lego pieces. The Qwiic Connect HAT should slide nicely on top of the Raspberry Pi header pins, and from there you can daisy chain all the breakout boards together (in no particular order, as I2C doesn't dictate any particular orientation), as shown in the following picture.



With your weather station assembled, you're ready to start putting those sensors to use and capturing weather data.