

Extracted from:

# Build a Weather Station with Elixir and Nerves

Visualize Your Sensor Data with  
Phoenix and Grafana

This PDF file contains pages extracted from *Build a Weather Station with Elixir and Nerves*, published by the Pragmatic Bookshelf. For more information or to purchase a paperback or PDF copy, please visit <http://www.pragprog.com>.

Note: This extract contains some colored text (particularly in code listing). This is available only in online versions of the books. The printed versions are black and white. Pagination might vary between the online and printed versions; the content is otherwise identical.

Copyright © 2022 The Pragmatic Programmers, LLC.

All rights reserved.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior consent of the publisher.

The Pragmatic Bookshelf

Raleigh, North Carolina

# Build a Weather Station with Elixir and Nerves

Visualize Your Sensor Data with  
Phoenix and Grafana

Alexander Koutmos,  
Bruce A. Tate, and Frank Hunleth  
*edited by Jacquelyn Carter*



# Build a Weather Station with Elixir and Nerves

Visualize Your Sensor Data with  
Phoenix and Grafana

Alexander Koutmos

Bruce A. Tate

Frank Hunleth

The Pragmatic Bookshelf

Raleigh, North Carolina



Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and The Pragmatic Programmers, LLC was aware of a trademark claim, the designations have been printed in initial capital letters or in all capitals. The Pragmatic Starter Kit, The Pragmatic Programmer, Pragmatic Programming, Pragmatic Bookshelf, PragProg and the linking *g* device are trademarks of The Pragmatic Programmers, LLC.

Every precaution was taken in the preparation of this book. However, the publisher assumes no responsibility for errors or omissions, or for damages that may result from the use of information (including program listings) contained herein.

For our complete catalog of hands-on, practical, and Pragmatic content for software developers, please visit <https://pragprog.com>.

The team that produced this book includes:

CEO: Dave Rankin

COO: Janet Furlow

Managing Editor: Tammy Coron

Development Editor: Jacquelyn Carter

Copy Editor: L. Sakhi MacMillan

Layout: Gilson Graphics

Founders: Andy Hunt and Dave Thomas

For sales, volume licensing, and support, please contact [support@pragprog.com](mailto:support@pragprog.com).

For international rights, please contact [rights@pragprog.com](mailto:rights@pragprog.com).

Copyright © 2022 The Pragmatic Programmers, LLC.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior consent of the publisher.

ISBN-13: 978-1-68050-902-1

Encoded using the finest acid-free high-entropy binary digits.

Book version: P1.0—January 2022

## 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<sup>12</sup>-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,<sup>13</sup> or if you are feeling more DIY, you can also solder your own Qwiic Connect SHIM<sup>14</sup> 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<sup>15</sup>*

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*<sup>16</sup>

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)*<sup>17</sup>

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

#### *BME680 Environmental Sensor*<sup>18</sup>

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

#### *SGP30 Air Quality Sensor*<sup>19</sup>

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

#### *Qwiic Connection Cables*<sup>20</sup>

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

#### *MicroUSB connection cables*<sup>21</sup>

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*<sup>22</sup>

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*<sup>23</sup>

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>

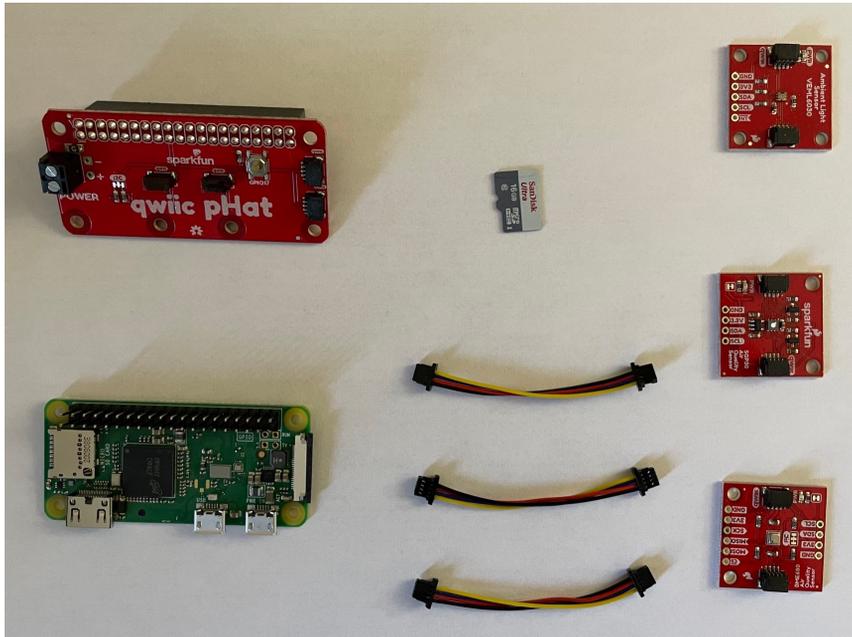
21. <https://www.sparkfun.com/products/10215>

22. <https://www.sparkfun.com/products/15051>

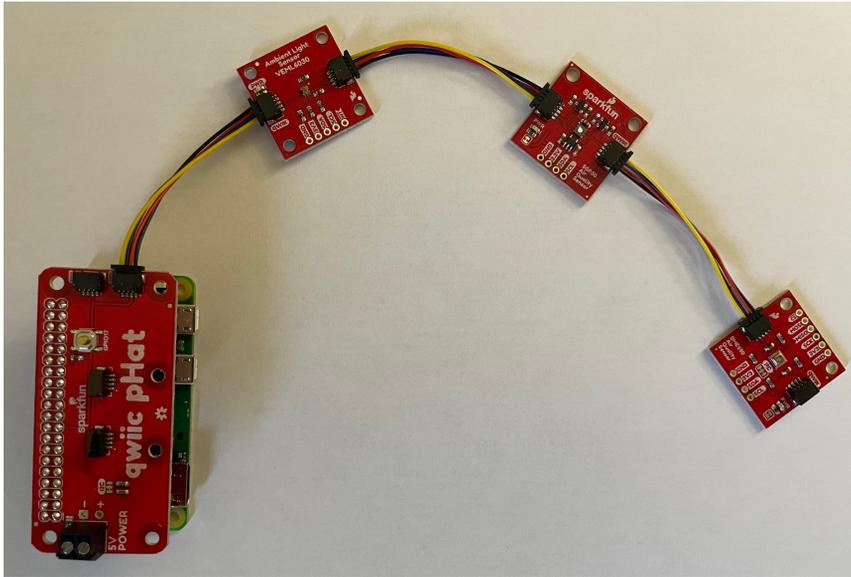
23. <https://www.sparkfun.com/qwiic>

## 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.