Data Farming

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https://blog.nowwhywouldyoudothat.com

Legal made me do it…

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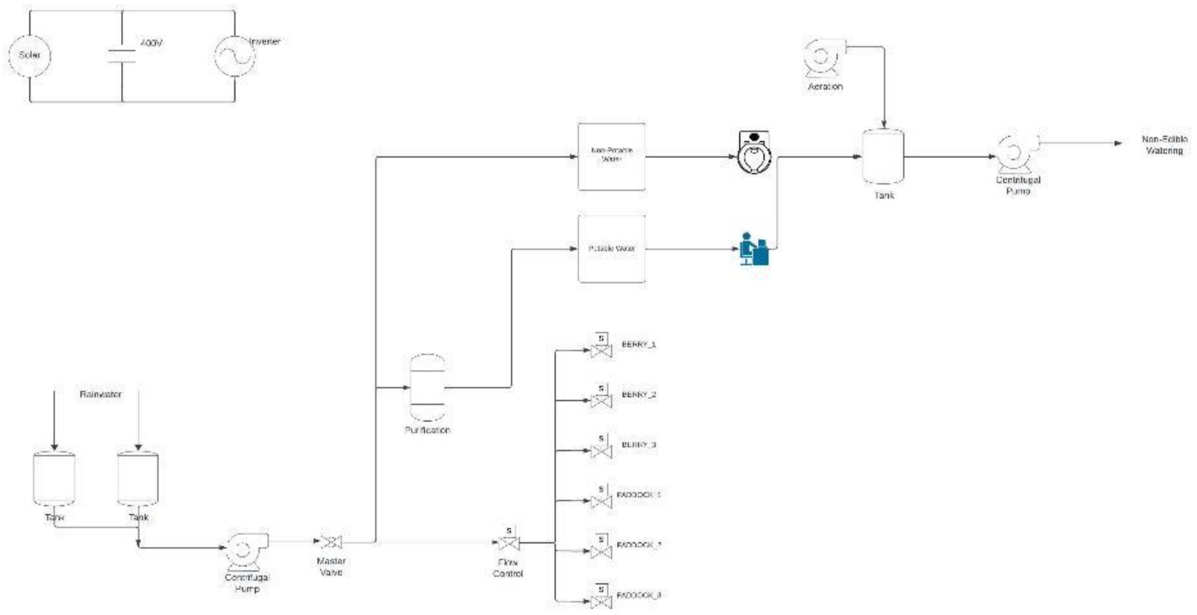
- ✓ A lot of product names and brands are mentioned in this presentation. Any mention does not constitute my endorsement of that company or said company's endorsements of my activities.
- ✓ I have released all source code for this research under a standard BSD "3-Clause" license, and if you use any of this work then you agree to be bound by the terms of that license.
- ✓ There. That ought to do it.

Problem Definition - 1

- ✓ Background
  - ✓ We live on a “larger than usual” semi-rural property on the outskirts of Sydney
  - ✓ We don’t have town water, sewerage or electricity
  - ✓ We like our creature comforts (Aircon, hot water, TV, internet, lights in the nighttime)
  - ✓ My wife likes to garden and has a lot of plants
  - ✓ I love data
- ✓ Problem
  - ✓ How much water do we have?
  - ✓ Are the batteries charged?
  - ✓ Is that ^#*$&* septic tank about to overflow?

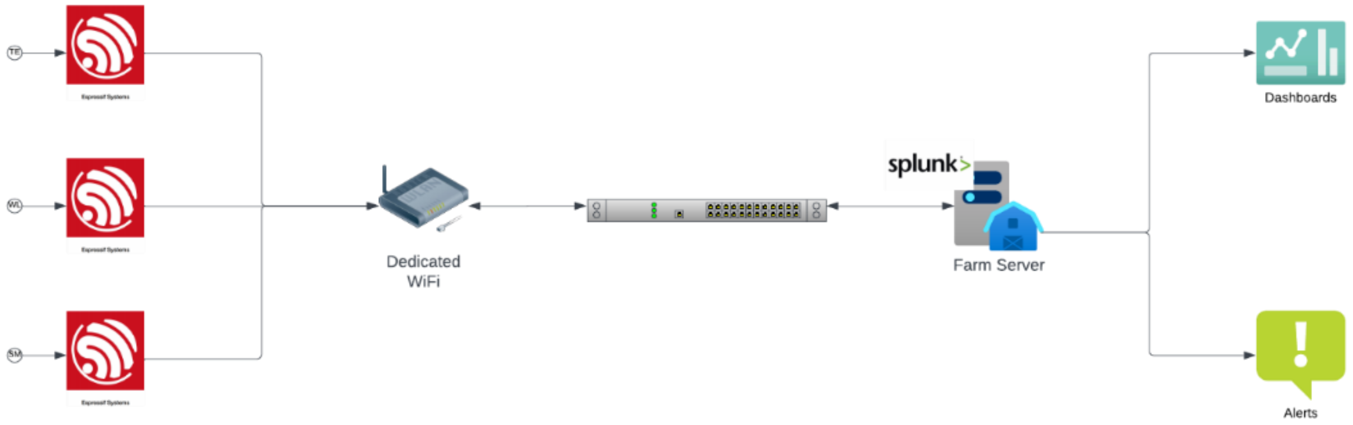
Problem Definition - 2



Seriously?

- ✓ I need to monitor everything
  - ✓ Rainwater
    - ✓ Tank depth, Water Temperature, Pump State
  - ✓ Power
    - ✓ Solar output, Battery Input & Output, Inverter State
  - ✓ Gardens
    - ✓ Soil Moisture, Water Flow, Temperature
  - ✓ Climate
  - ✓ Where’s my mower?

The Solution



DIY Monitor Hardware

Wi Fi™

ARDUINO™

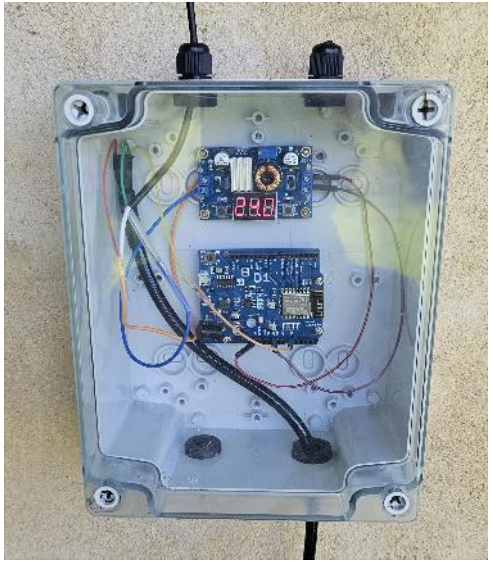
Espressif Systems

BUNNINGS warehouse

jaycar

JACK DANIEL'S OLD TIME Old No.7 BRAND

DIY Monitor Hardware



Sensor Details

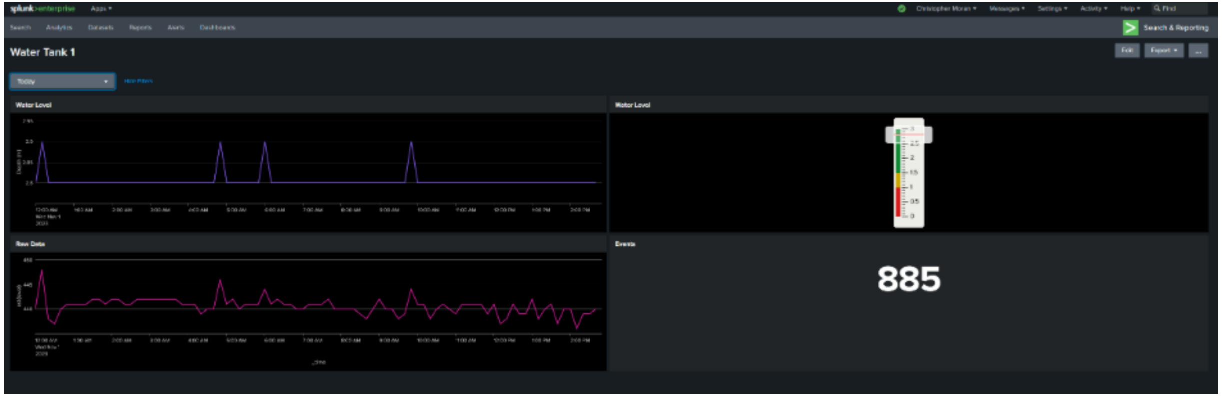
- ✓ ESP-32 WROOM modules
  - ✓ Cheap
  - ✓ Pretty easy to use
  - ✓ Not very reliable – Buy spares!
  - ✓ Can use ESP8266 in some cases
- ✓ Hydrostatic pressure sensor for tank depth
  - ✓ Because ultrasonics, floats and lasers will make you crazy
  - ✓ Of course, the outputs aren’t compatible with the ESP-32
- ✓ Current transformers for power monitoring
  - ✓ Needs signal conditioning
- ✓ Bosch BMP280 environmental sensor
- ✓ Capacitive soil moisture sensors
  - ✓ Electrolysis isn’t nice
- ✓ Fronius Inverters have a Python interface
- ✓ Duracell have a web API, but it’s under NDA

Why Splunk?

- ✓ It’s made to store, analyse and present data
- ✓ I already know how to use it
- ✓ My needs fall within the “free” use case. Even with 110 sensors
- ✓ Full disclosure – I did try:
  - ✓ ELK – Works, but visualising gets messy
  - ✓ Grafana/Prometheus – DIY is big hardware; Cloud can get expensive
  - ✓ AWS IoT – No inbuilt data retention without extra cost

How?

- ✓ Create an index so you know how much data you’re using.
- ✓ HTTP Collector is easy to use.
- ✓ Have the input timestamp the data so that you don’t have to.
- ✓ Write some dashboards, or better, get an artistic person to write the dashboards.



Demo Time

What did I learn?

- ✓ You can do a lot on a limited budget.
- ✓ Document what you have before you start building.
- ✓ Analogue inputs on ESP-32s are crap.
- ✓ Your dog will dig up any, and all cables you bury.
- ✓ IP65 doesn’t mean waterproof if you put holes in it.
- ✓ Monitor battery voltage on remote sensor and alert when low.
- ✓ Don’t do unit conversions on the sensors. Let Splunk handle it.
- ✓ Your neighbours and significant other won’t understand your greatness.
- ✓ There is always more data.

Thank You!

https://github.com/au-chrismor/datafarm

https://blog.nowwhywouldyoudothat.com

Source Types

```
{
    “host”: “sensor_name”,
    “sourcetype”: “datafarm”,
    “index”: “index_name”,
    “event”: {
        “sensortype”: “sensor_type”,
        specific-data-pairs
    }
}
```

Sensortype = “tankdepth”

```
{
     “host”: “sensor_name”,
     “sourcetype”: “datafarm”,
     “index”: “index_name”,
     “event”: {
          “sensortype”: “tankdepth”,
          “depth”: ADC Value (int),
          “temperature”: DS18B20 Output (float),
          “battery”: ADC Value (int)
     }
}
```

Set to “-274” if not used

Set to “-1” if not used

Sensortype = “soilmoisture”

```
{
        “host”: “sensor_name”,
        “sourcetype”: “datafarm”,
        “index”: “index_name”,
        “event”: {
                “sensortype”: “soilmoisture”,
                “moisture”: ADC Value (int),
                “battery”: ADC Value (int)
        }
}
```

Set to “-1” if not used

Sensortype = “temperature”

```
{
    “host”: “sensor_name”,
    “sourcetype”: “datafarm”,
    “index”: “index_name”,
    “event”: {
        “sensortype”: “temperature”,
        “temperature”: DS18B20 Output (float),
        “battery”: ADC Value (int)
    }
}
```

Set to “-1” if not used

Sensortype = “environment”

```
{
        “host”: “sensor_name”,
        “sourcetype”: “datafarm”,
        “index”: “index_name”,
        “event”: {
              “sensortype”: “environment”,
              “temperature”: BME280 Value (float),
              “humidity”: BME280 Value (float),
              “pressure”: BME280 Value (float),
              “battery”: ADC Value (int)
        }
}
```

Set to “-1” if not used

Sensortype = “acpower”

```
{
    “host”: “sensor_name”,
    “sourcetype”: “datafarm”,
    “index”: “index_name”,
    “event”: {
        “sensortype”: “acpower”,
        “voltage”: ADC Value (int),
        “current”: ADC Value (int),
        “battery”: ADC Value (int)
    }
}
```

Set to “-1” if not used

Sensortype = “dcpower”

```
{
     “host”: “sensor_name”,
     “sourcetype”: “datafarm”,
     “index”: “index_name”,
     “event”: {
          “sensortype”: “dcpower”,
          “voltage”: ADC Value (int),
          “current”: ADC Value (int),
          “battery”: ADC Value (int)
     }
}
```

Set to “-1” if not used

Sensortype = “weather”

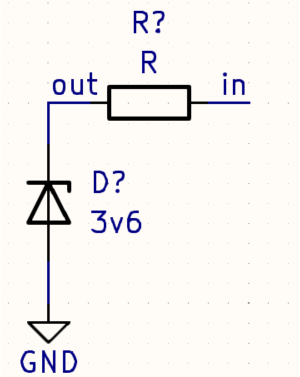
```
{
    “host”: “sensor_name”,
    “sourcetype”: “datafarm”,
    “index”: “index_name”,
    “event”: {
        “sensortype”: “weather”,
        “windspeed”: last m/s (int),
        “winddir”: lookup value (int),
        “rainfall”: pulse count (int),
        “uv”: ADC value (int),
        “light”: ADC value (int),
        “temperature”: BME280 Value (float),
        “humidity”: BME280 Value (float),
        “pressure”: BME280 Value (float),
        “battery”: ADC Value (int)
    }
}
```

Set to “-1” if not used

Progress Photos

In case you didn't know…

Input Protection



ADC Resolution

Device Family	Resolution (Bits)	Count Range	Resolution*
ESP8266 / AVR Arduino	10	0 - 1023	2.4mm
ESP32 / Due / MKR	12	0 – 4093	0.7mm
ADS1115 (External)	16	0 – 65535	0.06mm

*Assuming 5V = 3m Depth