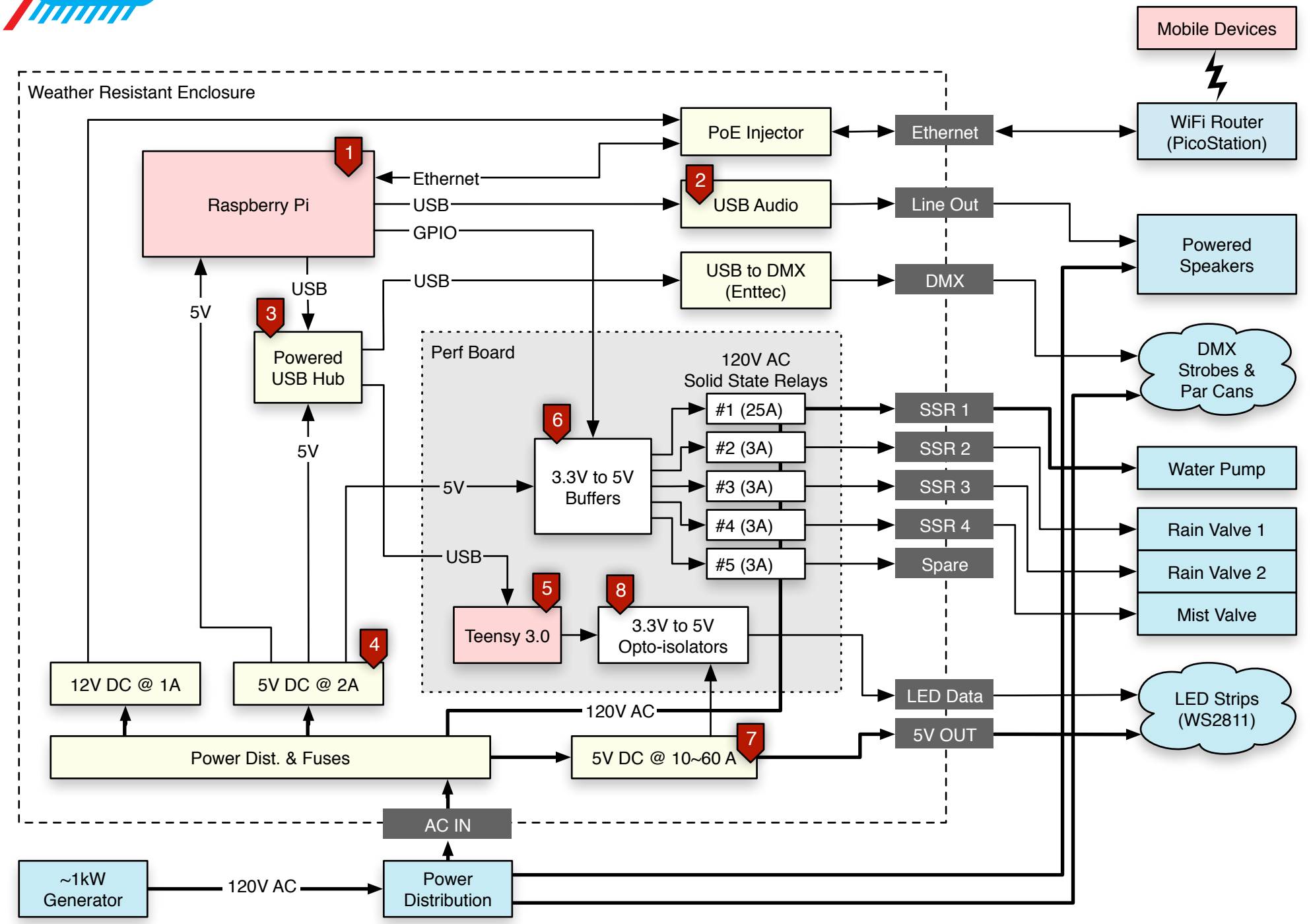
Electrical System Overview



Electrical System Notes

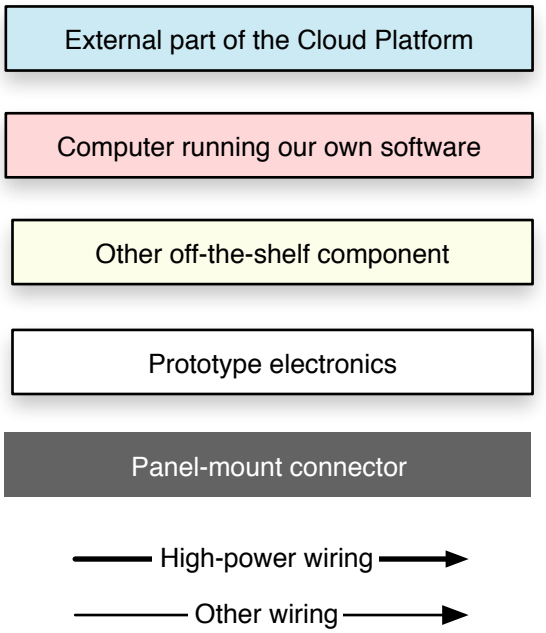
1. The Raspberry Pi single-board computer runs our custom control software, orchestrating light and sound performances.
2. An external USB sound adapter provides higher quality audio than the Raspberry Pi's built-in D/A converter.
3. The Pi only has two built-in USB ports. One of these is connected directly to the USB audio interface, to avoid bottlenecks due to Isochronous USB streaming via hubs. The other two peripherals are less demanding of the USB protocol, so they connect via a hub.

   The hub is externally powered, so that we can route less power through the Raspberry Pi's 750mA main fuse.
4. The low-current 5V power supply only runs the Raspberry Pi, USB devices, Teensy micro-controller, and the low-voltage side of the Solid State Relay circuit.
5. The Teensy 3.0 is a tiny ARM microcontroller board which can interface with the WS2811 LED strips, and off-load some of the repetitive real-time tasks associated with driving the LEDs.
6. Level-shifting buffers convert the low-current 3.3V signals from the Raspberry Pi's GPIO port into slightly higher current 5V signals suitable for driving the solid state relays. They also provide a layer of protection for the Pi's GPIO port.
7. The LED strips are powered by a large 5V supply, sized according to the number of LEDs we plan to support.
8. Opto-isolators are used to level-shift the WS2811 serial signals from 3.3V to 5V, for fault and EMI isolation, and to avoid power supply sequencing issues between the two 5V supplies.

Goals

- Keep it simple
- Use parts we already have on hand
- High quality audio
- High quality and nuanced LED animation
- Fault isolation and safety precautions

Legend



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