



Prince William Sound Underwater Profiling Vehicle



The Aquanauts

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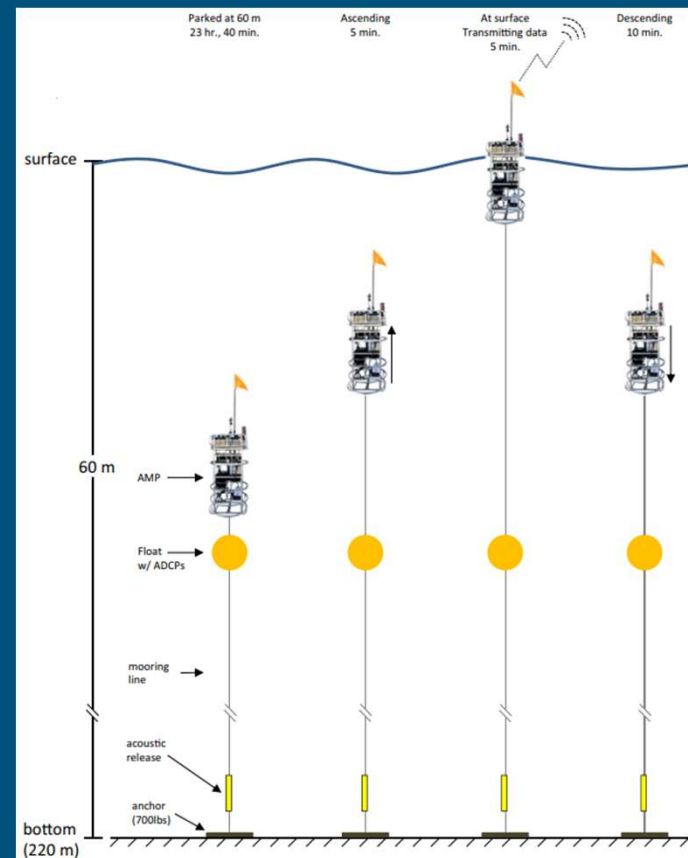
Background: Prince William Sound

- In 1989 the Exxon Valdez oil tanker crashed into Bligh Reef, spilling 10.8 million gallons of oil in PWS
- Many species and industries were affected by this disaster
- There has been improvement over the years, but PWS is still in recovery



Background: Profiler

- Since 2013 Ocean scientists have used an autonomous moored profiler (AMP) to collect environmental data on the recovery of PWS
- The profiler has an anchor that holds it at a specified depth
- The profiler ascends to the surface once a day to collect data and transmit a signal that it is still alive



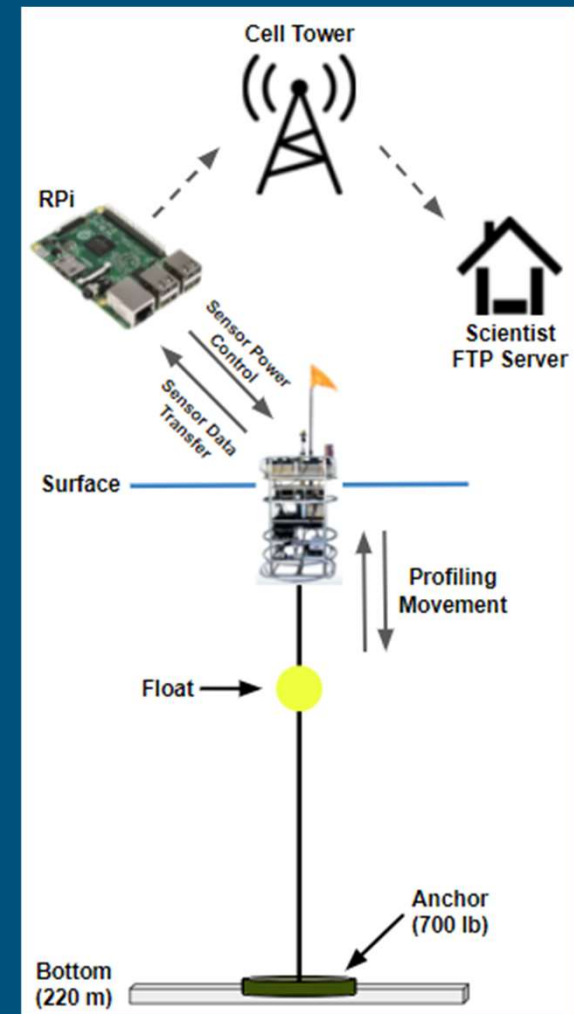
Problems

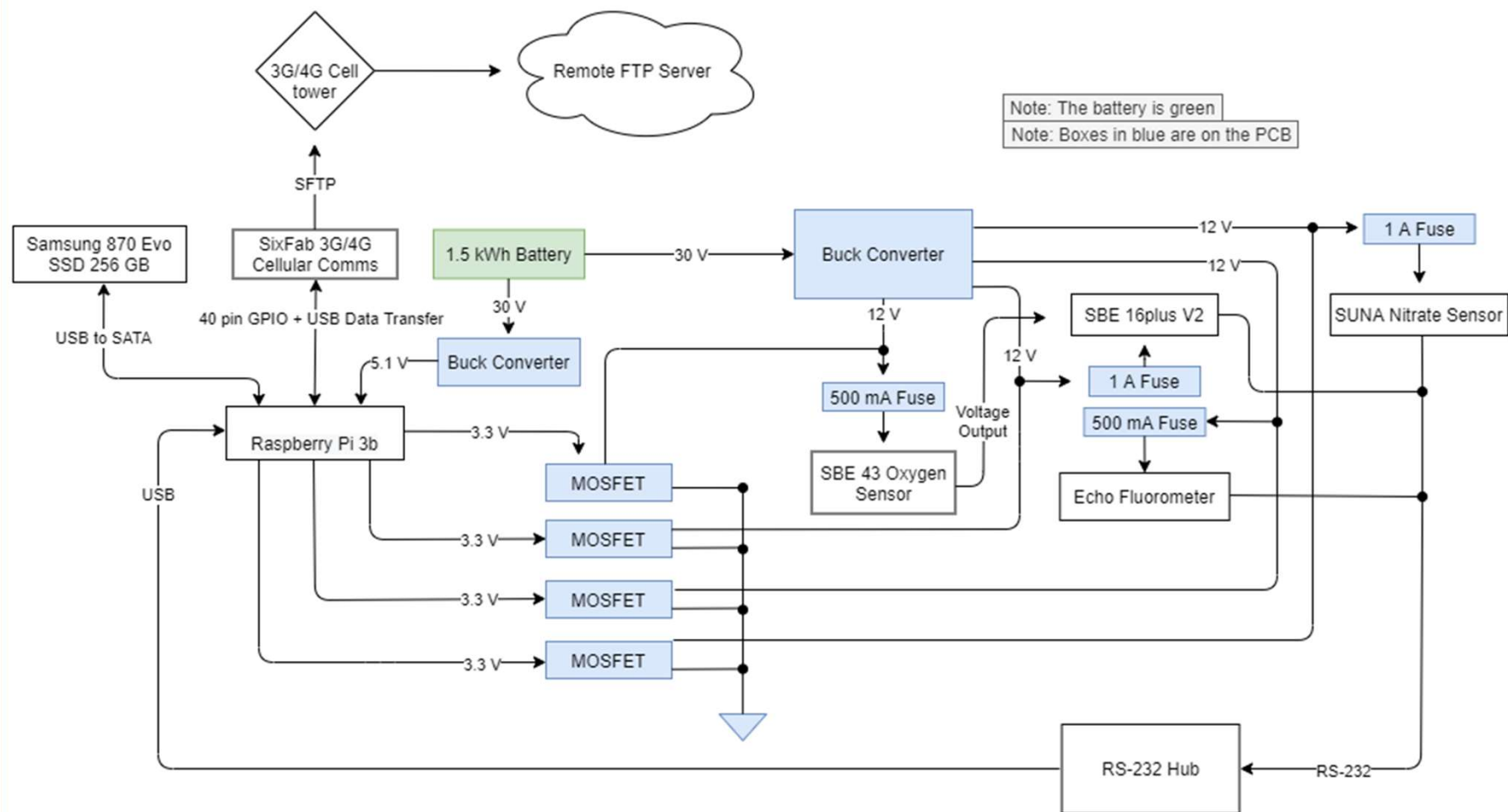
- Only 1/10th of data is currently being transferred remotely
 - Someone must travel to the platform every few weeks in order to extract data
 - This trip can be difficult and dangerous
- The data processing components are outdated
- The profiler does not have the flexibility to turn on/off individual sensors (save battery life)

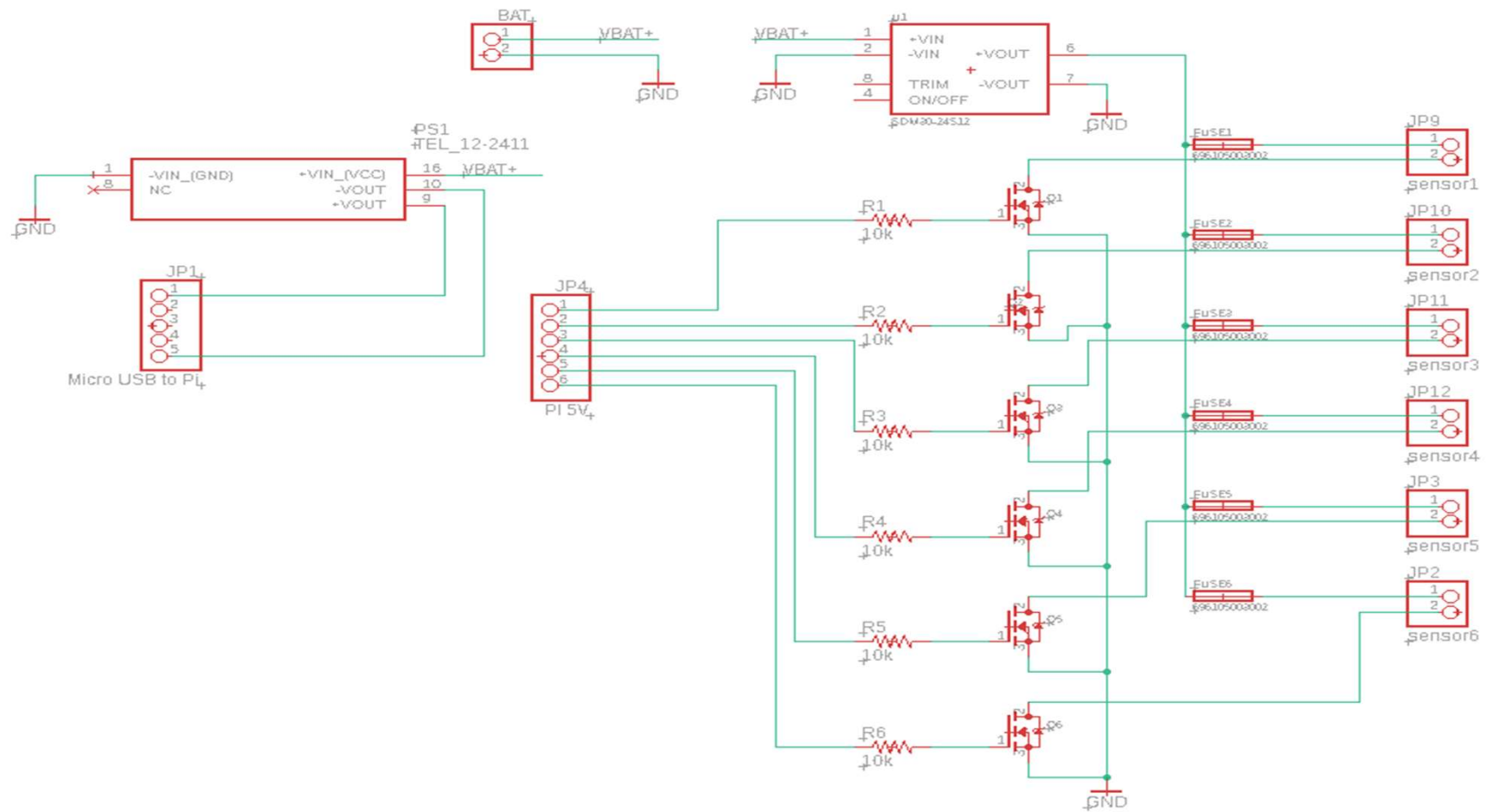


Our Solution

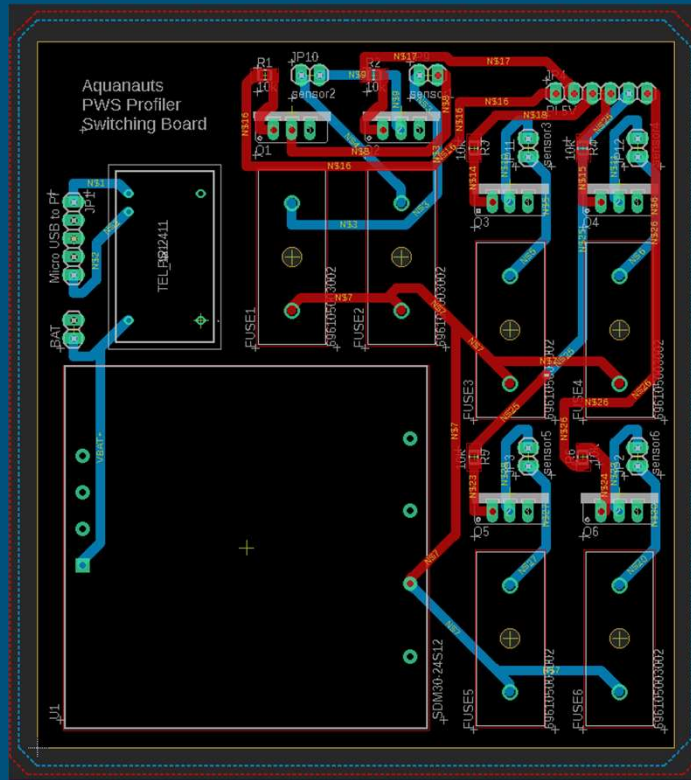
- Update the microcontroller to accommodate modern cellular capabilities and data storage
 - Raspberry Pi 3B running Raspbian (Lightweight Debian Linux)
- Transmit 100% of data to ocean scientists via FTP over a cellular connection
 - Not considering plankton camera
- Custom PCB to power microcontroller & enable sensors on a schedule from the profiler's on-board battery
 - Signal to enable or disable sensor from Raspberry Pi







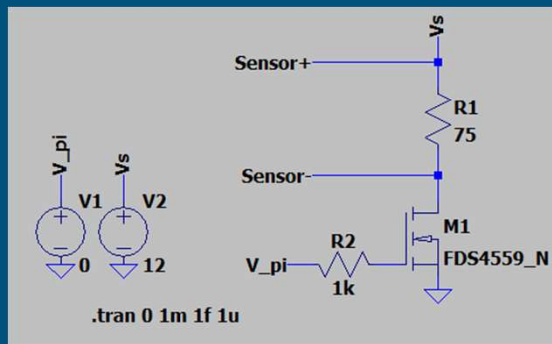
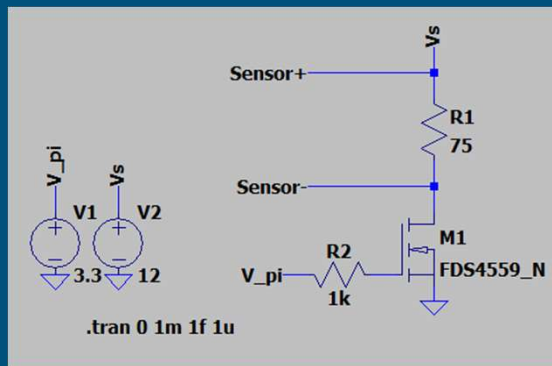
PCB



Raspberry Pi and PCB



Results (Simulation)



Results (Experimental)



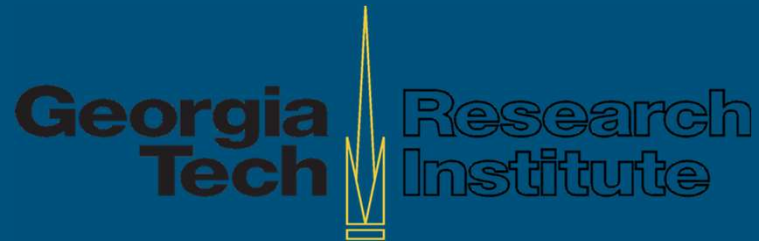
Part	Manufacturer	Retailer	Price per Item	Quantity	Part Total
Raspberry Pi 3B	Raspberry Pi	Amazon	37.99	1	37.99
Raspberry Pi 4G/LTE Cellular Modem Kit	Sixfab	Sixfab	109	1	109
Sixfab Connect Sim	Sixfab	Sixfab	2	1	2
SAMSUNG PRO Plus SDHC Full Size SD Card 32GB	Samsung	Amazon	9.99	1	9.99
MKR SD PROTO SHIELD	Arduino	Arduino	13.8	1	13.8
USB 3.0 SATA III Hard Drive Adapter Cable, SATA to USB Adapter Cable	SKL Tech	Amazon	7.99	1	7.99
SAMSUNG 870 EVO 250GB 2.5 Inch SATA III Internal SSD	Samsung	Amazon	39.99	1	39.99
30 W DC/DC Converter	Mean Well USA	Digi-Key	26.71	1	26.71
FQP30N06L	ON Semiconductor	Digi-Key	1.22	6	7.32
USB to Serial RS232 Adapter	SIIG	Amazon	49.85	1	49.85
12 W DC/DC Converter	Traco Power	Digi-Key	28	1	28
PCB	JLC PCB	JLC PCB	14.8	1	14.8
500 mA Fuse	Bel Fuse Inc	Digi-Key	0.234	5	1.17
1A Fuse	Bel Fuse Inc	Digi-Key	0.224	5	1.12
5x20 mm Fuse Holder	Würth Elektronik	Digi-Key	0.64	8	5.12

Total

354.85



Special thanks to Dr. West and Dr. Campbell





Questions?