Remote Sensing for Forest Fires
Pricing Estimate

UBC Cloud Innovation Centre

Capstone Team CG-23

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2024-04-30

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1. Budgeting

The team budgeted for the total $650 amount and ended up spending $626.71. The budgeting for this project is outlined below.

Name	Base Price	QTY	Tax	Shipping	After-Tax Price	CAD/USD	Final Price ($CAD)
SHT31 Temp & Humidity Sensor	$31.08	1	12%	$8.00	$42.81	CAD	$42.81
SenseCAP M2 indoor Gateway	$95.00	1			$125.54	USD	$170.34
Wio-E5 mini Dev Board (order 1)	$21.90	2	12%	$29.74	$57.88	USD	$78.53
2.6 dBi Long Range Antenna	$2.49	2			$6.58	USD	$8.93
SMA to I-PEX Antenna Cable	$1.90	2			$5.02	USD	$6.81
ST-LINK V2 PROG FOR STM8 STM32	$32.90	1	15%	$8.00	$45.84	CAD	$45.84
Wio-E5 mini Dev Board (order 2)	$30.29	1	15%		$34.83	CAD	$34.83
STEMMA QT BME688 Sensor Board	$33.25	2	15%	$0.00	$74.48	CAD	$76.48
Battery Holder	$1.74	1	15%		$2.00	CAD	$2.00
Jumper Wire F/F 6" 20PCS	$2.99	2	15%		$6.88	CAD	$6.88
AN-05 Polycase	$42.95	1		$21.80	$64.75	USD	$87.86
PCB Fabrication	$7.00	1		$17.80	$24.80	USD	$33.65

Table 1: Expenses List

Category	Amount Budgeted (CAD)	Amount Spent (CAD)
Sensors	$100	$119.29
Microcontrollers + Components[1]	$100	$135.98
Gateway	$200	$170.34
Enclosure + Components	$100	$89.86
Power Supply	$50	$0
ST-Link	$50	$45.84
PCB	$50	$33.65
Import Charges	$0	$31.75
$650	$626.71	

Table 2: Budgeting Overview

1.1 Sensors

IoT sensors are fundamental to the project as they play a vital role in data collection. A device will consist of two temperature sensors and two humidity sensors (for redundancy) and a gas sensor. A temperature and humidity sensor was purchased for $42.81 but was not used in the final product[1]. This sensor was replaced with two temperature, humidity and gas sensors which were purchased for $76.48 [2].

1.2 Microcontroller

A microcontroller with a LoRa radio will be needed to communicate with the LoRaWAN gateway. Three microcontrollers have been purchased for redundancy and facilitate seamless collaboration among team members, enabling multiple individuals to separately engage with

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[1] Components: Refers to any additional components required for the designated section, such as antennas, cables, etc. Price is usually negligible compared to the total budget.

the microcontroller. The three microcontrollers along with a pair of antennas, antenna cables, and jumper wires (for prototyping) have been purchased for $135.98 [3][4][5].

1.3 Enclosure

The housing of our device is an IP67 rated waterproof aluminum electronics enclosure. This has been purchased along with a vent plug and battery holder for $89.86 [6][7].

1.4 Gateway

A LoRaWAN gateway is needed for long distance communication with the microcontroller. This has been purchased for $170.34 [8].

1.5 Power Supply

A rechargeable lithium ion battery is used to supply power to the microcontroller and IoT sensors. This component had no cost as a team member already had one available.

1.6 ST-Link/V2

An ST-Link is used for writing and flashing firmware onto the microcontroller. This is essential for taking readings from the IoT sensors without the need of an Arduino. This has been purchased for $45.84 [9].

1.7 PCB

A PCB was designed to fit into the enclosure and house the microcontroller, two sensors, and debug connector. This was fabricated for $33.65.

1.7 AWS

AWS accounts in the IAM identity center and AWS credits are provided to the team by the UBC Cloud Innovation Center.

Note: All costs given have been converted to CAD with tax included.

Final Estimate

The total amount spent on this project is not representative of the actual cost to build this product as many expenses are independent of the final product. Some of these purchases include the BME688 and MCU dev boards which were used in the prototyping stages [2][3]. Other expenses include the SHT-31 sensor which was replaced with an improved sensor (BME688 sensor) and therefore did not make it into the final product.

Overall the final estimate to rebuild our product would be roughly $350. This cost includes the price of the LoRa gateway ($170.34), fabricating the PCB ($33.65), the PCB components ($44.82), the enclosure ($89.86), the antenna and antenna cable ($7.90). This also assumes the client already owns an ST-Link which would add an additional $45.84 cost. This is the cost of the sensor device and a gateway. The cost of building an additional sensor device alone would be roughly $180. It should be noted that these pricing estimates come from building a single PCB which is considerably more expensive than ordering PCBs in bulk.

References

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