PathFindr

University of Ottawa
GNG 2101 B
October 14th, 2020
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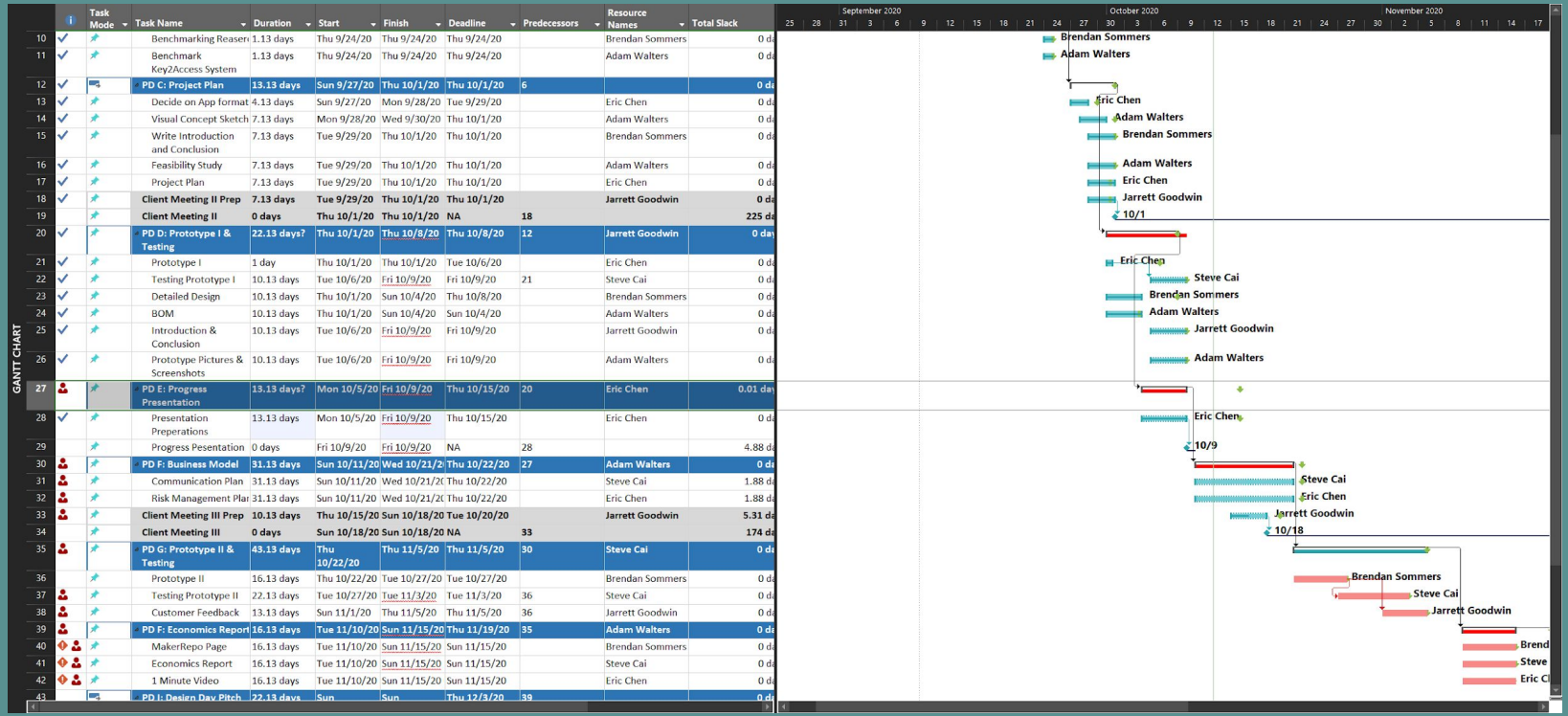
Problem Statement

Design a system that can be accessed by visually impaired and other library users through an app that allows users to navigate to important locations on the first floor of the Morisset Library.

Project Plan



GANTT CHART

	Task Mode	Task Name	Duration	Start	Finish	Deadline	Predecessors	Resource Names	Total Slack
10		Benchmarking Reasen	1.13 days	Thu 9/24/20	Thu 9/24/20	Thu 9/24/20		Brendan Sommers	0 da
11		Benchmark Key2Access System	1.13 days	Thu 9/24/20	Thu 9/24/20	Thu 9/24/20		Adam Walters	0 da
12		**PD C: Project Plan**	**13.13 days**	**Sun 9/27/20**	**Thu 10/1/20**	**Thu 10/1/20**	**6**		**0 da**
13		Decide on App format	4.13 days	Sun 9/27/20	Mon 9/28/20	Tue 9/29/20		Eric Chen	0 da
14		Visual Concept Sketch	7.13 days	Mon 9/28/20	Wed 9/30/20	Thu 10/1/20		Adam Walters	0 da
15		Write Introduction and Conclusion	7.13 days	Tue 9/29/20	Thu 10/1/20	Thu 10/1/20		Brendan Sommers	0 da
16		Feasibility Study	7.13 days	Tue 9/29/20	Thu 10/1/20	Thu 10/1/20		Adam Walters	0 da
17		Project Plan	7.13 days	Tue 9/29/20	Thu 10/1/20	Thu 10/1/20		Eric Chen	0 da
18		**Client Meeting II Prep**	**7.13 days**	**Tue 9/29/20**	**Thu 10/1/20**	**Thu 10/1/20**		**Jarrett Goodwin**	**0 da**
19		**Client Meeting II**	**0 days**	**Thu 10/1/20**	**Thu 10/1/20**	**NA**	**18**		**225 da**
20		**PD D: Prototype I & Testing**	**22.13 days?**	**Thu 10/1/20**	**Thu 10/8/20**	**Thu 10/8/20**	**12**	**Jarrett Goodwin**	**0 da**
21		Prototype I	1 day	Thu 10/1/20	Thu 10/1/20	Tue 10/6/20		Eric Chen	0 da
22		Testing Prototype I	10.13 days	Tue 10/6/20	Fri 10/9/20	Fri 10/9/20	21	Steve Cai	0 da
23		Detailed Design	10.13 days	Thu 10/1/20	Sun 10/4/20	Thu 10/8/20		Brendan Sommers	0 da
24		BOM	10.13 days	Thu 10/1/20	Sun 10/4/20	Sun 10/4/20		Adam Walters	0 da
25		Introduction & Conclusion	10.13 days	Tue 10/6/20	Fri 10/9/20	Fri 10/9/20		Jarrett Goodwin	0 da
26		Prototype Pictures & Screenshots	10.13 days	Tue 10/6/20	Fri 10/9/20	Fri 10/9/20		Adam Walters	0 da
27		**PD E: Progress Presentation**	**13.13 days?**	**Mon 10/5/20**	**Fri 10/9/20**	**Thu 10/15/20**	**20**	**Eric Chen**	**0.01 da**
28		Presentation Preperations	13.13 days	Mon 10/5/20	Fri 10/9/20	Thu 10/15/20		Eric Chen	0 da
29		Progress Pesentation	0 days	Fri 10/9/20	Fri 10/9/20	NA	28		4.88 da
30		**PD F: Business Model**	**31.13 days**	**Sun 10/11/20**	**Wed 10/21/2**	**Thu 10/22/20**	**27**	**Adam Walters**	**0 da**
31		Communication Plan	31.13 days	Sun 10/11/20	Wed 10/21/2(	Thu 10/22/20		Steve Cai	1.88 da
32		Risk Management Plar	31.13 days	Sun 10/11/20	Wed 10/21/2(	Thu 10/22/20		Eric Chen	1.88 da
33		**Client Meeting III Prep**	**10.13 days**	**Thu 10/15/20**	**Sun 10/18/20**	**Tue 10/20/20**		**Jarrett Goodwin**	**5.31 da**
34		**Client Meeting III**	**0 days**	**Sun 10/18/20**	**Sun 10/18/20**	**NA**	**33**		**174 da**
35		**PD G: Prototype II & Testing**	**43.13 days**	**Thu 10/22/20**	**Thu 11/5/20**	**Thu 11/5/20**	**30**	**Steve Cai**	**0 da**
36		Prototype II	16.13 days	Thu 10/22/20	Tue 10/27/20	Tue 10/27/20		Brendan Sommers	0 da
37		Testing Prototype II	22.13 days	Tue 10/27/20	Tue 11/3/20	Tue 11/3/20	36	Steve Cai	0 da
38		Customer Feedback	13.13 days	Sun 11/1/20	Thu 11/5/20	Thu 11/5/20	36	Jarrett Goodwin	0 da
39		**PD F: Economics Report**	**16.13 days**	**Tue 11/10/20**	**Sun 11/15/20**	**Thu 11/19/20**	**35**	**Adam Walters**	**0 da**
40		MakerRepo Page	16.13 days	Tue 11/10/20	Sun 11/15/20	Sun 11/15/20		Brendan Sommers	0 da
41		Economics Report	16.13 days	Tue 11/10/20	Sun 11/15/20	Sun 11/15/20		Steve Cai	0 da
42		1 Minute Video	16.13 days	Tue 11/10/20	Sun 11/15/20	Sun 11/15/20		Eric Chen	0 da
43		**PD I: Design Day Pitch**	**22.13 days**	**Sun**	**Sun**	**Thu 12/3/20**	**39**		**0 da**

Customer Needs

1. The system assists visually impaired users
2. The system is accessed through the users' phone
3. The system is used to navigate to key locations within the library
4. The system is reliable
5. The system is for the first floor of the library
6. The system is accessible for everyone, not only those who are impaired
7. The system is easily modifiable
8. The system notifies users via auditory and visual notifications
9. The system costs less than similar products on the market
10. The system enables staff to broadcast new announcements and change existing ones

Benchmarking

- Wayfindr is used in the London Underground
- Key2Access (K2A) is used in an Ottawa Public Library and City Hall

Metric	Wayfindr	K2A (OPL)	Units
Time from app start to navigation start	--	10	Time (s)
Customer Satisfaction	4/5	2/5	Subjective
Effective range of the beacon	100	5	Distance (m)
Battery Life of beacon	3	--	Years
Time to reprogram beacon locations	--	--	Time (s)
Cost per beacon	$132.64	--	CAD$
Beacon Weight	86	--	Weight (g)
Beacon Size	6.9	~15	Size (cm)
Effectiveness of notification	5/5	1/5	Subjective
Time to broadcast announcement	--	--	Time (ms)

Target Specifications

Metric	Marginal Range	Ideal Range	Units
Time from app start to navigation start	$x \leq 30$	$x \leq 15$	Time (s)
Customer Satisfaction	$x \geq 3/5$	$x \geq 5/5$	Subjective
Effective range of the beacon	$x \geq 6$	$x \geq 10$	Distance (m)
Battery Life of beacon	$x \geq 1$	$x \geq 5$	Years
Time to reprogram beacon locations	$x \leq 420$	$x \leq 300$	Time (s)
Cost per beacon	$x \leq 70$	$x \leq 30$	CAD$
Beacon Weight	$x \leq 750$	$x \leq 500$	Weight (g)
Beacon Size	$x \leq 25$	$x \leq 10$	Size (cm)
Effectiveness of notification	$x \geq 4/5$	$x = 5/5$	Subjective
Time to broadcast announcement	$x \leq 6000$	$x \leq 5000$	Time (ms)

Decision Matrix - App

Metrics:
1) Time from app start to navigation start
2) Customer Satisfaction
5) Time to reprogram beacons
9) Effectiveness of notification
10) Time to broadcast announcement

Concepts:
1) Create android app from scratch
2) Cross-platform app from prebuilt frameworks
6) Create app using MIT App Builder
8) Auditory notifications
9) Haptic notifications

		App				
M	**W**	**1**	**2**	**6**	**8**	**9**
1	27%	5	4	4	2	5
2	37%	5	4	4	5	3
5	10%	3	3	3	2	3
9	22%	4	3	4	5	3
10	4%	4	3	3	4	5
	Score	**4.54**	**3.64**	**3.86**	**3.85**	**3.62**

Decision Matrix - Beacon

Metrics:
2) Customer Satisfaction
3) Effective range
4) Battery life
5) Time to reprogram
6) Cost
7) Weight
8) Maximum Dimensions

Concepts:
3) Wi-fi signals
4) Ultrasonic acoustic signals
5) IR signals
7) Bluetooth signals
14) Position vectors via triangulation
15) 3D Printed beacon housing

		Beacons					
M	**W**	**3**	**4**	**5**	**7**	**14**	**15**
2	26%	2	1	2	4	5	5
3	16%	5	2	2	4	5	4
4	18%	1	4	4	4	3	3
5	3%	1	5	5	5	2	4
6	21%	2	4	5	3	3	4
7	8%	2	5	5	5	3	2
8	8%	2	5	5	5	3	3
	Score	**2.27**	**3.09**	**3.56**	**3.98**	**3.81**	**3.84**

Concepts

App:

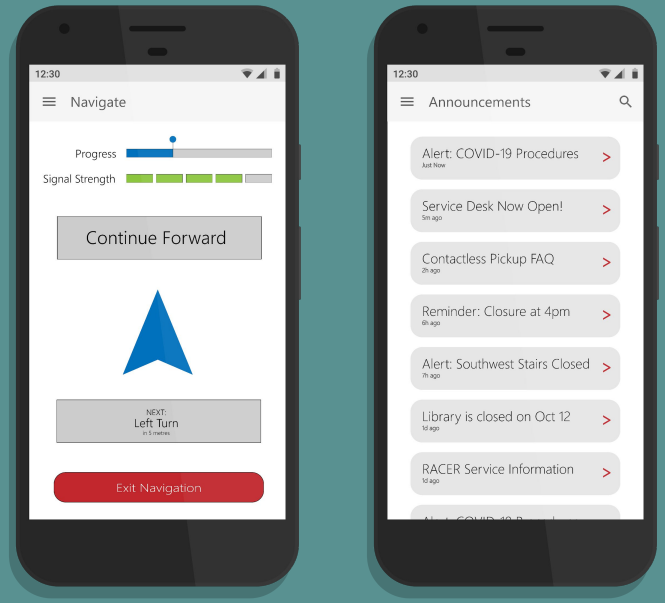
- Android app
- Haptic and/or Auditory Notifications
- A unique app or authentication process for employees to use for administrative tasks

Beacon:

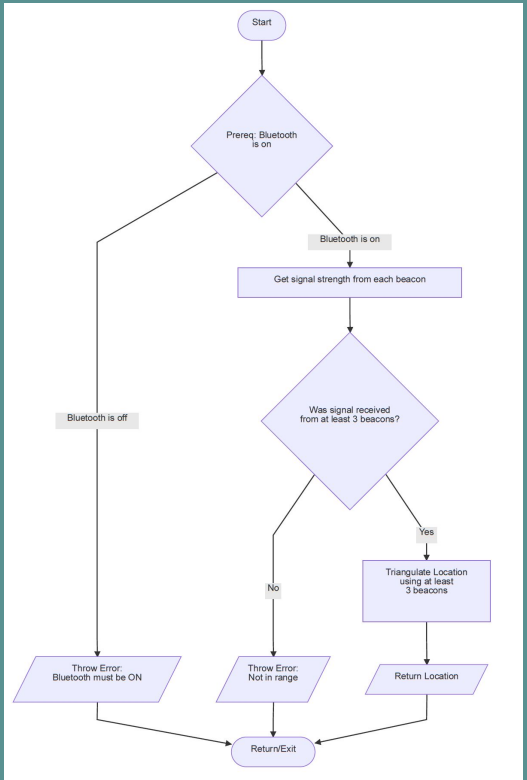
- Bluetooth Signals
  - Triangulation and displacement vectors
- 3D Printed PLA
- Mounted with screws

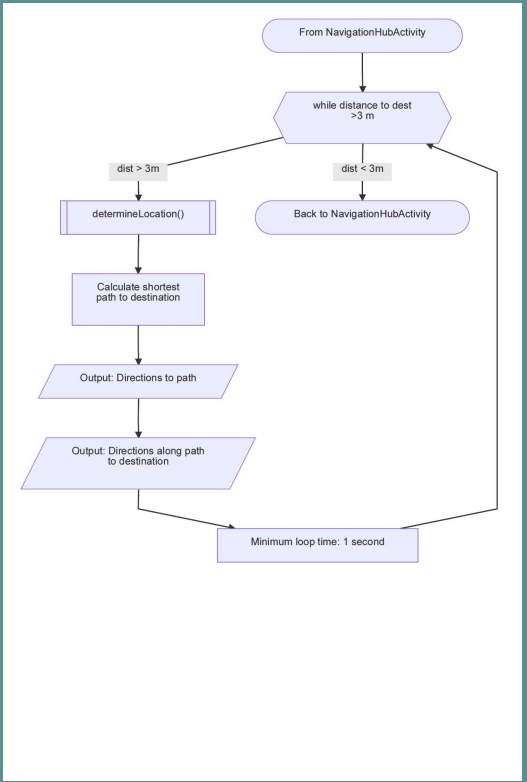
Software Prototype Development

- Using Android for higher-fidelity prototypes
  - Android is the final platform
  - Our team is already familiar with it
- Lower-fidelity prototypes are split into flowcharts and simulated screenshots
  - Screenshots for getting feedback from the client about the visual style and flow of the app
  - Flowcharts for validating the logical flow of the app

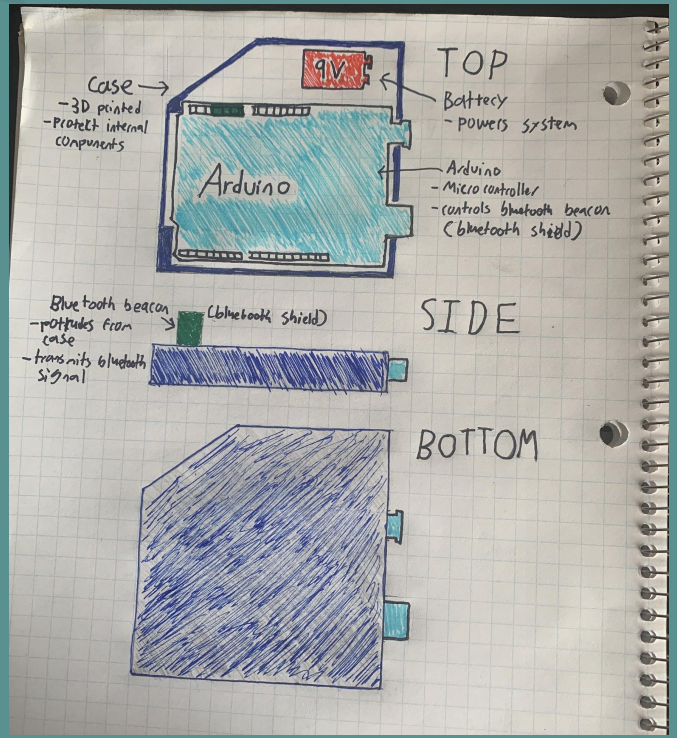


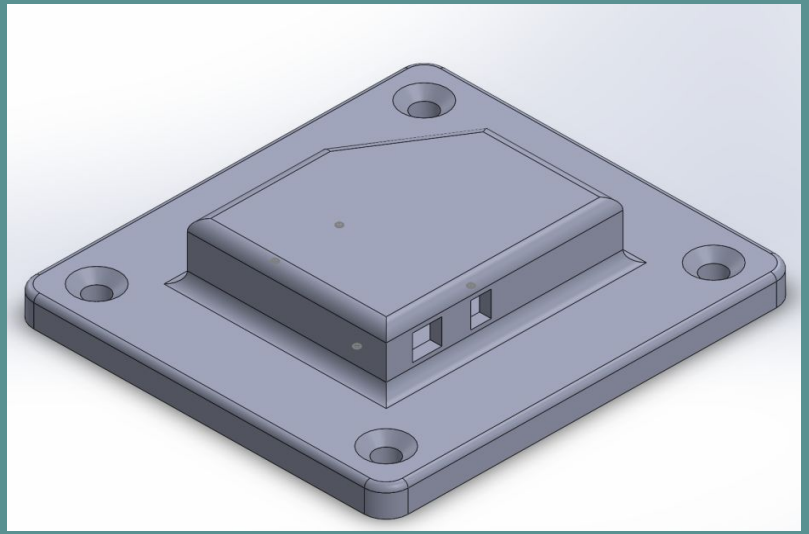
Software Prototype Development



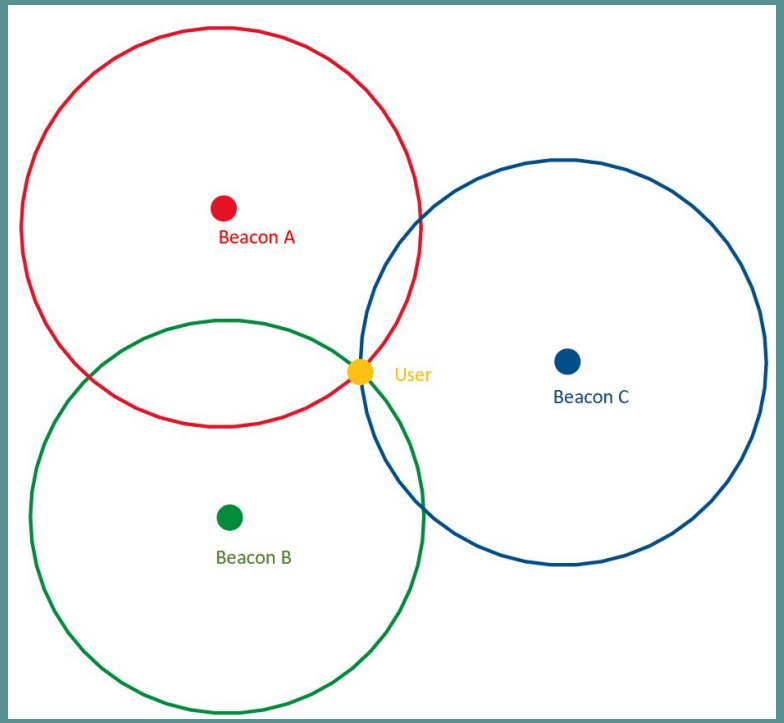


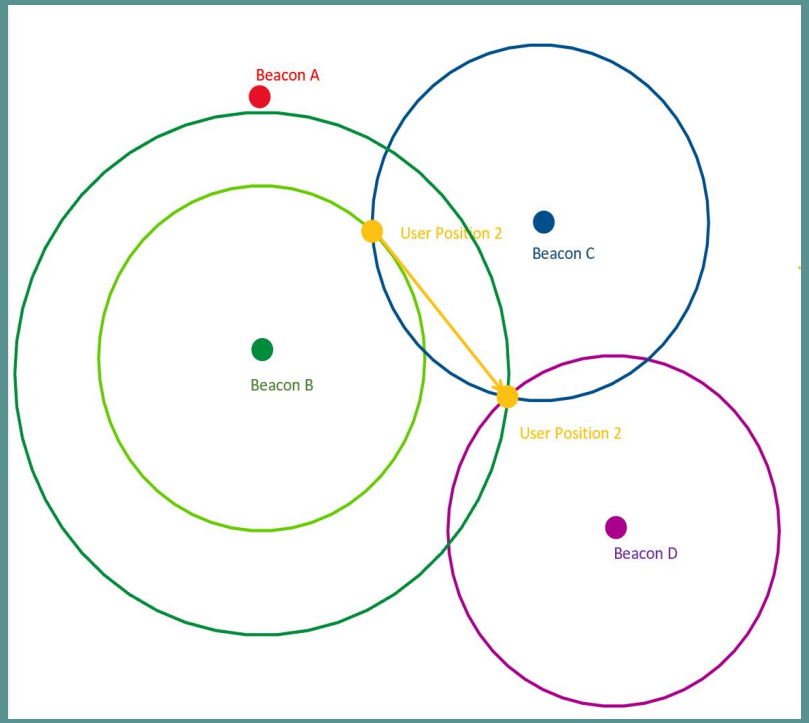
Physical Prototype Development





Tracking Position





Client Feedback

- From Client Meeting 1 our team received feedback on our initial ideas and gauged the clients needs which were outlined previously in this presentation

- During the Second Client Meeting the team had a plan set for our prototypes and layout of the system, Meghan was very happy with our progress so far

Feasibility Study

Technological

- Previous Knowledge in Android
- Bluetooth is better then other signal forms

Economic

- A Budget of $100 is enough for 4 beacons

Legal

- Our project has no current or foreseeable legal issues

Organizational

- The due dates we are bounded by are achievable
- Our team will learn and use any necessary skills to forward the project

Scheduling

- Our current strategies are working, but our team is willing to adapt if necessary

Bill of Materials

Notable Features:

- Shipping is free
- BOM is for 4 beacons
- 3D printed case is only free if PLA is used

Material	Location	Quantity	Unit Cost	Extended Cost
3D printed case	From Makerlab	4	$ -	$ -
Battery Clips	From Makerlab	4	$ 1.00	$ 4.00
AA Batteries	From Makerlab	16	$ 0.60	$ 9.60
M3 Screws	McMaster-Carr (93640A125)	16	$ 0.19	$ 3.04
M3 Heat Inserts	McMaster-Carr (94180A331)	16	$ 0.14	$ 2.24
MCU + Bluetooth	From Makerlab	4	$ 17.00	$ 68.00
Shipping			**$ -**	**$ -**
Subtotal				**$ 86.88**
Taxes				**$ 11.29**
Grand Total				**$ 98.17**

THE END

Thank you for listening!