SmartBand:

An Arduino-Powered Wristband To Keep Kids Safe

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Purpose of the SmartBand

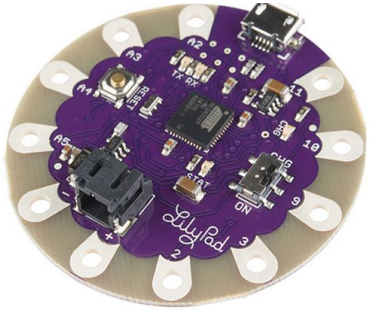
To address the safety issues/problems related to young kids walking alone to and from school.

Design Requirements of Building a SmartBand

- Developing a prototype of the SmartBand for the safety of kids using ***Arduino microcontrollers***.
- The SmartBand should be able to:
    - Vibrate (For the user to know the SmartBand is on)
    - Flash Lights (To alert the bystanders)
    - Make Noise (To alert the bystanders)
    - Send the Geolocation (For the Parents/Guardians/Police)
    - Make a Distress Call (For the Parents/Guardians/Police)
- It should be:
    - Cheap
    - Affordable
    - Easy to Operate

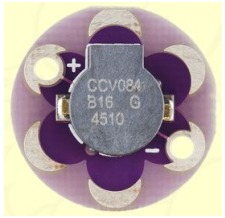
Materials Used

- LilyPad Arduino USB - ATmega32U4 Board



- LED Lights

- LilyPad Buzzer



- Alligator Clips

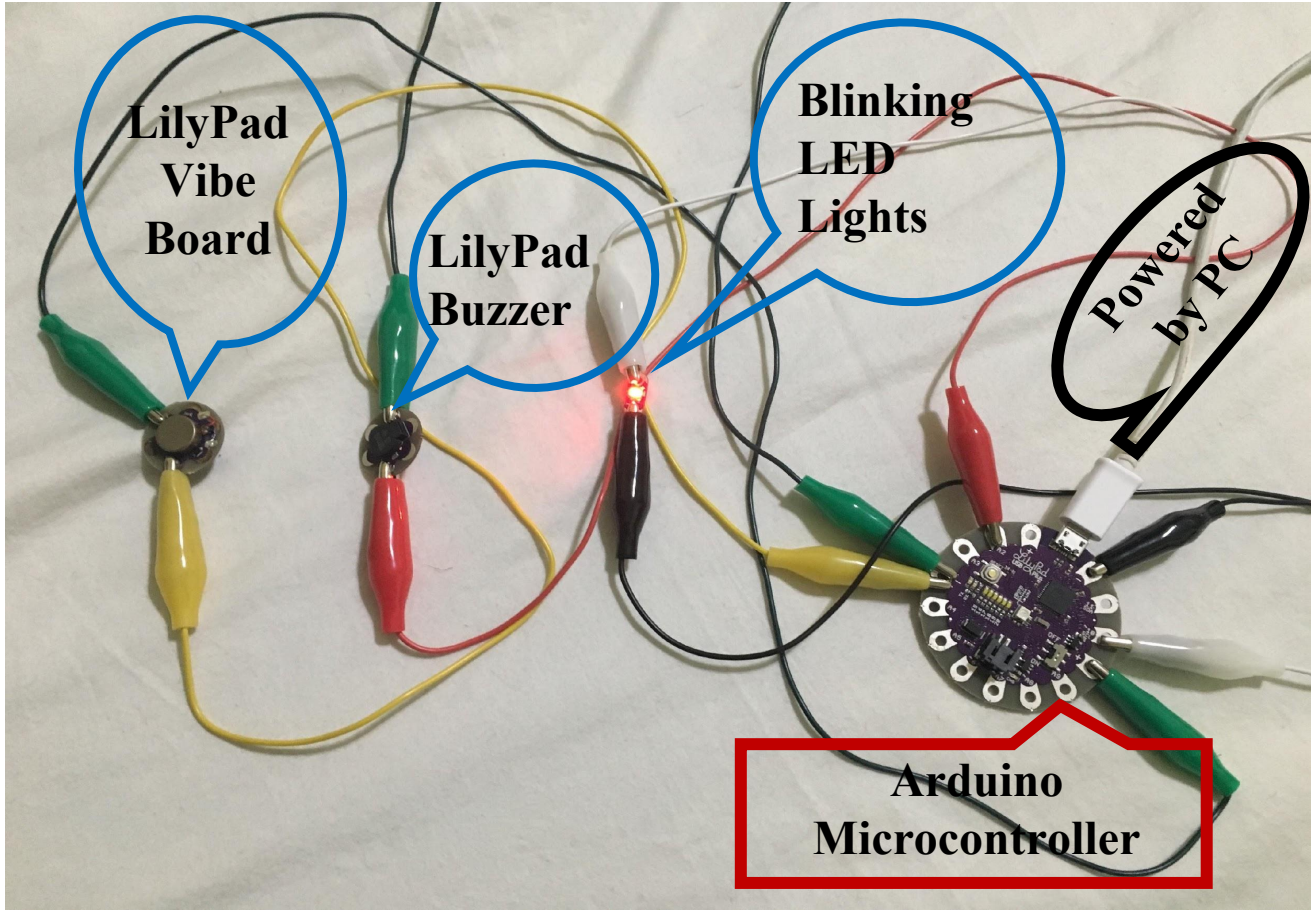
- LilyPad Vibe Board

- Conductive Thread
- Wrist band
- ESP8266 Wifi Bee (Arduino Compatible)

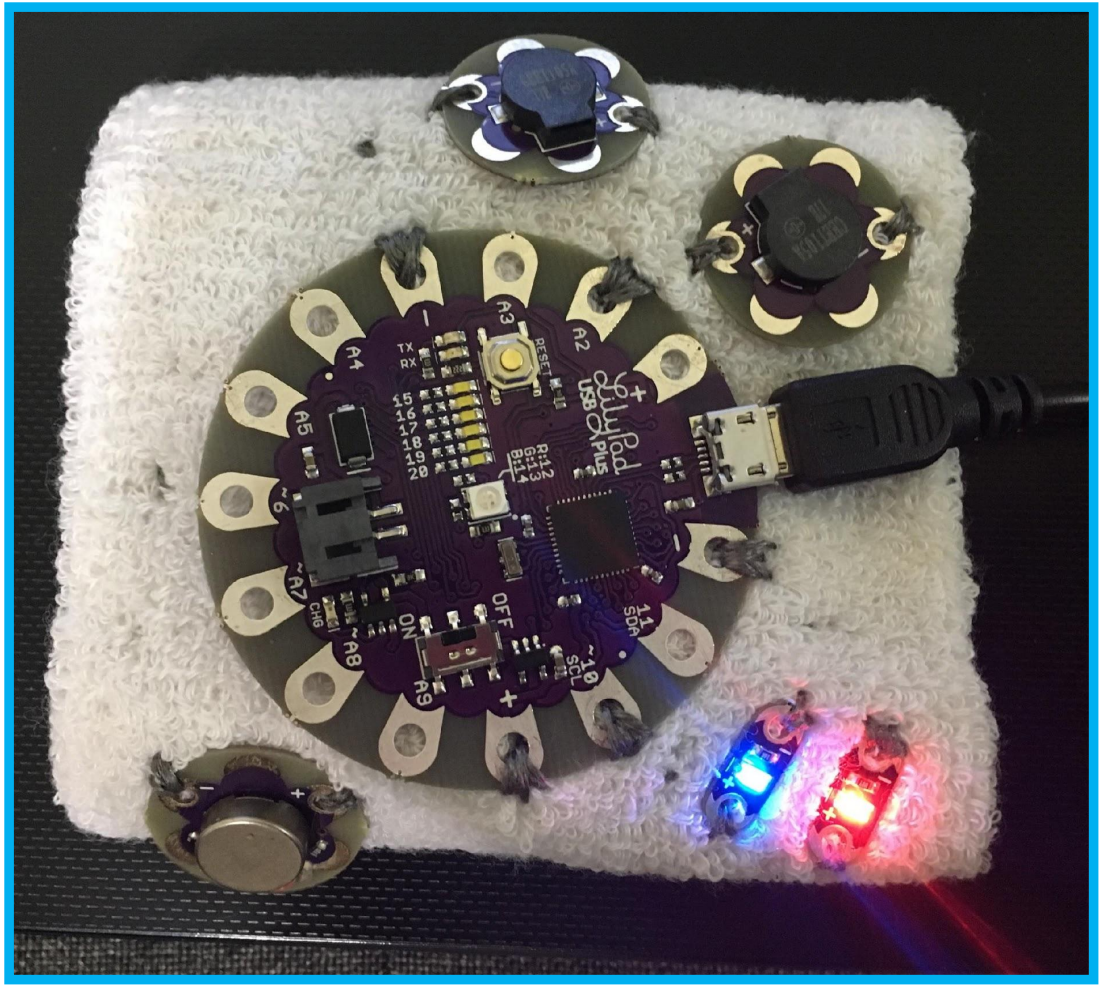
- E-Textiles Battery

- SoftwareSerial + ESP8266 libraries
- Flask library
- Google Geolocation API

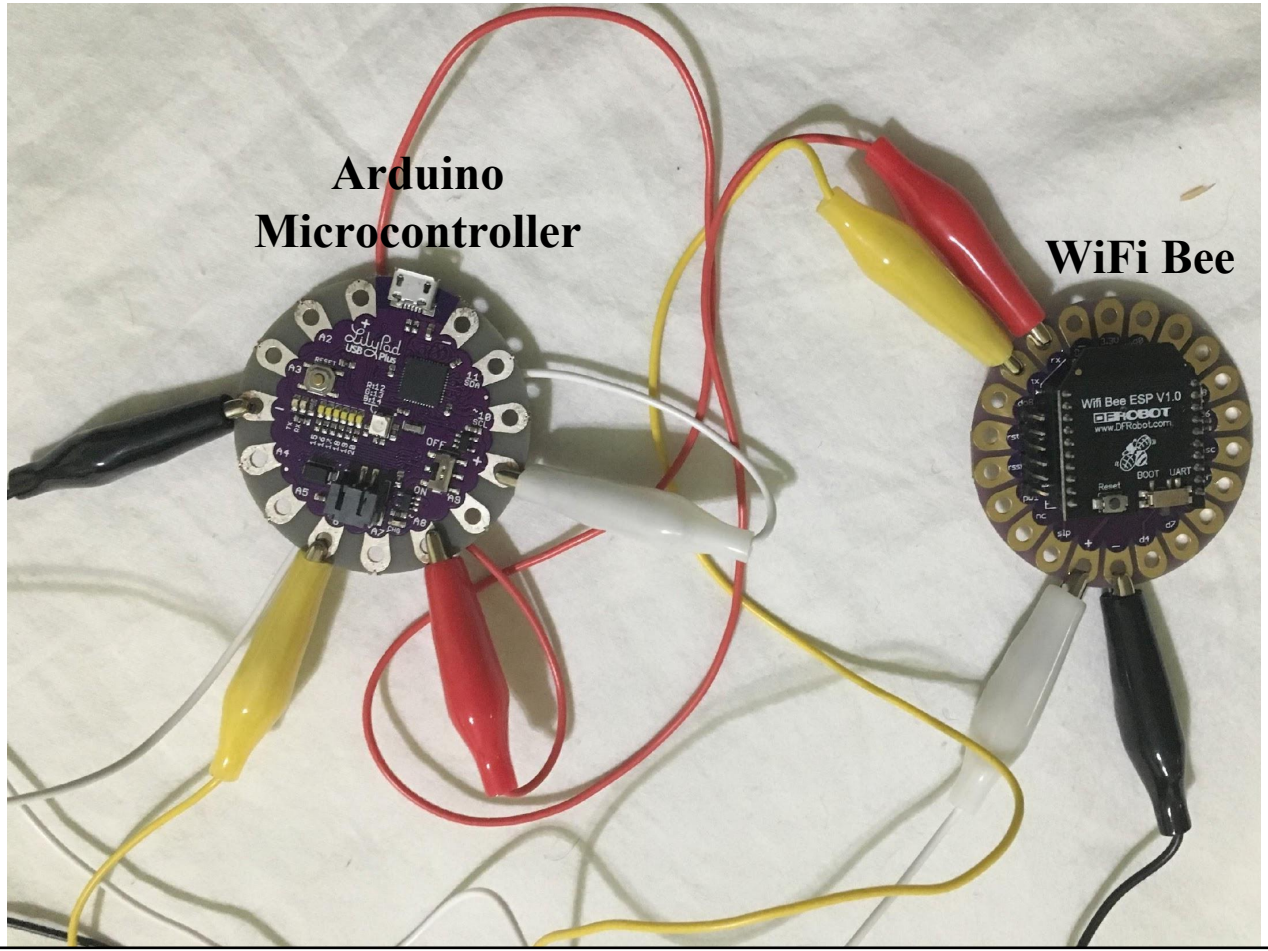
Functionality Testing



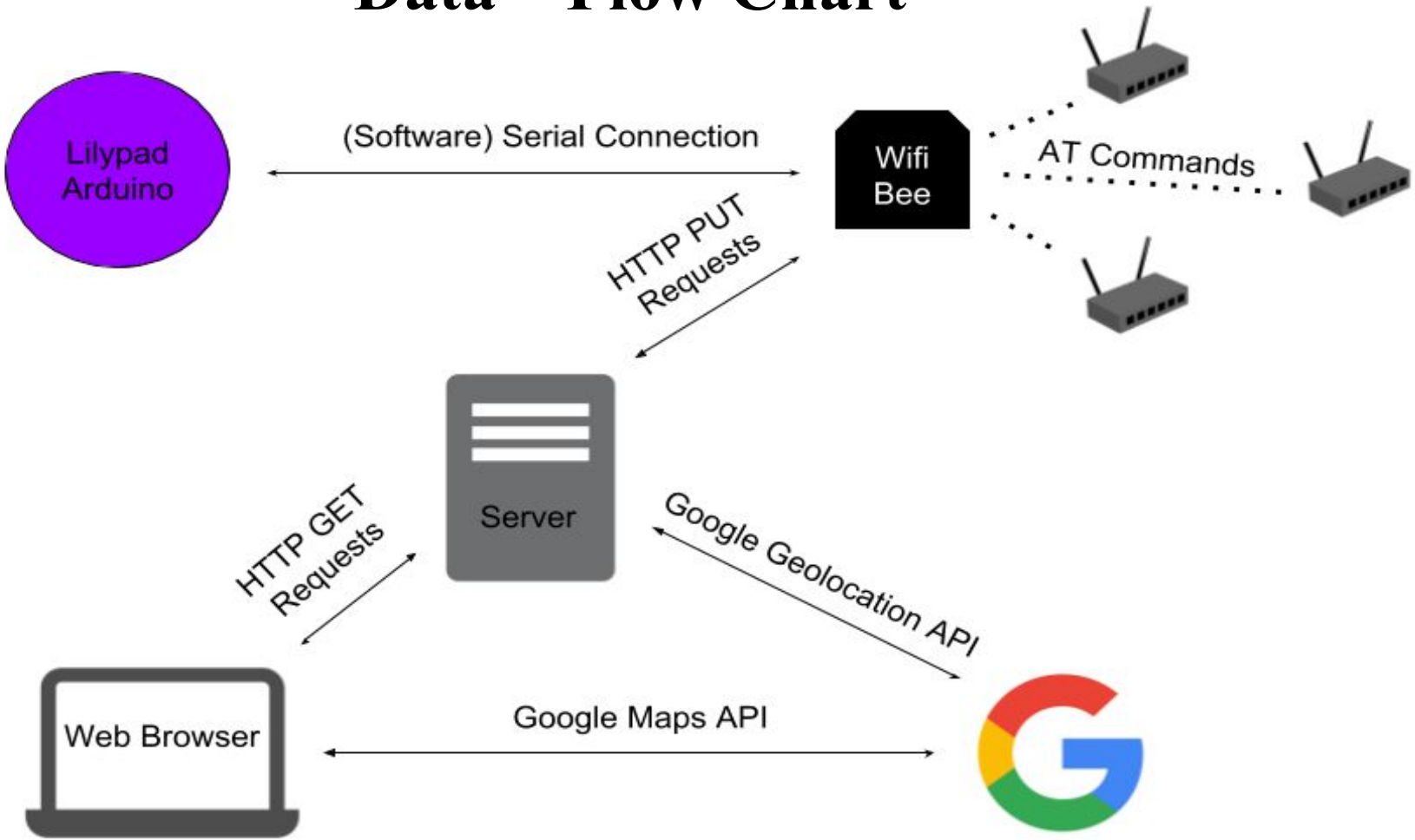
SmartBand Prototype

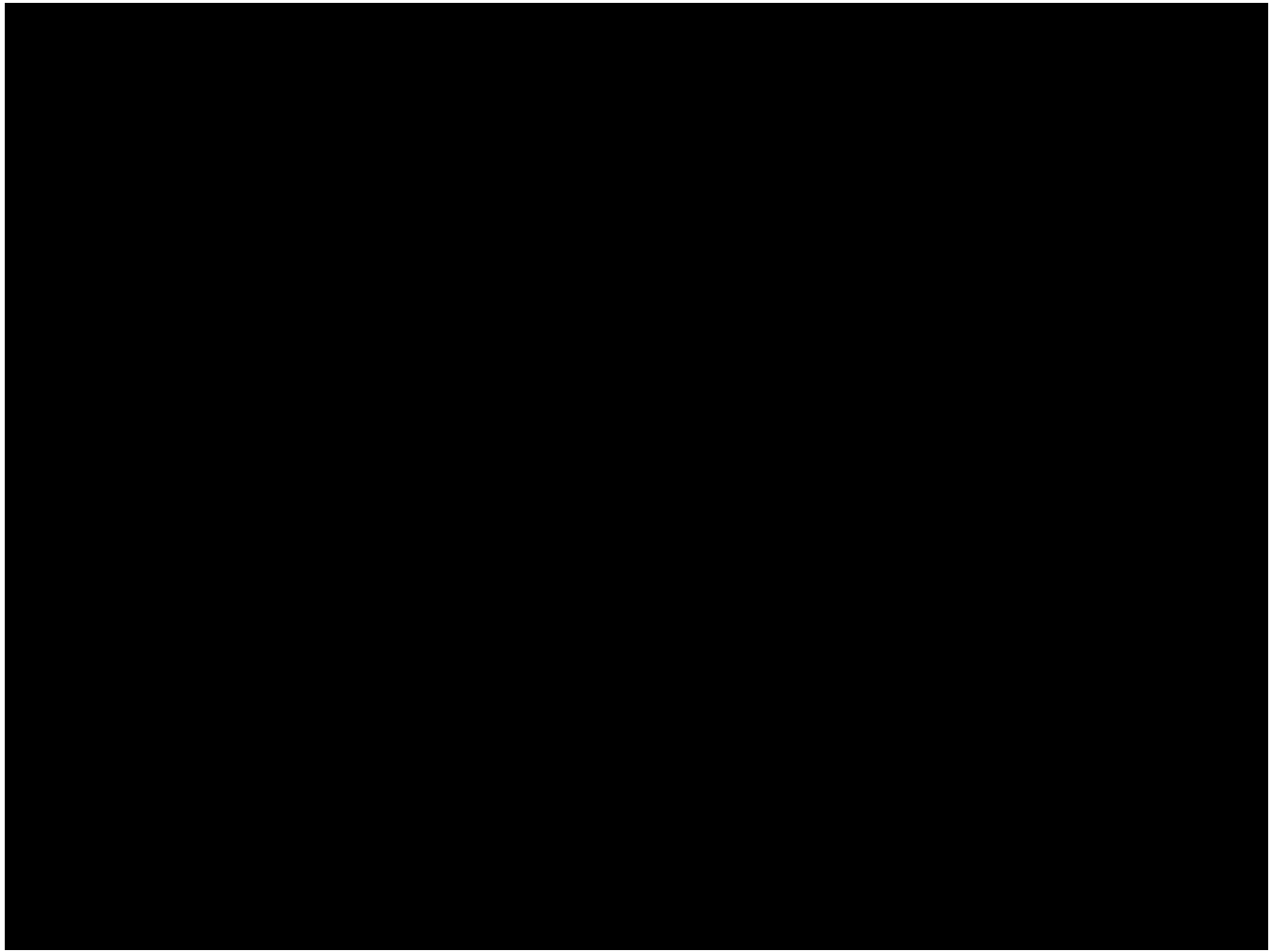


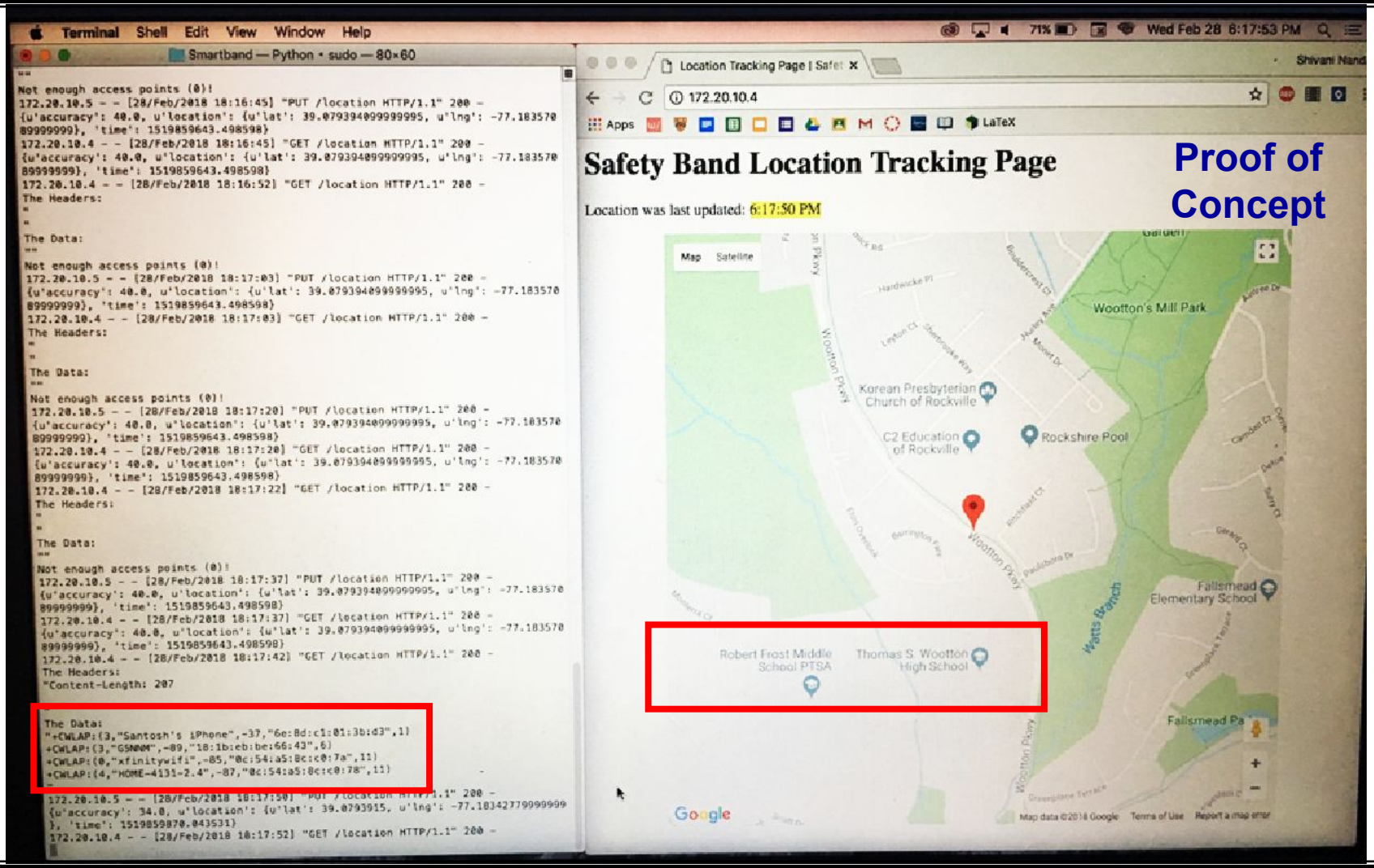
WiFi Connectivity of Microcontroller



Data – Flow Chart






Terminal Shell Edit View Window Help
Wed Feb 28 8:17:53 PM
Smartband — Python • sudo — 80×60
Not enough access points (0)!
172.20.10.5 - - [28/Feb/2018 18:16:45] "PUT /location HTTP/1.1" 200 -
{u'accuracy': 40.0, u'location': {u'lat': 39.079394099999995, u'lng': -77.183570
89999999}, 'time': 1519859643.498598}
172.20.10.4 - - [28/Feb/2018 18:16:45] "GET /location HTTP/1.1" 200 -
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89999999}, 'time': 1519859643.498598}
172.20.10.4 - - [28/Feb/2018 18:16:52] "GET /location HTTP/1.1" 200 -
The Headers:
The Data:
Not enough access points (0)!
172.20.10.5 - - [28/Feb/2018 18:17:03] "PUT /location HTTP/1.1" 200 -
172.20.10.4 - - [28/Feb/2018 18:17:03] "GET /location HTTP/1.1" 200 -
The Headers:
The Data:
Not enough access points (0)!
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172.20.10.4 - - [28/Feb/2018 18:17:20] "GET /location HTTP/1.1" 200 -
172.20.10.4 - - [28/Feb/2018 18:17:22] "GET /location HTTP/1.1" 200 -
The Headers:
The Data:
Not enough access points (0)!
172.20.10.5 - - [28/Feb/2018 18:17:37] "PUT /location HTTP/1.1" 200 -
172.20.10.4 - - [28/Feb/2018 18:17:37] "GET /location HTTP/1.1" 200 -
172.20.10.4 - - [28/Feb/2018 18:17:42] "GET /location HTTP/1.1" 200 -
The Headers:
"Content-Length: 207
The Data:
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+CWLAP:(0,"xfinitywifi",-85,"0c:54:a5:8c:c0:7a",11)
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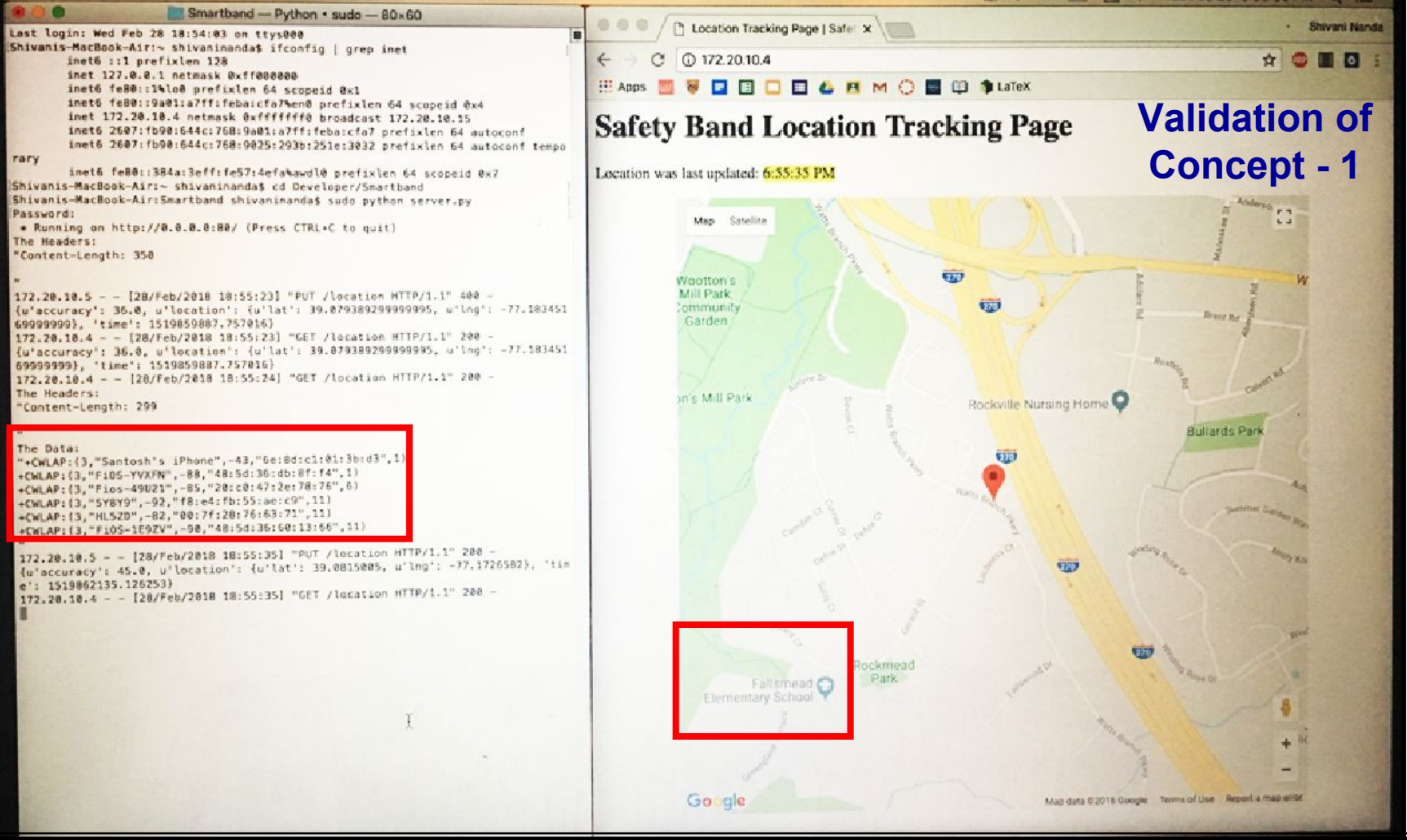
172.20.10.4 - - [28/Feb/2018 18:17:52] "GET /location HTTP/1.1" 200 -
Location Tracking Page | Safet
172.20.10.4
Apps
LaTeX
Safety Band Location Tracking Page
Location was last updated: 6:17:50 PM
Proof of Concept
Map
Satellite
Wootton's Mill Park
Korean Presbyterian Church of Rockville
C2 Education of Rockville
Rockshire Pool
Robert Frost Middle School PTSA
Thomas S. Wootton High School
Falls mead Elementary School
Google


Terminal Shell Edit View Window Help
Wed Feb 28 6:55:36 PM
Smartband — Python • sudo — 80×60
Last login: Wed Feb 28 18:54:03 on ttys000
Shivanis-MacBook-Air:~ shivaninanda$ ifconfig | grep inet
inet6 ::1 prefixlen 128
inet 127.0.0.1 netmask 0xff000000
inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
inet6 fe80::9a01:a7ff:feba:cfa7%en0 prefixlen 64 scopeid 0x4
inet 172.20.10.4 netmask 0xfffffff0 broadcast 172.20.10.15
inet6 2607:fb90:644c:768:9a01:a7ff:feba:cfa7 prefixlen 64 autoconf
inet6 2607:fb90:644c:768:9025:293b:251e:3032 prefixlen 64 autoconf tempo
rary
inet6 fe80::384a:3eff:fe57:4efa%awdl0 prefixlen 64 scopeid 0x7
Shivanis-MacBook-Air:~ shivaninanda$ cd Developer/Smartband
Shivanis-MacBook-Air:Smartband shivaninanda$ sudo python server.py
Password:
* Running on http://0.0.0.0:80/ (Press CTRL+C to quit)
The Headers:
"Content-Length: 358
"
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"Content-Length: 299
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The Data:
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+CWLAP:(3,"Fios-49U21",-85,"20:c0:47:2e:78:76",6)
+CWLAP:(3,"5Y8Y9",-93,"f8:e4:fb:55:ae:c9",11)
+CWLAP:(3,"HL5ZD",-82,"00:7f:28:76:63:71",11)
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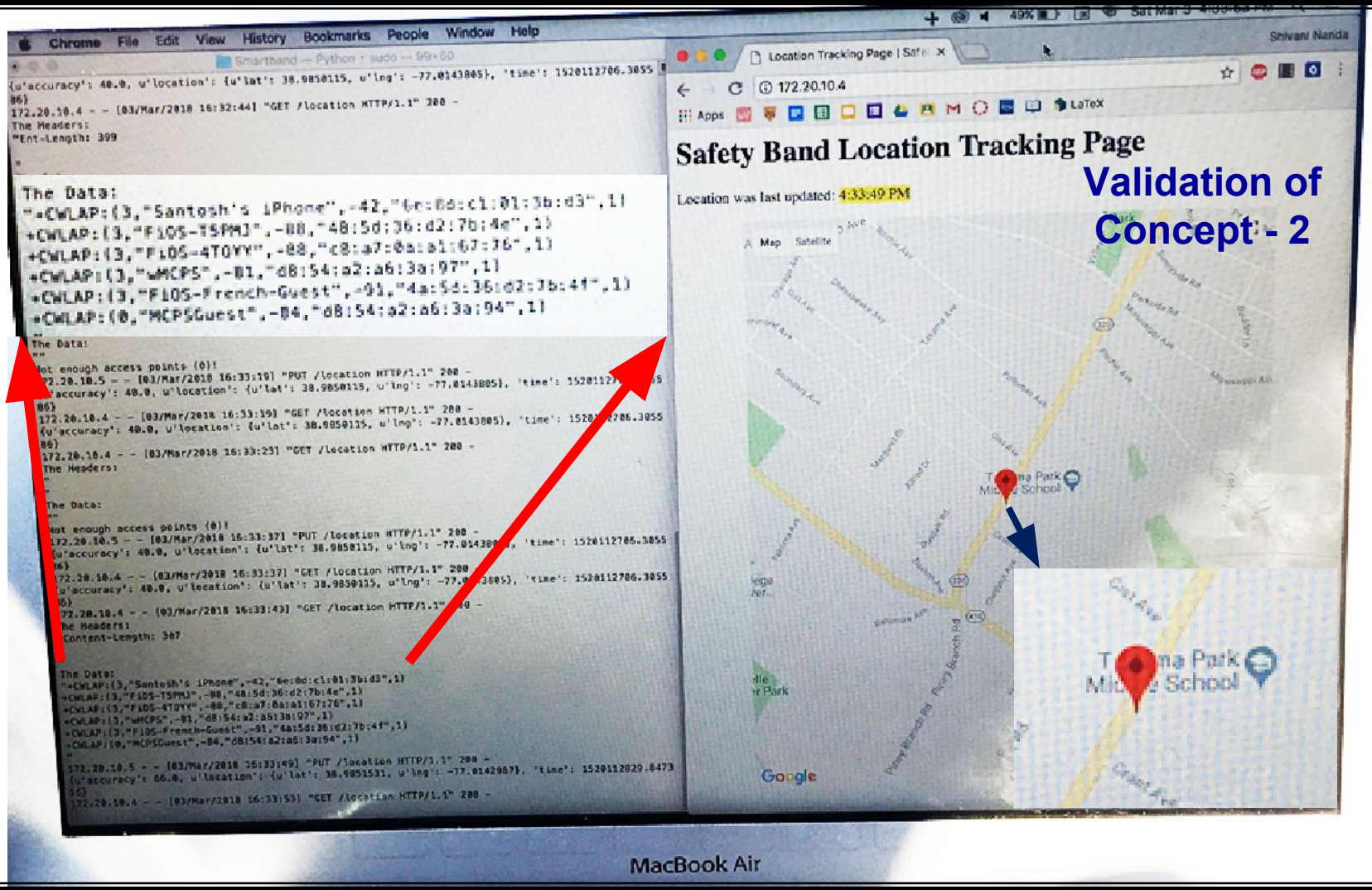
172.20.10.4 - - [28/Feb/2018 18:55:35] "GET /location HTTP/1.1" 200 -
Location Tracking Page | Safe
Shivani Nanda
172.20.10.4
Apps
LaTeX
Safety Band Location Tracking Page
Location was last updated: 6:55:35 PM
Validation of Concept - 1
Map
Satellite
Wootton's Mill Park Community Garden
Rockville Nursing Home
Bullards Park
Rockmead Park
Fallsmead Elementary School
Google


Safety Band Location Tracking Page
Location was last updated: 4:33:49 PM
Validation of Concept - 2
MacBook Air

Challenges Encountered

- The Arduino ports were labelled wrong on the microcontroller.
  - In the future I will make sure to check the port connectivity to the correct pin on the Arduino microcontroller.

- It is always good idea to check the functionality of each component separately with the Arduino microcontroller using the alligator clips.

Existing Solutions vs. SmartBand

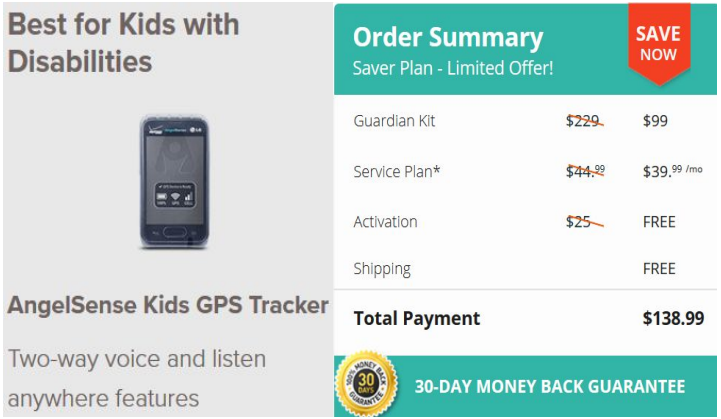
hereO

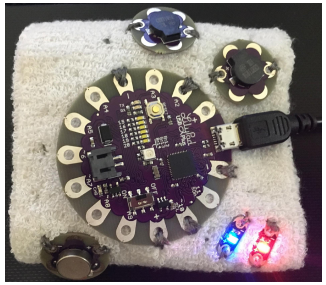
hereO V2 GPS Watch for Kids- Lemon

1 customer review

Price: $171.90 FREE Shipping for Prime members

- Existing solutions are prohibitively expensive
- Technically challenging for operations by kids
- Need apps, smartphones & monthly payments





- Cheap & affordable
- Easy to operate with flip of a switch

Cost Estimate

LilyPad Arduino USB	$ 24.95
WiFi Bee	$ 5.90
Wristband	$ 0.50
Battery	$ 6.95

Future Directions

- Buzzers will be replaced with high pitch speakers
- Sound alert will be replaced with police siren
- Geo location will be replaced with GPS tracker
- Arduino GSM Shield will be added to enable voice calls
- Sharing of GPS coordinates with parents, guardians and/or police while in distress

Acknowledgements

- Professor Monica Mallini, Montgomery College
- My Family
- Mr. Bryan Goehring, my science teacher

Sources Consulted

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