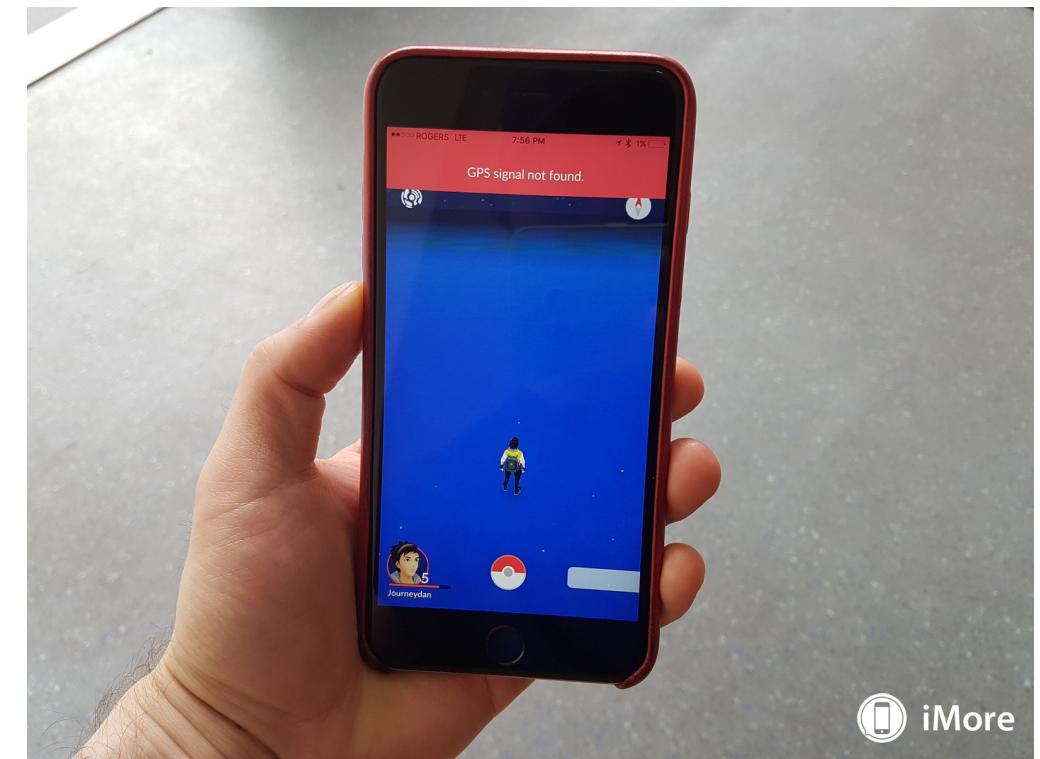
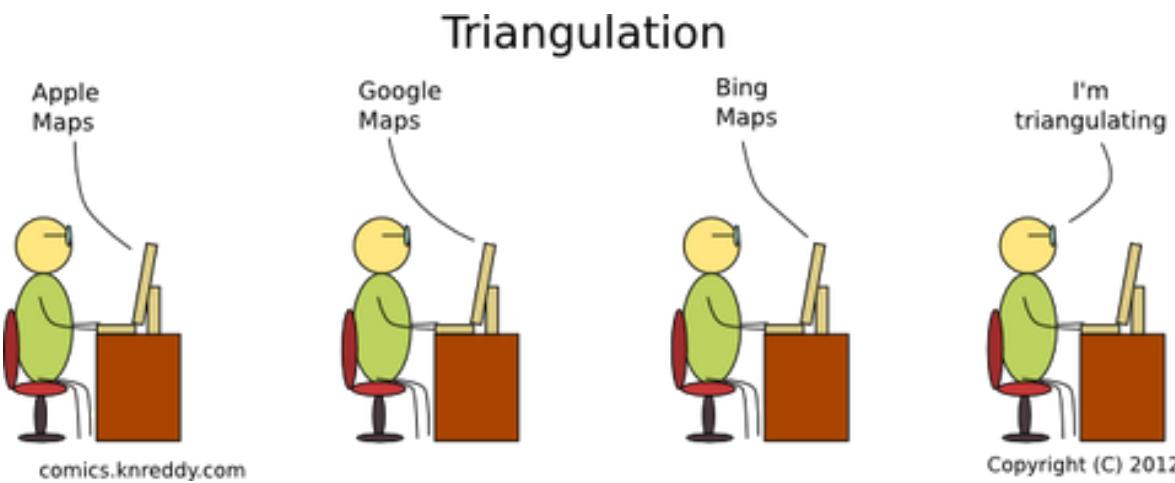


# Indoor Localization system using Time of Flight in UWB spectrum

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Albert Davies  
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# Objective

- Compute a mobile node's position in 3 Dimension in an indoor setting



# Application and Use Cases

- Indoor Localization systems can be developed and applied to any large venue: Shopping Malls, Airports, Universities, etc.
- Indoor Localization systems can be used to provide directions, provide relevant advertisement, raise requests for help, asset tracking etc.
- Similar localization systems can also be used in remote environments like coal mines to track coal miners



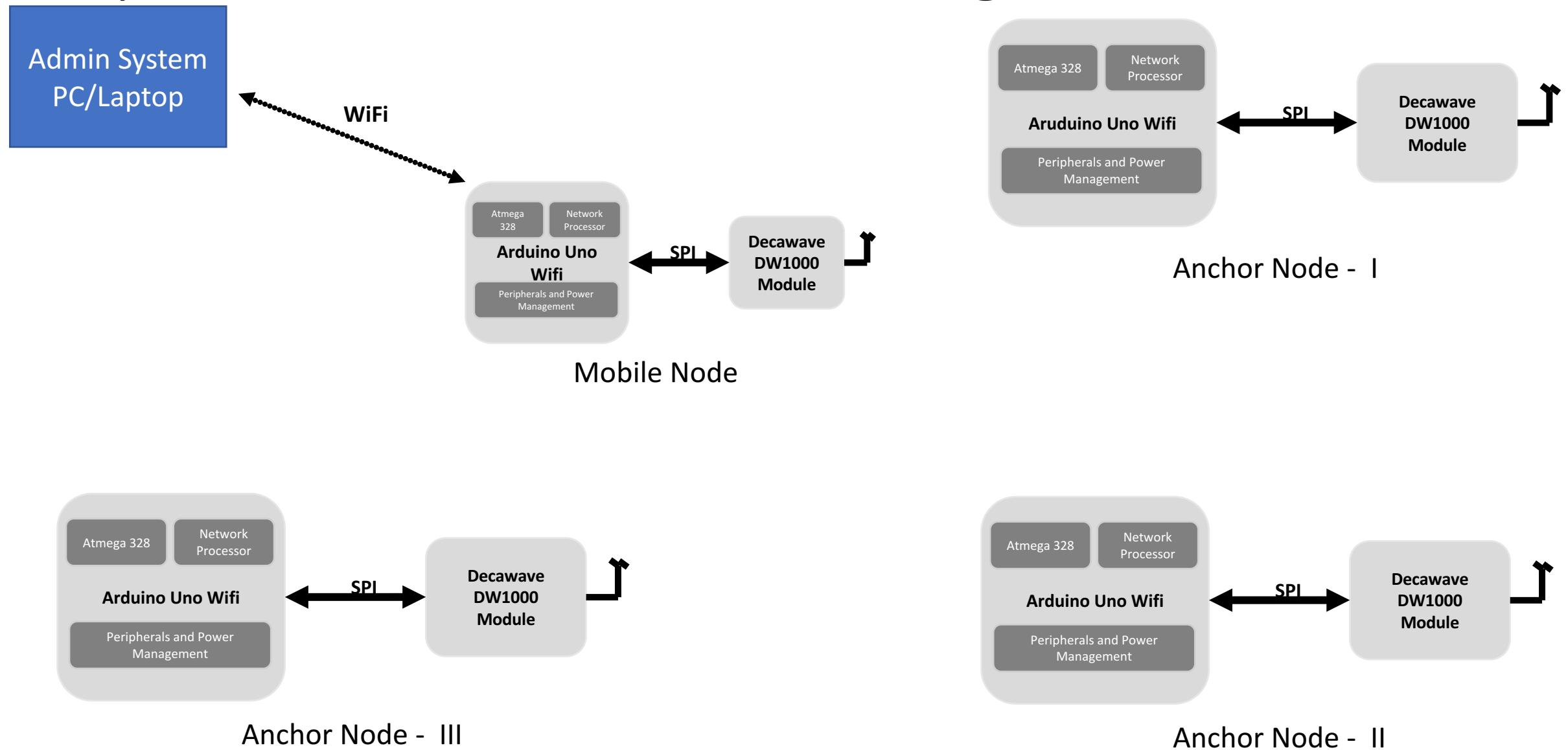
Image source: Google

# Approaches to achieve localization

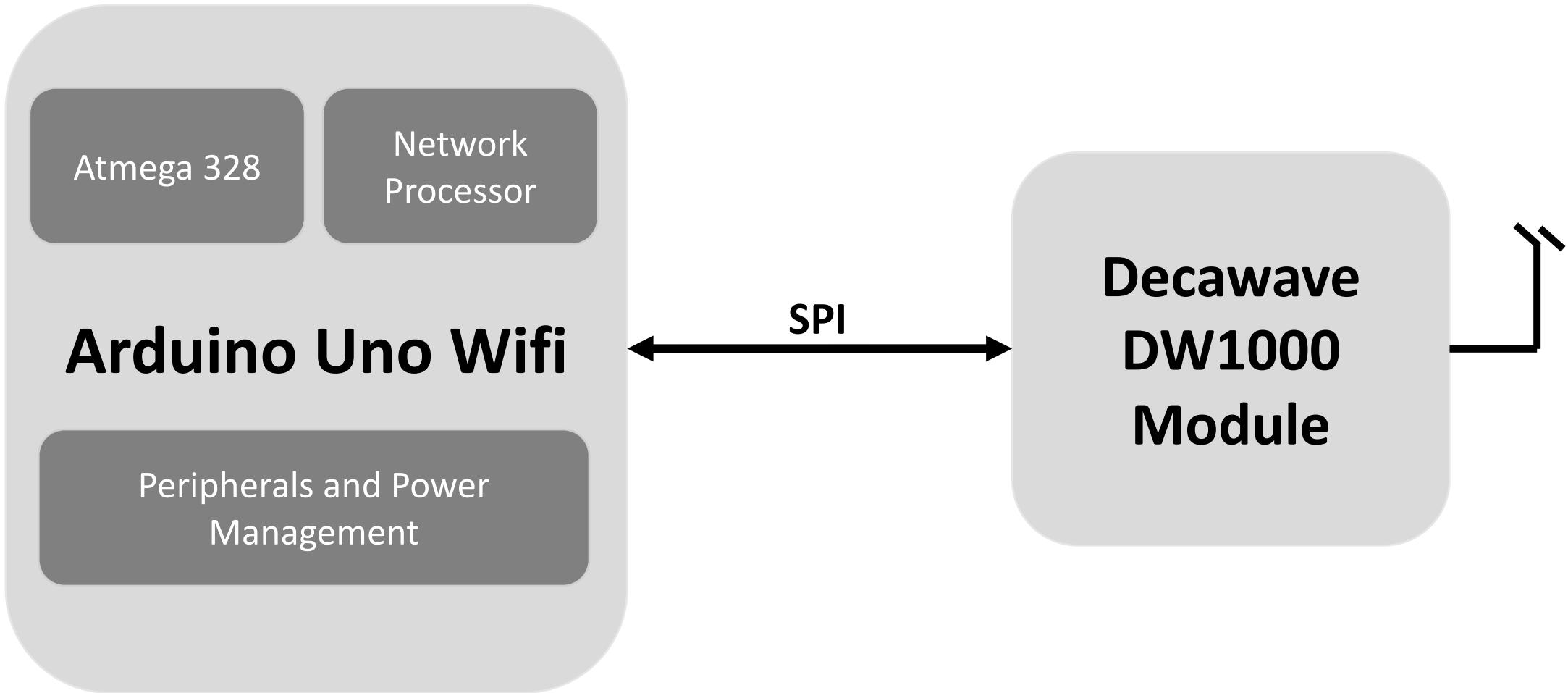
- BLE
- Ultrasound
- WiFi
- UWB
- Zigbee
- Cameras
- LEDs



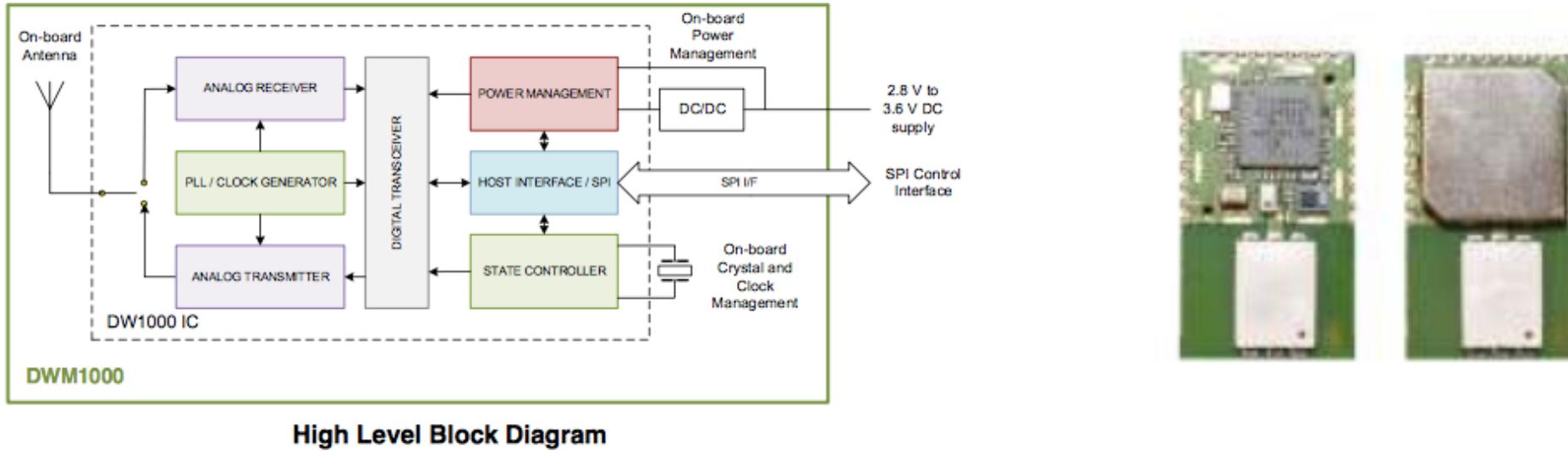
# System Architecture and Design



# System Diagram of a Node



# DWM1000 Module



- IEEE802.15.4-2011 UWB Compliant (Operates from 3.5 – 6.5 GHz)
- Locates objects to a precision of 10cm indoors
- Up to 290m LOS
- Highly immune to multipath fading
- Factory trimmed
- Integrated Antenna

# Localization schemes

- DWM1000 Modules can be used in two modes:
  - 2 – way ranging (Time of flight)
  - Time Difference of Arrival(TDOA)

# MID Semester Presentation

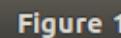
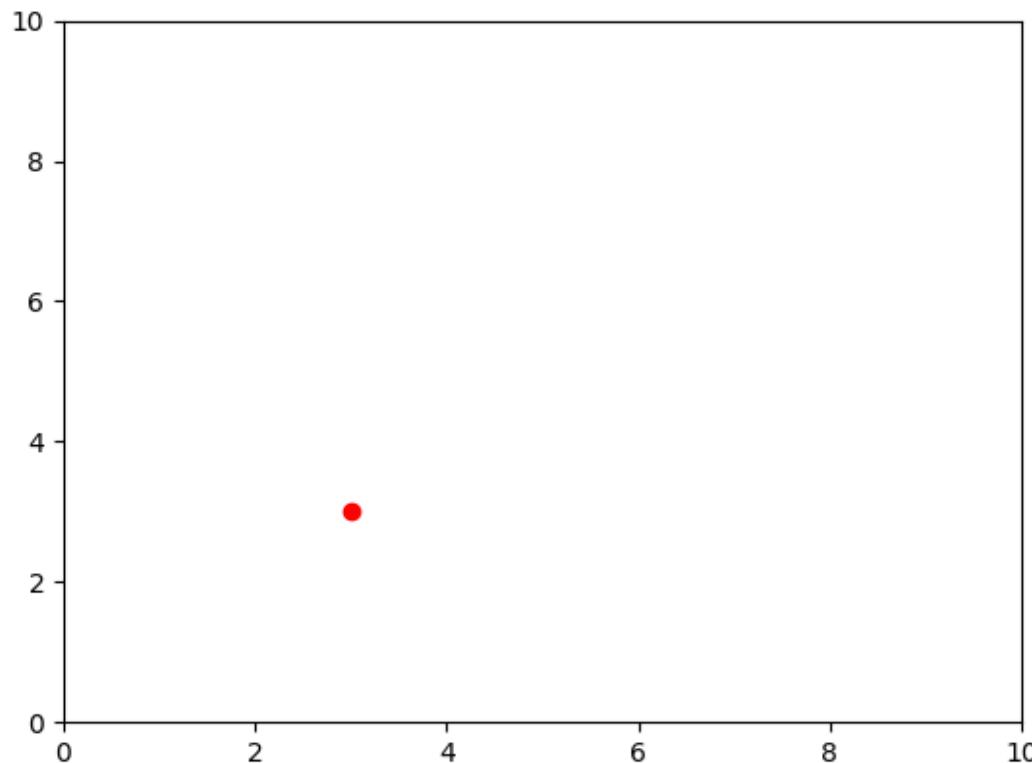


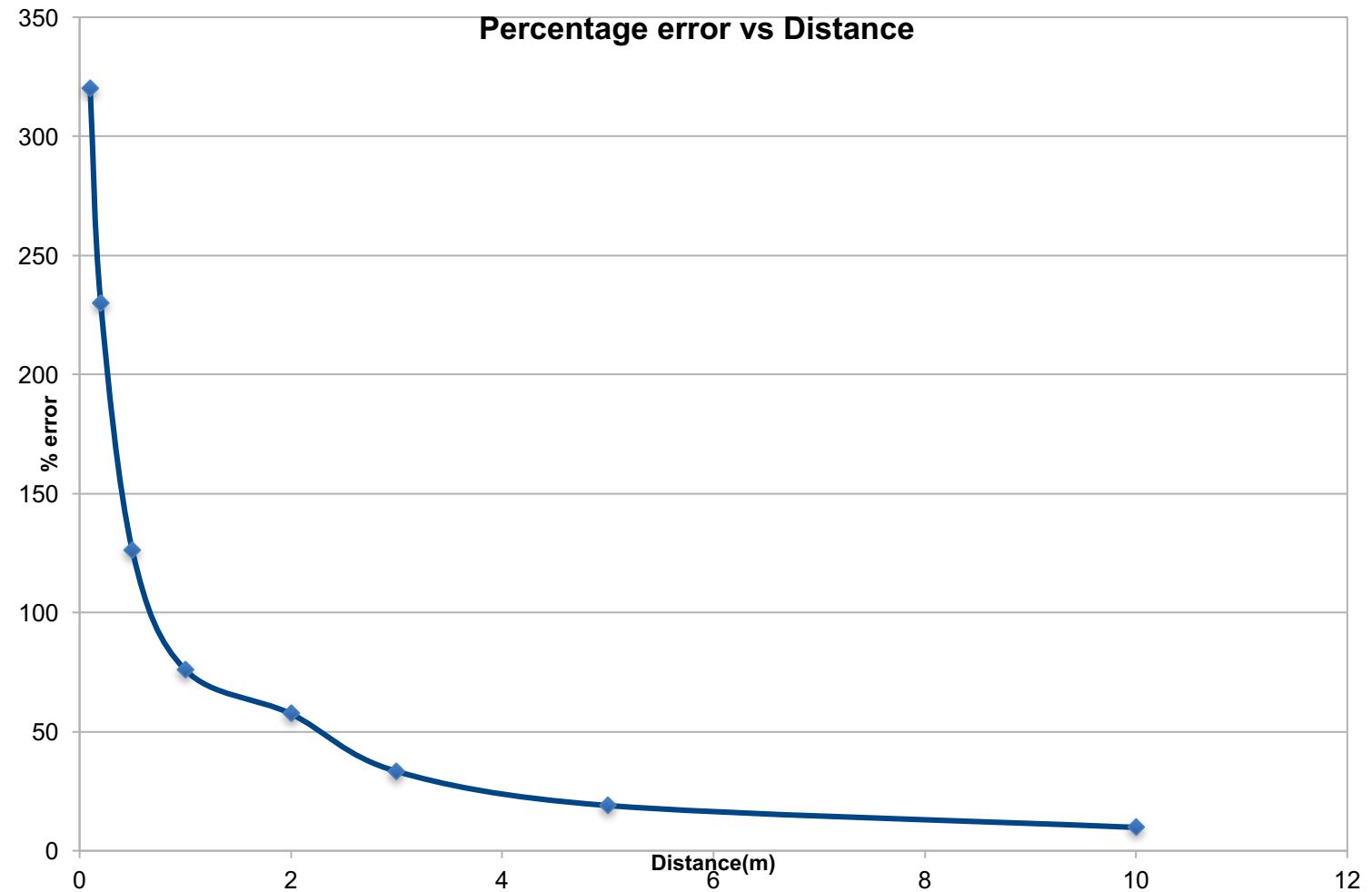
Figure 1

- Achieved distance ranging in 1 dimension with visual front-end



# DWM1000 Distance Ranging Accuracy

- Not accurate for short distances out of the box.



# Current State of Project

- Localization  
working!!

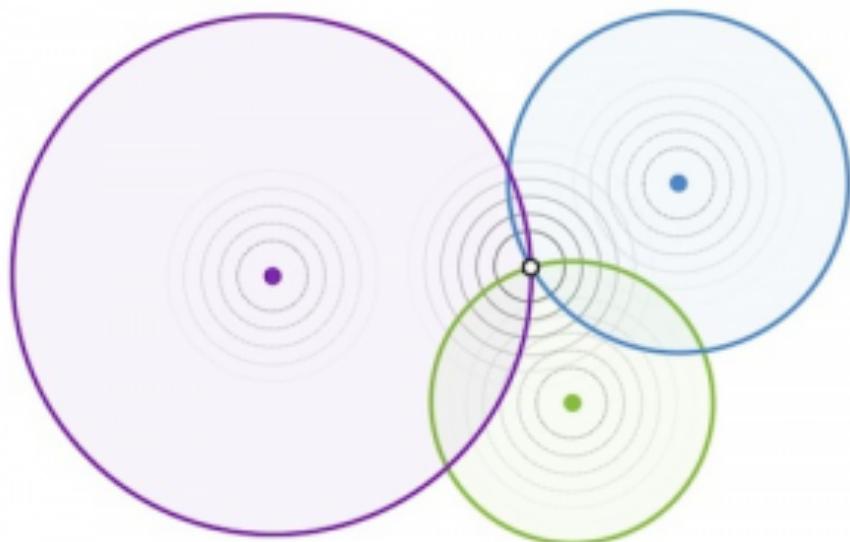
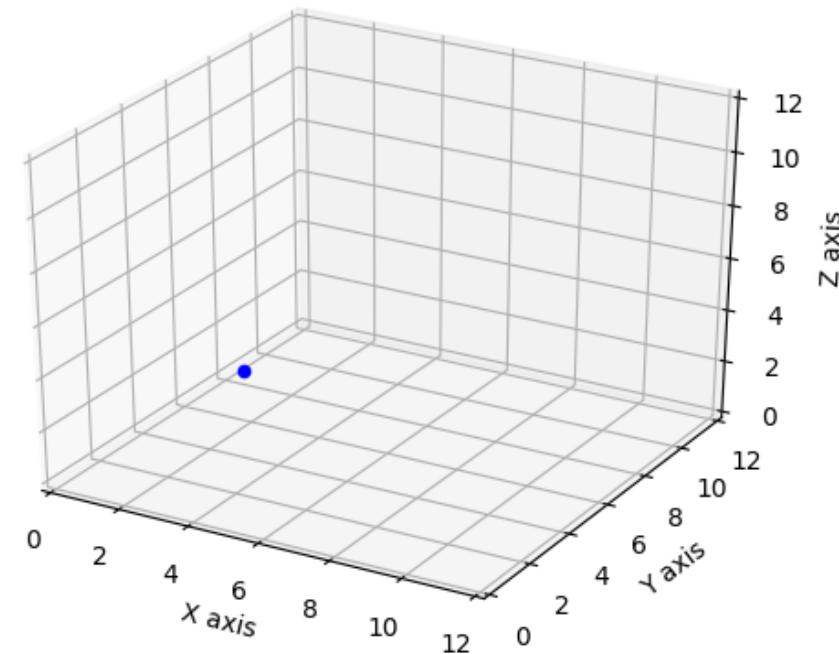


Figure 1



x=-0.224091 , y=9.72231 , z=0.220427

But...

- Increase accuracy
- Constrain co-ordinate space
- Sensitive to Anchor Placement
- Integrate WiFi

# Timeline

<b>Week</b>	<b>Milestone</b>	<b>Status</b>
Mar 27-31	Basic Arduino Code test, Solder 2x DW1000 modules, breadboard prototyping, Py interface	Done
Apr 3-7	Mid term demo. Level shifters interface, DW1000 baseboards arrive, Perf board bring up	Done
Apr 10-14	Develop TOF code with 5 DW1000 modules working at once.	Done
Apr 17-21	Change library for robust multi-anchor network connectivity and addressing	Done
Apr 24-28	Test TOF Code with 4 anchor+1 tag. Accuracy measurements, integrating solver code with python interface code and GUI extension	Done
May 1-5	Prep for final demos, code and H/W cleanup, calibrations, WiFi Integration	Pending

# Final Demonstration

- Final demonstration: Use multiple anchor nodes whose locations are pre-determined to track the mobile node in the same environment. Display the movement of the mobile node on a GUI(using a PC application) in real time

Questions?