Zotikon

Athlete Analysis System

The Zotikon Team

Bruce Bowlin

Eric Farmer

Joseph Hastings

Van Kingma

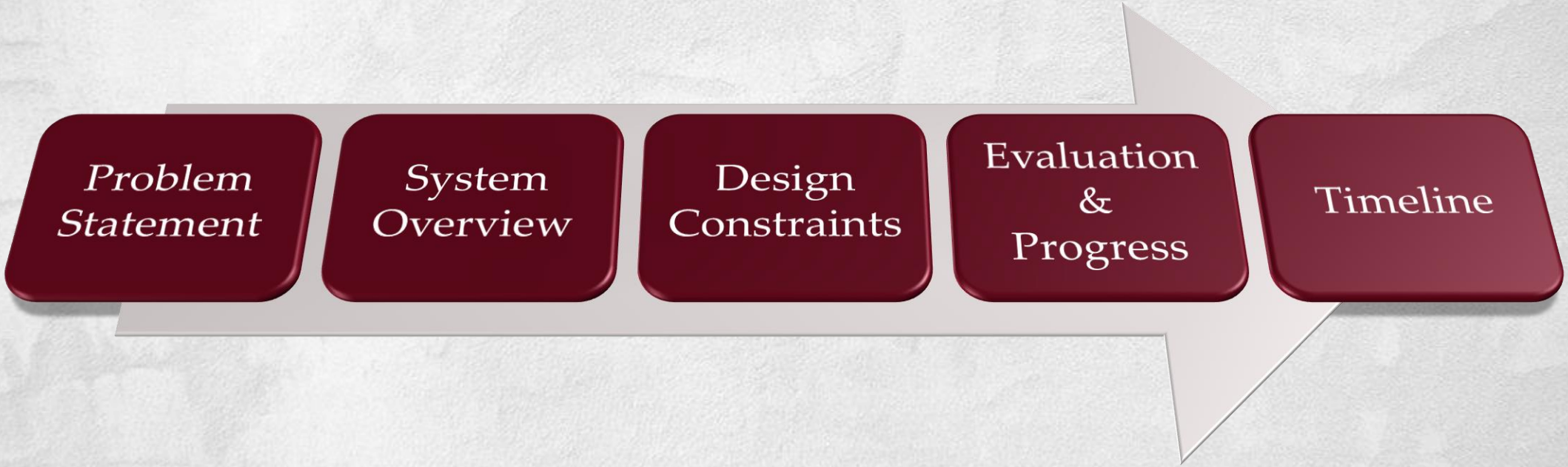
Curtis Prehn

Zotikon's Advisor

Dr. Mehmet Kurum

- Assistant Professor
  - PhD, Electrical and Computer Engineering, George Washington University, 2009
- Fields of Interest
  - Microwave and Millimeter-wave Remote Sensing
  - RF Sensors & Systems
  - Radiation and Scattering Theory
  - Antennas & Computational Electromagnetics
  - Subsurface & Subcanopy Sensing and Imaging
  - GNSS Reflectometry

Outline


Problem Statement
System Overview
Design Constraints
Evaluation & Progress
Timeline

Althlete Analysis System

Zotikon

NOUN: (Greek origin) ***health and vitality***

Applications

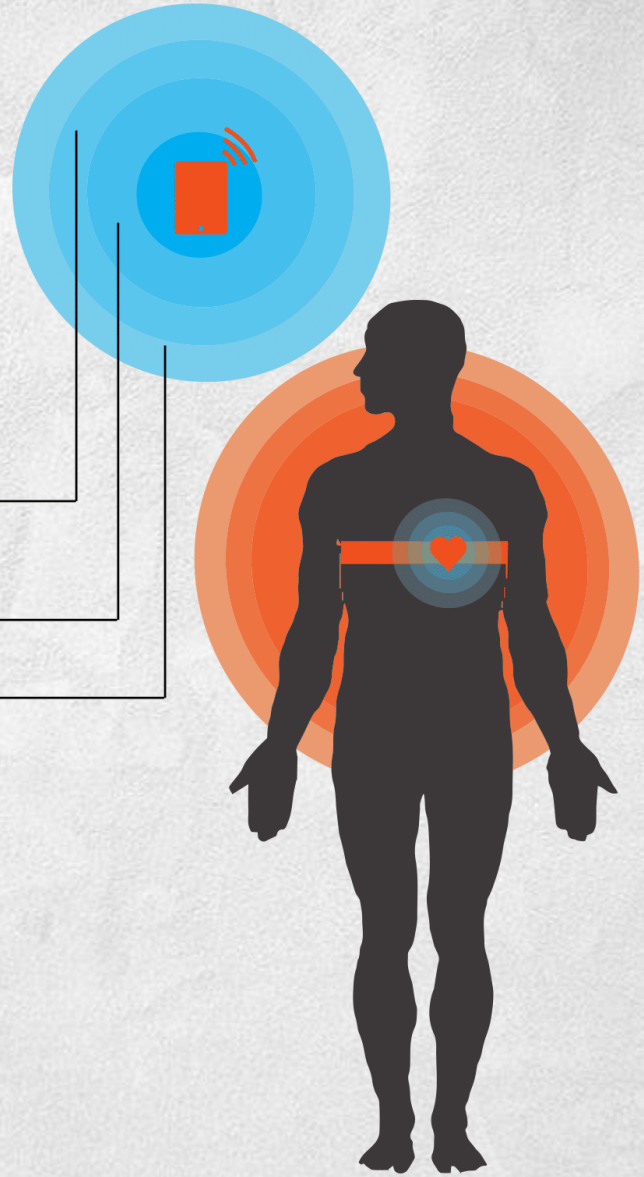
Team-based and individual athlete performance measurement system
AND
Real-time trainer monitoring system to observe athlete performance

Features

Heart rate and core temperature monitoring

Reliable mesh network system

Realtime graphical presentation



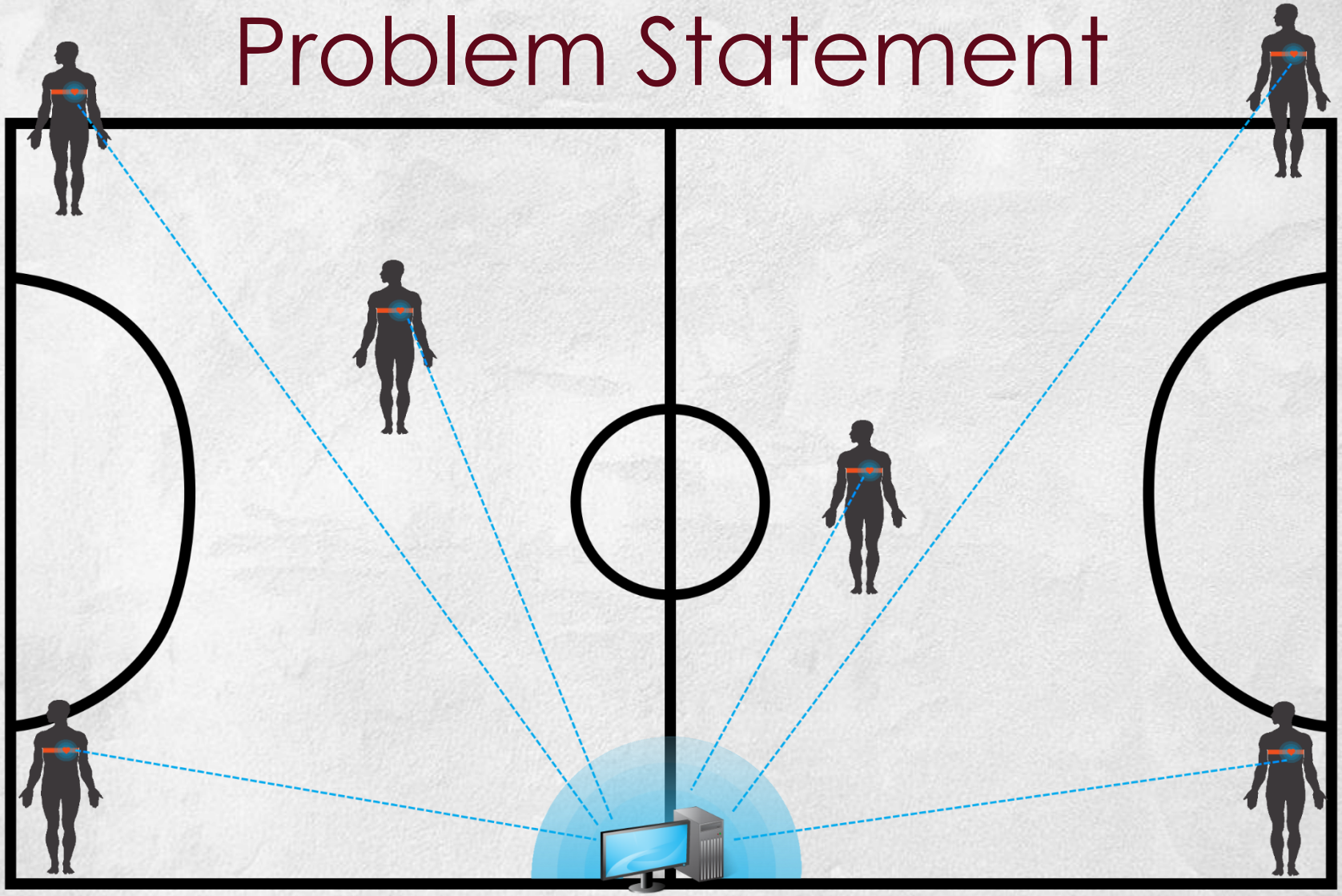
Specifications

2.4GHz Band wireless communication

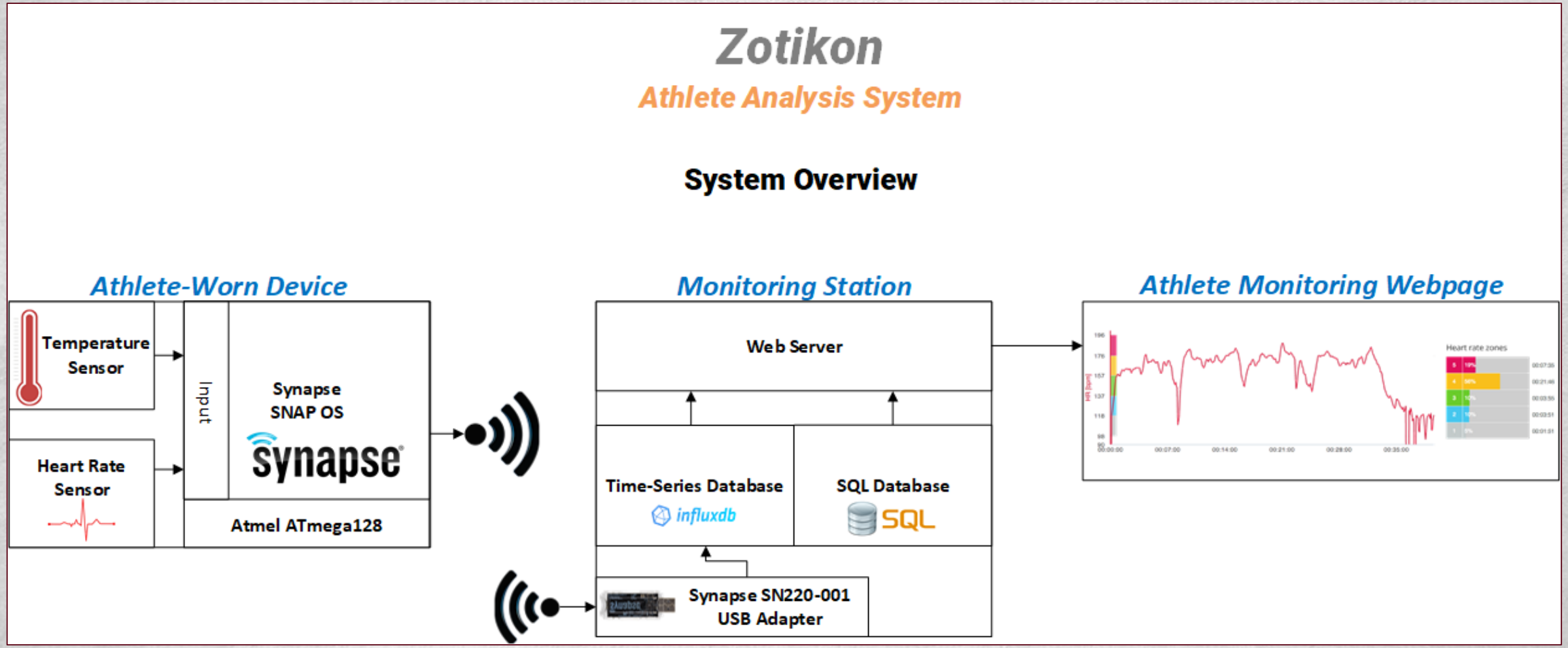
Up to 0.5 mile range

Accurate ECG heart rate monitoring

Problem Statement



System Overview



Design Constraints

Technical

Name	Description
Transmission Range	The Zotikon system must be able to reliably transmit data to at least 70 meters in a noisy environment with radio interference with a success rate of at least 90 percent.
Max Beats per Minute (BPM)	The maximum beats per minute the athlete-worn device must be able to measure is 220 BPM.
Simultaneous Users	The monitoring station must be able to receive data from 11 athlete-worn devices simultaneously.
Runtime	The athlete-worn device must be able to operate continuously for no less than 4 hours.
Body Temperature Measurable Range	The athlete-worn device must be able to measure temperatures in the range of 15°C - 47°C with 0.25°C accuracy.

Design Constraints

Practical

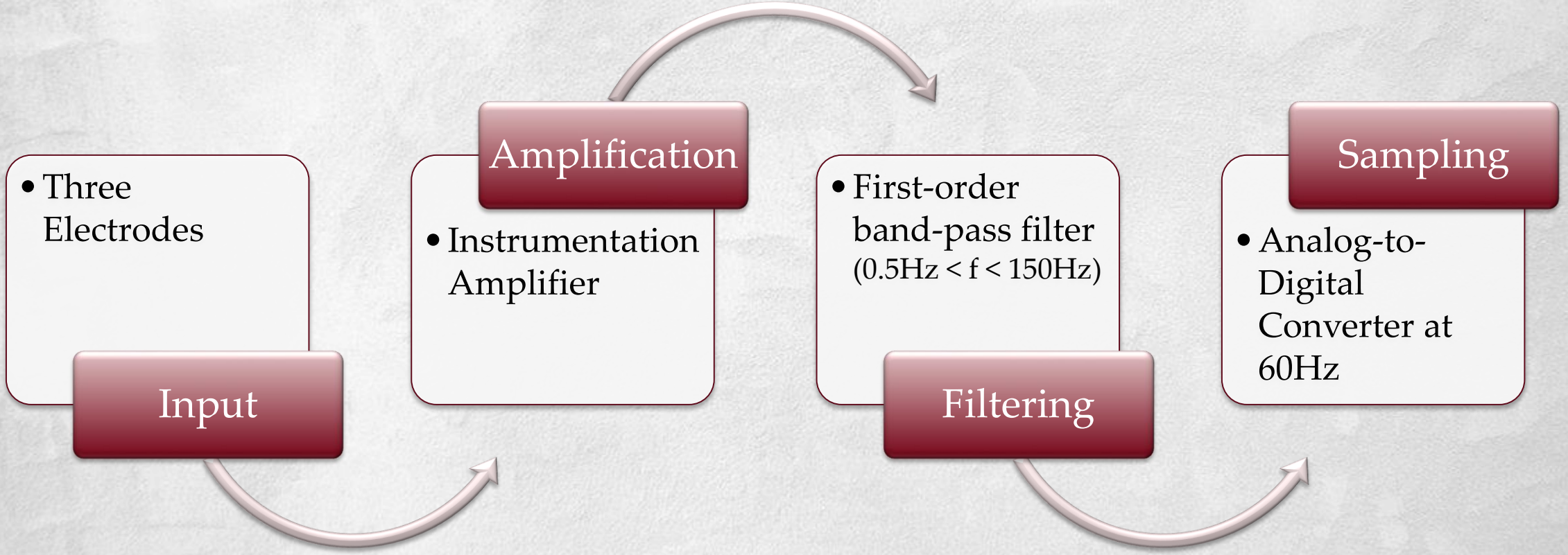
Type	Name	Description

Economic	Cost	• Total System Cost: $3,000
		  • Athlete-Worn Device: $150
		  • Monitoring Station: $1,500

Environmental	Physical	• IP64 Compliant • Temperature Range: -40°C to 85°C

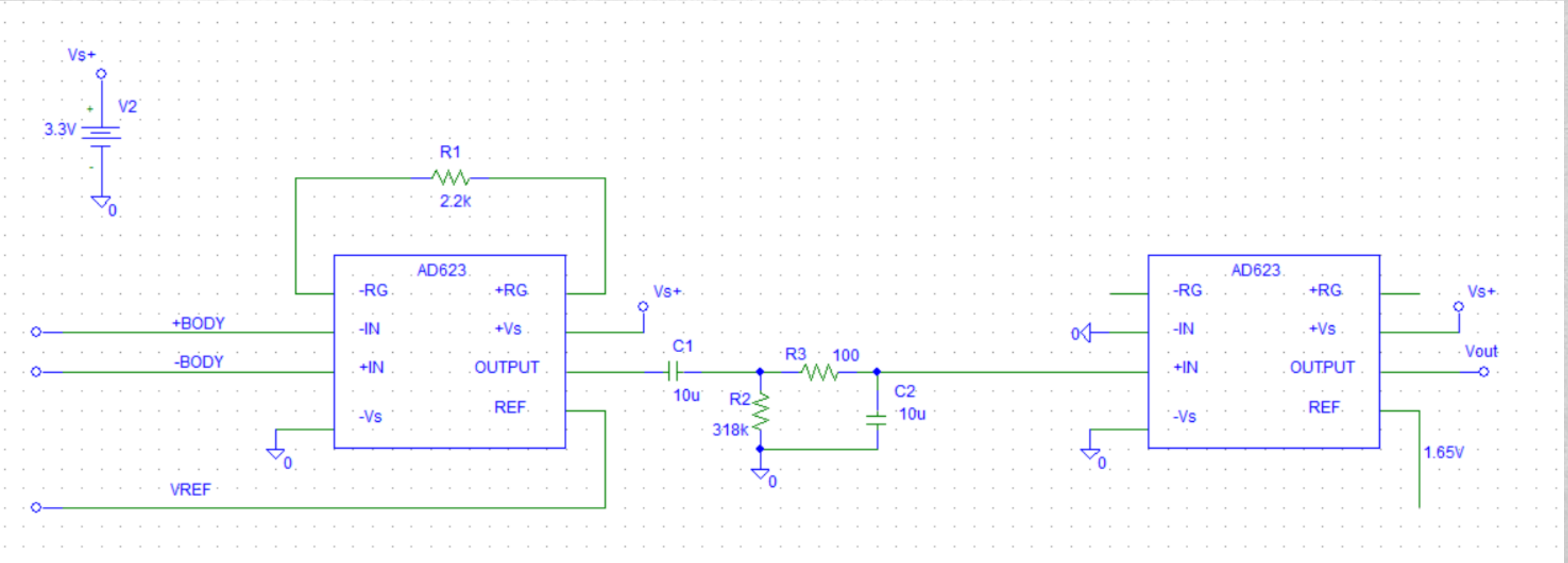
Evaluation: Unit Test

Heart Rate System



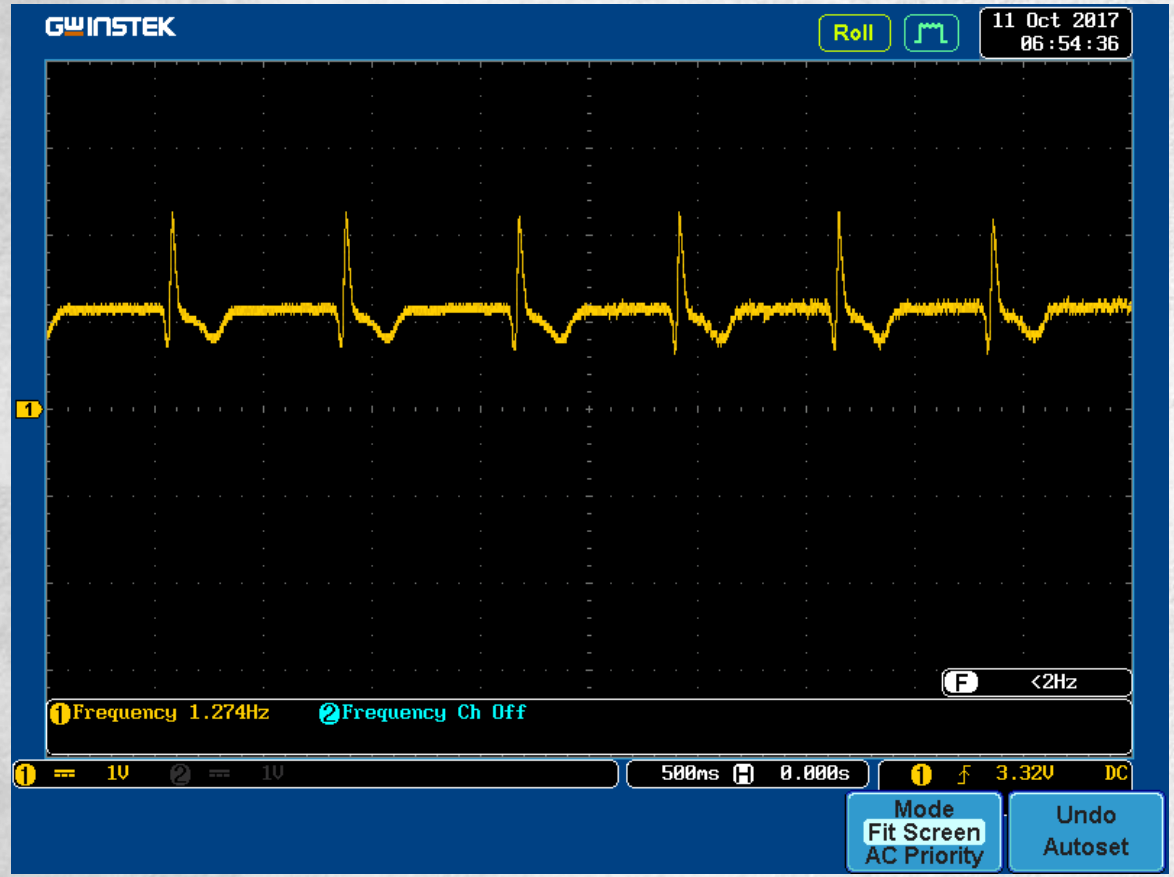
Evaluation: Unit Test

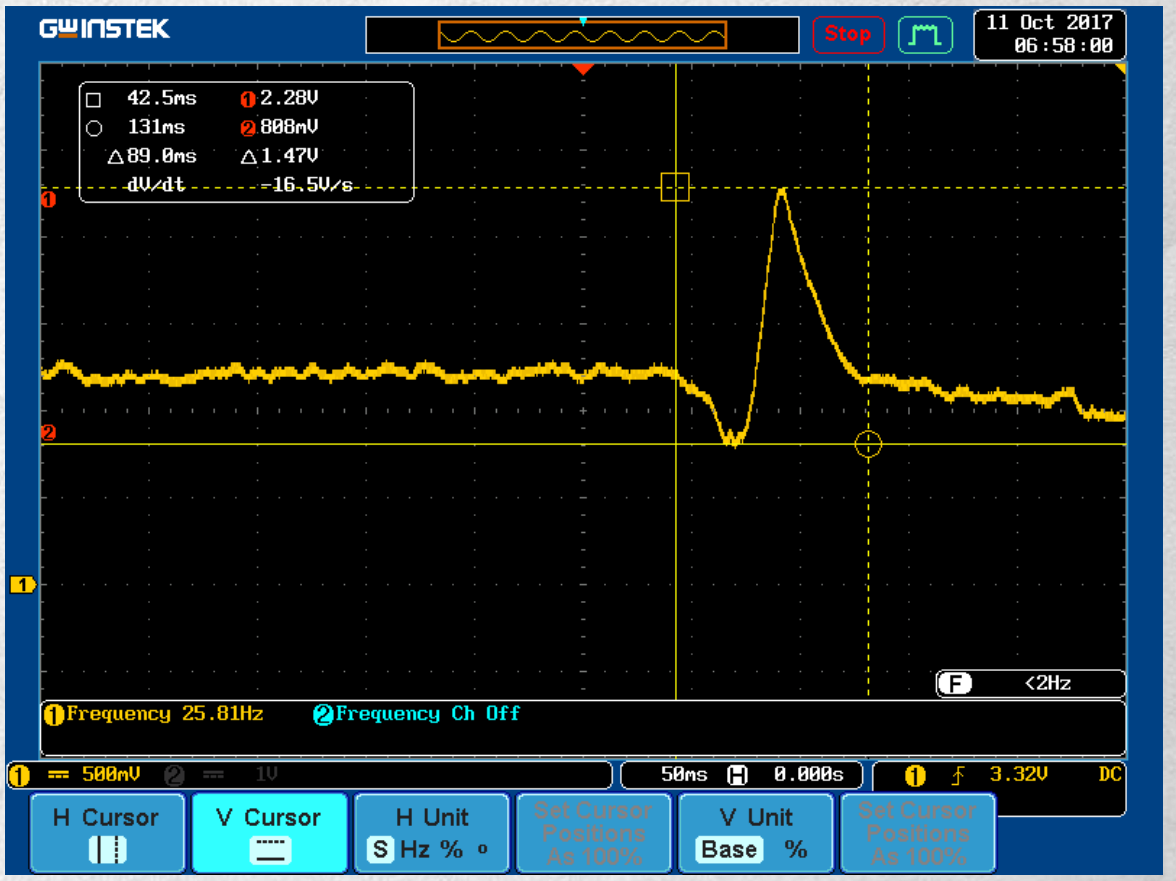
Heart Rate System



Evaluation: Unit Test

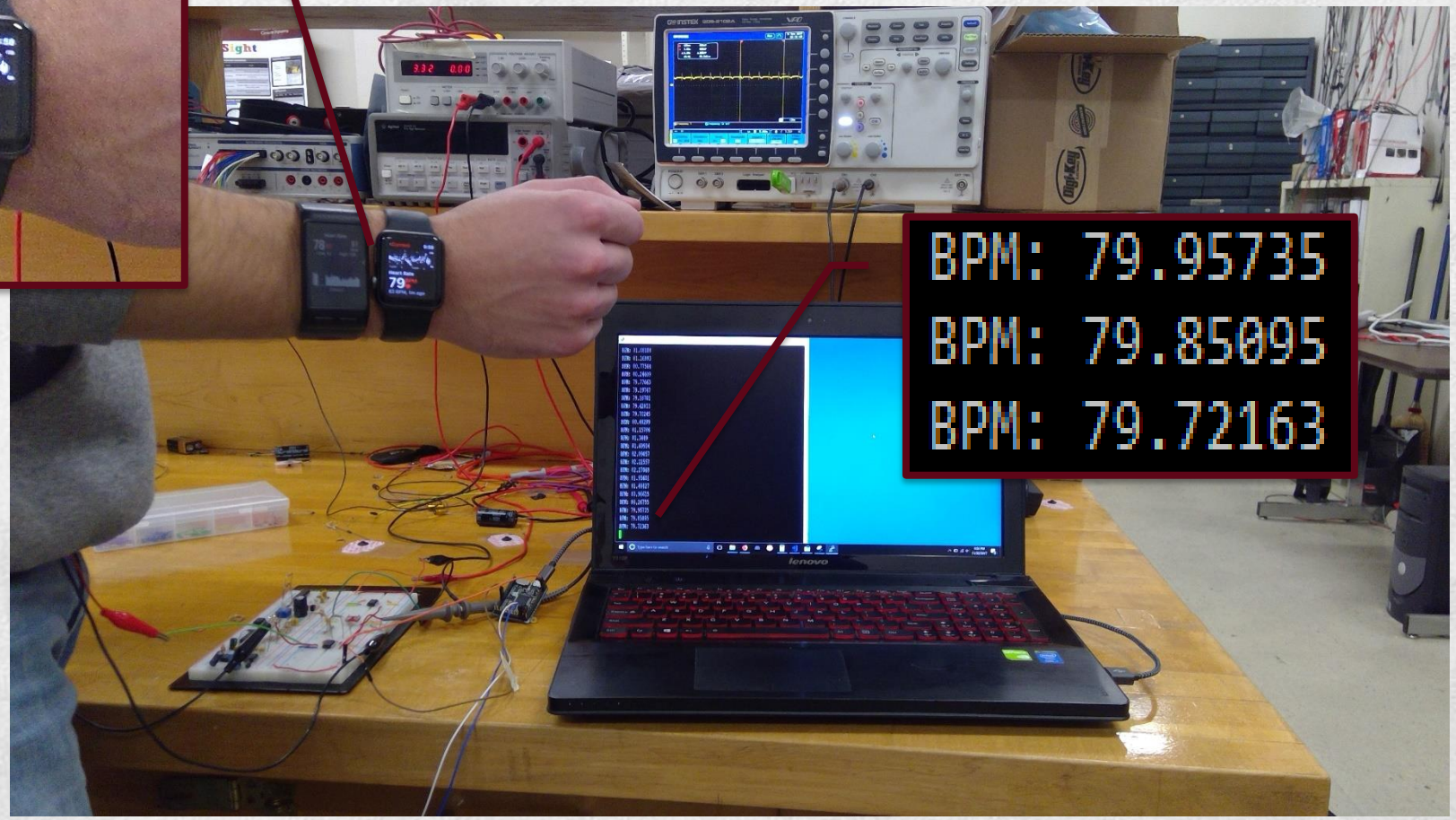
Heart Rate System





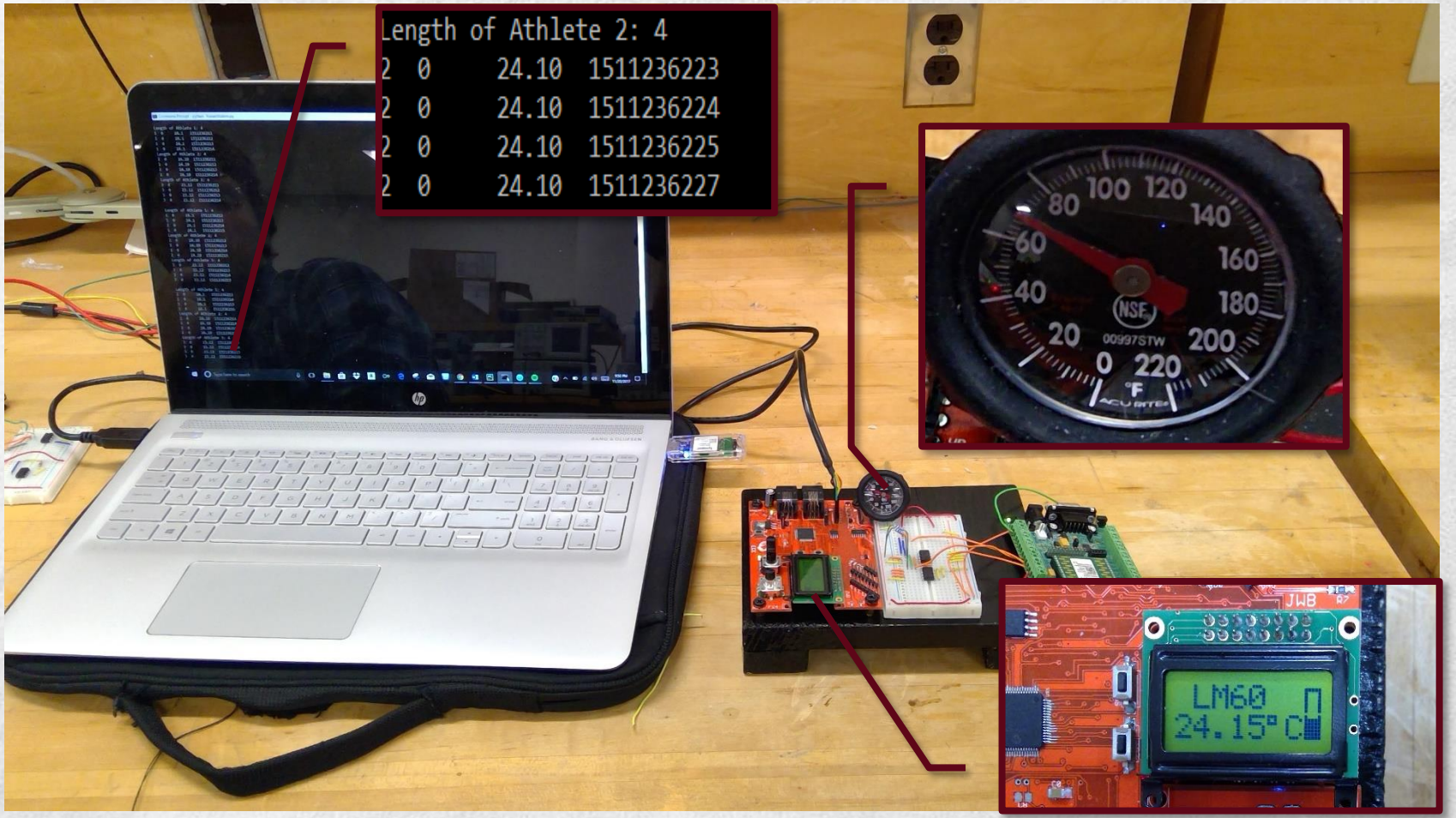
Evaluation: Unit Test

Heart Rate System



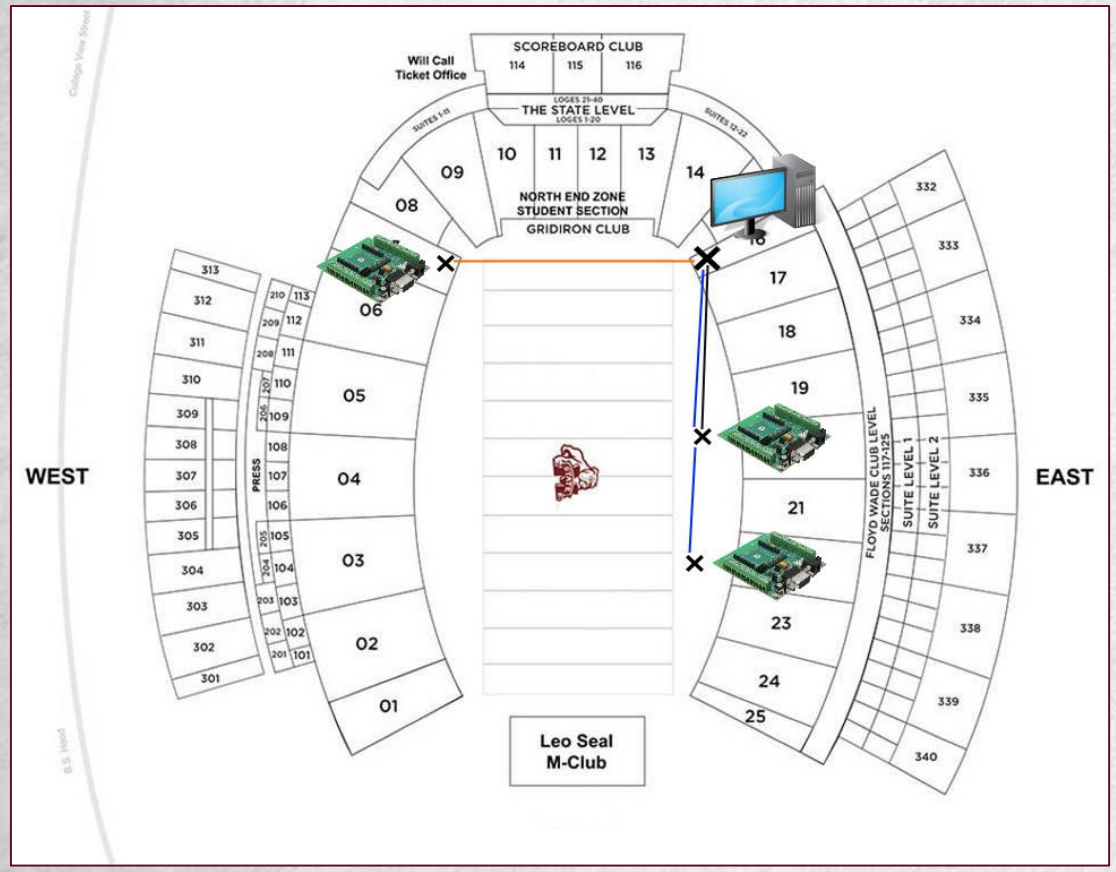
Evaluation: Unit Test

Temperature System



Evaluation: Unit Test

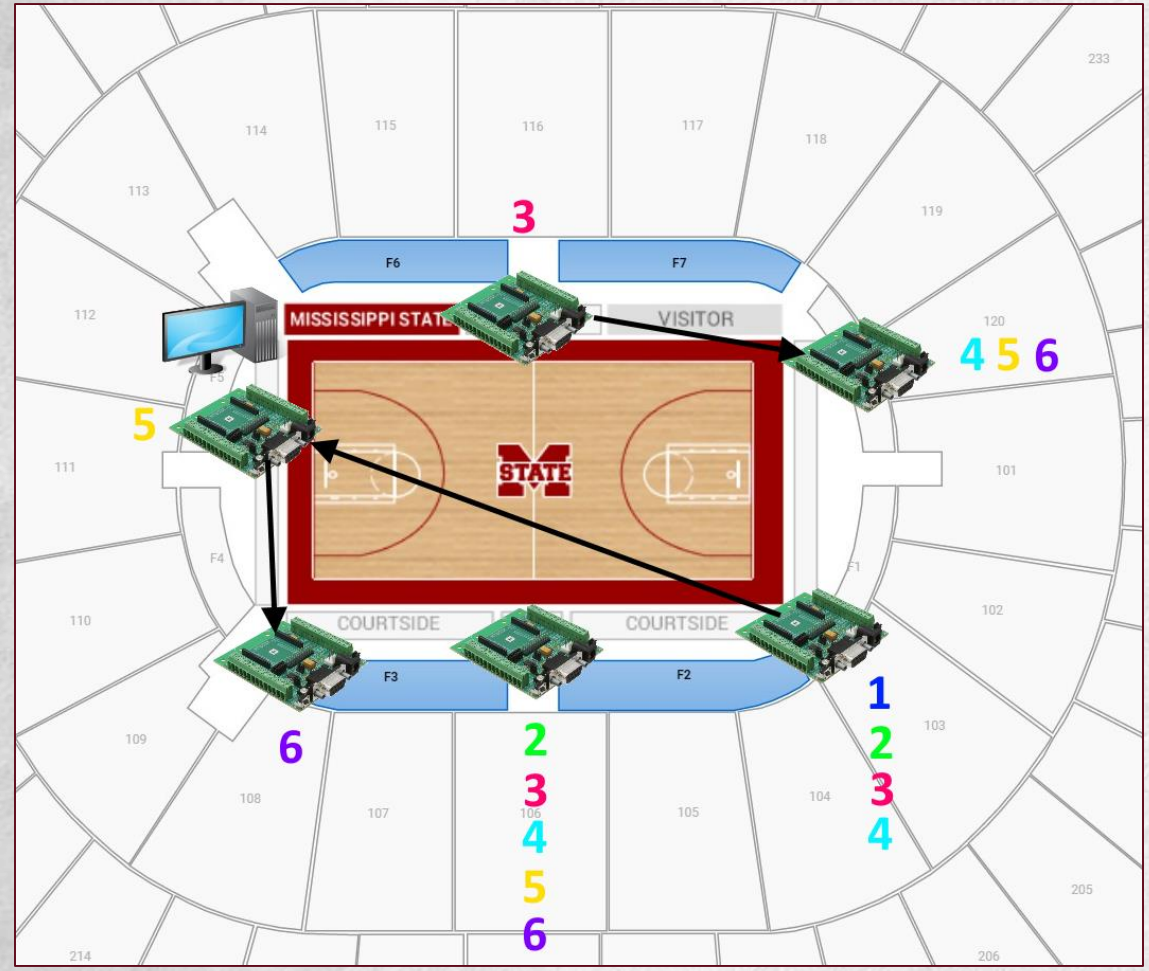
Wireless System



Test Case	Monitor Station Location	Device 1 Location	Device 2 Location	Max Distance	Best Success Rate
1	Sect. 16	Sect. 19	Sect. 19	50 yds	79.31%
2	Sect. 16	Sect. 20	Sect. 19	60 yds	33.76%
3	Sect.16	Sect. 7	Sect. 16	75 yds	41.42%

Evaluation: Unit Test

Wireless System



Test Case	Device 1 Success Rate (%)	Device 2 Success Rate (%)	Device 3 Success Rate (%)
1	N/A	N/A	100
2	69.85	N/A	100
3	68.97	85.36	100
4	77.22	67.36	100
5	93.22	79.31	100
6	58.62	23.64	100

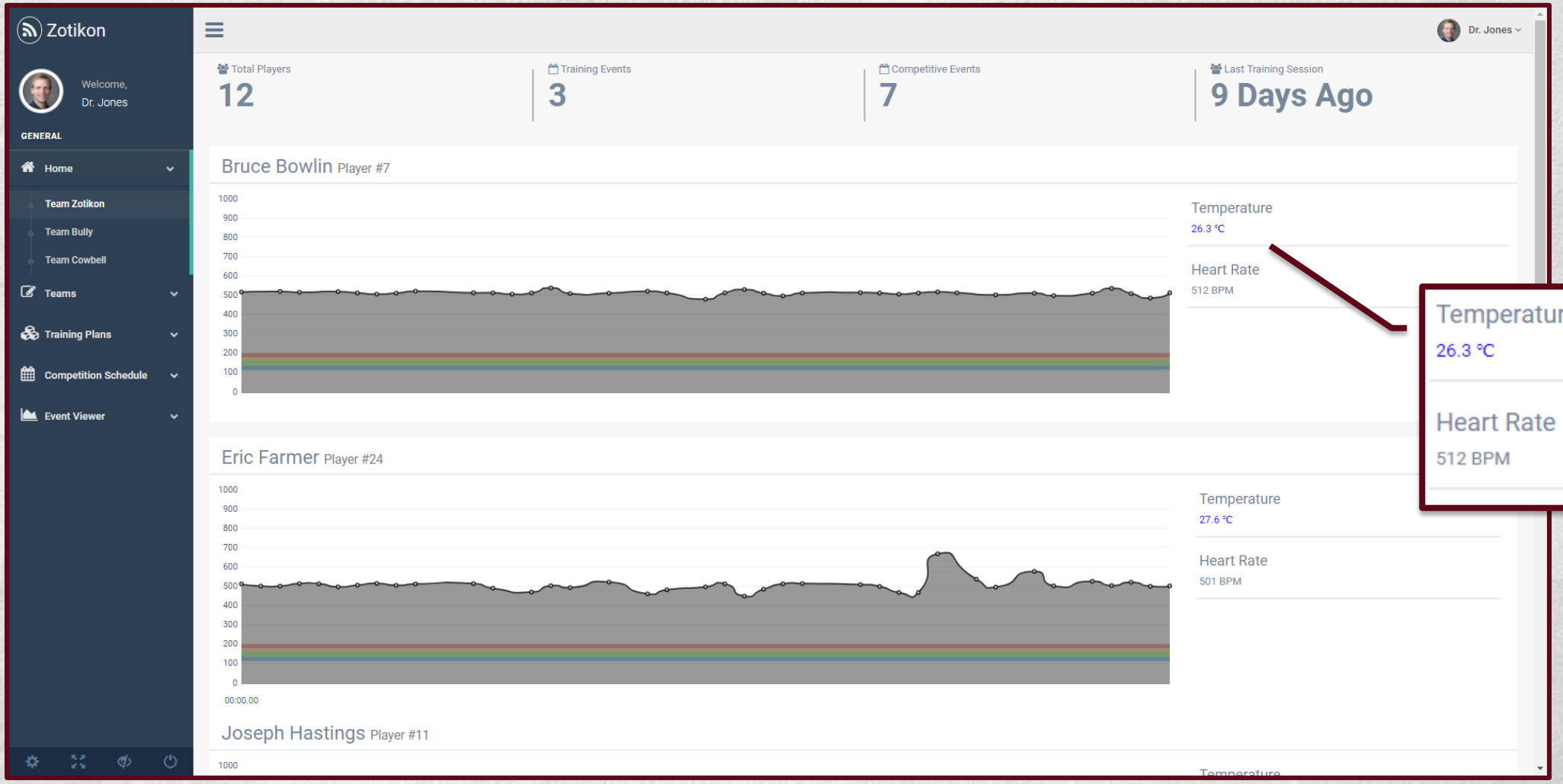
Evaluation: Unit Test

Monitoring Station – Time-Series Database

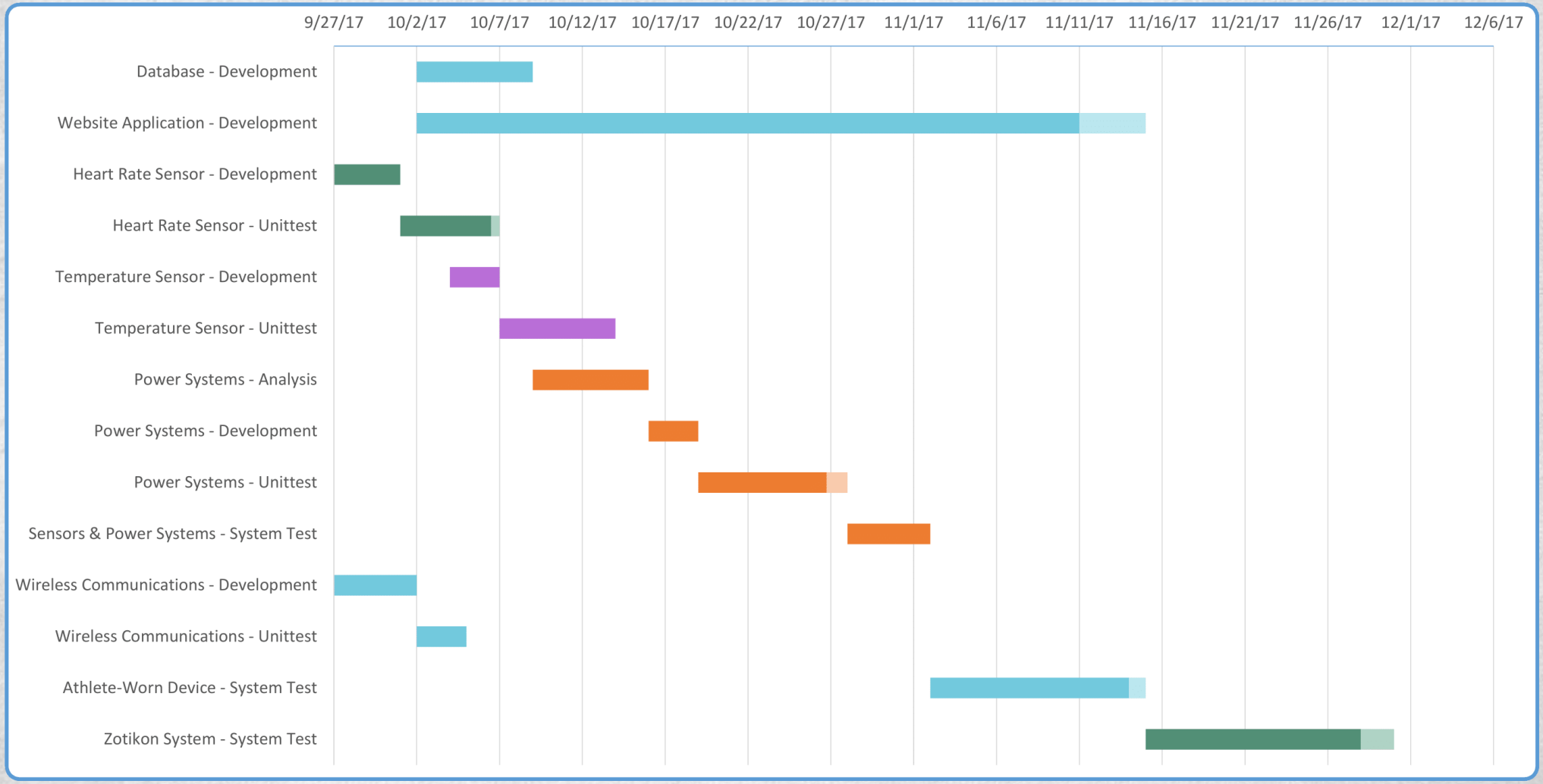
```
InfluxDB shell version: 1.3.7
> USE ZotikonEventTSDB
Using database ZotikonEventTSDB
> SELECT * FROM Event_005
name: Event_005
time       heartRate playerId temperature
----       --------- -------- -----------
1511223490 516       1        24.14
1511223490 509       3        24.4
1511223490 511       2        25.4
1511223491 497       3        24.4
1511223491 500       2        25.4
1511223492 499       3        24.4
1511223492 500       2        25.4
1511223492 519       1        24.14
1511223493 513       2        25.4
1511223493 515       1        24.14
1511223493 496       3        24.4
1511223494 512       2        25.3
1511223494 497       3        24.4
```

Evaluation: System Test

Zotikon



Project Timeline



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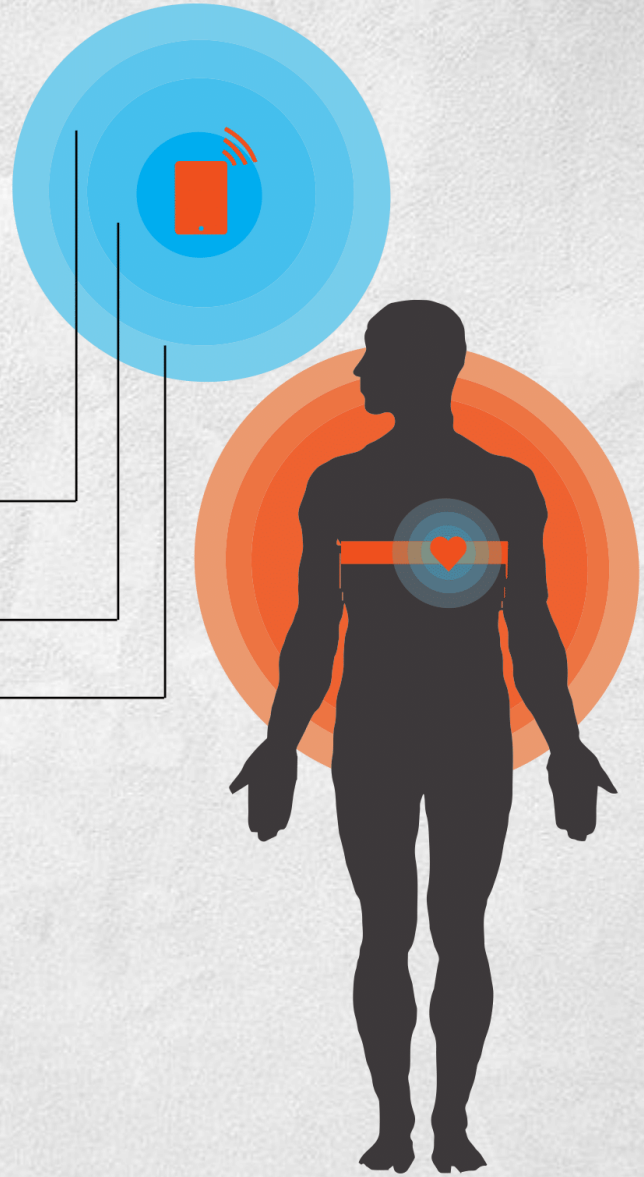

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