



PiOS

Pison iOS Integration

ELECOMP Capstone Design Project 2018-2019

Sponsoring Company:

Pison Technology Inc.

125 Lincoln Street 5th Floor Rear Suite, Boston, MA, 02111

<http://www.pison.com>

Company Overview:

Pison's overarching mission is to offer an easy-to-use wearable technology that enables control or interaction with computing devices. We have designed a wireless biopotential sensing system that captures neuromuscular and movement activity on the surface of the skin. The novelty of our unique solution attributes to our research on market/consumer needs as well as engineering development. Our innovative technology is unique because the sensing technology is not limited to a single location on the body. Our aim is to engineer the product for plug-and-play integration and control of a user's technologies and environment.

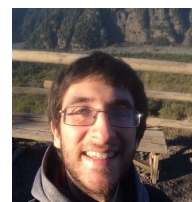
Technical Directors:

Sam Karnes (URI class of 2017)

Lead Research Coordinator and Biomedical Engineer

sam@pison.com

<https://www.linkedin.com/in/sam-karnes/>

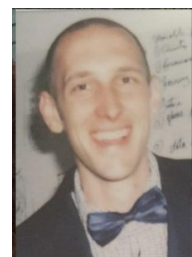


Mike Kowalczyk (URI class of 2009)

Research Engineer and Head of User Testing

mike@pison.com

<https://www.linkedin.com/in/mike-kowalczyk-78592839/>



Project Motivation:

Pison currently have a fully functional platform for PC and android based systems but would like to expand that functionality to macOS and iOS. This will in turn push the product out across a wider range of operating systems and improve user acceptability. Additionally, Pison requires a system to port additional functionality of the iOS platform to avoid duplicating work when new software builds become available.

Anticipated Best Outcome:

The anticipated best outcome for this project includes a combination of deliverables. Pison is looking for Bluetooth protocol support for macOS that conforms to our JNI accessible native library. In addition to this, Pison is requesting an iOS software development kit (SDK) that maintains feature-set parity with our current android and desktop SDKs. In order to ensure these deliverables are still viable after the project has been completed, we are also requesting a workflow for automated porting of any additional functionality that may be implemented later. As a final deliverable, students can present an example app that demonstrates these features.

Project Details:

Overall system concept

Current Android SDK Architecture to be Redesigned for iOS

1. Background service app (Pison Hub for Android)
 - a. Contains frontend to handle the following:
 - i. Connect to device via BLE using device selector or QR code
 - ii. View connection status (latency, activations classified etc.)
 - iii. Configure classifier
 - b. Background service
 - i. Provides API for clients to receive classified DeviceFrames
 - ii. Can be implemented via TCP or any other inter-process communication scheme
 - c. Overlay (stretch goal)
 - i. UI overlay that draws over all other apps
 - ii. Simulates existing input while providing real-time visual feedback

2. Android SDK (Java/Kotlin)
 - a. Can be added as dependency to any Android app for event-driven real-time access to DeviceFrames
 - b. Must be hosted on Thanos (Pison's private maven repo)
 - c. Should have similar interface to desktop SDK for easy porting and building of multi-platform demos

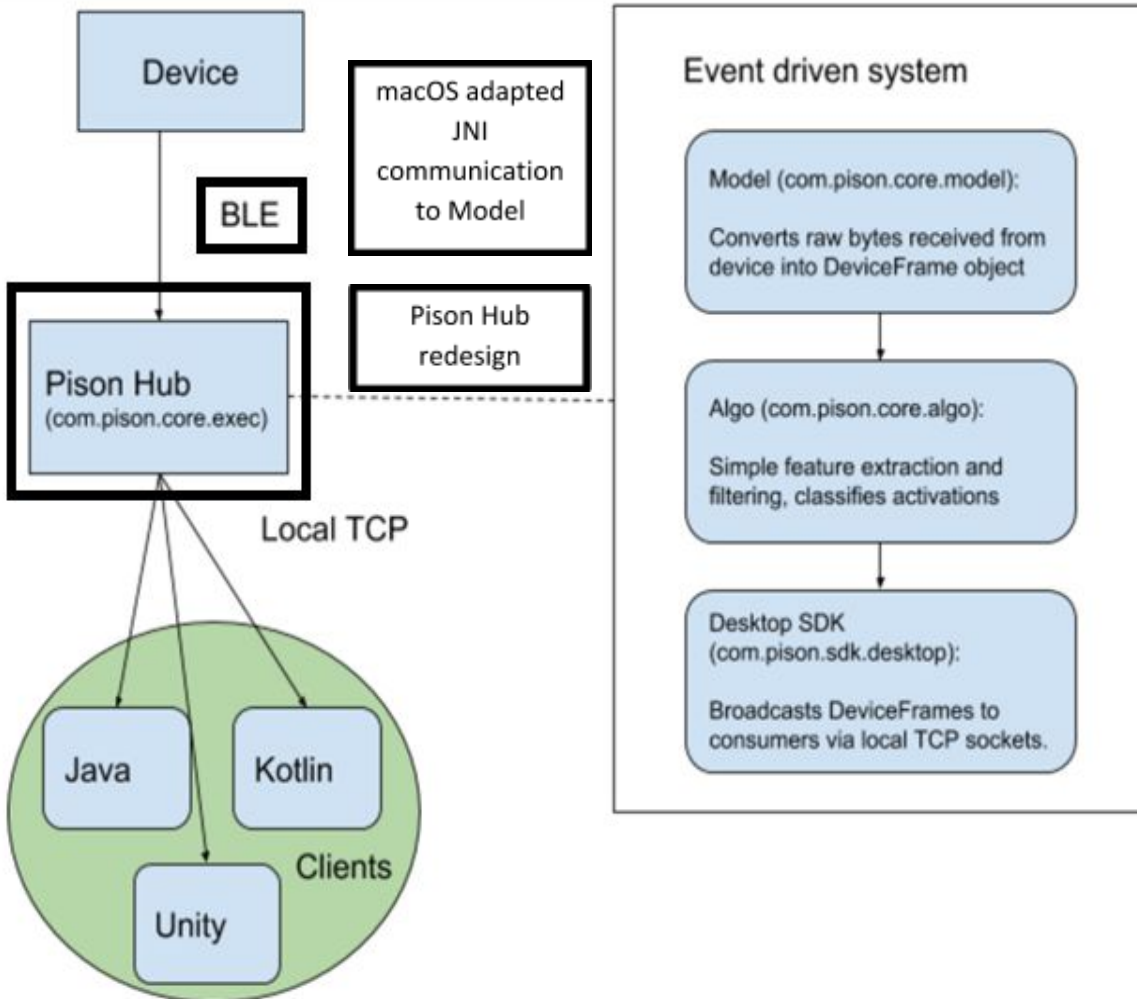
3. Unity Android SDK
 - a. Added as a dependency to any Unity project for access to Pison data on Unity based Android apps
 - b. Should be provided as Unity package file
 - c. Similar interface to [desktop Unity SDK](#)

Current Process:

1. Implement background service app (Pison Hub for Android) as Android application and client-side SDK as Android library (deployed as aar or jar), two modules in the same Android Studio project
2. Push code to [github repo](#) as it's implemented
3. Provide weekly updates via slack/email
4. Once bare-minimum functionality is reached (connecting to device and receiving DeviceFrames in client app), push to Thanos as v0.1.0

To accomplish these goals, iOS requires the redesign of the "Pison Hub" system with a porting feature. macOS requires a Bluetooth protocol in objective C that communicates with our JNI Library (see block diagram on next page).

Block Diagram



Firmware/Software/Computer Tasks

- Develop Bluetooth protocol support for macOS
 - JNI accessible native library
- Develop iOS SDK and feature-set parity with Android and desktop SDKs
- Establish a workflow for automated porting of additional functionality of iOS
 - We will conduct evaluation processes at certain steps of the workflow
- iOS functionality example app (ARkit)



Composition of Team:

2 Computer Engineers

Skills Required:

Computer Engineering Skills Required:

- Background in C, C++, Objective-C, or Swift programming languages
- Understanding of iOS and macOS platforms
- Previous experience developing SDKs is beneficial
- Mobile app development experience is not required, but highly recommended
- The ability to adapt, innovate and learn *new concepts* quickly
- Highly motivated and team oriented individual
- Prior development of Bluetooth communication is a plus
- Students interested in this project should consider enrollment in ELE 470: Mobile Computing, offered during the Fall semester. The course covers app development using Swift for iOS.

Anticipated Best Outcome's Impact on Company's Business, and Economic Impact:

The impact of this anticipated outcome allows Pison to offer the device across a wider range of operating system platforms. This factor benefits both the anticipated end-users and the company as a whole. There is wider acceptability towards the product launch if users have a variety of operating systems that can be used to interact with it. Furthermore, a process for porting any new functionality creates additional efficiency towards new software builds. As this product is still in development, the software has constant iterations in order to fulfill requested needs for end-user, troubleshooting, and research purposes. Time that can be saved while producing cross-platform software provides invaluable resources back towards the development of our product.

This development will increase pilot adoption and sales of batch units in the thousands. Furthermore, once consumer sales begin, this will have a revenue impact in the order of hundreds of thousands of dollars.



Broader Implications of the Best Outcome on the Company's Industry:

Industry partners will have further incentive to use our product as a result of the improved usability. Furthermore, our product will become more competitive in the wearable device, wearable HCI device, and assistive technology markets upon release. This will impact revenue as the company begins its sales process in the upcoming year.