# iOS-Loop

# A Guide to iOS-Loop Artificial Pancreas Software

The Latest Version of Loop is available at:
https://github.com/loudnate/Loop/releases

**Contributors:**

Nathan Racklyeft (@loudnate)
Pete Schwamb (@ps2)
Jeremy Lucas (@jlucasvt)

This document was developed using the following software and system versions

| | |
|---|---|
| XCode Version: | 7.3.1 |
| MacOS Version: | 10.11.6 (El Capitan) |
| iOS Version: | 9.x |
| Loop Version: | 0.10.x |

## Table of Contents

# Introduction

iOS-Loop is an open source artificial pancreas / bionic pancreas software that uses specific commercially available hardware and technologies to bring together Insulin Pumps, Continuous Glucose Monitors, and insulin dosing algorithms to create a continuous "Loop". This Loop predicts future glucose forecasts based on Carbohydrate intake, Insulin on Board, and current CGM readings.

# 1 Understanding what is required to make and use iOS-Loop

The following hardware and software are required to build/compile and run iOS-Loop as an Artificial Pancreas System on an iPhone.

## *1.1 Hardware*

The following information is a listing of hardware that is required or can be used with iOS-Loop.

### 1.1.1 Insulin Pump (Required)

TODO >>> List the Pumps Supported (Graphic from Readme.md)
TODO >>> Instructions how to find your firmware.
TODO >>> Link to OpenAps info on pumps

### 1.1.2 Continuous Glucose Monitor (Required)

#### 1.1.2.1 Dexcom G5

#### 1.1.2.2 Dexcom G4 with Share Receiver

#### 1.1.2.3 Medtronic CGM

TODO >>> Couple of paragraphs on G5 and G4 and usage Offline.

### 1.1.3 RileyLink (Required)

TODO >>> Paragraph and Graphic on what RileyLink is (BLE to SUBGRF)

Link to RileyLink Github
Link to RileyLink Ordersite

### 1.1.4 Apple iPhone (Required)

TODO >>> Info on iPhone Models to use 5s and above?

### 1.1.5 Apple Watch (Not Required but Cool)

TODO >>> Info on Apple Watch models

### 1.1.6 Apple Macintosh Computer (Required)

To Build the Loop application for an iOS Device you will need an Apple Macintosh computer running the latest version of OS X. Apple's Refurbished Store or eBay is a great place to find Apple hardware at a discounted price. Yes apple hardware is generally more expensive than commodity PC hardware. It also retains it's value much better than PC hardware so expect to pay $400 or more for a good used iMac, MacMini, or MacBook. See the requirements below for which hardware will run the latest version of Mac OS X. A good Late 2010 model MacMini works great if you already have a Keyboard/Mouse/Monitor. Just remember Mac's Like RAM so give them as much as you can.

Apple OSX El Capitan Hardware Requirements needed to run Xcode 7

## *1.2 Software*

1.2.1 **GitHub / GitHub Desktop (Not Required but useful when using Git)**

1.2.2 **Cloned or Forked Git Repo of Loop iOS App**

1.2.3 **Cloned or Forked Git Repo of RileyLink iOS App (Not Required to use Loop)**

1.2.4 **MacOS X (Required)**

1.2.5 **XCode 7 (Required)**

1.2.6 **Carthage (Required)**

1.2.7 **Apple Developer License (Not Required)**

1.2.8 **Nightscout (Not Required)**

1.2.9 **Amplitude (Not Required)**

1.2.10 **mLab (Not Required)**

## *1.3 How does iOS-Loop work*

>> Graphic of the components and Data Flow
>> Instruction on how Algorithm works

# 2 Assemble and Build the Loop

Setup your Mac for Development

### 2.1.1 **Install XCode**

### 2.1.2 **Install Carthage**

### 2.1.3 **Git the Code**

TODO >>> Discussion on Git and 2 options for getting the code. Clone and Download vs using GitHub / GitHub Desktop

#### 2.1.3.1 **Clone/Download the Repo (Easy)**

#### 2.1.3.2 **Git on Board , Fork and Pull the Repo (Advanced)**

### 2.1.4 **Configure/Build/Deploy Loop using XCode**

>> Meat and potatoes of what most ppl need very detailed lots of screenshots Especially the “entitlements” and BUNDLE info here.

# 3 Configuring and Running Loop App

## *3.1 iOS-Loop Application Settings*

3.1.1 **Closed Loop (switch)**

3.1.2 **Nightscout History Upload (Switch)**

3.1.3 **Devices: RileyLink Setup (Switch)**

3.1.4 **Configuration**

3.1.4.1 **Pump ID**

3.1.4.2 **G5 Transmitter ID**

3.1.4.3 **G4 Share Receiver**

3.1.4.4 **Target Range**

3.1.4.5 **Insulin Action Duration**

3.1.4.6 **Basal Rates**

3.1.4.7 **Carb Ratios**

3.1.4.8 **Insulin Sensitivities**

3.1.4.9 **Maximum Basal Rate**

3.1.4.10 **Maximum Bolus**

3.1.5 **Services**

3.1.5.1 **Dexcom Share**

3.1.5.2 **Nightscout**

3.1.5.3 **mLab**

3.1.5.4 **Amplitude**

3.1.6 **CGM Setup**

3.1.6.1 **Dexcom G5**

3.1.6.2 **Dexcom G4**

3.1.6.3 **Medtronic CGM**

3.1.7 **Insulin Pump Setup**

3.1.7.1 **Medtronic 522/722 Pumps**

3.1.7.2 **Medtronic 523/723, 528/728 Pumps with MySentry**

## *3.2 iOS-Loop Application User Guide*

The following are guides to using the various displays

3.2.1 **Status Screen**

3.2.1.1 **Heads Up Display (HUD)**

3.2.1.1.1 Loop Status HUD

3.2.1.1.2 Glucose HUD

3.2.1.1.3 Temp Basal HUD

3.2.1.1.4 Reservoir HUD

3.2.1.1.5 Battery HUD

3.2.1.2 **Glucose Chart**

3.2.1.3 **Bolus Insulin-On-Board Chart**

3.2.1.4 **Temp Basal Chart**

3.2.1.5 **Carbohydrate Chart**

3.2.1.6 **Recommended Basal**

3.2.1.7 **Last MySentry (not for x22 Pumps)**

3.2.1.8 **Bolus Insulin On Board (not for x22 Pumps)**

3.2.1.9 **Sensor State**

3.2.2 **Carb Entry**

3.2.3 **Bolus Entry**

3.2.4 **Workout Mode**

3.2.5 **Notifications**

## *3.3 Loop WatchApp User Guide*

## *3.4 External Integrations*

3.4.1 **Nightscout**

3.4.2 **Amplitude**

3.4.3 **mLab**

# 4 Closing the Loop

>>> Testing your settings and preparing to Loop.

# 5 List of Terms

OpenAps
WeAreNotWaiting
Closed Loop
CGM