



# PROGRESS REPORT

## SECURE ON-SITE BOX

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# 1 Introduction

The SOSbox solution is an IoT-enabled secure parcel storage system designed to benefit both the courier service and end customer by eliminating inefficiencies that exist within the parcel delivery process. Our solution aims to use the power of the Internet and embedded technology to provide real time, remote communication with the end customer. In this way, the user is able to receive parcels without being present on-site when the courier arrives. Additionally, the system will be designed with surveillance and physical theft deterrence capabilities for added peace of mind. This document outlines the progress made by the SOS team on the SOSbox.

## 2 Progress

The SOSbox project can be split into physical/mechanical, electronic, and software subsections. The mechanical subsystem involves the door lock mechanism and automated door opening mechanism.

### 2.1 Mechanical

The door unit is ordered and pending delivery. This unit is required before the rest of the chassis can be assembled. The mechanical system is partially complete. The lock solenoid and driver has been acquired and has been bench tested. For the door opener, a motor driver has been acquired but the exact stepper motor to be used has not been chosen because it relies on the delivery of the door unit.

### 2.2 Electronics

The electronic subsystem consists of the embedded system controller, camera, accelerometer, LED array, motor driver, lock solenoid driver, and miscellaneous interfacing components. At present, the box design has been done using modeling software. The wooden frame has been constructed but accommodations must be left to ensure all the parts fit correctly.

Two cameras have been tested streaming video from the BeagleBone to a desktop PC using a web server. They have also been used to scan various barcodes and QR codes with good results. The LEDs are delivered and the driver circuit has been designed. Two accelerometers are also delivered, and a selection of which to use in the proof-of-concept will be made soon.

### 2.3 Software

The software effort has been in general split into several parts, the server-client model, video streaming from one to the other, loading the application onto the Beaglebone, wirelessly transmitting the stream, and finally communication via IP to a simple mobile application.

The original schedule outlined in early October (September was dedicated to research and set-up) had set the following software deadlines:

- October 18th: software test Application complete: Met only for PC versions of client/server pair
- October 25th: Hardware driver integration: Not Met, hardware slippages made this milestone infeasible, additional time was allocated to Server protocols
- November 8th: Streaming audio and video functionality ready: Partially Met, while the streaming capability has been successfully tested, the . Streaming audio has been removed from the project scope due to platform limitations and low overall utility.
- November 25th: Pattern recognition software ready: On schedule, the pattern recognition is already working as a standalone feature and will be integrated by the scheduled date. The streaming functionality will likely be integrated at the same time.

## 3 Schedule

### 3.1 System Schedule

Our original schedule created late September had outlined system-level, hardware, software and documentation deadlines. Many of our deadlines have been pushed back a week-10 days because less than enough time was allotted to completing documentation, specifically the functional and design specs. A deadline of Dec 2nd, 2014 was set prior to commencing work on the SOSbox and our initial schedule allowed us to complete the project a week in advance, to account for any delays. In the case of delays, our deadline has also been pushed back to Dec 15th, 2014.

### 3.2 Hardware Schedule

Our initial design involved having an automatic aluminum retracting door, with a rubber backing to ensure waterproofing. However, it was later decided that waterproofing was not necessary for a proof-of-concept product to demonstrate the underlying technology. Initial emphasis on having the SOSbox remain firmly positioned (ie. anchored) during theft has also been scrapped

A possible schedule slippage issue could occur due to the arrival of the door unit being delayed. The group originally planned to use a roller shutter style door that does not intrude on the parcel cavity or the user when it is opened or closed. The door was ordered, but has taken a while to arrive and may require modifications to fit in the enclosure. The chassis design and selection of a motor to open or close the door are dependent on the door unit's arrival. In the meantime, the group has designed a conventional swinging door that can be used if the roller door does not arrive in time or is troublesome. The figure below represents all of the scheduling done until now and for the future.

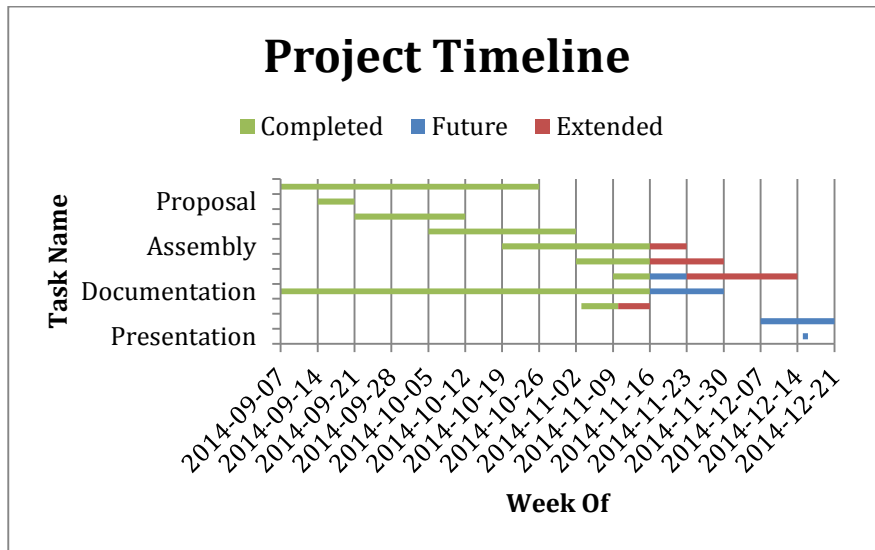


Figure 1: Revised Schedule for the SOSbox

## 4 Financial

The main source of funding for our project has thus far been contributions from our team members. We have agreed to contribute up to \$550 for the development of the proof of concept. To date, the construction cost of the SOSbox is expected to be below \$100. An additional expenditure of about \$300 is expected for the necessary hardware and electronics (see Table 1). Thus, SOS Technologies has managed to reduce our initial forecasted cost (as outlined in the project proposal) by as much as 50%.

Table 1: SOSbox Budget (PoC)

Components	Estimated Cost (\$)	Actual Expenditure to date (\$)
Beaglebone Black kit	150	100
Electronic components (ie sensors, buttons, motors etc..)	100	70
Peripheral & Accessories	50	0
Box Construction	100	30
Miscellaneous Costs (Shipping, import duty etc..)	50	51
Contingency	100	0
<b>Total Cost</b>	<b>550</b>	<b>251</b>

## 5 Conclusion

We have made significant progress in the development of the proof of concept SOSbox. Most aspects of the project are progressing steadily with some falling behind schedule slightly. The design and initial construction of the SOSbox are well underway but some components such as the integration of the main door remain on hold due to delays in shipping.