



Homeland Security

Science and Technology



Counterfeit Prevention Project

Deploying mobile applications to modernize how the DHS counters fraud

Project Interns

Kyle Burns | San Jose State University
 Michela Burns | University of California, Berkeley
 Vincent-Patrick Espino | University of Southern California
 Kevin Luo | Cornell University
 Steven Rivera | Georgia Institute of Technology
 Tanner Summers | California State Polytechnic University, Pomona

Project Mentors

Ethan Chan | 8754 | Quantitative Modeling & Analysis
 Andrew Cox | 08716 | Systems Research & Analysis III
 Matthew Wong | 8754 | Quantitative Modeling & Analysis

Abstract

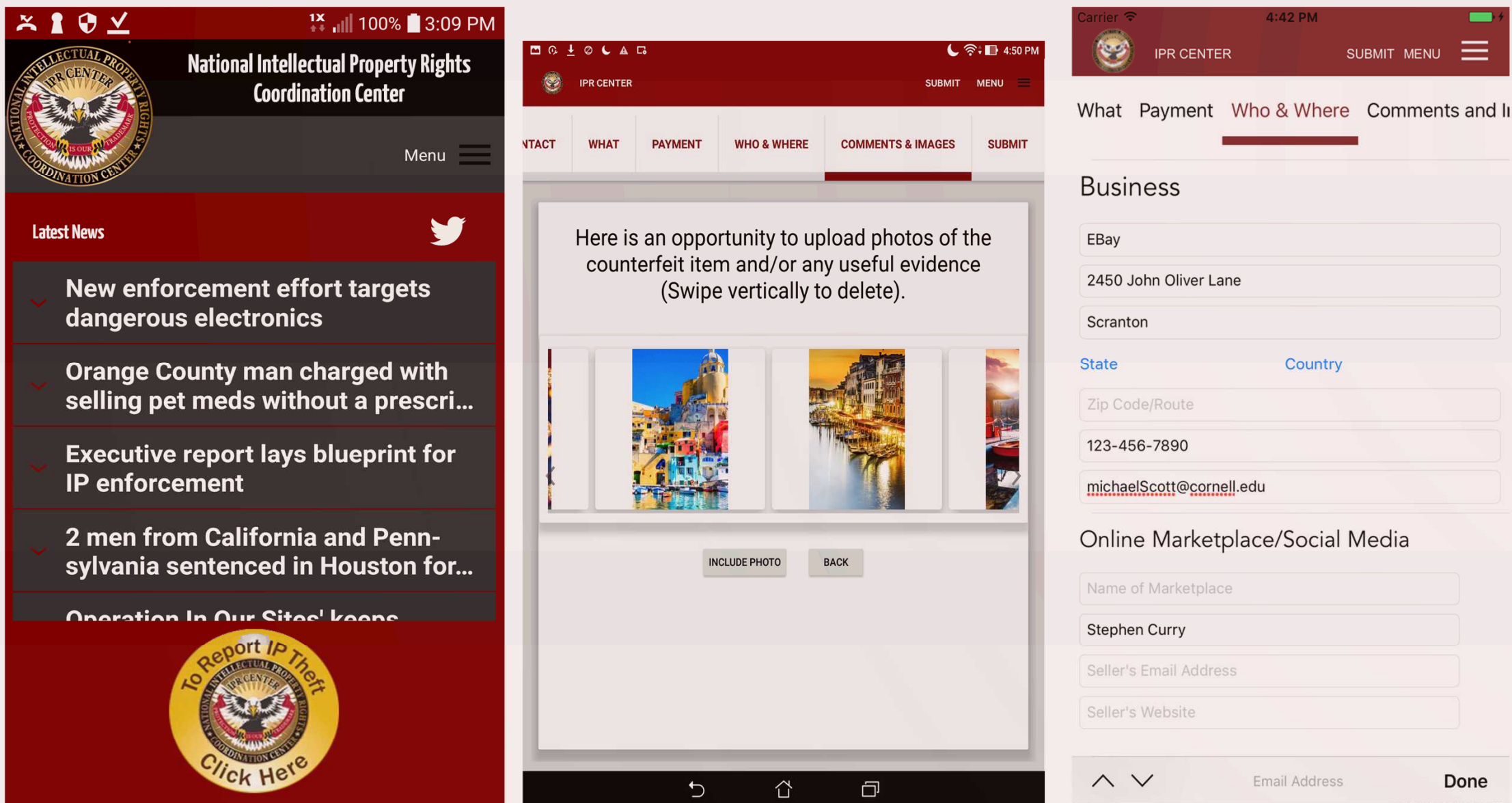
Each year, nearly half a trillion dollars in counterfeit goods are traded throughout the globe¹. Many of the proceeds play a substantial role in keeping organized crime financially viable. Furthermore, counterfeit products cause severe monetary and health risks, through items ranging from phony pharmaceuticals to faulty automotive parts. Currently, the Department of Homeland Security (DHS) Immigration and Customs Enforcement (ICE) relies on citizens to report fraud through a web-based PDF form that needs to be downloaded and emailed. The Counterfeit Mobile Application is a modern solution which places the vast DHS network of analysts and databases in the pockets of the general public. The central aim of this research project is to develop an app that maximizes the accessibility of DHS resources and minimizes both the effort and time it takes to detect, report, and transmit reports of intellectual property violations.

Reporting Fraud: The Core App

Overview

The core app is a user-friendly and concise mobile application. This interface design helps increase the speed and ease of reporting counterfeit items, encouraging reporting in both greater quantity and superior quality. Preliminary testing indicates that the app is faster than accessing and completing the PDF form.

The device splits the DHS information form into six sections, with a separate screen for each. The app complements its clearly outlined information fields with informative additions, like a scrollable news feed of the latest events in intellectual property rights.



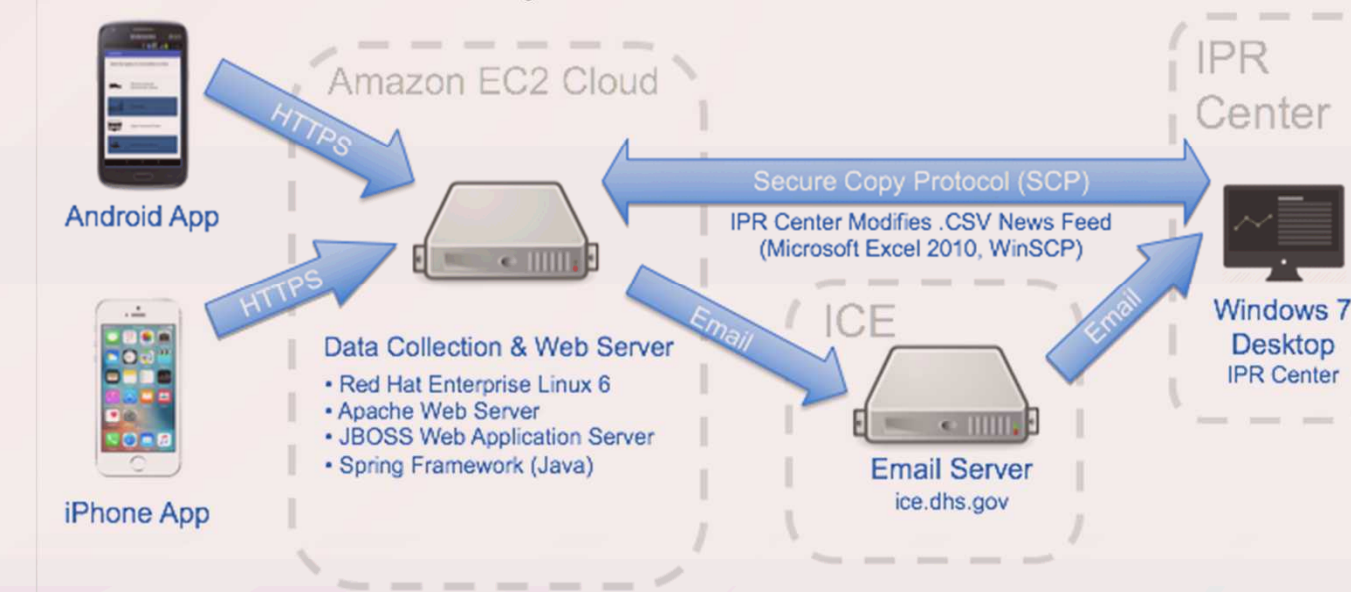
Home

Photo Selection

Seller Identification

Features

- Available for both iOS and Android
 - Both versions were developed to have a consistent feel
- Contact page** to document the user's information
- What page** to specify and describe the counterfeit item(s)
 - Built as an expandable table view which displays a hierarchy of items and allows users to enter a description in any choice
- Payment page** to note how the user bought the counterfeit item(s)
 - Clearly designated drop-down fields which move with ease
- Who and Where page** to report who sold the user the counterfeit item(s)
- Comments/Images page** to allow users to upload photos/analysis
 - Selected images can be viewed in a scrollable collection view
 - Users can swipe up or down on images to dismiss them
- Submit page** to prepare report before transmission
 - Communicates with all view controllers to transfer previously entered data into a preview-before-submission screen
- Emails responses immediately to the DHS server

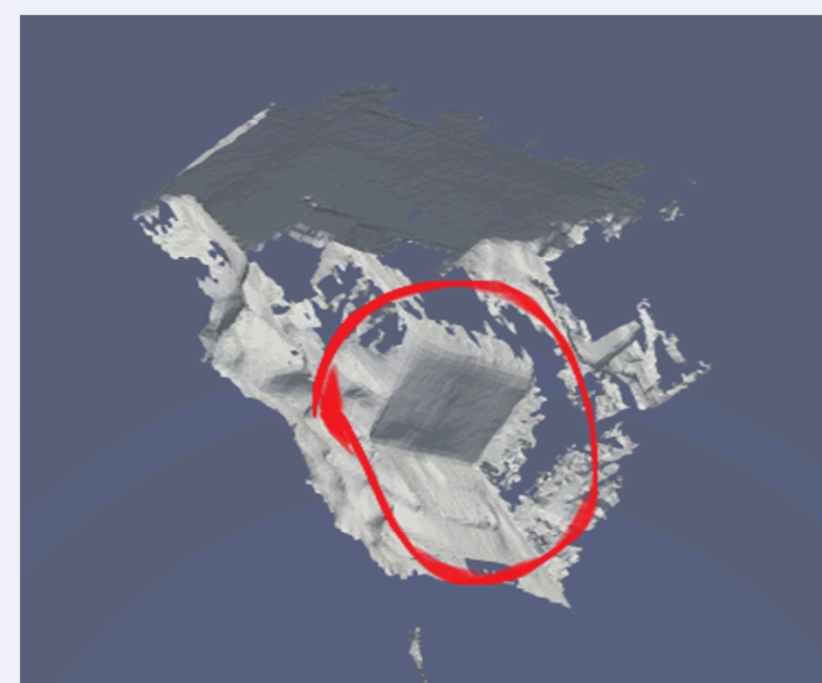


Detecting Fraud: Barcode Scanning & Natural Language Processing

The barcode scanning application is designed to expand the core app's capabilities, by allowing users to quickly detect straightforward counterfeit items. The app scans barcodes and immediately displays the associated product information from multiple databases. Individuals can then compare what is in front of them, with what the item is actually supposed to be.

Ongoing Efforts:

- Problem: Databases often associate barcodes with the wrong product
- Three-Pronged Solution:
 - Connect to 6+ databases to obtain maximum information
 - Utilize Natural Language Processing to cluster product names with similar meanings
 - Return product name with highest clustering (most found name = most likely to be correct)
- Why Natural Language Processing?
 - Information across databases is inconsistent. A product's name might be worded differently in database x vs. database y -> thus, ideally we cluster on meaning instead of exact string matching



Laptop mesh by Tango app



A test app using iOS ARKit

Detecting Fraud: Computer Vision

The project team is researching the capability of mobile devices to create 3D physical models of laptops through sensing their physical dimensions. These efforts are a foray into leveraging mobile sensors to rapidly identify products which are inconsistent with their specified dimensions. Instead of the DHS identifying fraud from user information, users can identify the fraud themselves.

Google Tango (Android):

- Tango is a Google Augmented Reality platform
- Developing an app that can scan surroundings, construct meshes, and measure distances based on user taps

iOS ARKit (AR beta software):

- Currently developing test apps to experiment with utilizing hit testing and other techniques to detect planes and place objects certain distances away
- Long-term goal: use plane detection to model counterfeit laptops and distance capability to measure dimensions

iOS Core ML (integration of ML models into iOS):

- Currently developing test apps that can identify the identity of an item from its picture
- Long-term goal: detect counterfeit items from photos