CIS551 HW3: Drone Research, Engineering And Defense (DREAD)

Overview: The overall goal of the assignment is to understand teleoperated drones to the point where a privacy-preserving defense action can be taken. We are using the Parrot AR.Drone 2.0 drones as our platform. Groups have been formed already, and it is presumed that each group has a device suitable for controlling the AR.Drone and a laptop with WiFi. The scenario, as illustrated below, is that Dr. Evil is using the AR.Drone camera(s) as a surveillance tool in preparation for his usual list of nefarious deeds. He connects to a stock AR.Drone using WiFi and flies it over his surveillance targets. You, Agent 00551, are charged with defending the free world against Dr. Evil by any means necessary. You have been given a Defense Laptop by Q, and it is equipped with many tools for network analysis, as well as a build environment that lets you improvise in the field. Good luck, 00551!

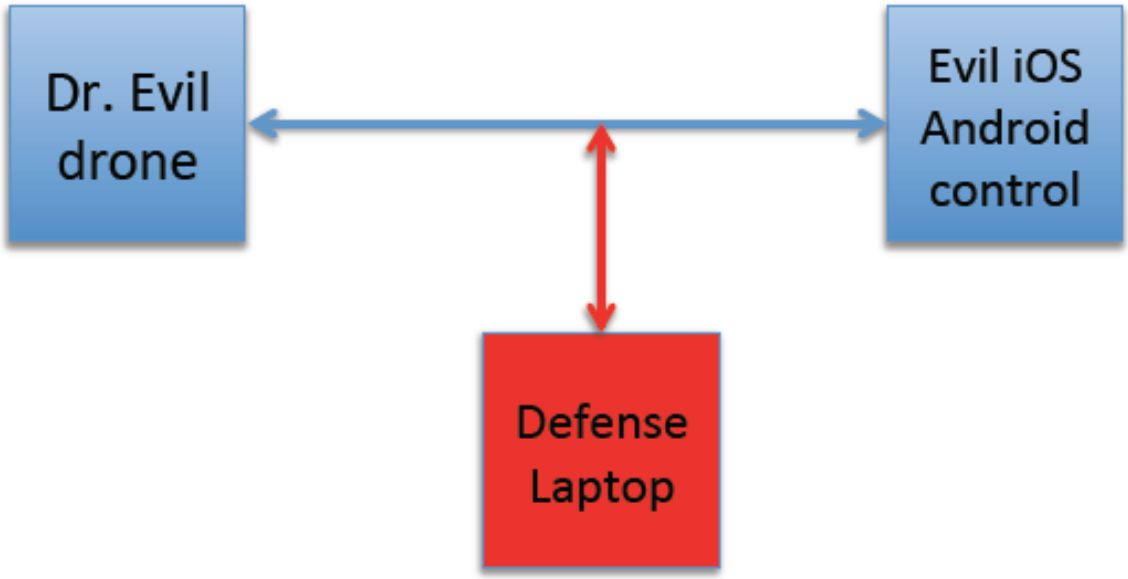

Figure 1: The Scenario

Part 1, 25%: (Due 4/9/14, before class). "Watching the Watchers". Dr. Evil cares more about timeliness than quality and therefore wants to see the video or photos captured by his drone immediately on his control device. He configures the Parrot client application such that video is sent to his client device. Your mission: surreptitiously capture his video stream and partially or wholly reproduce what Dr. Evil is seeing on his control device. Turn in your code (any language you choose; give credit if you use code you find on the web), a makefile, a packet capture (pcap) file as a record of your capture from the Defense Laptop, a video stream or photograph in a form the TAs can view (JPEG or some flavor of MPEG) that shows you made progress on discovering Dr. Evil's intentions, and a plaintext README file that tells us how everything works, including how to view the imagery. All of this material should be composed into a tar file, gzipped and turned in.

Part 2, 25%: (Due 4/16/14, before class). "Hatching a Scheme". Dr. Evil is still not aware of you, as Agent 00551 is a *Secret* Agent. Conflicts with Dr. Evil have not always turned out well (for evidence, see the secret obituaries of Agents 001-00550…), so you are VERY cautious and see the need to develop a plan for surprising Dr. Evil and snatching away control of his drone. The primary deliverable is a plan for obtaining control of the "Dr. Evil drone" in PDF format (we do not care about the particulars of the text formatter, but advise the use of one capable of embedding screenshots, as you will need to do this). The beginning of the document (the majority of the text in most cases) should read like a diary, describing tools that you used to discover things about the AR.Drone, and the results of your discoveries. If you needed to write new code, describe it and include it in the bundle you turn in, along with any logs, captures, images, etc. Please cite any blog entries, wikis or other sources you used to help you discovery process. The document should conclude with a plan of attack, including IP port #s, what you know about them, any tools you will use or software you plan to write for the Dr. Evil drone takedown (see below), and contingency plans if things don't work as expected.

Part 3, 50%: (Due 4/30/14, 5PM). "Judge DREAD". Dr. Evil will be teleoperating his drone over a line. He will attempt to stay on one side of the line (imagine, if it helps, a border or a river). Your job is to get the drone on the other side of the line. The demonstration of your drone defense's success will be an operator (probably TA) attempting to keep the drone traveling slowly in a straight line on one side of the line. He/she will be using the Parrot client software. If the drone moves across the line under your partial or complete control, in spite of the operator's efforts, you have succeeded and saved the free world. What should be turned in is the software you used to wrest control from Dr. Evil, a document in PDF format (as in Part 2) that: (1) discusses the effectiveness of your Part 2 plan; (2) describes how experience modified the plan; (3) what you finally did (including a discussion of your software design/tool use); and (4) a discussion of what Dr. Evil might do to better secure his drones.

Demos will be on April 28th and April 30th during the class period; even-numbered groups on the 28th, odd numbered groups on the 30th; each group will have a strictly monitored 15 minute window. We will use the front of the room as our test run from the Towne 311 windows to the projector side in a straight line (I'll get a tape or something of that nature for objective judging). Each group should plan on three (3) test runs as a demonstration that the control is reproducible.

Advice: remember "Murphy's Law".