# ITP 125
# Final Project Options

*Due: Last Week of Classes (April 29th)*

## Overview

Students will demonstrate their knowledge of topics covered throughout the semester. Students will have a choice between a scripting project, a research whitepaper, and a critical thinking research project. Each project is designed to require 20-30 hours of work.

## Option 1: Password Cracking

For this option, students will write a brute-force password cracking script in Python. A brute force password cracker works by iterating through every combination of characters sequentially until it finds a password match. Please see http://en.wikipedia.org/wiki/Brute-force_attack for further explanation. Other programming languages may be approved at the discretion of the Faculty.

Students will draft a script to crack MD5 hashed passwords, the same hashing algorithm used by most Linux distributions. Students will then analyze the cracking of various passwords of predetermined length, documenting how long the script took to crack it.

### Part I - The Script

Write a script that will crack a series of MD5 hashed passwords. The passwords must be read in from a text file named "hashes.txt", with one password on every line. The script should then start generating passwords, starting with single character, and then two characters, etc. For every generated password, generate the MD5 of the password, and check it against the text file. If there is a match, then output the password to the screen, followed by a tab, and how long it took to crack, in seconds.

### Part II – Testing

Create the file "hashes.txt" with the hashes of the following "passwords." Document how long it took for your script to crack each one. You can use http://www.md5hasher.net/ to generate a hash for every password. The list of passwords is below:

Z
AD
God
1234
AbCdE
Trojan
F1ghtOn
Earlgrey

## Part III - Analysis

You should now have a listing of the passwords and how long it took to crack them. Is there a relationship to the length of the password and the time to crack? Is there a way you could make the password cracking go faster?

## Extras

It is possible to earn extra credit on this project by making the script faster or more compact. The point values given are maximums; earning the maximum requires good code quality and appropriate performance for the option chosen.

- Write in 2-5 lines of Python: 5 points
- Utilize multiple processor cores: 5 points
- Utilize the GPU (see note): 5 points

Note on the GPU option: Many laptop GPUs have limited computing power, and code targeting your vendor and model might not run elsewhere. Avoid compatibility issues by using widely available APIs such as OpenCL and CUDA. If you need a stronger/more capable GPU to test on, consider using a GPU instance from a cloud vendor. AWS offers a $100 credit for USC students through AWS Educate.

## Grading

Submit through blackboard a zip file containing the following:

- The script, including any special instructions, if any, for running the script (required libraries, etc.)
- The list of hashed passwords for part 2, and the results (password, time to crack)
- The analysis

## Part I - 20 Points

Working Code - 15 Points
Comments - 5 Points

## Part II - 15 Points

Each cracked password and the time to crack

## Part III - 15 Points

Analysis of password length vs. time – 10 points
How to make cracking go faster - 5 Points

## Option II: White Paper

For this option, students will write a white paper on a particular security topic or tool. Suggested topics include:

- Security policy architecture of a particular environment
- Configuration and deployment of a particular hardware or software firewall
- Configuration and deployment of a particular hardware or software intrusion detection/prevention system
- Proper security configuration of Linux systems
- Proper organization of domains within an enterprise environment
- Proper server configuration in a virtual environment
- International politics and cybercrime
- Any other security topic or tool

It is expected that the white paper will be between 10 – 15 pages (double-spaced, including any charts, graphics, figures, etc.). It will be graded on the factual accuracy, writing style, grammar, and usefulness to someone learning about cyber security.

If you choose to do a white paper, you must submit a topic to me by no later than 3 weeks before the deadline. If you do not send me a topic by that date, you must do one of the two other options. I will respond with suggestions or alterations to your topic. All topics require my approval before proceeding.

Total: 50 points

## Extras

It is possible to earn extra credit on this project by creating an additional set of PowerPoint slides to summarize your proposal. It must be aimed at an executive level, including real products and costings as well as estimated implementation time. You do not need to present it, just submit to blackboard.

Your work must be fully referenced using APAv6 /v7: 10 **points**

Your report to begin with an 'Executive Summary' of around half a page, aimed at senior management level audience: 5 **points**

## Option III: Secure Infrastructure Design

For this option, students will write a paper in the form of a proposal. They will design a secure network strategy based on a set of requirements standard for a small business office. If you chose this, do not leave it to the last minute, this should be a professional project proposal that is well researched and technically accurate.

**Requirements**

- A DMZ and a LAN with the proper devices in the proper locations
- Web server
- E-mail server
- File server
- Accounting server (financial – QuickBooks)
- Database server (Customer data [CRM])
- 15 End-user workstations
- A high-speed copy, print, scan machine (think large Xerox unit)
- Secure Wireless network
- Guest Wireless network (that is isolated from the internal network… can't trust those Guests!)
- A VPN to allow remote users to securely connect
- Any other items required to make your network functional & secure

You will need to research and design a secure network topology that encompasses the above items. Not everything required for a secure network is on the list above. Select specific networking devices with which to build a secure network infrastructure (firewall, router, IDS/IPS, etc.). Specify server hardware, operating systems, and applications. Your paper should describe the important features of the products you have selected as well as describing the software and steps you would take to secure the servers and workstations on the network. You should also submit a comprehensive network diagram with your paper in which you have placed all the devices on the network and labeled them. The diagram should be done in Microsoft Visio similar to the Secure Network Architecture lab (Lab 10) and turned in as a PDF.

Consider this a proposal to the small business about how you will build their new office space from the ground up.

Note: You do not have a budget, so feel free to design an ideal network with some really cool security appliances/technology! You must specify vendor names and identify specific models of all hardware/software used.

Total: 50 points

## Extras

It is possible to earn extra credit on this project by creating an additional set of PowerPoint slides to summarize your proposal. It must be aimed at an executive level, include real products and costings as well as estimated implementation time. You do not need to present it, just submit to blackboard.

Your work must be fully referenced using APAv6 /v7: 10 **points**

Your report to begin with an 'Executive Summary' of around half a page, aimed at senior management level audience: 5 **points**