

## Proposal-Team Robocop

Ricky Barillas, Elizabeth Brack, Adams Clark, Edward Mauger, Thomas Mauger, Jaylynn Walker, and Brianna Washington

Team Robocop's problem space and statement has gone through several iterations and changed drastically over the time the team has spent together. Initially, the intent was to focus on police-community interactions. After the recent events at Ferguson and other occurrences that seemed to highlight the strain between people and law enforcement, we wanted to find some way to ease that tension. Law-enforcement is in place to protect people, after all, and as a result the community as a whole ought to feel more comfortable. However, through our interviews with multiple experts and after doing extensive research, we as a group came to realize that the infrastructure and complexities of city and state law enforcement make it incredibly difficult for a small student group coming out of a research institute to make any significant difference.

Because of how difficult large law enforcement entities are to infiltrate and change, we chose to downsize our project to a much more manageable size: that of a university or college. By choosing to work in a smaller environment, our project became much more manageable and easy to work with. The Georgia Tech Police Department is actually very willing to work with students to improve and actually enjoys that close interaction. However, our group once again encountered the issue of not being able to affect something. GTPD does an incredible job of managing crime on campus, and as a result there is not much room for a small student group to change things. After many changes and considerations, the group decided to move away completely from the idea of improving the interactions between police and people and to reducing crime altogether.

In order to work on reducing crime, rather than focus on all types of crime and the many ways we could affect that, we decided to work on the most common type of crime committed on our own campus: theft and larceny, particularly laptop theft. This issue affects students and administrators alike and is commonly one of the more difficult crimes to solve on college campuses in big cities, where the stolen piece of equipment can be sold or traded with relative speed and ease. As of now, there are several solutions already available to the public that can be utilized to help solve this problem; most pieces of Mac technology are able to be found using a certain built-in program or software, and there are similar solutions available for Windows and other operating systems. However, the problem of information security itself is something that Team Robocop feels would be accessible. Many times, the issues that people worry most about with laptop theft have to do with their private and personal information being stolen. Seeing as the issue of laptop theft has already been thoroughly addressed in the past, Team Robocop has chosen to focus more on the issue of information theft and security in hopes that an affordable and effective system to prevent information loss and theft can be found.

The issue of information security and protection against theft is far-reaching and tends to impact many facets of life. Whenever technology is lost or stolen it can mean monumental costs for the person dealing with the issue. Data like credit card numbers and social security information is one of the first vital pieces of information that comes to mind, as these things can

allow other people access to bank accounts and credit cards, potentially ruining someone's financial future if the perpetrator is not caught in time. Sometimes the biggest threat that a person can experience is not to their personal financial data but rather to their academic information and the work that they had done in the past. For instance, if a person experiences hard drive failure, they may lose hours worth of hard work done on an important paper and become unable to turn in the paper. As a result, their grades may suffer and they could even fail a class. Students are the main focus of Team Robocop because of the issues they may have to deal with if they lose their data.

The issue of information security and data loss is incredibly important for several reasons. The first reason is that people that do lots of work on computers or their phones or other smart devices can often experience hard drive failure and end up losing hours of work. Additionally, people that have poor security for their data can experience losses in the financial sector, as their credit card information or other data is accessed by outside parties and exploited to make purchases. Finally, people that experience data loss or some other issue from inability to access their data can lose important records that they may need in the future for some personal reason, including birth documents that were scanned into computer files or financial records that may be required for a loan in the future ("10 Reasons Why Your Organization...", 2015)

The cost to society in the situation of data loss is large and difficult to afford. Through data loss, there are not only financial losses, but also time and energy losses as tons of work is lost to some random hard drive failure or theft. If a person had been doing extensive work or research on a particular project and had failed to back up all of their data constantly, they would most definitely end up with lost data and, as a result, lost time (Kovacs, E., 2004). The other side of lost data has to do with people losing financial information to hacking or being stolen, or even hard drive failure. A family attempting to get a loan for a new house would have trouble showing their financial history without some of the data that is often saved on computers (Smith D., 2003)

The possible causes for the problem are everywhere. Many times, data loss occurs as part of what is known as natural causes. These natural causes generally include things like hard drive failure or even accidental data deletions. However, sometimes problems with data arise as part of thefts or hacks or by a computer contracting a virus of some kind ("Statistics about Leading Causes of Data Loss"). Whenever these types of data losses occur, it is important to understand the causes and try to develop a solution for these causes. Many times, the issue with people losing their data through hard drive failure or some other natural cause, and sometimes unnatural causes, has to do with the fact that they did not backup their data and make sure it was saved in more than one place ("7 Greatest Causes of Data Loss")..

Were this problem to be addressed correctly, society would see many great benefits. The reduction in data loss would lead to greater productivity on the whole and to many less stress filled nights, especially in the case of college students. When college students have to write essays and end up losing the work they have done over time they can end up doing poorly on an assignment in a class and get a poor grade in that class, which truly can induce stress in students

and possibly damage their future (Arbel 2013). Additionally when businesses, companies, and organizations experience data loss they can have financial issues large enough to destroy the organization (Ansanelli, J.).

Many entities might be able to act as stakeholders in relation to our problem space, including victims of data loss or insecurity, particularly in this situation, students, families that experience a loss of data with including financial records, companies that have many clients whose financial data is in their system, and manufacturers of products that are meant to impact data security. For the perspective of a student on a college campus that could potentially experience a data loss, this problem would be very important to them. Many students would probably feel guilty and scared were they to lose hours of work for an assignment due the next day, as they would probably end up with a bad grade in the class. To lose an investment as important as time would be very devastating as colleges are notorious for moving quickly through material and putting large amounts of work on their students.

Families that experience data insecurity or issues with data loss are one of the largest stakeholders in this problem space, as they can often run into issues involving the financial system. Having the ability to back up your own data is important and each person should learn how, especially families that have so much at risk. If for some reason a family is hacked by a foreign entity and lose private information to an unknown source they could have to deal with big problems down the road. They must always keep vigilant and should invest in ways that will keep their data safe.

Another Perspective that is important to look at in this problem space is that of a company or organization that has custody of some private information of customers. The more customers that a company has, the more liability they have with the people that have chosen to invest in them. Were some important data to be leaked or lost to the public or private sectors, companies could encounter many issues, particularly lawsuits that could even shut down the company or organization in the long run.

Finally, the last perspective that is important to examine as a stakeholder in this problem space is manufacturers of products that help in situations of data loss. These groups may end up becoming interested in any product or solution developed by Team Robocop. These entities try their hardest to help people that need backup solutions or have experienced data loss, be it from hard drive failure or some other cause. For this reason they could totally benefit from some of the work done by Team Robocop and perhaps expand their work to impact many more people that have suffered through data loss.

Nearly 1 of 2 people (46%) lose computer data each year (Budman, 2009). Google reported in 2007 that 90% of all new information is being stored on magnetic media such as hard disk drives, yet 50% of hard drives die within five years (Pinheiro, 2007), and a study done at North Carolina's Information Technology Service showcased that a hard drive dies in the United States every 15 seconds (SMB Storage, 2010). In regards to theft and data loss, Ponemon Institute reported 637,000 laptops were stolen at large US airports in 2008, and 65% of those laptops were never reclaimed. 53% percent of the laptops lost at airports were claimed to have

contained confidential company information, yet 63% of all the individuals whose laptops were taken reported to have never backed up their data (Shah, 2008). In a global IT study, it was estimated enterprises have lost over \$1.7 trillion dollars in data in 2014, while companies lost a 400% increase in data in contrast to the past two years (Luboja, 2014). On a consumer standpoint, in a study done by Verbatim showed one out of five consumers reported to have never backed up their personal computers (Barker, 2015).

Given the wide scale this problem has the potentiality to affect, many corporations, information technology specialists, and computer scientists have worked to tackle this issue. Whether it be hard drive failure, data corruption, or computer theft or loss, data loss has the potentiality to affect devices on multiple fronts, and many companies see the necessity and the opportunity to capitalize on such an issue. Many solutions exist for this issue. A user can manually back up files to a external hard drive device (Ngo, 2015) although this takes quite some time, or install backup programs that help users to more efficiently back up data to the external storage device on either a set time or when desired (Iosafe, 2009) (Seagate, 2015) (Mac Basics, 2015), although the storage device has to be brought along with your computer to access files and are susceptible to the same natural disasters as a computer. Individuals can also use file recovery options on their computers, such as File History (Set up a Drive, 2015), although they are dependent on the computer working properly and being with you at the time of necessity. Users can also implement cloud storage backup services for backup given an internet connection, although they often require high monthly costs (When it Comes, 2015) (External Hard Drive Backup, 2015) (Google Developers, 2015).

If solutions are out there, then why is this a prevailing issue? As seen in the statistics above, the problem still persists for companies and consumers alike and is growing immensely, despite ever-growing dependence on technology. What is the problem?

The information listed above (high monthly costs, dependency on hardware, susceptibility to natural disasters, etc.) are just some of the problems at hand. In a study done by Verbatim, 25% of people admit to not wanting to put the effort into backing up their data. 18% of people polled stated they were unaware with how to backup data, and 6% stated it takes too much time to research a backup solution, while 12% stated it takes too much time to use a backup solution (Barker, 2015).

In consideration of those reasons, our group would like to make an efficient, low-cost, easy-to-use, and quick solution to address this problem-space. We would like to focus on increasing the effectiveness of data backup to decrease data loss, with the hope of implementing a solution that will effectively reduce the monetary and time costs present in current solutions.

The main component of Team Robocop's solution is data backup. Because our solution focuses on the protection of information security, data backup is a very important aspect of solving our problem. With the ability to backup data, computer users are vulnerable to losing their personal information from a variety of causes such as hardware failure. In order to achieve this objective, Team Robocop must utilize the resources of the Georgia Tech library as well as our mentor to find methods of data backup that already exist. These results will allow the team to create a method of data backup that is less problematic than those that are currently used. We will also need to figure out the percentage of computer users that do not backup data and the reasoning for them not. Based on a survey of the Georgia Tech student body, we have concluded

that the main reasons for students not backing up their data is because it is either too time consuming or users do not know how to complete the process. As of now, we have decided to create a data backup system that is more user friendly than our competitors. The user would be able to back up data from their computer effortlessly and automatically. If this objective is fulfilled, the team will be able to create a prototype for a software that will automatically backup data. A problem that could occur while finding a method for easy-to-use data backup is thinking of an original idea. Because there are so many programs and methods for data backup already in existence, it may be hard to find a completely original idea.

The second objective is very much related to the first. Because the solution is primarily for Georgia Tech students, the OneDrive will be utilized. Every Georgia Tech student has access to a terabyte of memory on a drive that Team Robocop will use to back up students' data. We have narrowed our solution to only Georgia Tech students to limit the costs for our product. Many backup softwares require payment for a certain amount of memory space. Since every Georgia Tech student has access to a terabyte of memory, this will significantly decrease the cost of our product. Our team will learn how to use the OneDrive storage space by working with Georgia Tech's Office of Information Technology(OIT). Most importantly, each member of the team will use the OneDrive to be able to apply it to our solution. By working with OIT, we will consult with them to learn how to use the OneDrive and how to access it. We will also conduct a survey of the student body to find out how many people are aware that they have access to a terabyte of storage. All of these actions will allow us to effectively utilize the OneDrive and apply it to our solution. Success for this objective would be using the result of the first objective to allow every student to backup data onto their OneDrive. A possible problem that could occur while attempting to complete this objective is related with working with OIT. Because OIT is often busy it may be difficult to set up time to meet with them. This would be a tremendous problem in achieving a solution for the problem because Team Robocop does not have the necessary expertise to carry out the solution without assistance.

The third objective that Team Robocop will achieve is to find a method for data encryption. Because the protection of computer data is the main component of our problem, this objective is just as important as the first. If computer users are able to have their computer data automatically backed up and simultaneously encrypted, it will be the most ideal solution. Having data encryption as part of our solution will help the originality of our product as well as its functionality. This objective will be fulfilled using the same steps as the data back up objective. The team must do much research to learn the methods of data encryption and all that it entails. Because this will not be a simple task, it is crucial that our team fully uses its resources, especially the mentor who has knowledge in this topic. This objective will be completed and successful if the prototype of our product is able to adequately encrypt all types of data that the user may be uploading. This data encryption will coincide with the data backup so that as the

users data is backing up it is also encrypting. Our mentor is knowledgeable in the area of data encryption so we should be able to understand what is needed for this objective.

The next objective would be to work with OIT again to learn how to have data encryption work on Georgia Tech's network. This objective is important because if the campus network is programmed to deny encrypted data, then our product will not work. The team must work alongside OIT in order to ensure that our product will work. Based on the knowledge that we gain from the previous objective, we will create a data encryption software. This software will be presented to OIT so that we can work together to execute this software into our final solution. This objective will be considered complete if our product will work for every Georgia Tech student. If the product is applicable for every student, then success will be the widespread use of the solution. a widely used solution will mean that our product is found useful and necessary for all students. An anticipated problem will be the same problem as the third objective. It may be difficult to meet with OIT and work to synchronize the data backup with the data encryption. A problem may also be that the implementation of our product may negate some of the programming that is in place for the schools network.

The final objective is for Team Robocop to consult with a computer science expert to review our product. At this point, Team Robocop will have a working prototype that will automatically backup and encrypt the data from each Georgia Tech student's computer onto the student's OneDrive account. In this objective the goal is to have a computer science expert review the prototype for any errors we may have in coding if our solution is a software. This objective is extremely important for us to be able to implement our solution product and have a successful, working product. The first task in this objective is to find someone who is able to revise our product. It would be preferable if this person was related to Georgia Tech in someway, however, we will also search outside of the university. We will need this person to have some background in data encryption so that we can have the best product possible. Success for this objective would be if the solution is improved by the revisions of the computer science expert. These revisions will lessen the likelihood of product failure. The biggest problem that may occur while carrying out this objective is finding a suitable expert that is able to hone his or her skills for the benefit of our product.

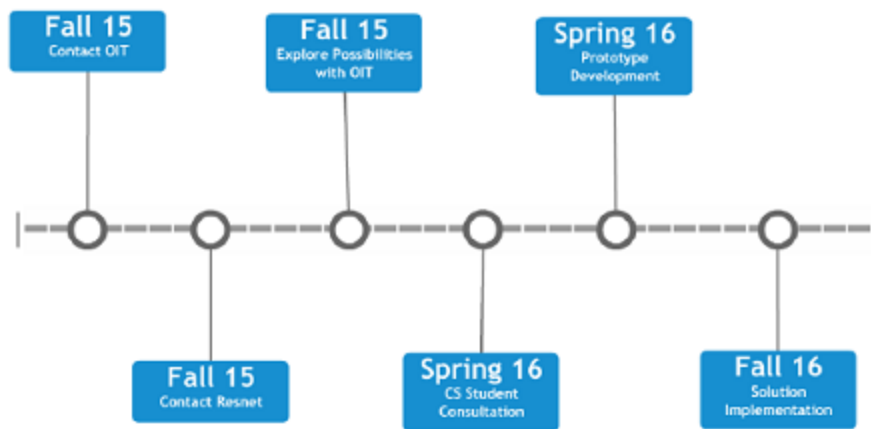
For our research team, we will need students with background in computer science and computer engineering.. Our current idea focuses on a software solution so we want at least one computer science major along with either other computer science majors or individuals who are proficient with coding. It would be ideal if one of these computer scientists was proficient in graphic design as it would be best for any software to look like a polished program that fits in with Georgia

Tech's online design language versus a free source program. The computer scientists would be in charge of creating the program and communicating with OIT to make sure the program will work. We would need a computer engineer that understands the stress put on the GT network if a large amount of data is being backed up through the network.

We have found a mentor/consultant. He is Thomas G. Throwe, a physicist and researcher in the field of computer security and data storage. He currently works as the head of computer support and security in the physics department at Brookhaven National Laboratory in Upton, New York. He co-authored a paper on online data storage in 2003, in the days of its infancy.

As for people we would be interested in working with, Cedric Stallworth, the Assistant Dean of the College of Computing is one name. Four of the members on our team know Cedric Stallworth through OMED and we believe he would be able to guide our group through choosing the best programming language to use and other issues related specifically to the programming itself. Another person who would be great to work with is Richard Allen, a Senior Research Engineer and Lead Architect at GTRI. His expertise is defense technology. He spent eleven years working with the Department of Defense and teaches courses at Tech on computer security, one specifically on mobile device security. He would have a good understanding of the importance of securing sensitive research data as well as backing it up so that it is not lost.

## Project Timeline



- **Fall 15**  
The first thing we need to do is initiate contact with OIT. We need someone from that office that can support us and sponsor us throughout the duration of our project.
- **Fall 15**  
We need to communicate with Resnet and find a liaison in that department for future use in our project.
- **Fall 15**  
Work with OIT and layout a plan to establish a working interface with the One Drive accounts
- **Spring 16**  
Colloberate with a student or students in the College of Computing to be a consultant with us throughout the project.
- **Spring 16**  
Start working on creating an algorithm and protocol for our solution.
- **Fall 16**  
This stage is ambiguous in timeliness since it is dependent on the progress of the prototype's progress.



## Budget

### **Materials and Supplies:**

- Laptop for prototyping and testing
  - \$129 for an Asus Chromebook laptop that will be used solely for the prototyping and implementation of test softwares.

### **Equipment:**

- There will be no need for equipment exceeding the cost of over \$1000. Our solution will most likely be a low budget product that involves minimal to no construction costs

### **Services:**

- Since the specifics of the solution have not been define we cannot, at this time, specify the recipients of our services budget. This being said we predict to generally allocate the following funds
- Software development
  - \$500-\$1000 depending on the nature and market of our desired software
  - \$?- Crowdcurity Bug Bounty Program- Crowdsourced service for finding security bugs, flat fee for entire program or priced per bug
- Hardware development
  - \$0-\$?- May be costs if there has to be any upgrades to the Georgia Tech network

### **Travel:**

- There will be no need for travel costs according to the current knowledge of the team. Since our problem space focuses on campuses, specifically Georgia Tech's campus, there is no need to travel off site

When the project is over, we hope to have our data backup system up working and integrated at Georgia Tech. As with any software, it may have further kinks and bugs to work out, and will need constant security updates. After year 2, we see the software being near completion. We want it to reliably upload and encrypt students' data, so I see our project going towards testing and limited distribution in order to find and fix bugs before widespread distribution. We will need to work with OIT and the College of Computing for the duration of the project. Collaboration with OIT will be vital to the project as they will control implementation of the software and we will need expertise from the College of Computing to help build the software.

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