

# **CS: 600/650.424 – Network Security Project – Assignment**

## **1. Project Goals**

The goal of the project in the course is to enhance your researching skills in the network security area so that you become familiar with the current state of the research and how you can start examining a security topic of interest to you. The path that is recommended is that you pick one or more papers in areas that are suggested in this assignment and after reading these papers come up with ideas that can lead to a possible extension of one of the papers, and once these ideas are implemented, and results are analyzed you are closer to having a publication quality paper of your own. You may have to read several papers before becoming comfortable with one that you will ultimately pursue. The reading of more papers, of course, is one of the key objectives of this course. These instructions are applicable to the five project types that were suggested in the course logistics lecture. The five project types are:

### **1.1 A Survey Paper**

A survey paper on a topic that is related to any aspect of secure communication is allowed. For example, topics that deal with:

1. Internet Network Security
2. Wireless Network Security (Cellular, Ad hoc, and Sensor Networks)
3. Key Exchange Protocols
4. Trust, Authentication, Privacy, Data Integrity
5. Security architectures – HW and SW, and the Operating System
6. Secure Algorithms, Protocols and Systems

The survey needs to be comprehensive that can include research papers and industry standards such as RFCs. Your focus should be on papers that have appeared in the security/trust/privacy area during the last two years. For a survey project, you are advised not to take up topics that have been surveyed already in the recent past and are published. If there is no survey on a topic in the last two years and there is an interest in that area as evidenced by number of papers published, you are allowed to work on the survey. You are advised to choose a most recent topic and then read at least 8-10 closely related papers and summarize them in a report. Please remember that excellent surveys are publishable. Additional information will be provided as the semester progresses.

## **1.2 Develop a tool that can break the security of the system (Demo required)**

Projects that hack a website and are able to access critical information are within the scope of the projects for this course. Please talk to the instructor if you are interested in hacking projects.

## **1.3 Develop a tool that can protect a system from hacking (Demo required)**

Projects that identify the well known security vulnerabilities of a website and propose solutions to those vulnerabilities are within the scope of this course. Please talk to the instructor if you are interested in projects that provide security cover to applications from hackers.

## **1.4 Simulation/Analytical Modeling**

Develop a model of a security system or protocol e.g. misbehavior modeling, cooperation and non-cooperation modeling, secure routing, secure medium access control etc. in ad hoc and sensor nets. This type of project will require the use of simulation and modeling tools such as NS-2, or NS-3, OPNET, Qualnet, or any other. You may also use game theory to model the security features. Game theoretic models are popular these days.

Please pick papers that involve simulation of a secure networking protocol at any layer and belonging to networks of any types such as wired or wireless cellular, ad hoc, sensor for some performance objective using tools like NS-2, OPNET, Qualnet, or any other, or algorithmic studies of some sort. Identify areas that you can improve upon and pursue these improvements as part of the project. Contributions that will result out of this extension are the key expectations of the project assignment. If you can solve the problems posed in the papers that you read in a totally different way using different algorithms, formulation etc. than the original authors, that will be great and is encouraged. Please remember that most of the papers that you may need are likely to be available on-line from the JHU library.

## **1.5 Develop and implement security algorithms that are more efficient (faster, less storage, reliable) and provide more coverage**

These projects are programming projects. Projects belonging to this class can be of two broad classes. The first class of projects will deal with proposing something new as a protocol, a technique, or an algorithm that has some security features. The second class of projects will focus on proposing ideas to improve existing security mechanisms, approaches or systems.

## 2. Group Size

Except for the hacking projects in which a group of two students can work together, all other projects need to be taken individually.

## 3. Suggested Topics

The following are the suggested topics:

1. All topics related to Trust, Biometrics
2. All topics related to secure architectures: Hardware, software, OS and protocols
3. Security projects that you are currently involved with in your organization
4. Security and the energy conservation
5. Intrusion Detection
6. Secure Broadcasting
7. Secure network protocols such IPSec, TLS/SSL, and others
8. Multi-channel MAC for ad hoc networks
9. Transport protocols e.g. TCP for Ad hoc networks
10. Secure Service Discovery
11. Security issues in sensor networks
12. Security issues in ad hoc networks
13. Security issues in Dynamic Spectrum Access networks
14. Security in presence of mobility and smart phones, cognitive radios
15. Secure Internet
16. Security in cloud

## 4. Resources

You may begin researching a topic by reading papers that have appeared in IEEE publications such as IEEE Security and Privacy, IEEE Internet, IEEE Communications, IEEE Communications Survey and Tutorials, IEEE Networks, IEEE Wireless Communications, IEEE Computer, and ACM publications such as Communications of ACM in the security area. This will not only help you find a topic that interests you but will also provide you some hints as to what is still left uncovered. The references of the survey or tutorial papers will help you in getting the appropriate background necessary to start the project. Besides publications mentioned above you can also start by looking at conference proceedings that are most recent from some of the well known conferences that are given below. Your focus should be on years 2009-2010. Papers published before 2008 are not acceptable, unless a strong case is made in your proposal. In order to understand the main paper you may have to read older papers and references. Papers from the following conference proceedings and/or journals are appropriate:

1. IEEE Infocom,
2. ACM Mobicom

3. ACM Mobihoc
4. IEEE International Conference on Communication (ICC)
5. IEEE Global Conference on Communication (Globecom)
6. IEEE Wireless Networking and Communications Conference (WCNC)
7. ACM Monet
8. IEEE Journal on Selected Areas in Communication
9. IEEE/ACM Transaction on Networking
10. IEEE Transactions on Mobile Computing
11. IEEE Transactions on Communications
12. IEEE International Conference on Computer Communications & Networking (ICCCN)
13. ACM SIGCOMM - Computer Communications Review (CCR)
14. ACM Mobile Computing and Communications Review

White papers from commercial websites or trade magazines are not acceptable.

## 5. Proposal Requirements:

You are required to submit a typed project proposal not exceeding three pages by the due date or earlier to the instructor. Your proposal needs to provide the information requested below, and you can submit your proposal as an email attachment.

- A. Background of the Problem
- B. Citation of the Paper(s)
- C. Description of the project
- D. Description of deliverables
- E. Description of approach to produce deliverables
- F. What will be novel/new in your project as compared to the chosen paper(s)? Describe the differences clearly. (This is your contribution)
- G. Required resources e.g. OPNET, NS-2, Qualnet, any other software, algorithm, or tools that you will be used

Instructor will review the proposal and provide feedback and/or approval by the due date. You can only begin your project after it is approved. Unapproved projects are not acceptable.

## 6. Information to include in the Project Report

I am expecting your report to include the following items:

- A. Your report for the project will look like a document that has content ready for submission to a well known conference. Therefore the contents of the report will be those that are typically included in a conference paper. Since you are reading many papers, you may know what to include in your report.

- B. A template indicating contents and formatting guidelines for the report will be provided via the class website.
- C. Your report created using MS Word needs to be submitted by the due date that will be announced.

## **7. Evaluation Criteria:**

The project will be evaluated based on the overall report, its contents, conformity to the guidelines and your own contributions. Detailed evaluation criteria will be posted on the class website.

## **8. Detailed submission requirements**

These will be posted on the class web site.

## **9. Schedule**

Proposal Due: 3/2/12 or earlier

Approve Proposal/Provide Feedback: 3/9/12

Final Report Due: 4/13/12