MSSI Capstone Project Agreement
Johns Hopkins University

Student Name(s)	_____Jay Chow_____(Only one form needed from each team)
	_____Kevin Hamilton_____(No more than **3** students in one team)
	_____James Ballard_____
Faculty Mentor	_____Lanier Watkins_____
Other Personnel	_____Kevin Klous(Consultant)__(Please specify the role of each person)
Project Start Date	_09 /_12_/_2019_ (At least 2 months before completion date)
Intended Completion Date	_12_/_15_/_2019_ (Annual deadlines are approx. e.g., 8/20,12/15, 5/10)

The student(s) must submit this signed form and the final version (both hard and electronic copies) of the MSSI capstone project report to the Information Security Institute by the completion date. In addition, any code or data produced should be carefully documented and turned in to the faculty mentor/academic advisor by the completion date.

A project report is typically about 25 pages single-spaced, not including the cover page, table of contents, references, figures, tables, etc. Where appropriate, it may take the form of a single-author or multiple-author paper about the work (written for submission to a conference or journal), augmented by the student with further details as needed.

Research is open-ended, so the direction may change, within reason. To fulfill the MSSI degree requirement, the amount of work contributed by the student should be equivalent to the total workload of about two 400 or higher level courses.

Proposed Title Bio-inspired, host-based firewalls based on cell-membrane mechanisms in a distributed setting

Project Description

Our aim with this project is apply biological cell-membrane mechanisms to a stateful host-based firewall in a distributed setting. In doing so we hope to research the viability of a distributed firewall system where each endpoint defends itself from the threats it perceives. This mimics organisms that are made up of many cells. We will compare this approach to the popular enterprise-level perimeter firewall.

Materials to be produced (papers, code, data, experiments, etc.)

1. Research paper to be published
2. Modified source code, based on an open-source host-based firewall technology
3. We will write code that reads in a flow of real IP traffic, then break up the traffic into windows of different sizes. Then we will take the average entropy of the packet payloads and store these values for all the windows for an entire flow. We may consider both inbound and outbound flows. Now, we will look at the deltas between entropy values for each window size. If the deltas are small or constant, this means that the cell membrane is not stressed.
4. After conducting the experiments with the modified source code, the stressed part is if the average entropy for a window is much larger than the previous window. We will come up with a threshold value derived from our experiments. Once this threshold is exceeded, the firewall or cell membrane is being stressed, then methionine will be encoded into the new proteins that make up the cell membranes. We will use decreases in a count-down timer for every time the threshold is exceeded. Once the timer reaches zero, the firewall will stop accepting network traffic from an IP address. This process represents cell defending themselves from viruses, bacteria with armor of protein errors.

Agreement by student (to be signed at the start of the research):

The opportunity to work with other researchers is a privilege. I understand that this project should be my top academic priority, both out of consideration for my supervisor and faculty mentor's time and because others may be depending on my results.

I agree to keep my supervisor apprised of my progress throughout the project, via regular updates or another agreed-upon mechanism.

I will submit a well-written report or thesis and properly documented supporting materials to my supervisor at least **2** weeks before the completion date. I understand that my supervisor may request changes or additions before approving the project, or may decline to approve it, which could affect my ability to graduate.

Student signature(s) _____Jay Chow_____ Date ____09/12/2019____

_____Kevin Hamilton_____ Date ___09/12/2019___

_____James Ballard_____ Date ___09/12/2019___

Approval by faculty mentor (to be signed upon completion of the research):

I certify that the capstone project entitled _____
has been satisfactorily completed by _____
and that it fulfills one of the requirements of the MSSI degree.

Faculty Mentor signature _____ Date _____

Updated January 25, 2014