**Weiheng Bai**

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# **Education**

**Johns Hopkins University,** Baltimore, America

**Master of Science in Information Security(GPA: 3.93)** Aug.2019-

**Beihang University,** Beijing, China **(GPA: 3.3 Rank: 1/7)**

**Bachelor of Mathematics** Sep.2015-Jun.2019

**Skills & Learning**

* **Programming Languages: Python, Javascript, Matlab**
* **Tools: Kali, Linux, WireShark, VScode, MySQL, Django, MetaSploit, VMware, R Studio, Ghidra，Burp suite, XAMPP**

**Security Experiences**

**University of Austin Capture the Flag Competition (Rank top 100 of 1000 teams)**

# **Project Experiences**

**Develop and implement protocol stack similar to OSI model** Aug. -Dec.2019

*Keywords: TCP/IP, TLS protocol, C/S, OSI model, Python, Handshake, DH, AESGCM, X.509, Certification Chain, packet*

* Implemented the mechanism of the **TCP/IP** and **TLS** protocols based on self-build environment similarly to OSI model.
* Implemented a client/server **interactive game** by python and used it as the application layer.
* Implemented **three-way handshake** including **Nonce,** which can ensure **Integrity,** to realize TCP protocol initialization.
* Used **asyncio** to determine the timeout and connection lost in TCP packet transform and used **packet** **slicing** and **hash** function to slice the application layer data into small slicing and encapsulated them into signal packet to realize TCP packet transform to ensure **Availability**.
* To implement TLS layer, I used **Diffie–Hellman algorithm** for key exchange between client and server and used **AESGCM** for data encryption and user authentication to ensure the **confidentiality**. Utilized **X.509** for signature and implemented a **Certification Chain** from professor to team member for security in order to avoid tampering with the contents of a certificate by man-in-the-middle attack.

**Hacking the Parrot Bebop 1 Drone** Jan.- March.2020

*Keywords: penetration test, Netdiscover, nmap, Wireshark, Nessus, DoS, ARP, Python*

* Led other 5 members to do **penetration test** on a drone named Bebop Parrot and find three zero-day vulnerabilities
* Used **NetDiscover** to find the certain host under the given network and used **nmap** to find the opening ports and use **Nessus**.
* Set up cloned controllers to test the maximum number of connections that exist. Got the AR Discovery Process in MDNS by **Wireshark.**
* Implemented a **python** script which sends numerous costumed **JSON** data initializing the connection to launch **flood attack.**
* Launched **DoS ARP attack** based on python against AR Discovery Process and break the connection between drone and its controller.

**Used Metasploit shell reverse TCP with self-build payload to implement shell reverse attack** Mar.2017-Jul.2016

*Keywords: Assembly coding, C, Metasploit, payload, Kali* (project: <https://drive.google.com/file/d/10VYobZUsr8-sDDtX1EVbetVY_wZ3Kllu/view?usp=sharing>)

* Used **assembly coding** to spawn a shell in Linux 64 and converted assembly code into shell code by **NASM** and **Objdump**.
* Implemented a **C** code to test this shellcode based on function pointer and used **GCC** to compile the C file into executable file to get shell.
* Modified the file named shell\_reverse\_tcp.rb file in **Kali Linux** by used self-build shellcode and used **msfvenof** to generate new **payload**.
* Opened **Metasploit** and used **Handler** for listening on the attack machine to get the reverse shell after the target machine which is a ubuntu VM downloaded this payload and executed it.

**Course Security Analytics.**  Aug – Dec. 2019

* Finished the paper named Yelp Fake Review Detection Based on Deep Learning.
* Software Compared the results based on SVM, Bi-LSTM, Bi-LSTM embedded in BERT.
* Led the team of 4 to fulfill tasks and mainly responsible for the part of vectorization and Bi-LSTM and paper writing.

**Intern, University of Illinois at Urbana-Champaign**  Summer,.2017

**Intern, Institute of Software, Chinese Academy of Sciences.**  Aug.- Dec.2017

* Grasped skill to apply Python by learning A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers
* Learned a new method for the prevention of side channel attack and did simulation after reading the conference paper: CacheD: Identifying Cache- Based Timing Channels in Production Software
* Grasped taint analysis by learning the paper All You Ever Wanted to Know About Dynamic Taint Analysis and Forward Symbolic Execution

**The Interpolation Theory and its Application** Nov 2017 – Jun 2018

* Introduced almost all the basic interpolation theories in Banach Space, such as M.Riesz interpolation theory, Marcinkiewicz interpolation theory and so forth.
* Summarized the application of interpolation theories in theoretical and practical.

**Identity Authentication of Satellite Network Based on Blockchain.**  Aug.- Dec.2017

* Led other 4 members to study on blockchain, and held group discussions about three times a week
* Took charge of the study on “Composition of Blockchain” and “Identity Authentication of Blockchain”
* Responsible for the thesis writing

**MCM/ICM, Analysis of Terminal Inspection Flow Based on Queuing Theory and Petri Net** Dec.2017

* Took charge of theoretical analysis, modeling, Matlab realization, and thesis writing
* Model one: proved the number of passengers arriving per unit time subject to
* Model two: introduced the concept of queuing theory and the main parameters of data, put forward the concept of optimization, and built a queuing model.

# **Patent**

Weiheng Bai, A Kind of Computer Wire Clamp’s Structure, Patent Number: 201720362458.0 April 09, 2017

**Award**

* Outstanding Graduate (8/120);
* First-class Scholarship
* China Excellent Student Leader (Academic year of 2017-2018)
* Student Committee President (2016, 2017, 2018)