B. THOMAS GOLISANO COLLEGE OF COMPUTING & INFORMATION SCIENCES

Constructing Malicious Ransomware In Python

Aidan Rubenstein ar2126@rit.edu Andrew Giannone atg5232@rit.edu
Evan Hirsh exh7928@rit.edu ■ ■ ■ Advisor: Dr. Rajendra K. Raj rkr@cs.rit.edu

Computer Science

Introduction

- Popularity of ransomware has increased drastically
- Responsible for some of the largest attacks and loss of capital globally by malware
- This study is motivated to build, test, and observe ransomware so that it can be better understood and mitigated

Ransomware

- Ransomware is a type of malware that renders users' files inaccessible by encrypting them with a key known only to the attacker.
- In most cases, a ransom in the form of cryptocurrency is demanded by the malicious actor, hence the term ransomware [1]
- In 2019, the average payment requested to release □les from ransomware was $84,116. This has been steadily increasing.
- the notable ”WannaCry” ransomware affected businesses and users in over 150 countries and cost an estimated $4 billion in financial losses [6]

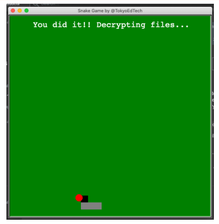
WannaCry Ransomware

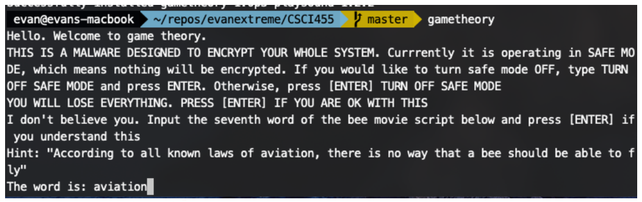
Our Program

- We built a simple ransomware in python using easily available resources, packaged into an executable, and targeting Windows machines.
- We do not want the executable to be used maliciously for actual ransomware purposes
- To solve this, it does not encrypt data by default, and asks consent from the user.
- Inspired by and utilizing voice clips from the YouTube channel Game Theory

System Design

- Detects the home directory on Windows, and encrypts all files
- Decrypts the files only if the user scores 3 points in a game of snake
- Downloaded and executed via malicious VBA Office macro
- Utilizes the python cryptography library to implement AES
- Utilizes a modified open source snake game written in python





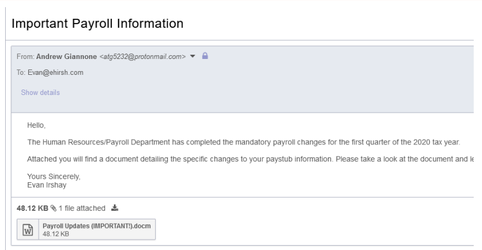
Implementation

Phishing Email → Word Doc → Ransomware EXE → Filesystem Encryption

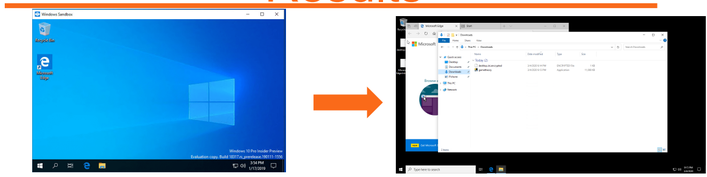
Microsoft Visual Basic for Applications

The Phish

- We created a phishing email which includes a word doc with a macro that downloads our ransomware exe
- Looks completely innocuous, can be sent from any compromised account
- Not flagged as spam



Results



Before **After**

- **Before:** A clean uncompromised Windows Sandbox environment.
- **After:** A fully encrypted user directory, compromising even the desktop images.

Future Work

Parallelizing Encryption

- Encryption / Decryption runs serially
- Each file can be edited using a thread in a map pool

Circumventing Security

- Our program and macro was detected by the system at multiple points. This can potentially be improved.
- Chrome, Edge, and Windows Defender all saw the EXE as malicious.
- Office parses macros and flags any that download/execute payloads

Summary

- We determined that a ransomware is easy to implement in most languages
- Modern copies of Windows by default does an excellent job of detecting ransomware, but older versions deployed in enterprises do not.
- To protect these systems, it is imperative that files are backed up routinely and securely in offside or cloud locations.

References

- U.S. Cybersecurity and Infrastructure Security Agency. 2019. Ransomware.(2019). https://www.us-cert.gov/Ransomware
- Kaspersky Lab. 2018. What are the different types of ransomware? (2018). https://www.kaspersky.co.uk/resource-center/threats/ransomware-examples