A University Case Study on using the Metasploit to perform post exploitation in vulnerable networks

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Questionable Assumptions

- Can we automate to detect a specific exploit on a software honey-pot by monitoring network traffic in our campus network ?
- What is the best method to monitor the campus network traffic to and from the honey-pot to extract and match patterns of signature from an exploit ?
- How successful are these methods ?

Summary of the Assumptions

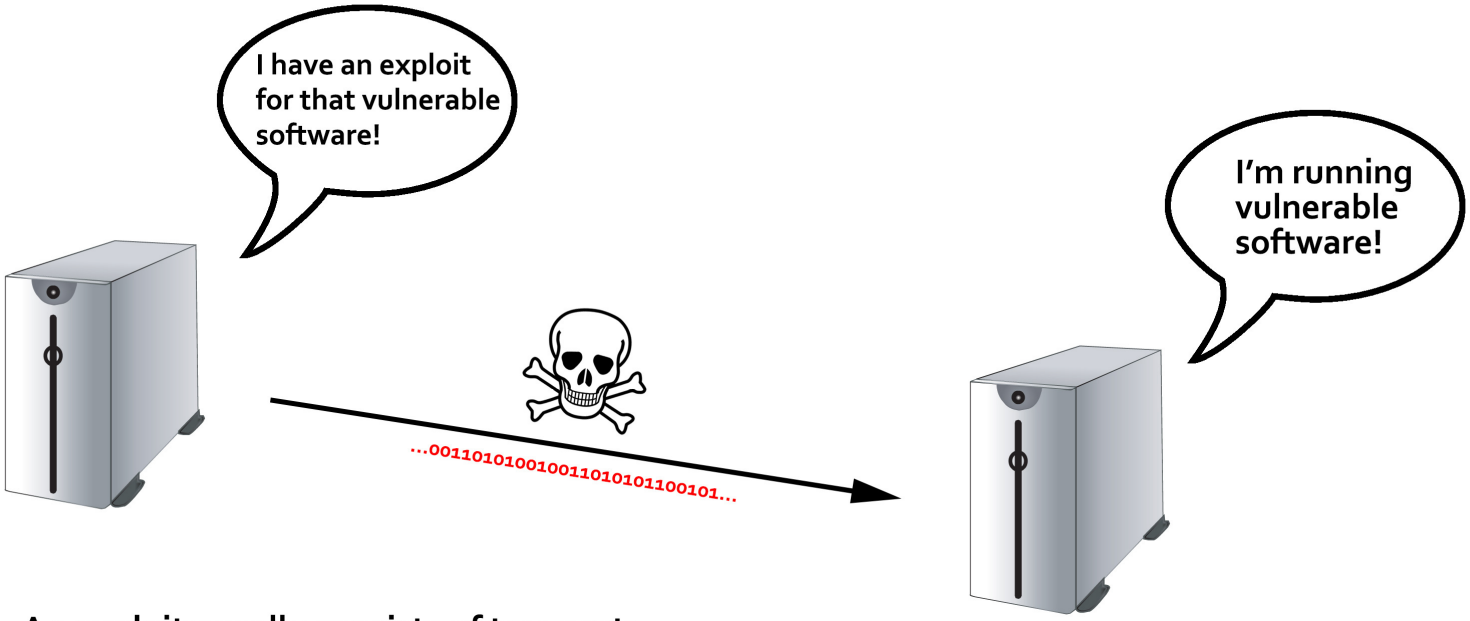
Research Overview

"A honeypot is [...] a resource which is intended to be attacked and compromised to gain more information about the attacker and the used tools." **(Baumann & Plattner, 2002)**

Research Overview

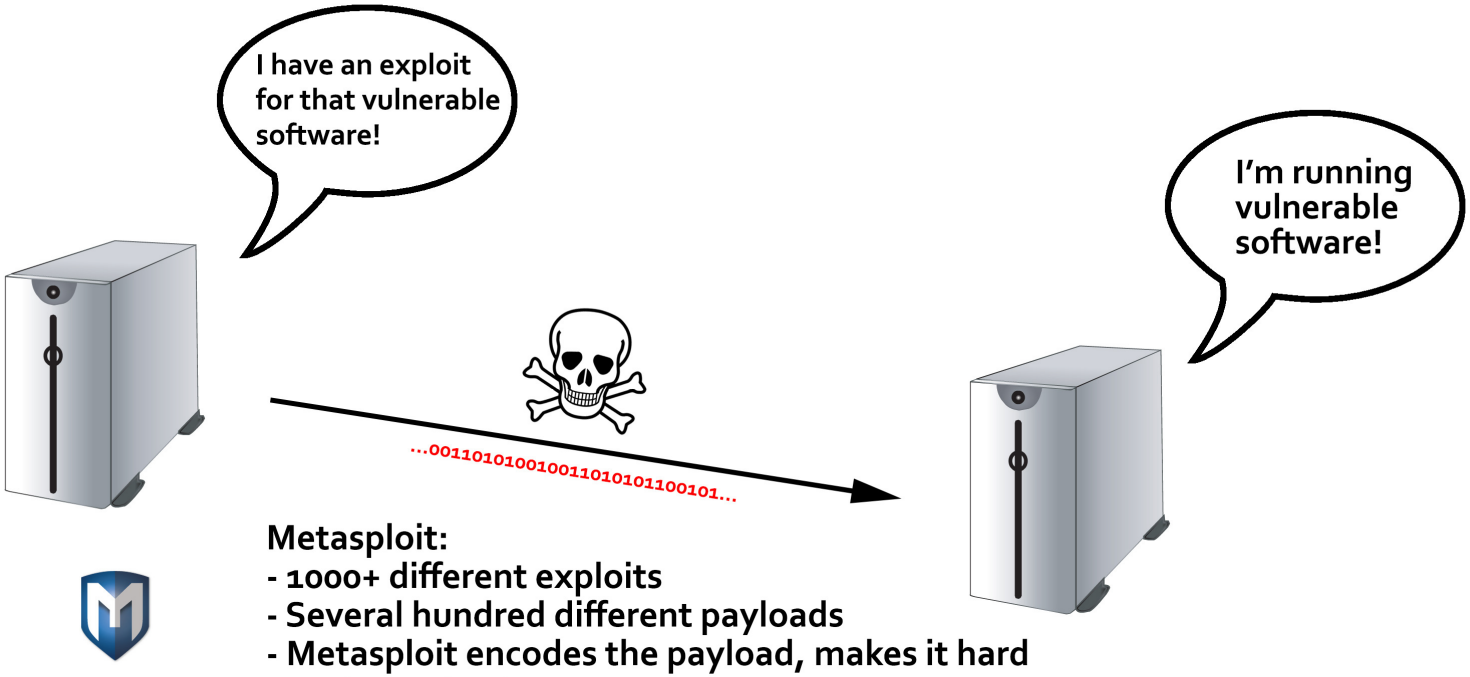
An exploit is used to abuse a security vulnerability, leading to an attacker gaining unintended privileges.
(Anley et al., 2011)

Research Overview



An exploit usually consists of two parts:
- First trigger the vulnerable application to execute custom code
- The "payload", containing the code to be executed

Research Overview

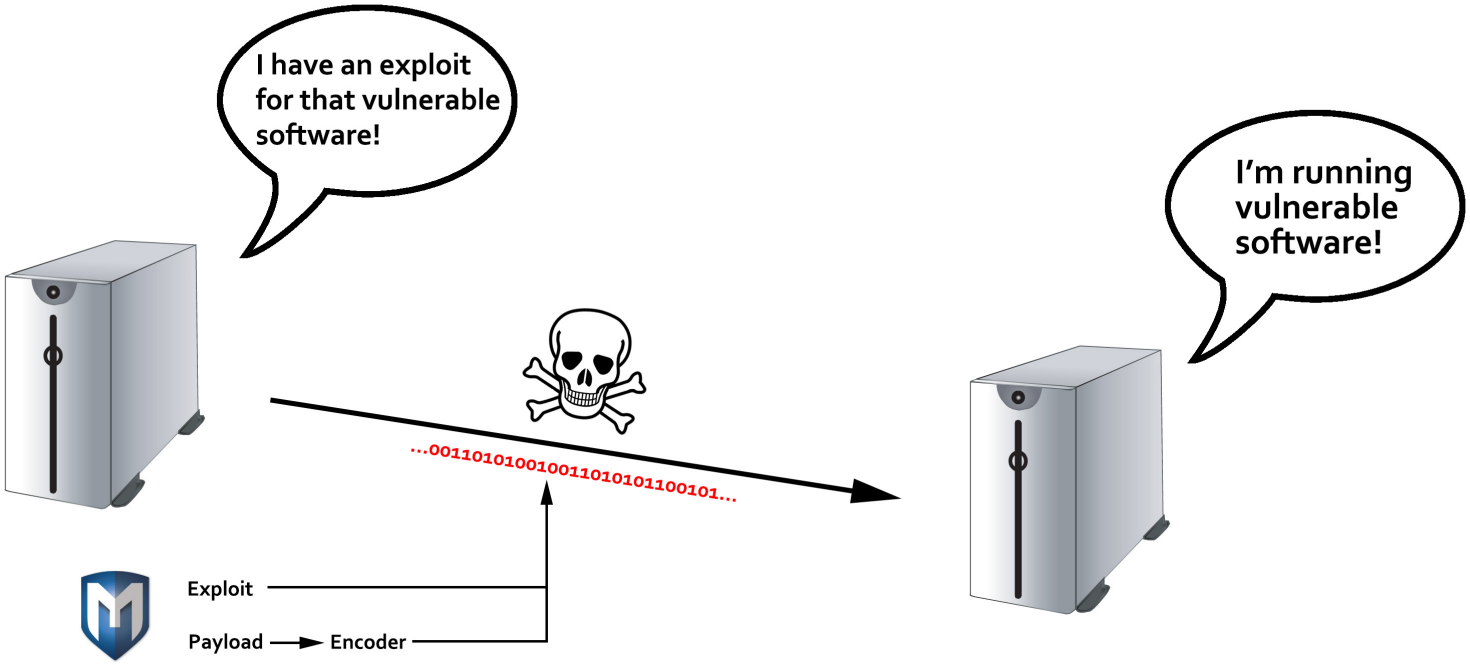


Metasploit:
- 1000+ different exploits
- Several hundred different payloads
- Metasploit encodes the payload, makes it hard to detect by signature
- Easy to use: choose an exploit, choose a payload to include, fire away!

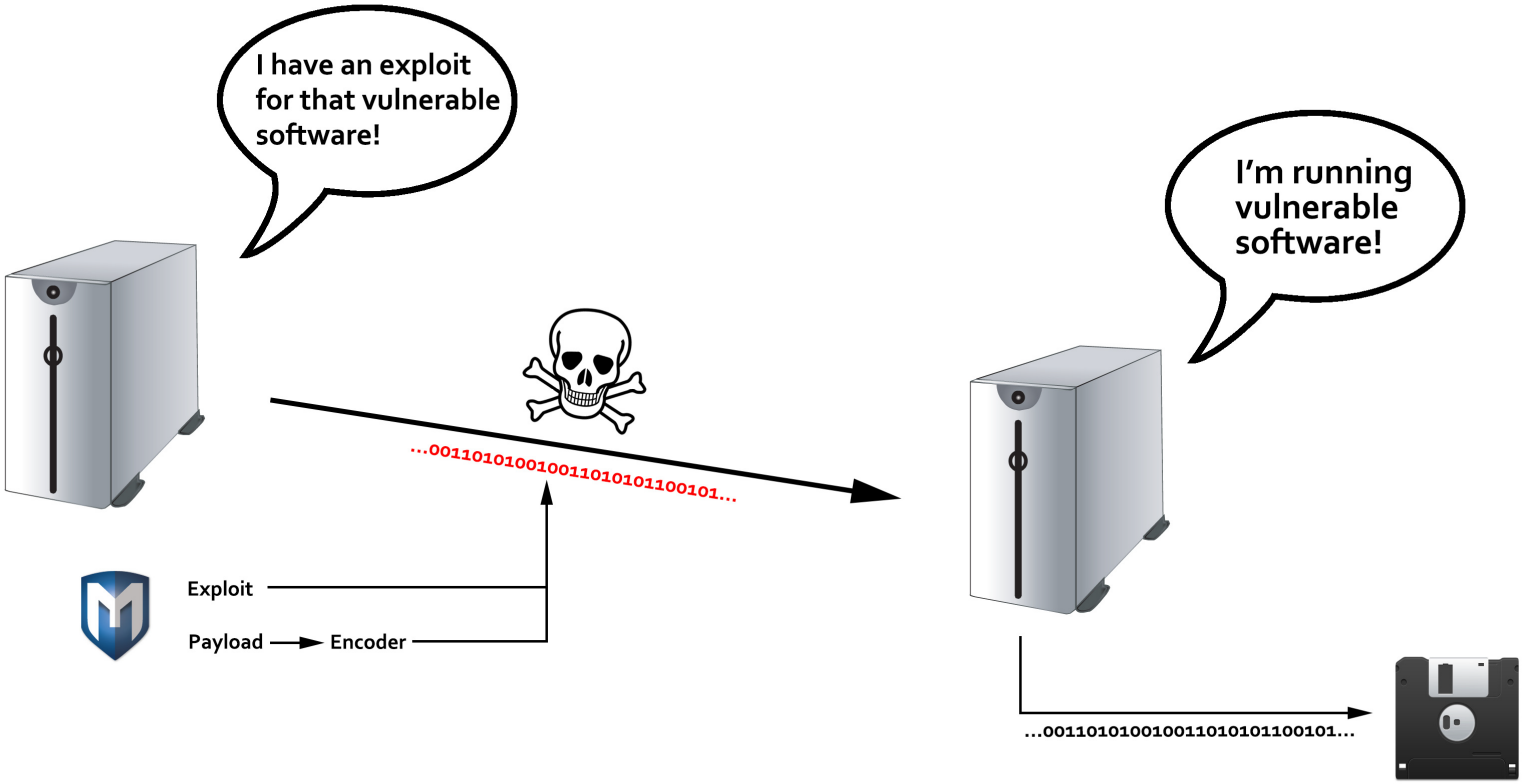
Research Overview

- The Metasploit Framework is a penetration testing toolkit, exploit development platform, and research tool.
- The framework includes a lot of pre-verified exploits and auxiliary modules for handling penetration test.
- Different payloads, encoders, and handlers are also a part of the Metasploit penetration testing environment. We run Backtrack to support our test domain

Research Overview



Research Overview



Why is this important ?

- The honeypot software itself may be a source of outdated vulnerabilities
- Analysis of what happened requires manual analysis
- Having signatures for the most-used penetration testing
- An automated tool allows for valuable insight in attackers' activities
- What we want is to automatically detect modern exploits and show which exploits were detected.

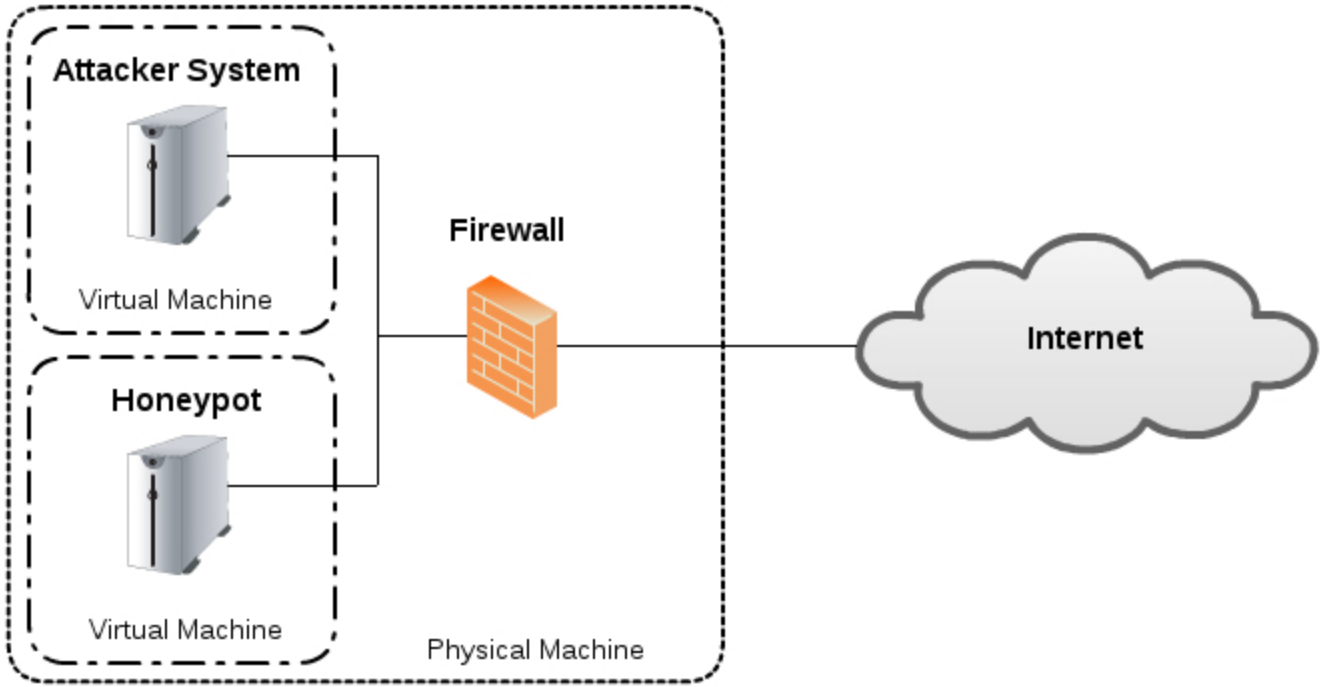
Exploits used within Metasploit

- FTP DNS server vulnerabilities
- Microsoft Based vulnerabilities
  Eg. Mso8
- We assume a large number of possible exploits

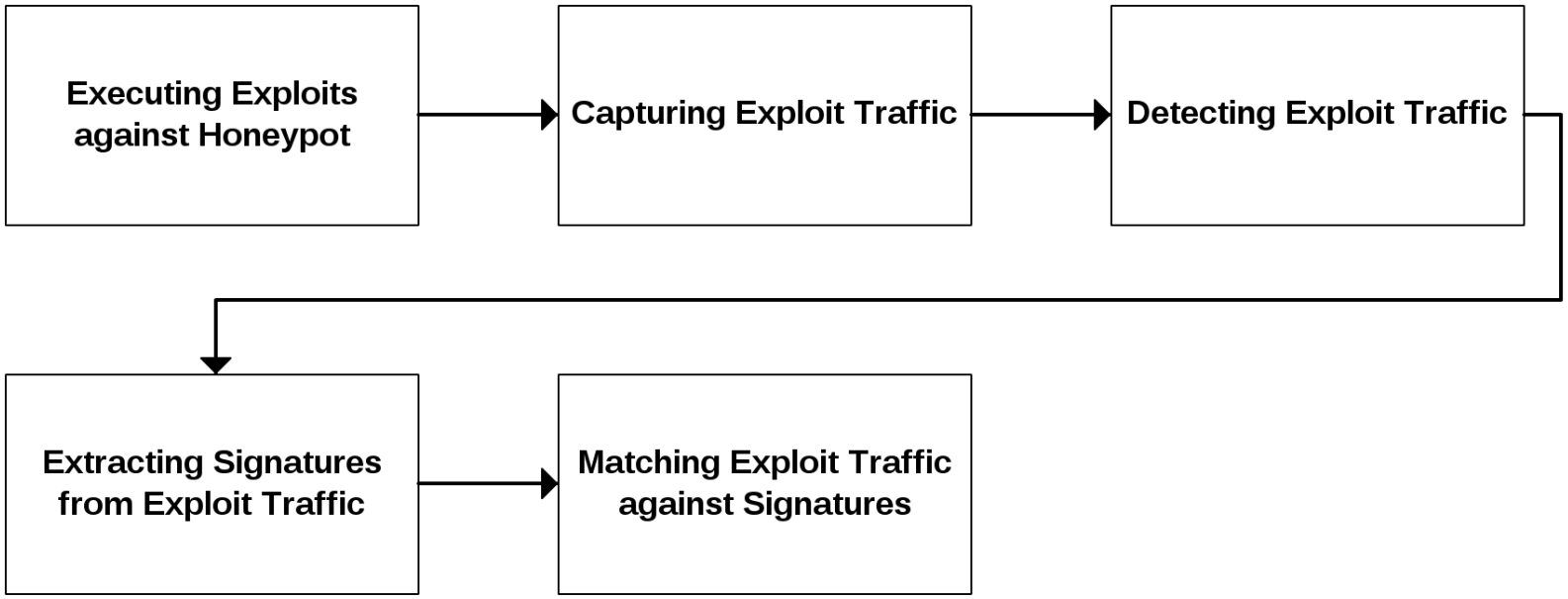
Post Exploitation Activities

- Copying Files using windows command shell
- Establishing Metrepeter sessions
  - Escalating priviliges
  - Dumping LM Hashes
- Modifying server Log files

Test Setup


Attacker System
Virtual Machine
Honeypot
Virtual Machine
Firewall
Internet
Physical Machine

Metasploit process



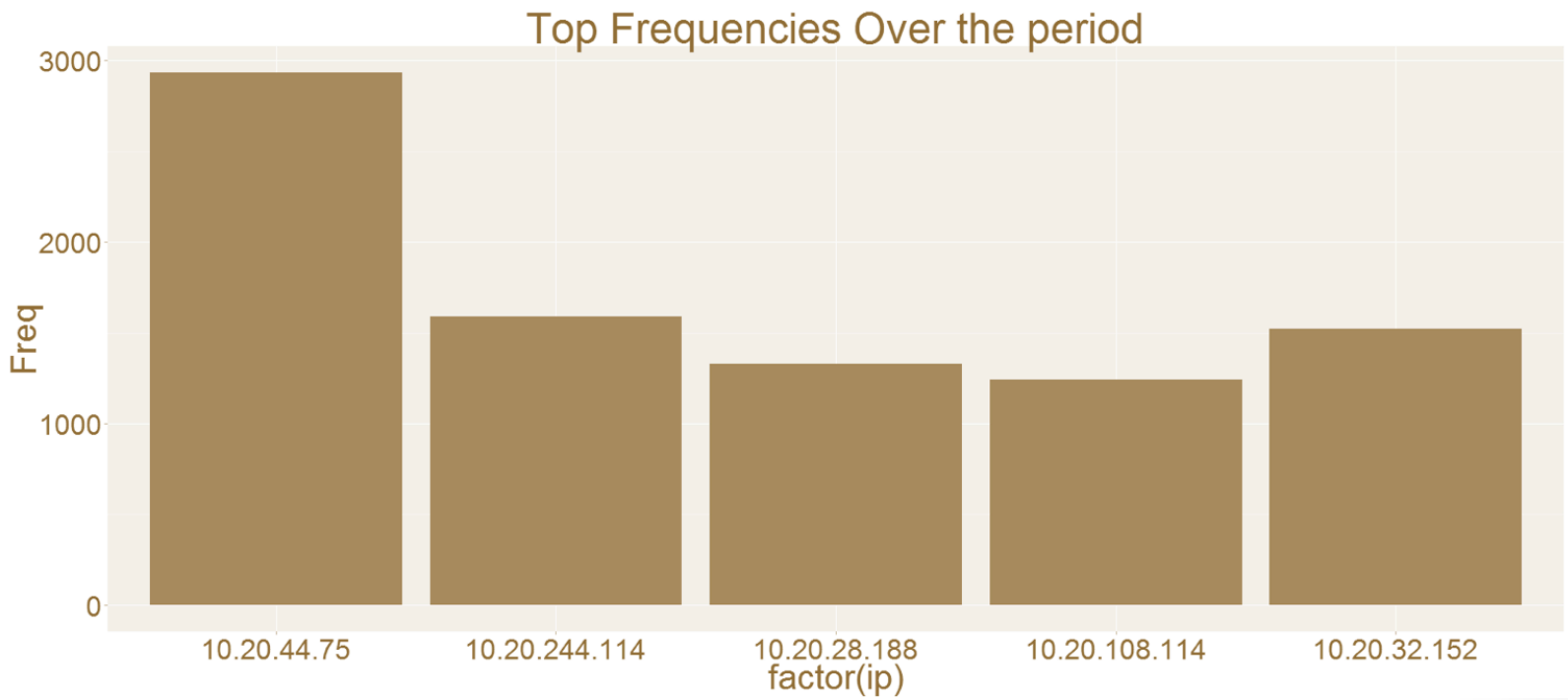
Experimental Tracking

- We run an academic license version of honeybot as our test honeypot.
- Honeybot DB becomes available as a .csv file database with all the vulnerable exploits
- The .csv file logs save all packet traffic
- Then we pattern match to find suspicious traffic

Detecting Suspicious Traffic

- We run likelihood test ratio analysis as our naïve pattern match technique
- We check each IP address based on timestamp for access logon frequency. Logon access of the passive attacker will be accepted by honeybot as "OK" as the decoy
- We set a daily threshold (t) on the logon frequency to determine the p-value/critical value of high ratio traffic
- where the p-value > t flag traffic as a suspect

Cumulative Traffic Frequency Ratios Over Six Weeks



Next Steps

- Extract signatures from the suspicious packet traffic
- Collect Multiple suspicious flows for the same exploit but different payloads
- Find the longest string shared by all suspicious flows using the Longest Common Substring (LCS) algorithm
- The resulting string will be used as signature compared with the LRT method we need to account for high false positives and negation of the null hypothesis
- This method depends on static parts in the exploit,
  regardless of the payload

Thank You

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Some Example Signatures

- Flow 1: eeddccacbefafabcdefbafcbaedfeaf
- Flow 2: aabcbeafeeddccafbdeaabcdefbcea
- Flow 3: feabcdefbfeacceafeabceaecbeafabcaedd
- The string "eeddcc" is the longest common substring in the
- First 2 rows, but it does not occur in the 3rd row.