

Computer Security Capstone

Project III: Ransomware Propagation and Payload

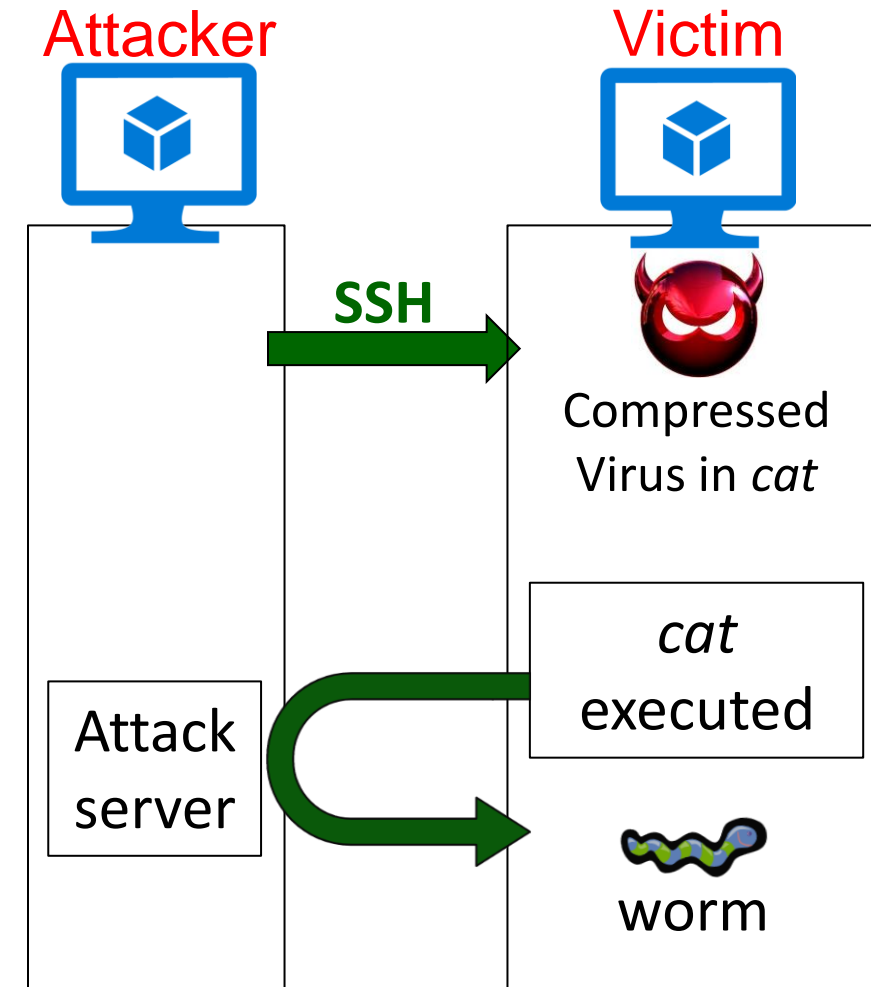
Chi-Yu Li (2021 Spring)
Computer Science Department
National Yang Ming Chiao Tung University

Goals

- Understand how a ransomware propagates and executes
- You will learn about the operation of
 - ❑ dictionary attacks
 - ❑ ciphering and deciphering
 - ❑ compressed viruses
 - ❑ worm propagation
 - ❑ ransomware

Attack Scenario

- You are going to play the role of an attacker
- Assume that you know the IP of the victim and the username of his/her SSH account, you are asked to
 - ❑ Crack the victim's SSH password
 - ❑ Install a compressed virus in an affected program
 - ❑ (virus payload) download and trigger a ransomware worm
- Consider the affected program: `/home/csc2021/cat`
 - ❑ When it is run, the virus payload is executed



Three Tasks

- Task I: Crack SSH password (30%)
- Task II: Create a compression virus with the propagation of the ransomware worm (40%)
- Task III: Prepare the ransomware payload (30%)

Task I: Crack SSH password

- Cracking the victim's password by launching a dictionary attack
 - ❑ Assume that the victim's username is known as csc2021
 - ❑ Assume that the password is created based on the victim's personal information
 - A file including the victim's personal information is given:
/home/csc2021/materials/victim.dat
 - Note: the password is composed of one or few information entries

- Hints
 - ❑ Trying strings combination in Python: **itertools**
 - ❑ Automatic SSH and SFTP operation in Python: **paramiko**

Task II: Compression Virus with Ransomware Propagation

- Infect `/home/csc2021/cat` by embedding your compression virus
- Infected 'cat' shall
 - ❑ keep the same size as the original 'cat'
 - The original 'cat' shall be compressed
 - ❑ contain the virus payload and the functionality of the original 'cat'
 - ❑ finish the execution of the payload before the end of the 'cat' execution
- The virus payload shall
 - ❑ fetch a ransomware worm from the attack server
 - ❑ execute the ransomware worm

Task II: Compression Virus with Ransomware Propagation

● Requirements 只能留cat

- ❑ The infection cannot leave any files except the infected 'cat' on the victim machine
- ❑ Including 0xdeadbeaf in the last 4 bytes of the infected 'cat' as your signature
- ❑ You can check the last bytes of a file with xxd

```
$ xxd cat | tail -n 1  
000088f0: 2024 0000 afbe adde
```

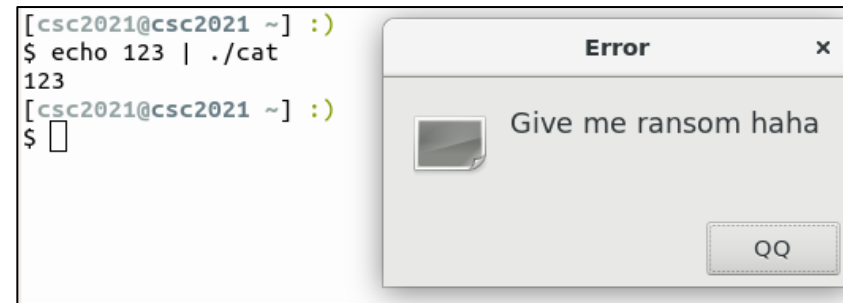
● Hints

- ❑ Compressing 'cat' using pack or zip
- ❑ Minimizing the virus size with various methods
 - e.g., using /dev/tcp/host/port to build tcp connections, gcc flags and strip
- ❑ Executing a program using the exec() family

Task III: Ransomware Payload

- Two major actions

- ❑ Encrypting **all picture files in jpg** in /home/csc2021/Pictures using RSA
- ❑ Popping up a window showing a message requesting ransom



- Requirements

- ❑ Using a public key (n & e) for the RSA encryption:
(22291846172619859445381409012451 & 65535)

- Hints

- ❑ Sample codes for RSA encryption/decryption in /home/csc2021/materials/

Requirements

- You need to develop/run your program in given VMs
 - ❑ VM image: TA will send out a download link on **5/4** (the same for both attacker and victim)
 - username/password: csc2021/csc2021
 - Note: Virtualbox network setting: Host-only Adapter (through File -> Host Network Manager)
 - Note: the victim's password will be changed based on a new victim.dat in the demo
- You are allowed to use C/C++, Shell Script or/and Python
- You are allowed to team up; each team has at most 2 students
 - ❑ Teams: discussions are allowed, but no collaboration
- Please submit your source codes to E3
- Please email your questions to csc2021@nems.cs.nctu.edu.tw

Important: How to Prepare Your Attack Programs?

- Must provide a **Makefile** which compiles your source codes into at least two executable files: **crack_attack** and **attack_server**
- Test requirements for your program
 - ❑ Must be run in the given VM without any additional tools or libraries
 - ❑ Must work for the following two test commands
 - `./crack_attack <Victim IP> <Attacker IP> <Attacker port>`
 - `./attack_server <Attacker port>`

Important: Major Demo Steps (Not Exactly the Same)

● Attacker VM

- ❑ Run “make” to compile your source codes
- ❑ Run “./attacker_server <Attacker port>” to set up the attacker server
- ❑ Run “./crack_attack <Victim IP> <Attacker IP> <Attacker port>” to crack the victim’s password and infect ‘cat’ in /home/csc2021/

● Victim VM

- ❑ Check the size of ‘cat’ and any additional files generated
- ❑ Run 2 or 3 commands of ‘cat’
 - ‘cat’ shall perform its original function
 - Only the jpg files in /home/csc2021/Pictures are encrypted with the given security context
 - A ransom window shall pop up
- ❑ Check whether the encrypted files can be decrypted

● Note: no Internet access for both attacker and victim VMs

Project Submission

- Due date: 5/31 11:55pm
- Makeup submission (75 points at most): TBA (After the final)
- Submission rules
 - ❑ Put all your files into a directory and name it using your student ID(s)
 - If your team has two members, please concatenate your IDs separated by “-”
 - ❑ Zip the directory and upload the zip file to New e3
 - ❑ A sample of the zip file: 1234567-7654321.zip
 - Makefile
 - crack_attack.c
 - attack_server.c
 - ...

Questions?