Mastering Cyber Defense:

Hands-On Training with Montimage Cyber Range

Session 2

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Montimage

Key information of the company :

Type: SME

Creation date : 2004

Location: Paris, France

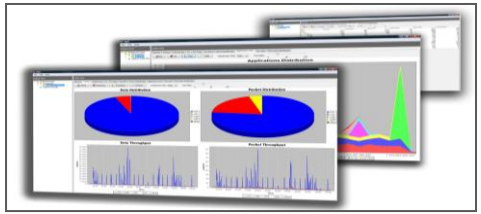
Employees : 15

Expertise

- Cybersecurity – Risk management
- Network Monitoring and analysis
  - Classification of network traffic, Statistics, QoS/QoE
  - Incidents/Anomaly detection: behaviour, security and performance
- Research and innovation in different fields related to cybersecurity in future networks, 5G and beyond, IoT, CPS, cloud computing etc.
- Flagship tool: MMT for Montimage Monitoring Tool

Activity :

Analysis of network traffic – supervision, detection, decision making, reactions



Montimage

AI4CYBER

PRECINCT

DYNABIC

DETERMINISTIC6G

Objectives

- **Raise awareness** about the growing landscape of cyber threats and risks.
- **Understand common cyber attacks** through realistic simulations using the Montimage Cyberrange.
- **Learn to detect** intrusions and suspicious activities using advanced monitoring tools.
- **Explore effective response strategies** to mitigate cyber incidents in real-time.
- **Enhance readiness** by practicing incident handling in a controlled, simulated environment.
- **Promote** a proactive cybersecurity culture across teams and organizations.

Agenda

- Part 1: Montimage ADR Cyber Range
  1. Introduction to ADR CR
  2. Attack and Defense
  3. Monitoring and Detection with Montimage Monitoring Tool (MMT)
- Part 2: Hands-On the ADR CR - Practical exercises
  1. How to use the ADR CR
  2. SSH Brute force attack
  3. Nestea denial of service attacks
- Part 4: Closing and Wrap-Up
  1. Summary of key takeaways
  2. Feedback collection from participants

Montimage ADR Cyber Range

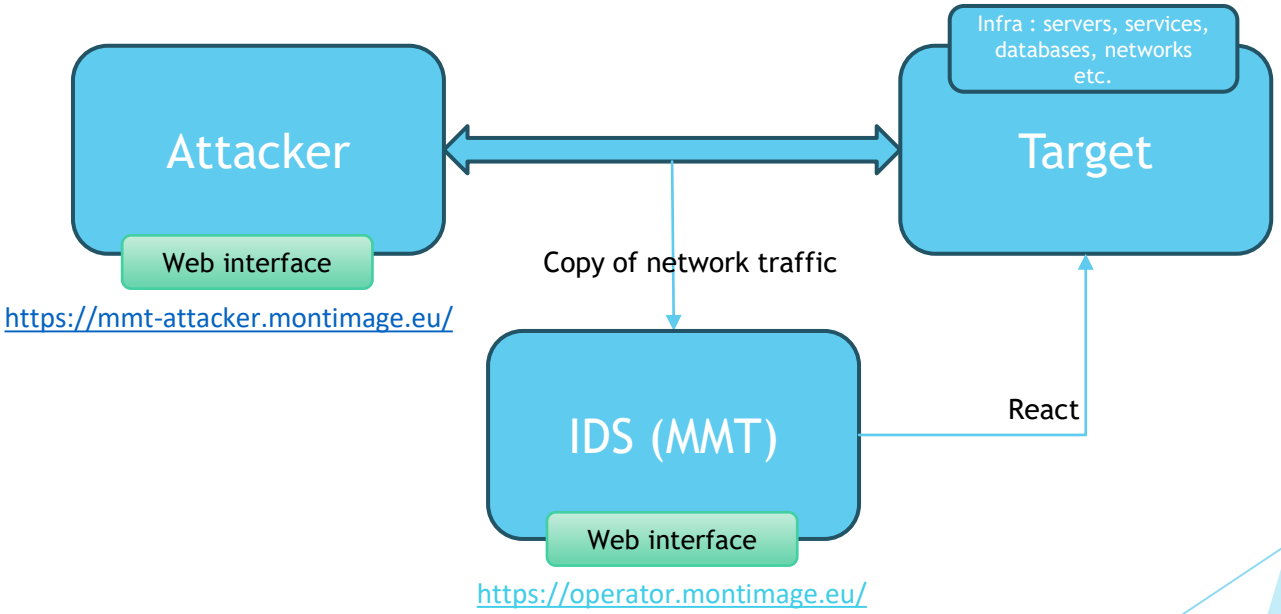
Montimage Cyber-Range Target public

- Any employee of a company concerned by the development of good practices in terms of cyber security including
  - ~~Category 1: Non-ICT experts~~
  - Category 2: ICT experts
  - Category 3: Security experts

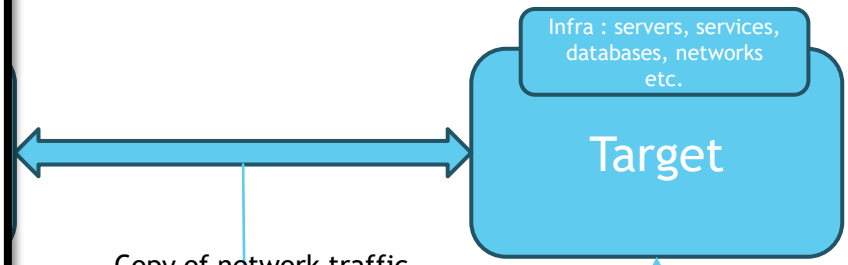
Montimage Cyber-Range - Functionnalities

- Traffic generation
- Attacks detection and reporting
- Reaction to attacks

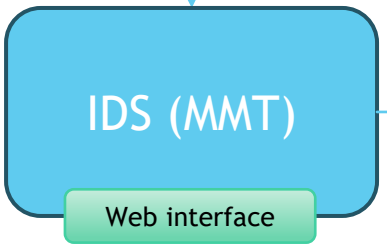
Architecture



Architecture



Copy of network traffic



React

https://operator.montimage.eu/

How to use the Montimage ADR

Montimage Cyber-Range - Functionnalities

- Book a slot for testing the Montimage Cyber-Range:

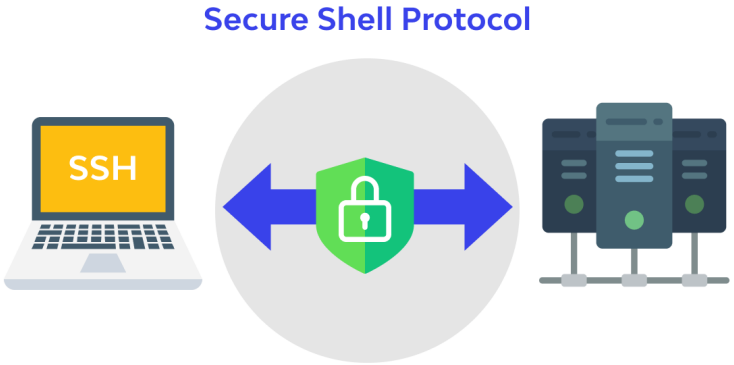
  https://adr-reservation.montimage.eu/

  - You'll receive a confirmation email
  - You'll receive credentials to connect
- MMT-Operator: https://operator.montimage.eu/
- MMT-Attacker: https://mmt-attacker.montimage.eu/

SSH Brute Force Attack

SSH brute force attack : What is SSH and Why It Matters?

- SSH (Secure Shell) is a widely used protocol for secure remote login and system administration.
- Used by sysadmins and developers to manage servers and devices.
- Default port: 22 (unless configured otherwise).
- Highly targeted by attackers due to its powerful access capabilities.



SSH brute force attack : What is a brute force attacks ?

- A brute force attack is a method where an attacker tries many usernames and passwords repeatedly until access is gained.
- Often automated using tools (e.g., Hydra, Medusa, Ncrack).
- Exploits weak or default credentials.
- Goal: Gain unauthorized SSH access to a server.

#bash

hydra -l root -P passwords.txt ssh://192.168.1.100

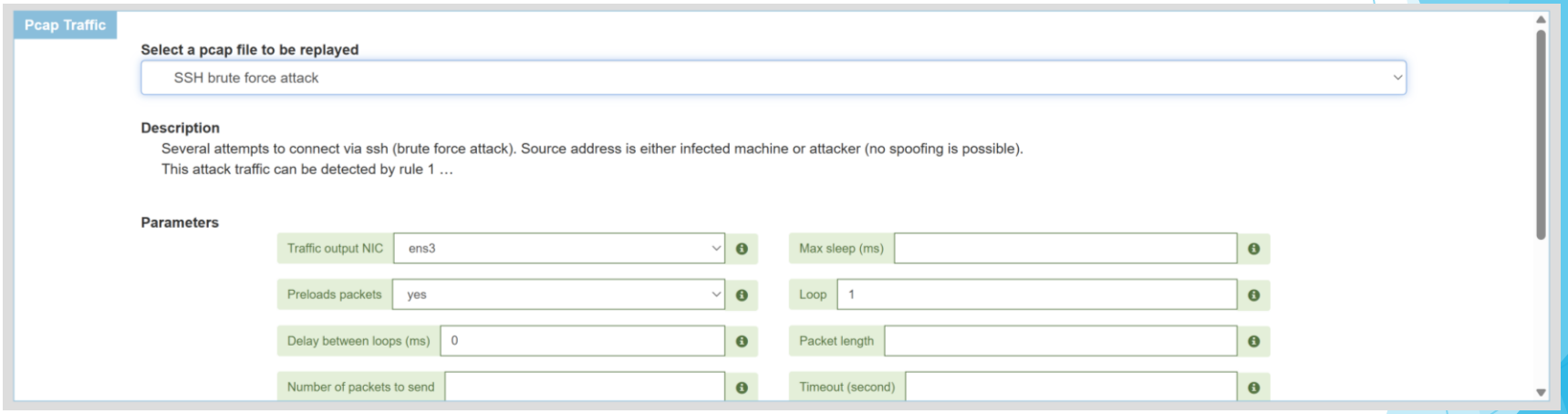
SSH brute force attack : Anatomy of an SSH Brute Force Attack

- Step 1: Attacker scans for machines with open port 22.
- Step 2: Initiates repeated login attempts with different credentials.
- Step 3: May use dictionary or credential lists.
- Step 4: If successful, attacker gains shell access and control of the system.
- Often leads to further exploitation (e.g., installing malware, creating backdoors).

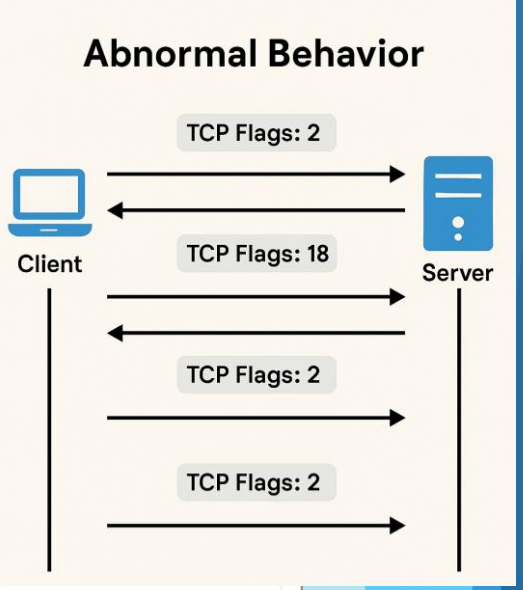
https://attack.mitre.org/tactics/TA0006/
https://attack.mitre.org/techniques/T1110/

18

Simulating the attack using the ADR Cyberrange



Simulating the attack using the ADR Cyberrange



github.com/Montimage/mmt-security/blob/main/rules/1.ssh.xml

Montimage / mmt-security

Type / to search

Code | Issues | Pull requests 1 | Actions | Projects | Wiki | Security | Insights | Settings

Files

main

Go to file t

- .github
- check
- doc
- rules
  - properties_all
  - .93.corrupted_ngap.xml.swp
  - 1.ssh.xml
  - 11.ip_size.xml
  - 13.datainSYN.xml
  - 15.nikto.xml
  - 18.GRE.xml
  - 20.icmp_flood.xml
  - 21.ip_frag_off.xml
  - 22.ip_frag_size.xml
  - 23.ip_frag_ooo.xml
  - 24.ip_frag.xml
  - 25.ip_frag.xml

mmt-security / rules / 1.ssh.xml

vinh_hoa.la ++new rule

Code | Blame 22 lines (22 loc) · 1.5 KB

```
<beginning>
<!-- Property 1: Several attempts to connect via ssh (brute force attack). Source address is either infected machine or
<property value="THEN" delay_units="s" delay_min="0+" delay_max="5" property_id="1" type_property="ATTACK"
    description="Several attempts to connect via ssh (brute force attack). Source address is either infected machine or attacker (no spoofing is possible).">
    <operator value="THEN" delay_units="s" delay_min="0+" delay_max="3">
      <event value="COMPUTE" event_id="1"
             description="SYN request"
             boolean_expression="((tcp.flags == 2)&amp;&amp;((tcp.dest_port == 22)&amp;&amp;(ip.src != ip.dst)))"/>
      <event value="COMPUTE" event_id="2"
             description="SYN ACK reply"
             boolean_expression="((tcp.flags == 18)&amp;&amp;((tcp.src_port == 22)&amp;&amp;((ip.dst == ip.src.1)&amp;&amp;(ip.src == ip.dst.1))))"/>
    </operator>
    <operator value="THEN" delay_units="s" delay_min="0+" delay_max="3">
      <event value="COMPUTE" event_id="3"
             description="2nd attempt"
             boolean_expression="((tcp.flags == 2)&amp;&amp;((tcp.dest_port == 22)&amp;&amp;((ip.src == ip.src.1)&amp;&amp;(ip.dst == ip.dst.1))))"/>
      <event value="COMPUTE" event_id="4"
             description="3rd attempt"
             boolean_expression="((tcp.flags == 2)&amp;&amp;((tcp.dest_port == 22)&amp;&amp;((ip.src == ip.src.1)&amp;&amp;(ip.dst == ip.dst.1))))"/>
    </operator>
</property>
</beginning>
```

https://github.com/Montimage/mmt-operator/tree/main/www/data/attack/pcap

SSH brute force attack : How to Defend Against SSH Brute Force

- Change default SSH port (not foolproof, but reduces noise).
- Disable root login via SSH.
- Use strong, unique passwords or better: SSH key-based authentication.
- Apply multi-factor authentication
- Limit SSH access via firewall rules or allowlists.
- Install tools like Fail2Ban: blocks IPs after too many failed attempts.

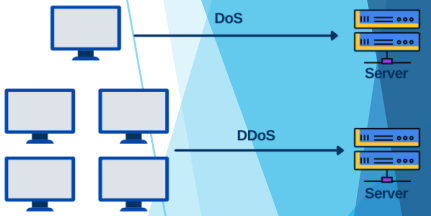
https://attack.mitre.org/techniques/T1110/

21

Nestea Denial of Service attack

Nestea DoS: What is a Denial of Service (DoS) Attack ?

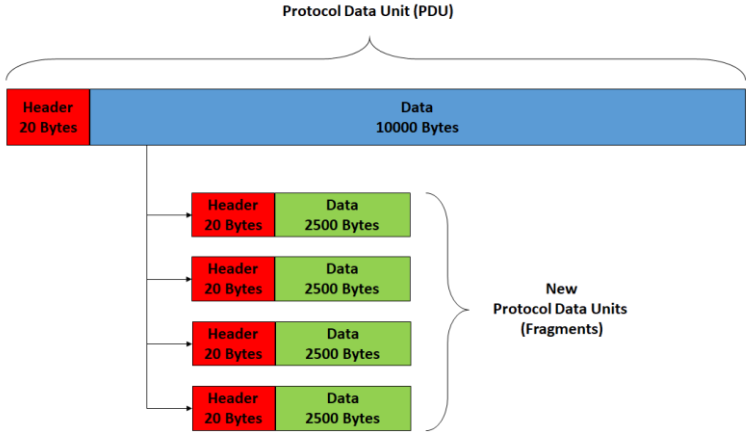
- A DoS attack aims to disrupt the normal functioning of a service by overloading or crashing it.
- It can target bandwidth, system resources, or protocol vulnerabilities.
  - Volumetric Attacks : Flood the target with massive traffic to saturate bandwidth.
  - Protocol Attacks : Exploit weaknesses in network protocols (TCP/IP, ICMP).
  - Application Layer Attacks: Target specific applications or services with resource-heavy requests.
  - Fragmentation Attacks : Send fragmented packets to exhaust reassembly logic.
  - Logic/Exploit-based Attacks: Exploit software bugs to crash or freeze the system.
- Nestea is a type of protocol-level and fragmentation related DoS.

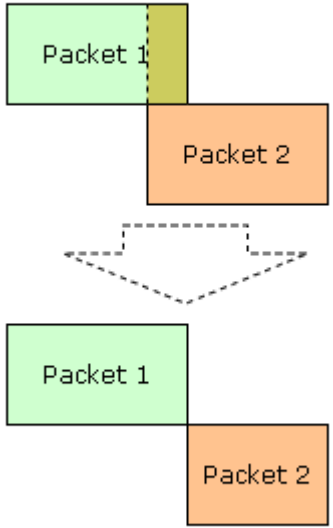


23

Nestea DoS: What is a Denial of Service (DoS) Attack ?

- Nestea is a crafted IP fragmentation attack.
- Targets systems with poor handling of overlapping IP fragments.
- The result: kernel panic or system crash.





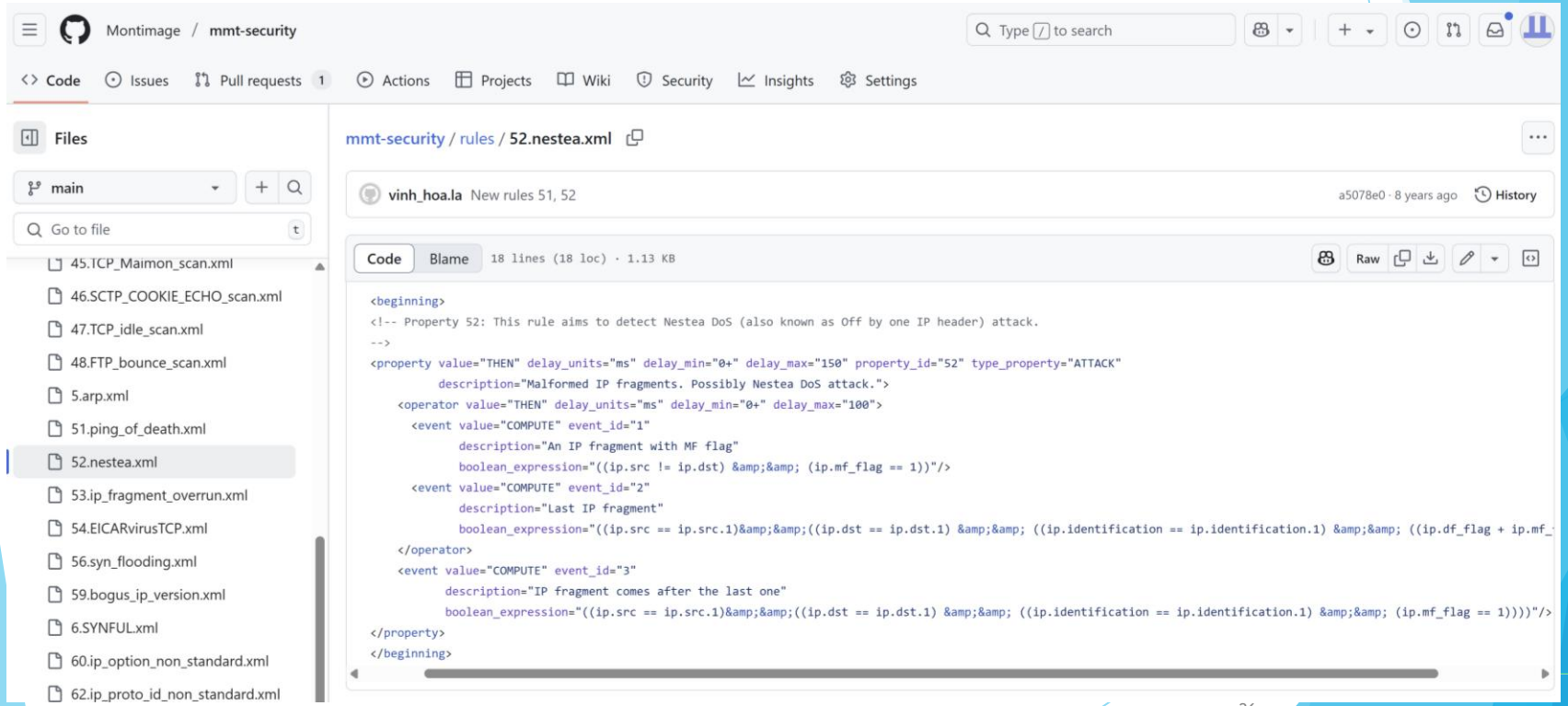
24

Nestea DoS: How Does Nestea Work?

- Attacker sends 3 IP fragments:
  - First fragment is normal.
  - Second fragment completes the datagram.
  - Third fragment overlaps previous data (confuses reassembly).
- Vulnerable systems fail during reassembly, causing a crash.

25

Nestea DoS: How Does Nestea Work?



Nestea DoS: Mitigation and Prevention

- Update the OS/kernel to patch known vulnerabilities.
- Use stateful firewalls that detect invalid fragments.
- Enable intrusion detection/prevention systems (IDS/IPS).
- Harden IP stack configurations to reject overlapping fragments.

27

Closing and Wrap-Up

Takeaways

- **Exploration of ADR Cyber Range:**
  - Understanding an attack allows to detect it and to react to it
  - The more « classical way » to react to an attacker is to block its IP source
  - Next session : AI-based anomaly detection

Post-training evaluation questionnaire

Profile

https://forms.gle/VN22UYAZFnkiuB6h6

Pseudo starts by ADR2……

Post-training evaluation questionnaire

https://forms.gle/JsA2nksf1LkuaH3Q6

- Use the same pseudo
- Select training : [DAY 2] Mastering Cyber Defense: Hands-On Training with Montimage Cyber Range (Session 2) by Wissam Mallouli (MI)