



Lecture 07: Digital Forensics

Question 1

The following are steps of the incident response process. Briefly explain each concept and provide a Norwegian translation. The steps can often be executed in parallel.

- a) Triage
- b) Investigation
- c) Containment
- d) Analysis
- e) Tracking
- f) Recovery

Answer

- a) Triage:
Triage is the initial assessment of an incident to determine its severity, to prioritise resources and to set the direction for further action.
Norwegian: Sortering og prioritering
- b) Investigation
Detect and collect evidence. Apply principle of OOV (Order of Volatility) to collect most volatile evidence first. Follow principles for chain of custody to allow the evidence to be admissible in court, in case that is needed.
Norwegian: Undersøkelse, innhenting og sikring av bevis
- c) Containment:
Stop the attack from propagating to limit further damage. Use judgement to determine whether servers, applications and systems should be shut down and disconnected, or be left running. It might be necessary to keep some systems running to support important business applications.
Norwegian: Skadebegrensing
- d) Analysis:
Determine source and nature of incident. Answer: who, how, when and why. Police should be called when the incident has characteristics of serious crime. Consider the consequence of calling the police, e.g. loss of control and seizure of equipment.
Norwegian: Analyse.
- e) Tracking:
Discovering the original source and cause of the incident when that is not immediately evident. This might involve collecting evidence from across networks and across the Internet. Collaboration with other organisations might be needed.
Norwegian: Sporing
- f) Recovery:
Clean infected systems, patch servers, restore from backups, reconfigure perimeter security, remove vulnerable services, train staff, and implement any other control necessary for avoiding similar incidents in the future. Learn from the incident and improve incident response process.
Norwegian: Gjenoppretting

Question 2

Briefly explain and provide a Norwegian translation for the following terms:

- g) Forensics
- h) Digital Forensics
- i) Computer Forensics
- j) Network Forensics
- k) Electronic data discovery
- l) Cyber Forensics
- m) Computational Forensics

Answer

- g) Forensics:
Application of a broad spectrum of sciences to answer questions of interest to a legal system. This may be in relation to a crime or a civil action. "Forensic" Comes from the Latin "forēnsis", meaning "before the forum", i.e. presented to forum of judges.
Norwegian: Etterforskning, Kriminaltekniske metoder
- h) Digital Forensics:
Recovery and investigation of material and legal evidence found in digital devices, often, but not necessarily, related to computer crime.
Norwegian: Digital etterforskning, Digitalkriminaltekniske metoder
- i) Computer Forensics:
Recovery and investigation of material and legal evidence found in computers and digital storage media used with computers.
Norwegian: Dataetterforskning
- j) Network Forensics:
Monitoring and analysis of computer network traffic for the purposes of gathering legal evidence and information about events, or for intrusion detection. Unlike other areas of digital forensics, network forensics deals with volatile and dynamic information. Network traffic is transmitted and then lost, so network forensics is often a pro-active investigation.
Norwegian: Nettverksetterforskning.
- k) Electronic data discovery:
eDiscovery refers to any process in which electronic data is sought, located, secured and searched with the intent of using it as evidence in a civil or criminal legal case. Electronic data includes emails, images, calendar files, spreadsheets and audio files.
Norwegian: Elektronisk dokumentetterforskning
- l) Cyber Forensics:
Cyber forensics is a general term covering the more specific topics of computer forensics and network forensics. It can be interpreted equivalent to digital forensics, but puts more focus on global aspects of forensics. The term is often used to describe courses, training programs and certifications.
Norwegian: Cyberetterforskning
- m) Forensic computing, or Computational Forensics:
Quantitative approach to the methodology of the forensic sciences. It involves computer-based modeling, computer simulation, analysis, and recognition in studying and solving problems posed in various forensic disciplines. CF integrates expertise from computational science and forensic sciences.
Norwegian: Digitale etterforskningsmetoder, Computerstøttet etterforskning

Question 3

Evidence integrity is essential in order for digital evidence to be admissible in court and to carry weight as evidence.

- a. What is CoC (Chain of Custody) and why is it important for evidence integrity?
- b. Assuming that a forensic team follows the right steps for preserving evidence integrity and for keeping an unbroken CoC, what must they do in order to convince the court that they have done so?
- c. What is OOV (order of volatility), and how does it influence decisions regarding which evidence should be preserved first?
- d. List various data storage media as a function of their OOV.

Answer

- a. Chain of custody (CoC) refers to the chronological documentation or paper trail, showing the seizure, custody, control, transfer, analysis, and disposition of evidence, physical or electronic. Because evidence can be used in court to convict persons of crimes, it must be handled in a scrupulously careful manner to avoid later allegations of tampering or misconduct which can compromise the case of the prosecution toward acquittal or to overturning a guilty verdict upon appeal.
- b. Document it.
- c. Data stored on media can be modified or erased due to various factors. The volatility expresses the rapidity and ease with which such factors can modify or erase data. The OOV expresses the relative ranking of media according to volatility.
- d. OOV of various media: Microprocessor registers, microprocessor cache, RAM, HD cache, HD, peripheral memory (R/W), Write once.

Question 4

- a. Explain the difference between “live acquisition” and “post mortem acquisition”.
- b. What are the advantages and disadvantages of live and post mortem acquisition?
- c. Give an example when “live acquisition” is necessary.

Answer

- a. In case of live acquisition, the evidence is collected from a system where the microprocessor is running. In case of post mortem acquisition, the evidence is collected from storage media of a system that is shut down.
- b. Post mortem provides better integrity preservation and does not influence the data. However, volatile data can be lost in the process of shutting down a system. Live acquisition enables the collection of volatile data, but also influences the data.
- c. In case the HD is encrypted, it is better to collect the data from the HD while it is running.

Question 5

Explain the basic steps of the forensic investigation process.

Answer

1. Identification

Discovering the incident

«My computer is acting weird»

«Someone just posted our entire database on wikileaks»

2. Preservation

Make sure that the evidence is not destroyed - «Do not turn that off»

3. Collection

Gathering all the potential evidence in a forensic manner - Volatile data first - RAM, then disks - Use write blockers, create multiple images, one image is kept as «master»

4. Examination

Find and extract hidden and deleted files and partitions

5. Analysis

Use two tools to verify results – the steps MUST be repeatable

Create timelines of events

6. Presentation

Presenting the evidence to the court

Question 6

Explain the basic scientific principles for the forensic investigation process.

Answer

1. Best evidence

Obtain the best possible evidence. Preferably, the original, if not, then a clone and so on.

2. Minimal Intrusion

Only seize what is necessary, only keep for as long as necessary

3. Minimal Force

Do not use excessive force to gain access to the evidence

4. Minimal Interruption

Do not interrupt the business unnecessarily

5. Transparency

All the evidence is revealed to the court, no steps taken are secret

6. Chain of Custody

Document how the evidence was kept and who had access to the evidence

7. Primacy of the Mission

Focus on the mission, despite interesting sidetracks. Note them and move back if necessary

8. Impartiality

Do not evaluate evidence with the focus of proving one or the other. Let it speak for itself

9. Documentation

Document everything. When, what, why. Both to provide to the court, and to remember. Often a long time between operation and trial.