Arizona State University

CSE 469: Computer and Network Forensics

Topic 0: Course Overview

Dr. Jaejong Baek | Spring 2020

Instructor

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+ 2 Graders

- Saiteja Padakandla
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INFOSEC at ASU

Programs:

- Two undergraduate IA concentration programs
  - BS in computer science
  - BSE in computer systems engineering
- Three graduate IA concentration programs
  - MS
  - MCS
  - PhD

INFOSEC at ASU

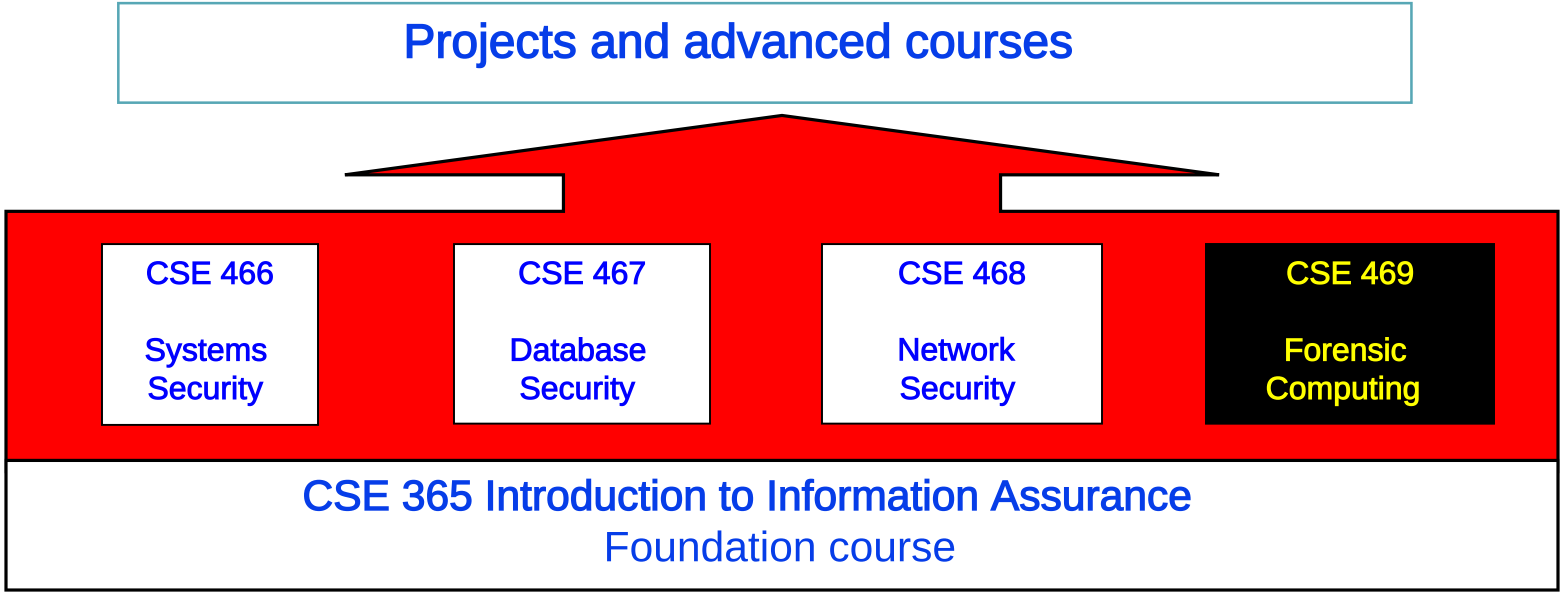
Concentration in BS (Computer Science):

- Minimum of 15 credits in IA and related areas as technical electives
- Courses:
    - CSE 465 Introduction to Information Assurance
    - CSE 466 Computer System Security
    - CSE 467 Data and Information Security
    - CSE 468 Network Security
    - CSE 469 Computer and Network Forensics

Graduate Level Security Classes

- CSE 539 Applied Cryptography
- CSE 543 Information Assurance and Security
- CSE 545 Software Security
- CSE 548 Advanced Computer Network Security
- Seminar: Computer Security: Techniques and Tactics

INFOSEC at ASU



Projects and advanced courses

CSE 466 Systems Security

CSE 467 Database Security

CSE 468 Network Security

CSE 469 Forensic Computing

CSE 365 Introduction to Information Assurance
Foundation course

NSA and DHS designated ASU as a National Center of Acader
Excellence in Information Assurance Education

Computer Security? Computer Forensics?

Arizona State University launches

the Center for Cybersecurity and Digital Forensics

within the ASU Global Security Initiative

IEEE TRANSACTIONS ON
INFORMATION FORENSICS
AND SECURITY

https://globalsecurity.asu.edu/center-cybersecurity-and-digital-forensics

Goals of Computer Security (CIA Triad)

- **Confidentiality**: Prevent/detect/deter improper *disclosure* of information
- **Integrity**: Prevent/detect/deter improper *modification* of information
- **Availability**: Prevent/detect/deter improper *denial of access to services* provided by the system

Examples

- You should not come to know the scores of your classmates in this class
- You should not be able to change your or others’ scores in this class
- You should always be able to view the assignments on the course web site

In Addition to CIA Triad

- **Authenticity**: The assurance that a message, transaction, or other exchange of information is from the *source* it claims to be from.

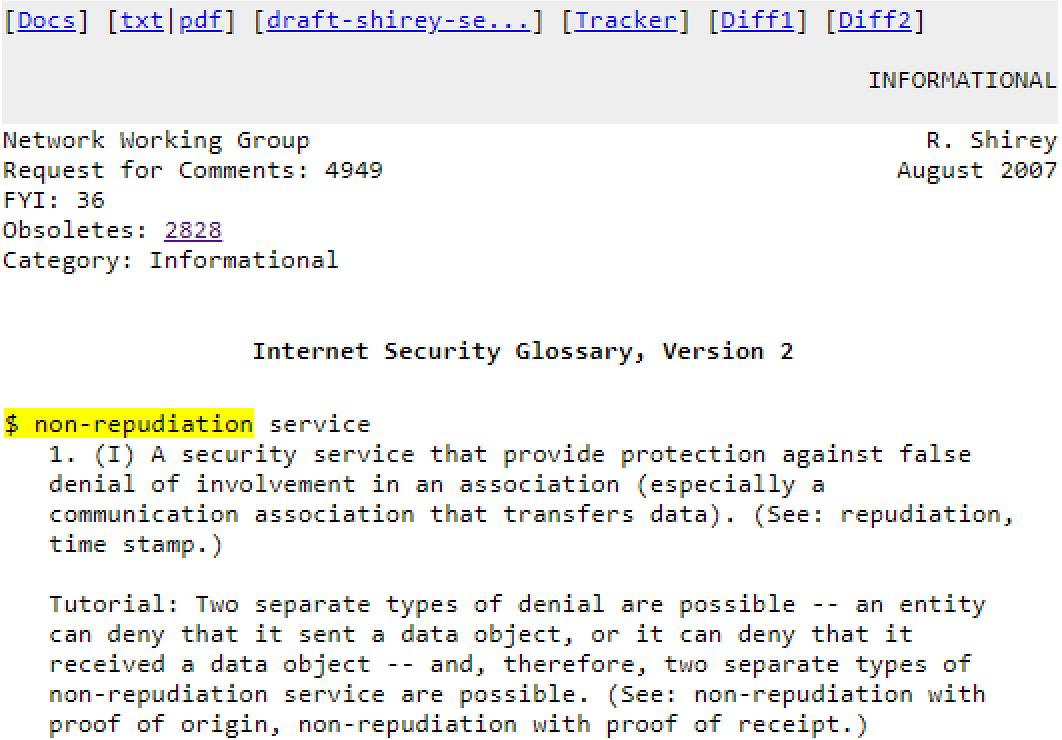
- **Non-repudiation**: The assurance that someone cannot deny something, such as the receipt of a message or the authenticity of a statement or contract.

Examples

- You should not pretend, as the TA, to send an email to your classmates

- The TA can not pretend he did not send out the message

For the further definition: RFC 4949



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                                                          INFORMATIONAL

Network Working Group                                         R. Shirey
Request for Comments: 4949                                  August 2007
FYI: 36
Obsoletes: 2828
Category: Informational


                  Internet Security Glossary, Version 2

$ non-repudiation service
   1. (I) A security service that provide protection against false
   denial of involvement in an association (especially a
   communication association that transfers data). (See: repudiation,
   time stamp.)

   Tutorial: Two separate types of denial are possible -- an entity
   can deny that it sent a data object, or it can deny that it
   received a data object -- and, therefore, two separate types of
   non-repudiation service are possible. (See: non-repudiation with
   proof of origin, non-repudiation with proof of receipt.)
```

Goals of Computer Forensics

- Forensics is defined as “relating to the use of scientific knowledge or methods in solving crimes.”

- Postmortem: Forensic analysis *after* a computer or network is compromised

- Acquire data even if the original owner does not want to leak that data (e.g. deleted from hard disk)
  - Breach the security goal **confidentiality**

Course Objectives

- The objective of this course is to provide basic and comprehensive understanding of computer forensics and corresponding techniques & tools (md5sum, dcfldd, FTK imager, Volatility, Autopsy, Hex workshop, OpenStego, etc)
  - Understand computer forensics principles
  - Understand computer forensics technologies
  - Understand/practice computer forensic tools
  - Understand other relevant topics including incident responses, cybercrimes, and ethics & legal issues

Course Objectives

- Get hands-on experiences with lab exercises and programming assignments
- Introduce you to reading research papers
- Introduce you to real-world security and forensics by inviting external speakers from government, industry, and academia

Two Elements of Digital Forensics

- Process
  - Distinguishes forensics from data recovery, bug hunting
  - How to acquire, handle, and analyze evidence properly
  - What precautions to take, pitfalls to be aware of
  - Difference between evidence being admissible in court!
  - Can apply to any type of digital forensic evidence (if the process is good)

- Technical Knowledge
  - Deep understanding of the specific technology you need to extract information from
    - How is the data stored at the binary level?
  - Technical side is where most forensic research is done

Digital forensics is the application of technical knowledge to extract information from evidence while adhering to a lawful process.

Course Prerequisites

- Knowledge of information systems, computer networks, and their operations:
  - CSE 310 Data Structures and Algorithms
    - Must understand relationship between a data structure and its binary representation

For example:

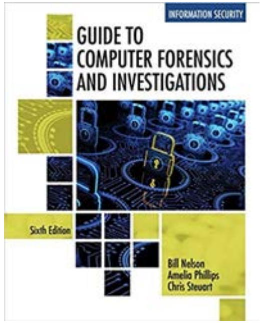
If I give you this data structure and tell you that a `short` is 2 bytes, an `int` is 2 bytes, and a `double` is 4 bytes, you should be able to tell me which hex values represent the person’s age in this memory sample:

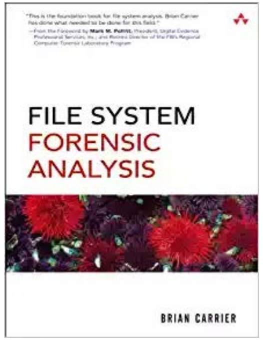
```
struct Employee {
    short id;
    int age;
    double wage;
};
```

0xd5	0x01	0x34	0x00	0x20	0xa1	0x07	0x00

Textbook/Readings

- No required textbook
- Highly recommended books:
  - Guide To Computer Forensics and Investigations
  - File System Forensic Analysis
- Slides and important reading material will be posted to the course website





NOTE: Please see the syllabus for more information!

Course Communication

1. Class website: jaejong.com/cse469s20
    a. Syllabus, assignments, schedule, lecture slidess, important links, etc.
2. Exam grades: Grade scope https://www.gradescope.com/courses/79694/
    a. Detailed, consistent grading
3. Lecture Notes and Mailing list: Piazza https://piazza.com/asu/spring2020/cse469/home
    a. Collaborative discussion board
    b. Be careful not to violate academic integrity! (see course website for examples)

NOTE: Please see the syllabus for more information!

Course Topics

- Principles of digital forensics (Process)
  - Acquisition
  - Authentication
  - Analysis
  - Presentation
  - Rules of evidence
- Computing basics
  - File systems
  - How computers store data
  - How computers communicate
- Forensic tools and technologies
  - Open-source tools
  - Commercial tools
  - How to write your own tools
- Cybercrime investigation
  - What constitutes cyber crime
  - Law and policies on cyber crime
  - Trends in cyber crime
- Other cool topics:
  - Mobile and car forensics
  - Cloud and web forensics

Grading Policy 1/2

- Homework: 45%
  - Assignments: 15%
  - Paper report: 5%
  - Course Project: 25%
- Exams: 50%
  - Midterm: 25%
  - Final: 25%
- Attendance: 5%

NOTE: Please see the syllabus for more information!

Grading Policy 2/2

- Homework: To be done individually
  - Unless otherwise noted in the assignment description
- Project: To be done in groups of 3
- Paper Report: Individual report on a research paper from list on the course website
- Late work: 20% deduction each day late

NOTE: Please see the syllabus for more information!

Academic Integrity

- Regular rules apply
  - See the ASU Student Code of Conduct and ASU Student Academic Integrity Policy.
- Use of code snippets is allowed as long as:
  - Proper credit for the source is given in a comment AND
  - The snippet doesn’t constitute a significant portion of your code AND
  - The source is not another past or present student of the course
- Posting assignment code online is not allowed

NOTE: Please see the syllabus for more information!

Class Format

- Lecturing
  - Lecture notes will be posted to the class website (Piaza)
  - Some videos clips will be provided when it needs
  - 5 min breaks after the first 40 min
  - Each class provides QR code for attendance-checking before class
- In-class exercises
  - Three students form a group, but each one has to do the exercise
  - Students MUST attend all classes
  - Bring your laptop and install Virtual machine

    https://ets.engineering.asu.edu/vmware/

Homework

- Done individually
- Several programming assignments:
  - Reinforce principles from class by forcing you to think through the details
  - Goal is to give you the skills to be computer forensic scientists, not just tool users
- Some lab exercises:
  - More hands-on practice with forensic tools
  - Extension/continuation of in-class exercises
  - Necessary software will be provided

Course Project

- Group project
  - Same groups of 3 for doing in-class labs
- Write a program for tracking actions taken with evidence items while in custody
- Command-line, Linux-compatible
  - Programming language is your choice

Group Formation Due : January 21

Instructions to be sent out via Piazza