Security Engineering
Fall 2015

Lecture 01 – Introduction to the course

Prof. Fabio Massacci,

Ms Kate Launets

Lecturers

- ***Main lecturers***
  - Prof. Dr. Fabio Massacci
    - Office hours by appointment in class
    - Can try your luck by email
  - Ms. Katerina Labunets
    - Office hour by appointment via email
- ***Others***
  - Industry guest speakers

The "Usual" Course

- ***The usual lectures/labs***
  - Prof. does theory + Assistant does exercises
  - Prof. does technique + Assistant does programs
  - Prof+Assist = Oracles resolving all doubts
- ***The usual exam***
  - Prof gives well defined problem,
  - Students mirroring exercises/code solutions
- ***The usual project***
  - Developing a project (i.e. code)
  - Prof. knows exactly requirements
- ***This course is not a "Usual" course***

Why I don't want to teach a "usual" course

- ***Reality is very different from the usual course***
  - Problem is not well defined
    - Already a big step if customers realize they have a problem
  - Customers don't know the solution
    - Otherwise they won't be paying you in the first place
  - Decision must be justified and understood by them
    - They won't pay just because you found a solution in a book
    - They don't read code. They paid you for that.
- ***The course's idea***
  - Teach you security engineering with a process as close as possible to real life including presenting and justifying your choices
- ***Consequence → the course is challenging (= tough)***
  - 40% hate it (too much work), 30% love it (learned a lot)
  - Still one of the popular courses

Why you don't want me to teach a "usual" course

- ***If you can only write programs →you're done for***
  - You must also be able to make decisions and communicate them to upper management
- ***Italian Industry Assoc. ICT Salary (24-30 yrs old)***
  - Web Developer/ IT/Network Administrator – 21-26K€
  - Programmer/Analyst – 29-41K€
  - Sys Engineer/Architect – 31-44K€
  - Sw Project Leader/IS Manager – 47-78K€
  - CIO – 98K€/year
- ***So better write a management report…(at least once)***

Course principles

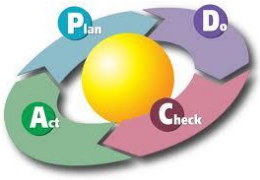
- ***Objective:***
  - Learn how to secure engineer a real life problem from high level management and early security requirements down to security architecture
- ***Methodology***
  - Lecturers present methodology in class
  - Students apply it on case study
- ***What do you have to prepare***
  - Presentations justify the solution to the customers
    - And they are never happy (but you get early feedback)
  - Deliverable is an executive report to justify your choices
    - You submit it into installments as in real life (here to get feedback)
    - Only at the end you get the money
- ***This year customer (not decided yet)***
  - ePayment - Poste Italiane (IT), Remotely Operated Tower by Eurocontrol/SESAR, Digital Cinema by Technicolor

Cognitive Levels: why the course is tough

- ***Knowledge***
  - Recall things by memory (eg repeat a proof from a book)
- ***Comprehension ←Most theory course stops here***
  - Justify methods and procedures
- ***Application ←Most design courses stops here***
  - Apply concepts and principles to new situations
- ***Analysis***
  - Understanding relationships between parts (content & structure)
- ***Synthesis ←This course***
  - Ability to put parts together to form a new whole
- ***Evaluation ←The best should arrive here***
  - Conscious ability to judge the value of material

Security Management Principles

- ***Governance, Risk Management and Compliance***
  - Identify Threats and Risk to your assets
  - Mitigate those with Sec
  - Deploy the Controls
  - Monitor their effectiver
  - Check security indicato
  - Revise periodically



What you are protecting?

- ***A Case study from an industrial company***
  - ePayment - Poste Italiane (IT) or Remotely Operated Tower by Eurocontrol/SESAR, Digital Cinema
- ***But irrespective of actual case study most modern architecture are of the form below***

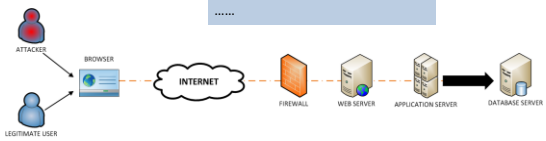
Specific Technologies will cover…

- ***The following security viewpoints***
  - Users (Database) Security
  - Web Application Security
  - Network Security
  - Cloud or Mobile Security
    - Depends on case study
- ***A price to pay***
  - There are only so many hours in 6 ECTS…
  - So we won't cover all aspects in details

Users (Database) Security

- ***We will review how <u>data confidentiality, integrity can be broken and how to protect your privacy</u>***

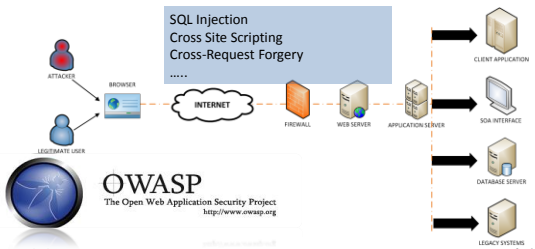
Aggregation Attacks
Inference Attacks
……



Application Security

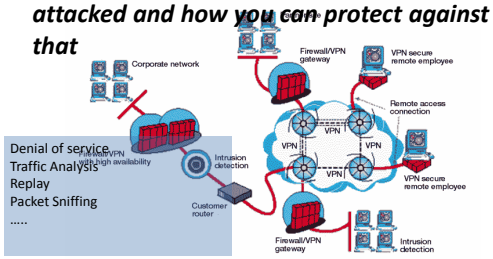
- ***We will review how an <u>HTTP session</u> can be <u>hijacked</u> and how you can prevent that***

SQL Injection
Cross Site Scripting
Cross-Request Forgery
…..



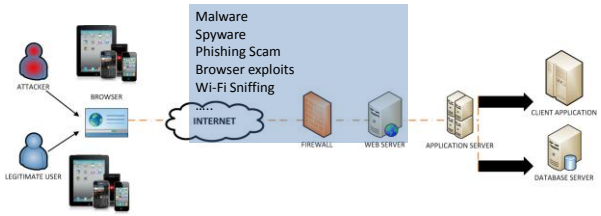
Infrastructure Security

- ***We will review how your network can be attacked and how you can protect against that***



Mobile Security (bonus if we have time)

- ***We will review the attacks that can target your mobile devices and how to prevent them***

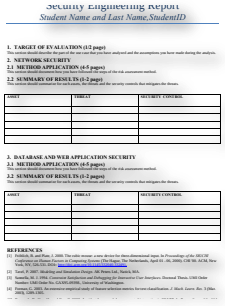


Activity

- ***Apply two methods for risk assessment CORAS and SecRAM to the case study scenario***
- ***Cover three levels***
  - user/Database Security, Web Application Security, Network Security
- ***For every type of technology***
  - Identify the security threats and security controls that mitigate the threats
  - Document the application of the methods and the results
- ***Report them***
  - in written form by a short report
  - By making a presentation in class

How to report your work: Report

1. ***Structure of the report***
   1. Target of Evaluation
   2. Users Threats & Controls
   3. Application's T&C
   4. Infrastructure's T&C
2. ***Delivery***
   1. In installment
   2. Download template from Web


Security Engineering Report
Student Name and Last Name,StudentID

1. TARGET OF EVALUATION (1/2 page)
2. NETWORK SECURITY
2.1 METHOD APPLICATION (4-5 pages)
2.2 SUMMARY OF RESULTS (1-2 pages)
3. DATABASE AND WEB APPLICATION SECURITY
2.1 METHOD APPLICATION (4-5 pages)
2.2 SUMMARY OF RESULTS (1-2 pages)
REFERENCES

Course Logistics

- ***Basic course***
  - 12 weeks of 4 hours of lectures
  - 2 weeks of 4 hours of students' presentations
- ***Practice work***
  - Students' presentations
  - Students' intermediate reports
- ***Final Exam in January***
  - Final report
  - Final Presentation (with a industry customer)

Grading

- ***Final report is the sum of the intermediate reports***
  - Final report determine the bulk of your vote
  - Final presentation of the work is around 20%
    - This is given by an industry person who will review your threats and security controls for relevance and appropriateness
    - His/her judgement is what counts
- ***Intermediate Deliveries***
  - You can ignore them and submit everything at the end.
    - This is always your right as a student taking any course
    - Statistics says you are not going to make the grade
  - Intermediate reports are mandatory

Evaluating your own methods…

- ***You will help us to evaluate CORAS and SecRAM with respect to***
  - Actual efficiency
  - Actual effectiveness
  - Easy of use, usefulness, intention to use
- ***You will provide us feeback on the methods through***
  - Post-Task Questionnaire
  - Individual Interviews
- ***Honest feedback are important to us!!!***

Rule of the game

- ***Real life is not built out of 2 hours classes spread across 14 weeks semester***
  - Attending lectures is optional but well-advised
  - Delivering class' presentations is optional but well-advised
  - Delivering reports as scheduled is mandatory
  - Attending final exam is mandatory
- ***On "I took this text from a collegue of mine"***
  - Remember I have been a student myself, thinking "he is not going to find it" is not going to be easy
  - If you are able to have people working for you and can sell their work as yours only as if they didn't existed, great, you'll be the next Steve Jobs
  - In all other cases (statistics is against you on) that's called plagiarism and is forbidden.
  - You will fail the class and that's it.

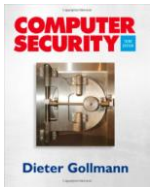
Rules of Engagement

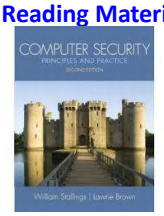
- ***Asking questions in class is always the best policy***
  - Your colleagues may be interested in the answer
  - Things are easier to explain
  - The prof gets hundreds email per day…
    - Today 9am – 14 am (66 emails and counting)
- ***Do your homework first***
  - "I can't bother to find the answer, I will ask the prof."
    - Q: "I don't remember to whom the deliverable should be submitted"
    - A: "read my slides"
- ***Write with "[SecEng-2015]" in the subject***
  - "important" is a no go
    - Got 57 in the last months
  - "urgent" is not better

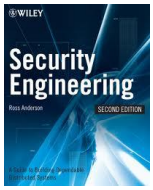
Wednesday

- ***Exercise will take place in Room PC201***
- ***Comprehensibility Exercise***
  - CORAS Model
  - SECRAM Model
- ***You will have to "look at a model" (for example as if you were participating to a presentation as a customer) and answer some questions***
  - Questions are in varying level of complexity
- ***Yes, we know that you know nothing of the models → this is the whole point of the exercise***

Reading Materials







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