Introduction to cybersecurity for Generalists

James Davenport

University of Bath

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CM50209: Security and Integrity

- Course is 6 ECTS (12 CATS) credits, in Semester 2
- Available on many MSc (including generalist MSc, and corresponding L7 Degree Apprenticeship), also MComp.
- Been running for many years, but IoC was an opportunity to rethink
- Tried to hire a Teaching Fellow, but failed, so I taught it myself
- Partly based on experience as a Fulbright CyberSecurity Scholar at NYU in 2017

Overview (inherited)

Aims:

1. To develop an understanding of the difficulties of security - everyone wants it but no-one can define it.
2. To develop the ability to analyse the security threats to a proposed design.
3. To develop the ability to propose realistic counter-measures, where available.

Learning Outcomes: After taking this unit, the student should be able to:

1. describe common security models;
2. discuss what it means for a given system to be 'secure';
3. identify security weaknesses in proposed systems.

Assessment (inherited format; own exercises)

50% Individual coursework on own experience of PCI DSS online. Buy from three different online vendors: capture both the HTML and the wire data, and analyse for weaknesses.

30% Group coursework: pick an OWASP weakness and give a 30-minute presentation on it.

* Four self-select groups of five — next time I might force groups; not sure how this one will work with Degree Apprentices.

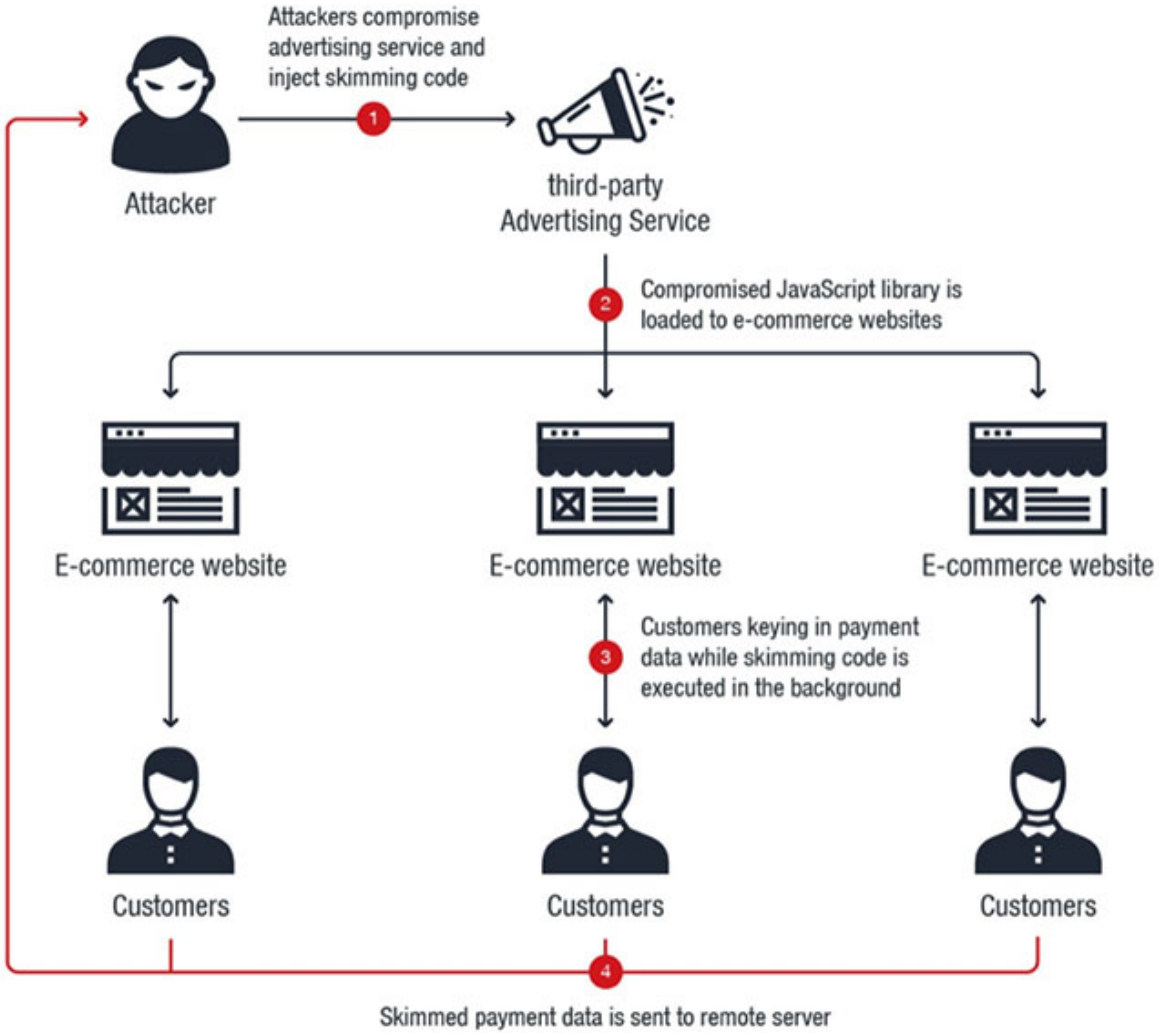
20% Class text (essentially an examination)

Course Overview (12 teaching weeks) I

1. Introduction, resources [And08], CIA triangle. But "In addition, other properties, such as authenticity, accountability, non-repudiation and reliability can also be involved. [ISO18]." Proven security [Pau99] but problems with "Plan B" procedures [Com14, "POODLE"].

Course Overview (12 teaching weeks) II

1b Payment Card System: [UK 19a]. Scale of system. The Adverline attack [Zor19, Kli19]



Course Overview (12 teaching weeks) III

2. Cryptography for Security Engineers. Kerckhoffs' Principle [Ker83]. Don't "roll your own".
3. PCI DSS [Pay18b, Pay18a]. Hosted compliance [UK 19b].
4. SQL Injection (example of OWASP for CW2). Lack of understanding [TS19]. Students work on capturing their own PCI DSS data for CW1.
5. Passwords: attacks, salt [MT79], policies, secure storage. Difficulty of correct implementation [NDTS18]. 2FA. Biometrics: weaknesses in practice [RMR17, BRT+17].
6. Access controls (Unix permissions, ACL, setuid, etc.). Principle of least privilege.
7. Vulnerability Scans versus Penetration Testing. PenTest tools [Gri19]. Guest lecture: automobile security.
8. "Consolidation week": no new material.

Course Overview (12 teaching weeks) IV

9. Forensics Principles, ACPO "guidelines" [Ass12]. Importance of ISMS [ISO18] and SIEM. Norsk Hydro as a current example [Clu19, Mun19]. Cyberinsurance, analogy with London Fire Brigade.
10. Guest Lecture (a CISO). Also two group presentations.
11. CSRF (prevented by Token-Based Mitigation, implemented by frameworks); XSS (destroys TBM protection). See `https://github.com/OWASP/CheatSheetSeries/blob/master/cheatsheets/Cross_Site_Scripting_Prevention_Cheat_Sheet.md`. Also two group presentations.
12. Revision and Class Test.

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