

Software and Security Engineering: Supervision 3

Lectures covered by the supervision:

<https://www.cl.cam.ac.uk/teaching/2425/SWSecEng/>

- Lecture 7: Software engineering as the management of complexity
- Lecture 8: The economics of software as a Service (SaaS)
- Lecture 9: Critical systems
- Lecture 10: Managing the development of critical systems

Past exam questions:

<https://www.cl.cam.ac.uk/teaching/exams/pastpapers/t-SoftwareandSecurityEngineering.html>

Supervision questions:

1. Discuss the example of exchange of messages between Brutus and Anthony (lecture 8), in terms of authenticity and secrecy.
2. How is software engineering different from other engineering fields? Why is it more difficult to engineer software than other physical products? Considering design limits, what is different in electrical engineering compared to software engineering? Consider the rate of change and expectations regarding the ability to change.
3. Define technical debt. Create 2 examples.
 - a. What is technical credit: <https://dl.acm.org/doi/10.1145/3690043>
4. Elaborate on “getting the specification right” during development. What do these specifications represent in terms of computer software? What are the consequences of “getting them right” and misunderstanding them/not specifying something? Do you think if anyone “got the specifications right” for systems like Google search engine or MS Word? If not, why such systems are successful?
5. Discuss economics of software systems and conclusions of Barry Boehm. Compare them with the DORA metrics (<https://dora.dev/guides/dora-metrics-four-keys/>).
6. Compare strengths and weaknesses of iterative model, evolutionary model, and spiral model of development.
7. Compare strengths and weaknesses of Waterfall and Agile model of software development.
8. What do you think, who (which role) and how decides on the model of development?
9. Discuss SaaS, its benefits, and drawbacks. Compare SaaS with binary release. Discuss potential challenges with privacy, confidentiality, and anonymity in SaaS. Discuss 1 example of a successful binary release to this day, and 1 successful example of SaaS where binary release would be unfeasible.
10. What are the benefits of continuous integration and continuous delivery (with focus on rolling deploy) and infrastructure-as-code. What do these concepts enable and what is necessary to establish them?
11. Create an example that demonstrates the role of redundancy in critical systems. What are general advantages and challenges with redundancy?
12. Compare incidental complexity vs intrinsic complexity.
13. Why is there a need for capability maturity level?
 - a. Compare it with a newer [Capability Maturity Model Integration](#)
14. Compare unit, integration, regression, and fuzzy testing. Elaborate on costs and benefits.
15. How to conclude if work on a software program is done?
16. What is the project management’s trilemma. Create one example with Gantt charts and PERT charts.

17. [2017p23q8](https://www.cl.cam.ac.uk/teaching/exams/pastpapers/y2017p23q8.pdf) - <https://www.cl.cam.ac.uk/teaching/exams/pastpapers/y2017p23q8.pdf> (ONLY a).
18. [2017p2q6](https://www.cl.cam.ac.uk/teaching/exams/pastpapers/y2017p2q6.pdf) - <https://www.cl.cam.ac.uk/teaching/exams/pastpapers/y2017p2q6.pdf>
19. Provide your opinion: benefits vs advantages of using AI in software and security engineering.
20. Summarize the main message from lecture 7 in 1-3 sentences?
21. Summarize the main message from lecture 8 in 1-3 sentences?
22. Summarize the main message from lecture 9 in 1-3 sentences?
23. Summarize the main message from lecture 10 in 1-3 sentences?

Bonus:

1. Introduce a continuous integration process to your previously created project. On every new commit, there has to be an action that triggers all tests, and if they are successful, builds a binary and deploys it to a folder. E.g., use Travis - <https://www.travis-ci.com/>
2. What are microservices?
3. What are circular dependencies?
4. What is SCRUM?
5. What are DevOps and DevSecOps?
6. Discuss code coverage related to testing.
7. Discuss causality relationship.

Save your answers into MS Teams or email them to me. Please use the following naming pattern:

SASE_Supervision_3_Answers_<last name>_<first name>_Easter_2025

Send your answers as a pdf, doc, image, or any other format of a document for which there exists an easily available software to open.

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