SE 14-322: Software Intensive Systems Engineering
Semester Project

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Contents

Chapter 1

Project Overview

During this course, you will iteratively develop a software systems project. You will design the system, specify its parts, create screens for its user interfaces, prepare sample databases, and partially design the class structure for it. The work will parallel the tools and techniques taught in class, so you'll have some practice working on the tasks in class before you need to do them for the project. The project will be documented using the same template/format that we used for the ePark example in class. The documents you'll produce are:

1. A user story
2. A requirements table
3. A *Software Requirements Specification (SRS)* for the software system
4. A *Systems Analysis and Design (SAD)* for the software system
5. A *Software Design Document (SDD)* for the software system

The system that you're going to build is the one that you described in the user story for Phase 0.

There will be two design reviews during the course of the semester for which you will be graded on the (partial) work submitted so far. For the final evaluation, the parts of the project will weighted as follows:

- User story: 10%
- Requirements: 15%
- SRS: 30%
- SAD: 30%
- SDD: 15%

1.1 Submission Iterations

You will submit the project in three iterations over the course of the semester. The table below summarizes what you'll submit in each iteration.

Project Phase	Date	What is due	Weight
User Story	27 March 2025	User story	0%
Iteration 1	14 May 2025	Requirements, partial SRS	15%
	15 May 2025	Design Review 1	
Iteration 2	11 June 2025	Requirements, partial SRS, Partial SAD	15%
	12 June 2025	Design Review 2	
Final Submission	30 June 2025	All complete documents	70%

1.1.1 How to Submit

All document submissions must be made via Moodle. All members of the team must submit the work via Moodle. If a student does not submit the work via Moodle, he will not receive a grade for the iteration or project, even if his name appears on the project documents.

1.1.2 Design Reviews

After iterations 1 and 2, there will be design reviews in which each team will present their work to the class. Details about the design reviews are found in separate iteration explanation files.

Students or teams who miss the design reviews for any reason (except Miluim and birth) will not receive a grade for the iteration.

1.2 About the Iterations

Details of each iteration, what to do, and what to submit are found in separate files.

1.3 Academic Integrity

As with all projects and homework, academic integrity principles apply to the project. I expect all student work submitted to be the work of all teammates and not derived from external sources. If you have any questions about what is permitted with respect to using material from external sources, ask.

In general teams will receive a single grade for each submission, but a student who does not participate or contribute significantly to the project effort will not receive a grade!

Any project work which does not meet expectations or which does not reflect the work of the students on the team will not receive a grade. See the syllabus for more details.

Chapter 2

Customer Story

In this assignment you'll write the customer and stakeholder story for the semester project.

2.1 About the Story

The user and stakeholder story must describe the system to be developed in a simple, non-technically specific way. The story must be written from the perspective of the one who is ordering the development of the system.

The system you're going to develop must be distributed (*i.e.* deployed on more than one computer). It might have a front end and a back end, a customer app with a set of backing servers, end user terminal and cloud based server/storage. You may choose the overall distributed architecture for the system, but it must be reasonable (*i.e.* meet the requirements implied in the story).

Write you story as prose, describing how the system should operate and behave using natural language. Do not use bullet or numbered lists. You may include literary devices such as characters, motivation, and marketing pitches to make the story more interesting. Include pictures and figures to give the user a better idea of what the system in the story will be about.

2.1.1 Story Minimum Requirements

To ensure that the stories are sufficiently complex and interesting, the story must have the following elements:

1. Have 3 or more user categories or roles
2. Have 3 or more types of hardware (*e.g.* end user computers, servers, specialized hardware)

2.1.2 Topic Blacklist

Due to repeated use of some project topics from past years, I will not accept project stories on the following topics this year:

- Security/police central office service
- Gym/Health Club management system

2.2 Use of Generative AI

In this part of the project, the use of generative artificial intelligence (AI) is acceptable. You may use generative AI tools to help you brainstorm for ideas, write story points, and organize your thoughts for story elements and behaviors. You may also use it to generate images for your story.

Edit all text created by the generative AI to ensure that it is logical and readable. You must also ensure that it meets the user story's content and technical requirements. Keep in mind that the user story will be graded as your work, so any mistake or error is your responsibility, not the AI's.

If you choose to use generative AI for your user story, you must include the following additional section to the user story template: **Use of Generative AI**. The section must include the following information:

- The manner in which the generative AI was used (*e.g.* brainstorming, idea elaboration, story points, image generation, etc.)
- A history of all prompt entries that were entered to generate the results.
- A short description of what editing steps were performed on the generative AI's output.

2.3 What to turn in by 27 March 2025

The customer story should let the reader answer the following questions without going into too many technical details or systems jargon:

1. What is the goal of the system?
2. In what environment will the system operate? (users, other systems, additional stakeholders)
3. What are the primary processes of the system?

You may use the ePark example or the other examples on the course web page for ideas. Use the MS Word template on Moodle to submit the user story.

Turn in the assignment as a single DOCX or PDF file filling in all parts of the MS Word template. All submissions must be turned in via Moodle.

2.4 Grading

The user story **will not** receive a numerical grade initially, but it must be approved to be able to continue with the course project. It will be given a numerical grade when the project is finally evaluated after the final project submission.

Chapter 3

Iteration 1: Project Design

This is the first design iteration for the semester project. We'll write some critical parts of the project documents and plan some of the software's behavior. At the end of the iteration, there will be a design review in which you'll get feedback on your work so far.

3.1 What to do: Documents

In this iteration you'll begin working on the requirements list and the *Software Requirement Specification (SRS)* for the project.

3.1.1 Requirements

Prepare the full requirements table for the complete system. Use the template for the requirements table from Moodle. Fill in the following columns of the template:

1. Header information: Project name, Student names
2. Requirement ID #
3. Requirement text
4. Source (*e.g.* user story, derived)
5. Functional category (FR)
6. Non-Functional category (NFR)

You **may skip** the trackback SUC, HW, and Class columns for now.

3.1.2 SRS

Complete the following sections of the SRS:

1. Header information (project name, authors, sources)
2. Section 1: System Use Case Diagram for the complete system
3. Section 2: List of actors and stakeholders
4. Section 3: List of System Use Cases for the complete system
5. Section 4:

(a) System Use Case details (all parts) for **5** main use cases

(b) Activity diagram for **2** System Use Cases, including swim lane divisions for actors and system elements

3.2 What to submit by 14 May 2025

Submit **all** of the following documents via Moodle:

1. User story. Highlight any changes from the previous submission.
2. Requirements file (XLSX) based on the temple provided and filled in as per the instructions above.
3. SRS document (DOCX) with sections 1, 2, 3, and 4 (partial) filled in as per the instructions above.
4. Slides to be presented at the design review (see next section).

3.3 Design Review

On 15 May 2025, we'll take time from class for each team to present their work to the whole class. Each team will have 20 minutes to present the following:

1. 1 cover slide with the name of the project and the names of the students on the team.
2. 1 slide with a summary of the user story
3. A selection of important requirements
4. A review of the use case diagram
5. 1 use case - one with the activity diagram in the SRS.

To make the presentations move more smoothly and remain interesting, practice the presentation before class to ensure it can be completed within 20 minutes. When presenting in class, explain what is written on the slides, do not just recite the words off the slide.

3.4 Feedback and Evaluation

Each team will receive oral feedback during the design review and written feedback with a design review grade.

Grades for the submitted work will be assigned as follows:

- User story: 5%
- Requirements: 25%
- SRS:
    1. Header info: 5%
    2. System use case diagram: 10%
    3. List of system use cases and actors: 5%
    4. System use case details (5): 35%
    5. Activity diagrams (2): 15%

Chapter 4

Iteration 2: Project Design

This is the second design iteration for the semester project. We'll fill in more parts of the project documents and plan more of the software's behavior. At the end of the iteration, there will be a design review in which you'll get feedback on your work so far.

4.1 What to do: Documents

In this iteration you'll begin working on the *Software Architecture Document (SAD)* for the project. You will also update and edit the requirements list and the *Software Requirement Specification (SRS)*.

4.1.1 Requirements

Update the requirements table. Fill in the following columns of the template:

1. Header information: Project name, Student names
2. Requirement ID #
3. Requirement text
4. Source (user story, derived)
5. Functional category (FR)
6. Non-Functional category (NFR)
7. *new* System Use Case (SUC) Trackback for use cases already written

4.1.2 SAD

Complete the following sections of the SAD:

1. Header information (project name, authors, sources)
2. Section 1: System Physical Architecture
   (a) Deployment Diagram. Fill in all hardware nodes with names and appropriate stereotypes. Connect the nodes appropriately with lines that include multiplicity, the protocol type, and the media type. The diagram must reflect the entire system. Create the diagram with Enterprise Architect.

(b) Nodes table. Fill in each hardware node's name (HWCI - Hardware Configuration Item), description, and requirements trackback.

(c) Devices table. Fill in each device's name, description, and requirements trackback.

(d) Components breakdown. The diagram must reflect the entire system and show which components are contained (manifest) within which modules (CSCI (Computer Science Configuration Item)). Create the diagram with Enterprise Architect.

3. Section 2: System Logical Architecture

   (a) Component Diagram. Show each component from the previous components breakdown. Include all provided and required interfaces and short descriptions for each interface. Create the diagrams with Enterprise Architect.

   (b) Component and interface detail tables. Include component names, roles, and all interface details (type, name, detail).

   (c) Composite diagrams. Show each physical node with its software components and ports, including delegation arrows. Create the diagrams with Enterprise Architect.

4. Section 3: Sequence diagrams. Fill in 5 sequence diagrams for the 5 System Use Cases you completed in the SRS in the previous iteration.

4.1.3 SRS

Update the sections of the SRS you wrote for the first iteration with changes as per feedback from the first design review.

4.2 What to submit by 11 June 2025

Submit all of the following documents via Moodle:

1. User story. Highlight any changes from the previous submission.
2. Requirements file (XLSX) based on the temple provided and filled in as per the instructions above. If anything changed since the previous submission, highlight the changes.
3. SRS document (DOCX) with sections 1, 2, and 3, fixed as needed.
4. SAD document (DOCX) with sections 1, 2, and 3 filled in as above.
5. Slides to be presented at the design review (see next section).

4.3 Design Review

On 12 June 2025, each team will be given a chance to present their work to the whole class during the class lecture slot. Each team will have 20 minutes to present the following:

1. 1 cover slide with the name of the project and the names of the students on the team.
2. The deployment diagram
3. The component breakdown
4. The component diagrams
5. The composite diagram

6. 1 of the sequence diagrams.

To make the presentations move more smoothly and remain interesting, practice the presentation before class to ensure it can be completed within 20 minutes. When presenting in class, explain what is written on the slides, do not just recite the words off the slide.

4.3.1 Feedback and Evaluation

Each team will receive oral feedback during the design review and written feedback with a design review grade.

Grades for the submitted work will be assigned as follows:

- User story: 5%
- Requirements: 5%
- SAD:
    1. System physical architecture
        (a) Header info: 5%
        (b) Deployment diagram: 15%
        (c) Nodes and Devices tables: 5%
        (d) Components breakdown: 10%
    2. System logical architecture
        (a) Component diagram: 15%
        (b) Component and interface detail tables: 5%
        (c) Composite diagrams: 15%
    3. Sequence diagrams (5): 20%

Chapter 5

Final Submission: Complete Project

This is the final submission of the semester project. You've submitted parts of the project documents before and received intermediate feedback. This is the final iteration, so you'll submit the entire project report and all supporting documents.

5.1 What to do: Documents

In this iteration you'll finish the project documents: the requirements list, the *Software Requirement Specification (SRS)*, the *Systems Analysis and Design (SAD)* for the project.

5.1.1 Requirements

A final requirements table for the complete system. Fill in all columns in the template:

1. Header information: Project name, Student names
2. Requirement ID #
3. Requirement text
4. Source (user story, derived)
5. Functional category (FR)
6. Non-Functional category (NFR)
7. System Use Case (SUC) trackback
8. *new* Hardware (HW) trackback - which hardware nodes support the requirement

Also fix any issues based on the feedback from the previous design review.

5.1.2 SRS

Complete all sections of the SRS:

1. Header information (project name, authors, sources)
2. Section 1: System Use Case Diagram for the complete system
3. Section 2: List of actors and stakeholders

4. Section 3: List of System Use Cases for the complete system
5. Section 4:
   (a) System Use Case details (all parts) for all use cases.
      - If there are more than 10 use cases, you may put details for the 10 most important ones.
   (b) Activity diagram for 3 System Use Cases, including swim lanes divisions for actors and system elements

Fix any parts of the SRS based on requests for changes or updates from the previous design review.

5.1.3 SAD

Complete all sections of the SAD:

1. Header information (project name, authors, sources)
2. Section 1: System Physical Architecture. All sections.
3. Section 2: System Logical Architecture. All sections.
4. Section 3: Sequence diagrams. For all System Use Cases in the SRS. Create the sequence diagrams using Enterprise Architect.

Fix any parts of the SAD based on requests for changes or updates from the previous design review.

5.2 What to submit by 30 June 2025

Submit the following documents via Moodle:

1. User story. If anything changed since the previous submission, note the changes.
2. Complete and final requirements file (XLSX) based on the temple provided.
3. Complete and final SRS document (DOCX).
4. Complete and final SAD document (DOCX).

5.3 Feedback and Evaluation

Each team will receive written feedback from the instructor and a final grade for the project.

5.3.1 Grading

Grading will be assigned as follows:

- User story: 5%
- Requirements: 20%
- SRS: 35%
  - Header: 5%
  - SUC diagram: 15%
  - List of SUC and actors: 10%
  - SUC details: 40%

  - Activity diagrams (3): 30%
  - SRS Total: 100% - weighted to 35 points for the total project
- SAD: 40%
  - Header: 5%
  - Physical architecture: 30%
    - Deployment diagram: 15%
    - Nodes and computers table: 5%
    - Component breakdown: 10%
  - Logical architecture: 30%
    - Component diagram: 15%
    - Detail tables: 5%
    - Composite diagram: 10%
  - Sequence diagrams: 35%
  - SAD Total: 100% - weighted to 40 points for the total project