CENG350 Software Engineering, Spring 2023-2024

Software Architecture Description (SAD)

SAD Outline and Evaluation v1.0 for FarmBot

In compliance with ISO/IEC/IEEE 42010; see clause 6.

For the definitions of the viewpoints to be used, refer to Rozanski & Woods' "A Viewpoint Catalog" (R&W) highlighted and commented.

Feel free to revise, extend, and refine the material that overlaps with your SRS.

Title Page **[0.5 pt]**

Table of Contents **[0.5 pt]**

List of Figures **[0.5 pt]**

List of Tables (as necessary) **[0.5 pt]**

Revision History **[0 pt]**

1. Introduction **[4 pts total]**

    1.1. Purpose and objectives of FarmBot **[2 pts]**

    1.2. Scope **[1 pt]**

    1.3. Stakeholders and their concerns **[1 pt]**

2. References **[1 pt]**

3. Glossary **[1 pt]**

4. Architectural Views **[65 pts total]**

    4.1. Context View **[10 pts total]** *(R&W chapter 16)*

        4.1.1. Stakeholders' uses of this view **[1 pt]**

        4.1.2. Context Diagram **[2 pt]**

        *Context Diagram should display all external entities that may interact with the system. This section should **include a Context Diagram and explanations** for the context diagram.*

        4.1.3. External Interfaces **[3 pts]**

        *This section should include an **External Interfaces Class Diagram**. Descriptions of the operations given in the external interface class diagram should also be given. **You should aim for 3 external interfaces.***

        4.1.4. Interaction scenarios **[4 pts]**

        *This section includes **2 Activity Diagrams** to show interaction sequences taking place over the external interfaces. Choose the 2 most complex interactions for activity diagrams. They must be different from those in your SRS document.*

4.2. Functional View **[25 pts total]** *(R&W chapter 17)*

    4.2.1. Stakeholders' uses of this view **[1 pt]**

    4.2.2. Component Diagram **[10 pts]**

*This section should include a **Component Diagram and explanations** for the component diagram. The provides/requires relationships between components must be shown.*

    4.2.3. Internal Interfaces **[5 pts]**

*This section should include an **Internal Interfaces Class Diagram**. Descriptions of the operations given in the internal interface class diagram should also be given. **You should aim for 4 internal interfaces.***

    4.2.4. Interaction Patterns **[9 pts]**

*This section includes **3 Sequence Diagrams** to show messaging sequences taking place among the system components over the internal interfaces. Choose the 3 most complex interactions for sequence diagrams. They must be different from those in your SRS document.*

4.3. Information View **[14 pts total]** *(R&W chapter 18)*

    4.3.1. Stakeholders' uses of this view **[1 pt]**

    4.3.2. Database Class Diagram **[9 pts]**

***Database Class Diagram** involving the key database or main memory objects. Complete with relevant associations. Descriptions of the non-obvious names (for classes, attributes, operations) should also be given.*

    4.3.3. Operations on Data **[4 pts]**

*Descriptions of the operations are given in the database class diagram. These operations may deal with the storage and handling of information regarding stores, customers, products, and so on. **Operations should be listed in a table or using bullets.***
These usually include CRUD (Create Read Update Delete) operations.

4.4. Deployment View **[12 total]** *(R&W chapter 21)*

    4.4.1. Stakeholders' uses of this view **[1 pt]**

    4.4.2. Deployment Diagram **[11 pts]**

*This section should include a **Deployment Diagram and explanations** for the deployment diagram.*

4.5. Design Rationale **[4 pts = 4*1]**

*State **one rationale** specifically referring to each view presented.*

5. Architectural Views for Your Suggestions to Improve the Existing System **[25 pts total]**

   5.1. Context View **[5.5 pts total]** *(R&W chapter 16)*

      5.1.1. Stakeholders' uses of this view **[0.5 pt]**

      5.1.2. Context Diagram **[1 pt]**

      Context Diagram for your suggestions *should display all external entities that may interact with the system. This section should* ***include a Context Diagram and explanations*** *for the context diagram.*

      5.1.3. External Interfaces **[2 pts]**

      *This section should include an **External Interfaces Class Diagram for your suggestions**. Descriptions of the operations given in the external interface class diagram should also be given.* ***You should aim for 2 external interfaces.***

      5.1.4. Interaction scenarios **[2 pts]**

      *This section includes **1 Activity Diagram** to show interaction sequences taking place over the external interfaces **for your suggestions**. Choose the most complex interaction for the activity diagram. They must be different from those in your SRS document.*

   5.2. Functional View **[9.5 pts total]** *(R&W chapter 17)*

      5.2.1. Stakeholders' uses of this view **[0.5 pt]**

      5.2.2. Component Diagram **[3 pts]**

      *This section should include a **Component Diagram and its explanations for your suggestions**. The provides/requires relationships between components must be shown.*

      5.2.3. Internal Interfaces **[3 pts]**

      *This section should include an **Internal Interfaces Class Diagram for your suggestions**. Descriptions of the operations given in the internal interface class diagram should also be given.* ***You should aim for 2 internal interfaces.***

      5.2.4. Interaction Patterns **[3 pts]**

      *This section includes **1 Sequence Diagram** to show messaging sequences taking place among the system components over the internal interfaces **for your suggestions**. Choose the most complex interaction for the sequence diagram. They must be different from those in your SRS document.*

   5.3. Information View **[4.5 pts total]** *(R&W chapter 18)*

      5.3.1. Stakeholders' uses of this view **[0.5 pt]**

      5.3.2. Database Class Diagram **[3 pts]**

      Database Class Diagram *involving the key database or main memory objects **for your suggestions**. Complete with relevant associations. Descriptions of the non-obvious names (for classes, attributes, operations) should also be given.*

5.3.3. Operations on Data [1 pt]

*Descriptions of the operations are given in the database class diagram. These operations may deal with the storage and handling of information regarding stores, customers, products, and so on. **Operations for your suggestions should be listed in a table or using bullets.***
These usually include CRUD (Create Read Update Delete) operations.

5.4. Deployment View [3.5 total] *(R&W chapter 21)*

5.4.1. Stakeholders' uses of this view [0.5 pt]

5.4.2. Deployment Diagram [3 pts]

*This section should include a **Deployment Diagram and its explanations for your suggestions**.*

5.5. Design Rationale [2 pts = 4*0.5]

*State **one rationale** specifically referring to each view presented for **your suggestions**.*

Overall Document Quality [2 pts]

6. SysML Diagrams for Existing System and Your Suggestions [30 pts total]

*(**This section should only be completed by three-person groups**. Three-person groups are expected to **model SysML diagrams** in addition to UML diagrams. Three-person group scores (out of 130) will be normalized (out of 100).)*

6.1. SysML Block Definition Diagram for Existing System [7.5 pts total]

***SysML Block Definition Diagram** for the **existing** system goes here.*

6.2. SysML Internal Block Diagram for Existing System [7.5 pts total]

***SysML Internal Block Diagram** for the **existing** system goes here.*

6.3. SysML Block Definition Diagram for Your Suggestions [7.5 pts total]

***SysML Block Definition Diagram** for your **suggestions** to improve the existing system goes here.*

6.4. SysML Internal Block Diagram for Your Suggestions [7.5 pts total]

***SysML Internal Block Diagram** for your **suggestions** to improve the existing system goes here.*

What is expected for SAD part-1:
The structure and format of your SAD document must be complete. All (sub)section titles must be present. The sections can be empty except **from Title Page to Glossary, and Section 4.1.2.**

Section 4.1.2 will have the **Context Diagram and explanations** for the context diagram. This is the minimum requirement; you can do more for SAD part-1.

Individual feedback will not be provided for SAD part-1. However, common obvious mistakes will be summarized within two days of the deadline.

Architectural Views for Suggestions to Improve the Existing System (Section 5):
Section 4 is based on FarmBot as is. Section 5 presents your suggestions to improve the existing FarmBot project. Section 5 exists to show architectural views of your suggestions to improve FarmBot. Your useful and realistic suggestions to improve FarmBot have been modeled in the SRS final, these suggestions' architectural views will be presented in this section. Section 5 will have the same organization as Section 4. In some cases, you may need to reproduce some material from Section 4 for the sake of clarity; keep it at a minimum. In other words, avoid unnecessary duplication between section 4 and section 5.

UML Diagrams (**Sections 5.1.2, 5.1.3, 5.2.2, 5.2.3, 5.3.2, 5.4.2**) **resulting from your suggestions** should be given in Section 5. UML Diagrams after your suggestions should be created here. If your suggestions provide **any changes different than the existing system's UML diagrams** (**Sections 5.1.2, 5.1.3, 5.2.2, 5.2.3, 5.3.2, 5.4.2**), these changes should be drawn using different color **-color yellow is a good choice-** for diagrams in Section 5. To sum up, the diagrams (**Context Diagram, External Interfaces Class Diagram, Component Diagram, Internal Interfaces Class Diagram, Database Class Diagram, Deployment Diagram)** in Section 5 should include both existing project architectural views and architectural views after your suggestions. Your suggestions on UML diagrams in Section 5 should be created **using a different color** so that we can easily understand your suggestions on diagrams.

Section 5.1.4 includes **one Activity Diagram** to show interaction sequences taking place over the external interfaces **for your suggestions**. You should choose the most complex interaction for the activity diagram.

Section 5.2.4 includes **one Sequence Diagram** to show messaging sequences taking place among the system components over the internal interfaces **for your suggestions**. You should choose the most complex interaction for the sequence diagram.

For **Section 5.3.3**, **CRUD (Create Read Update Delete) operations for your suggestions** should be listed in a table or using bullets, you don't need to list existing project CRUD operations in this section.

Note that both SAD part-1 and SAD final documents must include the **group number, students' IDs, and names of members in the group**.

What is to be submitted:
One submission per group.
A zip file submitted to ODTUClass and named as **group#** including the following materials:
    1) SAD document (including diagrams) named as **SAD.pdf**.
    2) UML diagrams' project files as separate files, which must be able to be opened by StarUML.

Grading (20% of overall course grade):

SAD part-1 → 2%
       Document Structure (All sections are present) → **10 pts**
       from Title Page to Glossary → **45 pts**
       4.1.2 → **45 pts**

SAD final → 18%
       The grading rubric above is for the SAD final.
       Total collectable points = **100.**

For the three-person groups, the **SAD part-1 expectation is the same** as for other groups. However, **three-person groups should complete Section 6** in addition to other sections (from Section 1 to Section 5) for the **SAD final**. In other words, one-person groups and two-person groups shouldn't complete Section 6. Section 6 includes SysML models for both the existing system and the improved system.

       SAD final grading for three-person groups:
       Total collectable points for three-person groups = **130**
       Overall grade for three-person groups = **Total collectable points *100/130**
       Overall grade for three-person groups is **total collectable points scaled to 100.**