



KRAVSPECIFIKATION & PROGRAMDESIGN

02161 SOFTWARE ENGINEERING 1


Afleveringsgruppe 13:

Rasmus Wiuff s163977

Mathies Henriksen s200747

Max-Emil Scotten s204633

Kasper Sylvest s205281

github.com/rwiuff/02161ExamProject 

8. maj 2023

INDHOLD

	Side
1 Kravspecifikation	1
1.1 Indledning	1
1.2 Ordliste	1
1.3 Use case diagrammer	2
1.4 Detaljerede use cases	3
2 Diskussion: Kravspecifikation	19
2.1 Oplægsmæssige overvejelser og afgrænsninger	19
2.2 Tekniske overvejelser	20
3 Programdesign	20
3.1 Klassediagram af programdesign	20
3.2 Sekvensdiagrammer	22
4 Diskussion: Programdesign	23
4.1 Datastrukturer	23
4.2 Klassestrukturer	24
Figurer	25
Tabeller	25
Listings	25

1 KRAVSPESIFIKATION

1.1. INDLEDNING

Denne del af rapporten dokumenterer de usecases og begreber som med udgangspunkt i projektoplægget, danner kravspecifikationerne for projektet. Use cases udvikles til Cucumber scenarier som igennem Behavior- og Test Driven Development bliver til den implementation som findes i anden rapport.

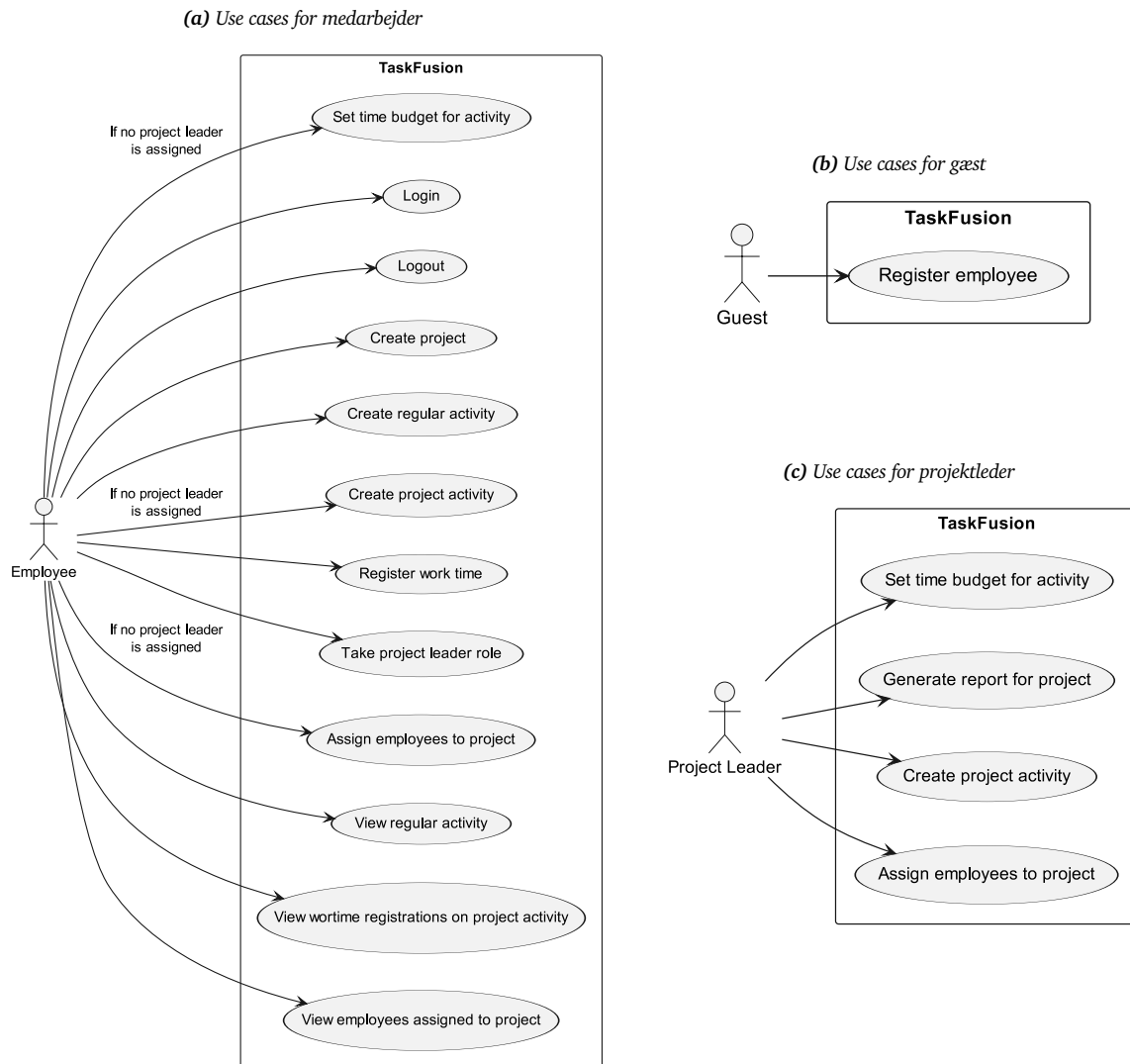
1.2. ORDLISTE

Medarbejder	<i>[Employee]</i> En medarbejder er en entitet ansat i Softwarehuset A/S, som har et unikt medarbejder ID (medarbejder initialer). En medarbejder kan påtage sig en projektleder rolle, oprette projekter, faste aktiviteter, projektaktiviteter og registrere arbejdstid på aktiviteter.
Projekt aktivitet	<i>[Project activity]</i> En delopgave af et projekt. Aktiviteter har en start- og slutuge, og kan få fastsat en budgetteret tid. Alle medarbejdere kan udføre arbejde på alle projektaktiviteter.
Fast aktivitet	<i>[Regular activity]</i> Aktivitet der ikke kan pålægges et projekt. Feks. ferie, sygdom, kurser. Disse har en start- og slutuge.
Projekt	<i>[Project]</i> Udviklingsarbejde udført for en kunde. Et projekt administreres af en projektleder og er inddelt i aktiviteter. Hvert projekt har et projektnummer.
Kunde	<i>[Customer]</i> En ekstern entitet som bestiller og er modtager af projekter.
Projektleder	<i>[Project leader]</i> En medarbejder der har ret til at oprette og tildele aktiviteter for et givent projekt samt generere projektrapporter.
Medarbejder initialer	<i>[Employee initials]</i> Unik identifikation for hver enkelt medarbejder, bestående af fire bogstaver. To første fra fornavn efterfulgt af to første fra efternavn. Feks. "rawi". Hvis initialer allerede er taget, vælges bogstav et og tre i efternavn, derefter et og fire, osv.
Projektnummer	<i>[Project number]</i> Identifikation for hvert enkelt projekt. Har formen årstal efterfulgt af et trecifret løbenummer. Feks. "23001"
Budgetteret tid	<i>[Time budget]</i> En aktivitets estimerede antal hele timer.
Arbejdstidsregistrering	<i>[Work time registration]</i> Mængde tid i inkremerter af halve timer, brugt på en aktivitet. Kan registreres af den medarbejder som har brugt arbejdstid på en given aktivitet.
Start- og sluttid	<i>[Start- and end week]</i> En periode med opløsning på uge-niveau til aktiviteter. Begge tider angives som år og uge, ved formatet "ÅÅUU". Feks. 2304 for uge 4 i 2023. En starttid afgrænser starten af en given uge, en sluttid afgrænser ved slutningen af en given uge. Start- og sluttid kan derfor godt være ens.
Projektrapport	<i>[Project report]</i> Et udskrift der viser info om et projekt, (Leder, kunde, projekt ID), samt aktiviteter, deres arbejdstidsregistreringer og samlede fremgang.

1.3. USE CASE DIAGRAMMER

Dette afsnit starter med Figur 1 som viser hvilke aktører der kan udfører hvilke cases. Herefter kommer en oversigt (Tabel 1) over de detaljerede use cases med henvisning til Cucumber features (3-??) og sekvensdiagrammer (Sider 22 til 23).

Figur 1: Use case diagrammer for programmet hvori de tre aktører inkluderet er Gæst, Medarbejder og Projektleder.



Som beskrevet i Figur 1 har vi tre roller: Medarbejder (Figur 1a), gæst (Figur 1b) og projektleder (Figur 1c). Gæsten er en indgang til et system uden data og kan kun oprette medarbejdere i systemet. Medarbejdere har rettigheder til stort set alle funktioner i programmet, indtil en projektleder udpeges. Herefter er det kun projektlederen på et projekt, der kan tilføje medarbejdere til projektet, oprette projektaktiviteter, angive tidsbudgetter og generere rapporter.

Tabel 1: Use cases for programmet

Detaljeret use case	Cucumber feature	Sekvensdiagram
Opret medarbejder	Listing 1	Figur 4
Login	Listing 2	Figur 5
Logout	Listing 3	Figur 6
Opret projekt	Listings 4 og 5	Figur 7
Påtag projektlederrolle	Listing 6	Figur 8
Tildel medarbejder til projekt	Listing 7	Figur 9
Se medarbejdere tilknyttet et projekt	Listing 8	Figur 10
Opret projektaktivitet	Listings 9, 10 og 11	Figur 11
Anfør tidsbudget på projektaktivitet	Listing 12	Figur 12
Opret fast aktivitet	Listings 13 og 14	Figur 13
Se fast aktivitet	Listing 15	Figur 14
Registrer arbejdstid	Listings 16 og 17	Figur 15
Se registreret arbejdstid på projektaktivitet	Listings 18, 19 og 20	Figur 16
Generér projektrapport	Listings 21 og 22	Figur 17

1.4. DETALJEREDE USE CASES

Listing 1: Cucumber feature: Opret medarbejder

```
1 Feature: Register employee
2 Description: A new employee is added to the application
3 Actors: Guest
4
5 #MAIN SCENARIOS
6 Scenario: 1. Register an employee
7   When the user registers an employee with first name "Michael", last name "Laudrup"
8   Then an employee with first
9     ↳ name "Michael", last name "Laudrup" and initials "mila" exists in the application
10
11 #ALTERNATIVE SCENARIOS
12 Scenario: 1a. First name is required to register an employee
13   When the user registers an employee with first name "", last name "Laudrup"
14   Then the error message "Fornavn mangler" is given
15
16 Scenario: 1b. Last name is required to register an employee
17   When the user registers an employee with first name "Michael", last name ""
18   Then the error message "Efternavn mangler" is given
19
20 Scenario: 1c. If initials exists for a new employee, next letter in last name is used
21   When the user registers an employee with first name "Michael", last name "Laudrup"
22   And the user registers an employee with first name "Mikado", last name "Laudrup"
23   Then an employee with first
24     ↳ name "Michael", last name "Laudrup" and initials "mila" exists in the application
25   And an employee with
26     ↳ first name "Mikado", last name "Laudrup" and initials "milu" exists in the application
```

Listing 2: Cucmber feature: Login

```
1 Feature: Employees can login
2 Description: An employee logs in to the application
3 Actors: employee
4
5 #MAIN SCENARIOS
6 Scenario: 1. Login using initials
7     Given the user registers an employee with first name "Michael", last name "Laudrup"
8     When the user logs in using initials "mila"
9     Then the user with initials "mila" is logged in as an employee
10
11 #ALTERNATIVE SCENARIOS
12 Scenario: 1a. Employee does not exist
13     Given the user logs in using initials "mila"
14     Then the error message "Ukendt medarbejder" is given
15
16 Scenario: 1b. Login is case insensitive
17     Given the user registers an employee with first name "Michael", last name "Laudrup"
18     When the user logs in using initials "MiLa"
19     Then the user with initials "mila" is logged in as an employee
```

Listing 3: Cucmber feature: Logout

```
1 Feature: Employees can log out
2 Description: An employee logs out of the application
3 Actors: employee
4
5 #MAIN SCENARIOS
6 Scenario: 1. Logout
7     Given the user registers an employee with first name "Michael", last name "Laudrup"
8     And the user logs in using initials "mila"
9     When the user logs out
10    Then none is logged in
```

Listing 4: Cucumber feature: Opret projekt (fortsætter på Listing 5)

```
1 Feature: Creating a project
2 Description: An employee creates a project in the application
3 Actors: employee
4
5 #BACKGROUND
6 Background:
7     Given the user registers an employee with first name "Michael", last name "Laudrup"
8     And the user logs in using initials "mila"
9
10 #MAIN SCENARIOS
11 Scenario: 1. Creating a project
12     Given the year is 2019
13     When the user creates a project with title "Projektplanlægning"
14     Then a project
15         ↪ with title "Projektplanlægning" with project number "19001" exists in the application
16     And the employee "mila" have 1 projects
17
18 Scenario: 2. A project can have a customer
19     Given the year is 2023
20     And the user creates a project with title "Projektplanlægning"
21     When the user sets customer "El-Giganten" on project "23001"
22     Then the project "23001" has customer "El-Giganten"
23     And the employee "mila" have 1 projects
24
25 Scenario: 3. A project in an internal project, if it does not have a customer
26     Given the year is 2023
27     And the user creates a project with title "Projektplanlægning"
28     Then the project "23001" is an internal project
29     And the employee "mila" have 1 projects
30
31 Scenario: 4. Project numbers increments with each new project for the same year
32     Given the year is 2023
33     And the user creates a project with title "Projektplanlægning"
34     When the user creates a project with title "Half-life 3"
35     Then a
36         ↪ project with title "Half-life 3" with project number "23002" exists in the application
37     And the employee "mila" have 2 projects
```

Listing 5: Cucumber feature: Opret projekt (fortsat fra Listing 4)

```
37 #ALTERNATIVE SCENARIOS
38 Scenario: 1a. A guest is not able to create a project
39     Given the user logs out
40     And the year is 2023
41     When the user creates a project with title "Projektplanlægning"
42     Then the error message "Login krævet" is given
43
44 Scenario: 1b. A title is required to create a project
45     When the user creates a project with title ""
46     Then the error message "En projekttitel mangler" is given
47     And the employee "mila" have 0 projects
48
49 Scenario: 3a. A project in an external project, if it has a customer
50     Given the year is 2023
51     And the user creates a project with title "Projektplanlægning"
52     When the user sets customer "El-Giganten" on project "23001"
53     Then the project "23001" is an external project
54     And the employee "mila" have 1 projects
55
56 Scenario: 5a. Project number increments is reset with each year
57     Given the year is 2021
58     And the user creates a project with title "Projektplanlægning"
59     And the user creates a project with title "Programdesign"
60     And the year is 2022
61     And the user creates a project with title "Half-life 3"
62     And the user creates a project with title "Implementering"
63
64     Then a project
65     ↪ with title "Projektplanlægning" with project number "21001" exists in the application
66     And a project
67     ↪ with title "Programdesign" with project number "21002" exists in the application
68     And a
69     ↪ project with title "Half-life 3" with project number "22001" exists in the application
70     And a project
71     ↪ with title "Implementering" with project number "22002" exists in the application
72     And there is 4 projects in the application
73     And the employee "mila" have 4 projects
```

Listing 6: Cucumber feature: Påtag projektlederrolle

```
1 Feature: Take on the role of project leader
2 Description: An employee can,
3   ↳ when no project leader is assigned to a project, appoint themselves as project leader.
4 Actors: Employees
5
6 #BACKGROUND
7 Background:
8   Given the user registers an employee with first name "Michael", last name "Laudrup"
9   And the user registers an employee with first name "Brian", last name "Laudrup"
10  And the user logs in using initials "mila"
11  And the year is 2023
12  And the user creates a project with title "Video game"
13  And the user logs out
14
15 #MAIN SCENARIOS
16 Scenario: 1. An employee can appoint themselves as project leader
17   Given the user logs in using initials "mila"
18   When the user takes the role as project leader on project "23001"
19   Then "mila" is the project leader on project "23001"
20
21 #ALTERNATIVE SCENARIOS
22 Scenario: 1a.
23   ↳ An employee appoints himself as project leader on a project where there is already one.
24   Given the user logs in using initials "brla"
25   Given the user takes the role as project leader on project "23001"
26   And the user logs in using initials "mila"
27   Given the user takes the role as project leader on project "23001"
28   Then the error message "Der kan kun være en projektleder" is given
29
30 Scenario: 1b. An employee appoints himself as project leader on a project that does not exist
31   Given the user logs in using initials "mila"
32   And the user takes the role as project leader on project "25001"
33   Then the error message "Projektet kunne ikke findes i samlingen af projekter" is given
```


Listing 7: Cucmber feature: Tildel medarbejder til projekt

```
1 Feature: Assign employees onto project
2 Description: Project leader assigns employees for a project
3 Actors: Project leader
4
5 #BACKGROUND
6 Background:
7     Given the user registers an employee with first name "Michael", last name "Laudrup"
8     And the year is 2023
9     And the user logs in using initials "mila"
10    And the user creates a project with title "Video game"
11    And the user logs out
12
13 #MAIN SCENARIO
14 Scenario: 1. Employee assigns employee to project
15     Given the user logs in using initials "mila"
16     And the user registers an employee with first name "Brian", last name "Laudrup"
17     And the user assigns "brla" to the project "23001"
18     Then the employee "brla" is assigned to the project "23001"
19     And the employee "brla" have 1 projects
20
21 Scenario: 2. Project manager assigns an employee
22     Given the user logs in using initials "mila"
23     And the user takes the role as project leader on project "23001"
24     And the user registers an employee with first name "Brian", last name "Laudrup"
25     When the user assigns "brla" to the project "23001"
26     Then the employee "brla" is assigned to the project "23001"
27     And the employee "brla" have 1 projects
28
29 #ALTERNATIVE SCENARIOS
30 Scenario: 1a. Employee assigns employee to project, with other employee as project leader
31     Given the user logs in using initials "mila"
32     And the user takes the role as project leader on project "23001"
33     And the user registers an employee with first name "Brian", last name "Laudrup"
34     And the user registers an employee with first name "Pape", last name "Poulsen"
35     And the user logs out
36     When the user logs in using initials "brla"
37     And the user assigns "papo" to the project "23001"
38     Then the error message "Kun projektleder kan tildele medarbejdere til projektet" is given
39     And the employee "papo" have 0 projects
40
41 Scenario: 1b. Employee doesn't exist
42     Given the user logs in using initials "mila"
43     And the user assigns "brla" to the project "23001"
44     Then the error message "Ukendt medarbejder" is given
```

Listing 8: Cucumber feature: Se medarbejdere tilknyttet et projekt

```
1 Feature: Get a list of participating employees from a project
2 Description: An employee can get a list of employees assigned to a project.
3 Actors: Employees
4
5 Background:
6     Given the user registers an employee with first name "Michael", last name "Laudrup"
7     And the user logs in using initials "mila"
8     And the year is 2023
9     And the user creates a project with title "Video game"
10    And the user assigns the project
11        ↳ activity "Graphics design" to project "23001" with startWeek "2304" and endWeek "2305"
12    And the user logs out
13
14 Scenario: 1. An employee can view a list of employees assigned to an activity
15     Given the user logs in using initials "mila"
16     And the user registers an employee with first name "Brian", last name "Laudrup"
17     And the user assigns "brla" to the project "23001"
18     And the user assigns "mefr" to the project "23001"
19     When the
20         ↳ user requests a list of employees assigned to the project with project number "23001"
21     Then the employee list contains 2 items
```

Listing 9: Cucumber feature: Opret projektaktivitet som projektleder

```
1 Feature: Creating a project activity for a project with assigned project leader
2 Description: A project leader creates a project activity for a project
3 Actors: employee, projectleader
4
5 #BACKGROUND
6 Background:
7     Given the user registers an employee with first name "Michael", last name "Laudrup"
8     And the user registers an employee with first name "Mette", last name "Frederiksen"
9     And the user logs in using initials "mefr"
10    And the year is 2019
11    And the user creates a project with title "Video game"
12    And the user takes the role as project leader on project "19001"
13    And the user logs out
14
15 #MAIN SCENARIOS
16 Scenario: 1. A project leader can create a project activity
17     Given the user logs in using initials "mefr"
18     When the user assigns the project
19         ↳ activity "Graphics design" to project "19001" with startWeek "1901" and endWeek "1902"
20     Then the project
21         ↳ with the project number "19001" has a project activity titled "Graphics design"
22
23 #ALTERNATIVE SCENARIOS
24 Scenario:
25     ↳ 1a. An employee is not able to create a project activity, when a projectleader is assigned
26     Given the user logs in using initials "mila"
27     When the user assigns the project
28         ↳ activity "Graphics design" to project "19001" with startWeek "1901" and endWeek "1902"
29     Then the error message
30         ↳ "Kun projektlederen kan oprette en projekt aktivitet for dette projekt" is given
```

Listing 10: Cucmber feature: Opret projektaktivitet som medarbejder (fortsætter på Listing 11)

```
1 Feature: Creating a project activity for a project without a project leader
2   Description: An employee creates a project activity for a project without a project leader
3   Actors: employee
4
5 #BACKGROUND
6 Background:
7   Given the user registers an employee with first name "Michael", last name "Laudrup"
8   And the user logs in using initials "mila"
9   And the year is 2022
10  And the user creates a project with title "Video Game"
11
12 #MAIN SCENARIOS
13 Scenario: 1. Creating a project activity
14   When the user assigns the project
15     ↳ activity "Graphics design" to project "22001" with startWeek "2201" and endWeek "2202"
16   Then the
17     ↳ project with the project number "22001" has a project activity titled "Graphics design"
18
19 Scenario: 2. A time budget can be added to a project activity
20   Given the user assigns the project
21     ↳ activity "Graphics design" to project "22001" with startWeek "2201" and endWeek "2202"
22   When the user sets the time budget to 50 hours
23     ↳ on the project activity with the title "Graphics design" and project number "22001"
24   Then the project activity with
25     ↳ the title "Graphics design" and project number "22001" has a time budget of 50 hours
26
27 Scenario: 3. A start week can be set to a project activity
28   Given the user assigns the project
29     ↳ activity "Graphics design" to project "22001" with startWeek "2204" and endWeek "2205"
30   Then the project activity
31     ↳ with the title "Graphics design" and project number "22001" has start week "2204"
32
33 Scenario: 4. An end week can be set to a project activity
34   Given the user assigns the project
35     ↳ activity "Graphics design" to project "22001" with startWeek "2204" and endWeek "2205"
36   Then the project
37     ↳ activity with title "Graphics design" and project number "22001" has end week "2205"
38
39 #ALTERNATIVE SCENARIOS
40 Scenario: 1a. A guest is not able to create a project activity
41   Given the user logs out
42   When the user assigns the project
43     ↳ activity "Graphics design" to project "22001" with startWeek "2201" and endWeek "2202"
44   Then the error message "Login krævet" is given
45
46 Scenario: 1b. A project activity title is unique in a project
47   Given the user assigns the project
48     ↳ activity "Graphics design" to project "22001" with startWeek "2201" and endWeek "2202"
49   When the user assigns the project
50     ↳ activity "Graphics design" to project "22001" with startWeek "2201" and endWeek "2202"
51   Then the error message "Projekt aktivitet findes allerede" is given
52
53 Scenario: 2a. A guest is not able to set a time budget on a project activity
54   Given the user logs out
55   And the user assigns the project
56     ↳ activity "Graphics design" to project "22001" with startWeek "2201" and endWeek "2202"
57   When the user sets the time budget to 50 hours
58     ↳ on the project activity with the title "Graphics design" and project number "22001"
59   Then the error message "Login krævet" is given
```

Listing 11: Cucmber feature: Opret projektaktivitet som medarbejder (fortsat fra Listing 10)

```
47 Scenario: 3a. A guest is not able to set a start week on a project activity
48   Given the user logs out
49   When the user assigns the project
50     ↳ activity "Graphics design" to project "22001" with startWeek "2202" and endWeek "2401"
51   Then the error message "Login krævet" is given
52
53 Scenario: 3b. A start week needs to be before or the same as the end week
54   Given the user logs in using initials "mila"
55   And the user assigns the project
56     ↳ activity "Graphics design" to project "22001" with startWeek "2202" and endWeek "2201"
57   Then the error message "Start uge skal være før eller ens med slut uge" is given
58
59 Scenario: 3c. A start week needs to be before or the same as the end week
60   Given the user logs in using initials "mila"
61   And the user assigns the project
62     ↳ activity "Graphics design" to project "22001" with startWeek "2302" and endWeek "2203"
63   Then the error message "Start år skal være før eller ens med slut år" is given
64
65 Scenario: 3d. A start week needs to be four digits
66   Given the user logs in using initials "mila"
67   And the user assigns the project
68     ↳ activity "Graphics design" to project "22001" with startWeek "222" and endWeek "2203"
69   Then the error message "Start uge og slut uge skal angives med fire cifre" is given
70
71 Scenario: 3e. A end week needs to be four digits
72   Given the user logs in using initials "mila"
73   And the user assigns the project
74     ↳ activity "Graphics design" to project "22001" with startWeek "2203" and endWeek "22211"
75   Then the error message "Start uge og slut uge skal angives med fire cifre" is given
76
77 Scenario: 4a. A guest is not able to set an end week on a project activity
78   Given the user logs out
79   When the user assigns the project
80     ↳ activity "Graphics design" to project "22001" with startWeek "2201" and endWeek "2202"
81   Then the error message "Login krævet" is given
```

Listing 12: Cucumber feature: Anfør tidsbudget på projektaktivitet

```
1 Feature: Set time budget for a regular activity
2 Description: Project leader assigns the time budget for a given activity
3 Actors: Project manager
4
5 #BACKGROUND
6 Background:
7   Given the user registers an employee with first name "Michael", last name "Laudrup"
8   And the user registers an employee with first name "Mette", last name "Frederiksen"
9   And the year is 2015
10  And the user logs in using initials "mila"
11  And the user creates a project with title "Projektplanlægning"
12  And the user takes the role as project leader on project "15001"
13  And the user assigns the project
14    ↪ activity "Graphics design" to project "15001" with startWeek "2301" and endWeek "2305"
15  And the user logs out
16
17 #MAIN SCENARIO
18 Scenario: 1. Project manager assigns a time budget
19   Given the user logs in using initials "mila"
20   And the user sets the time budget to 32 hours
21     ↪ on the project activity with the title "Graphics design" and project number "15001"
22   Then the project activity with
23     ↪ the title "Graphics design" and project number "15001" has a time budget of 32 hours
24
25 #ALTERNATIVE SCENARIOS
26 Scenario: 1a. Employee assigns time buget
27   Given the user logs in using initials "mefr"
28   And the user sets the time budget to 32 hours
29     ↪ on the project activity with the title "Graphics design" and project number "15001"
30   Then the error message "Kun projektlederen kan tildele tidsbudgetter" is given
```

Listing 13: Cucumber feature: Opret fast aktivitet (fortsætter på Listing 14)

```
1 Feature: Creating a regular activity
2 Description: An employee creates a regular activity in the application
3 Actors: employee
4 test
5
6 #BACKGROUND
7 Background:
8   Given the user registers an employee with first name "Michael", last name "Laudrup"
9   And the user logs in using initials "mila"
10  And the year is 2023
11
12 #MAIN SCENARIOS
13 Scenario: 1. Creating a regular activity
14   When the
15     ↪ user creates the regular activity "Ferie" with start week "2304" and end week "2306"
16   Then the user
17     ↪ has a regular activity with title "Ferie" with start week "2304" and end week "2306"
```

Listing 14: Cucmber feature: Opret fast aktivitet (fortsat fra Listing 13)

```
17 #ALTERNATIVE SCENARIOS
18 Scenario: 1a. A guest is not able to create a regular activity
19     Given the user logs out
20     When the
21         ↪ user creates the regular activity "Ferie" with start week "2304" and end week "2306"
22     Then the error message "Login krævet" is given
23
24 Scenario: 1b. A title is required to create a regular activity
25     When the user creates the regular activity "" with start week "2304" and end week "2306"
26     Then the error message "En titel mangler" is given
27
28 Scenario: 1c. A start week is required to create a regular activity
29     When the user creates the regular activity "Ferie" with start week "" and end week "2306"
30     Then the error message "En start uge mangler" is given
31
32 Scenario: 1d. An end week is required to create a regular activity
33     When the user creates the regular activity "Ferie" with start week "2304" and end week ""
34     Then the error message "En slut uge mangler" is given
35
36 Scenario: 1e. Start week needs to be before end week
37     When the
38         ↪ user creates the regular activity "Ferie" with start week "2304" and end week "2303"
39     Then the error message "Start uge skal være før eller ens med slut uge" is given
40
41 Scenario: 1f. Same start and end week is allowed
42     When the
43         ↪ user creates the regular activity "Ferie" with start week "2304" and end week "2304"
44     Then the user
45         ↪ has a regular activity with title "Ferie" with start week "2304" and end week "2304"
46
47 Scenario: 1g. Start week can be greater than end week if start year is less than end year
48     When the
49         ↪ user creates the regular activity "Ferie" with start week "2304" and end week "2402"
50     Then the user
51         ↪ has a regular activity with title "Ferie" with start week "2304" and end week "2402"
52
53 Scenario: 1h. Start week must be of 4 characters long
54     When the
55         ↪ user creates the regular activity "Ferie" with start week "23042" and end week "2305"
56     Then the error message "Start uge og slut uge skal angives med fire cifre" is given
57
58 Scenario: 1i. End week must be of 4 characters long
59     When the user creates the regular activity "Ferie" with start week "2304" and end week "2"
60     Then the error message "Start uge og slut uge skal angives med fire cifre" is given
61
62 Scenario: 1j. The year of start week must be before the year of end week
63     When the
64         ↪ user creates the regular activity "Ferie" with start week "2404" and end week "2305"
65     Then the error message "Start år skal være før eller ens med slut år" is given
```

Listing 15: Cucumber feature: Se fast aktivitet

```
1 Feature: View regular activity
2   Description: An employee wishes to view a regular activity
3   Actors: employee
4
5 #MAIN SCENARIOS
6 Background:
7   Given the year is 2023
8   And the user registers an employee with first name "Michael", last name "Laudrup"
9   And the user logs in using initials "mila"
10  And the
11    ↳ user creates the regular activity "Ferie" with start week "2304" and end week "2306"
12  And the user creates the regular activity "Syg" with start week "2304" and end week "2306"
13  And the user logs out
14
15 Scenario: 1. A employee can view a list of their regular activites
16   Given the user logs in using initials "mila"
17   When the user requests a list of own regular activities
18   Then the regular activities list contains 2 items
19
20 Scenario: 2. A employee can view a regular activity
21   Given the user logs in using initials "mila"
22   When the user requests a regular activity with id 2
23   Then a regular
24     ↳ activity is returned with id 2, title "Syg", start week "2304" and end week "2306"
25
26 #ALTERNATIVE SCENARIOS
27 Scenario: 2a. Only owners of a regular activity can view it
28   Given the user registers an employee with first name "Brian", last name "Laudrup"
29   And the user logs in using initials "brla"
30   When the user requests a regular activity with id 1
31   Then the error message "Du har ikke rettighed til at se denne aktivitet" is given
32
33 Scenario: 2b. Guests cant view a regular activity
34   When the user requests a regular activity with id 1
35   Then the error message "Login krævet" is given
36
37 Scenario: 2c. A non existing id is given
38   Given the user registers an employee with first name "Brian", last name "Laudrup"
39   And the user logs in using initials "brla"
40   When the user requests a regular activity with id 3
41   Then the error message "Kunne ikke finde fast aktivitet" is given
42
43 Scenario: 2d. A non existing parameter list is given
44   Given the user
45     ↳ registers an employee with first name "Mette Frederiksen", last name "Frederiksen"
46   And the user logs in using initials "meffr"
47   When the
48     ↳ user requests a regular activity "Ferie" with start week "2404" and end week "2305"
49   Then the user does not have such a regular activity
```

Listing 16: Cucmber feature: Registrer arbejdstid (fortsætter på Listing 17)

```
1 Feature: Register work time on a project activity
2 Description: An employee registers their work time on a project activity.
3 Actors: employee
4
5 #BACKGROUND
6 Background:
7     Given the user registers an employee with first name "Michael", last name "Laudrup"
8     And the user logs in using initials "mila"
9     And the year is 2023
10    And the user creates a project with title "Video Game"
11    And the user assigns the project
12        ↪ activity "Graphics design" to project "23001" with startWeek "2303" and endWeek "2305"
13
14 #MAIN SCENARIOS
15 Scenario: 1. Register work time on project activity
16     When the user registers a work time of 6 hours to the project
17         ↪ activity with title "Graphics design" in the project with project number "23001"
18     Then the user has 6 hours of registered work
19         ↪ time on the project activity with title "Graphics design" and project number "23001"
20
21 Scenario: 2. Register work time on project activity twice
22     When the user registers a work time of 6 hours to the project
23         ↪ activity with title "Graphics design" in the project with project number "23001"
24     And the user registers a work time of 2 hours to the project
25         ↪ activity with title "Graphics design" in the project with project number "23001"
26     Then the user has 8 hours of registered work
27         ↪ time on the project activity with title "Graphics design" and project number "23001"
28
29 Scenario: 3. User can register worktime if a regular activity exists outside activity period
30     Given the
31         ↪ user creates the regular activity "Ferie" with start week "2305" and end week "2306"
32     And the user
33         ↪ creates the regular activity "Sygeorlov" with start week "2301" and end week "2302"
34     When the user registers a work time of 6 hours to the project
35         ↪ activity with title "Graphics design" in the project with project number "23001"
36     Then the user has 6 hours of registered work
37         ↪ time on the project activity with title "Graphics design" and project number "23001"
38
39 Scenario: 4. User cannot register worktime if a regular activity exists in activity period
40     Given the
41         ↪ user creates the regular activity "Ferie" with start week "2303" and end week "2304"
42     When the user registers a work time of 6 hours to the project
43         ↪ activity with title "Graphics design" in the project with project number "23001"
44     Then the error message "Medarbejderen er optaget af den faste aktivitet: Ferie" is given
```


Listing 17: Cucumber feature: Registrer arbejdstid (fortsat fra Listing 16)

```
34 #ALTERNATIVE SCENARIOS
35 Scenario: 1.a Register worktime in half-hour increments
36   When the user registers a work time of 6.5 hours to the project
37     ↳ activity with title "Graphics design" in the project with project number "23001"
38   Then the user has 6.5 hours of registered work
39     ↳ time on the project activity with title "Graphics design" and project number "23001"
40
41 Scenario: 1.b Project not found
42   When the user registers a work time of 6 hours to the project
43     ↳ activity with title "Graphics design" in the project with project number "23002"
44   Then the error message "Projektet kunne ikke findes i samlingen af projekter" is given
45
46 Scenario: 1.c Project activity not found
47   When the user registers a work time of 6 hours to
48     ↳ the project activity with title "Regndans" in the project with project number "23001"
49   Then the error message "Projektaktiviteten findes ikke." is given
```

Listing 18: Cucumber feature: Se resterende arbejdstid

```
1 Feature: Get remaining activity progress
2 Description: Project leader gets remaining time on activity
3 Actors: Project manager
4
5 #MAIN SCENARIO
6 Scenario: Project leader gets remaining time on activity
7   Given the user registers an employee with first name "Michael", last name "Laudrup"
8   And the year is 2025
9   And the user logs in using initials "mila"
10  And the user creates a project with title "Projektplanlægning"
11  And the user takes the role as project leader on project "25001"
12  And the user assigns the project
13    ↳ activity "Graphics design" to project "25001" with startWeek "2501" and endWeek "2505"
14  And the user sets the time budget to 32 hours
15    ↳ on the project activity with the title "Graphics design" and project number "25001"
16  And the user registers a work time of 6 hours to the project
17    ↳ activity with title "Graphics design" in the project with project number "25001"
18  When the user requests the remaining time on "Graphics design" on project "25001"
19  Then the activity returns 26 hours
```

Listing 19: Cucumber feature: Se registreret arbejdstid på projektaktivitet (fortsætter på Listing 20)

```
1 Feature: View summary of registered work time pr. activity
2 Description: A project leader can view a summary of registered work time per activity
3 Actors: Project leader and employee
4
5 # #BACKGROUND
6 Background:
7     Given the user registers an employee with first name "Michael", last name "Laudrup"
8     And the user registers an employee with first name "Lars", last name "Svendsen"
9     And the year is 2025
10    And the user logs in using initials "lasv"
11    And the user creates a project with title "Video game"
12    And the user takes the role as project leader on project "25001"
13    And the user assigns the project
14        ↪ activity "Graphics design" to project "25001" with startWeek "2501" and endWeek "2505"
15    And the user assigns the project
16        ↪ activity "Gameplay" to project "25001" with startWeek "2501" and endWeek "2502"
17    And the user registers a work time of 6 hours to the project
18        ↪ activity with title "Graphics design" in the project with project number "25001"
19    #ID 1
20    And the user registers a work time of 10 hours to the project
21        ↪ activity with title "Graphics design" in the project with project number "25001"
22    #ID 2
23    And the user logs in using initials "mila"
24    And the user registers a work time of 10 hours to
25        ↪ the project activity with title "Gameplay" in the project with project number "25001"
26    #ID 1
27    And the user registers a work time of 10 hours to
28        ↪ the project activity with title "Gameplay" in the project with project number "25001"
29    #ID 2
30
31 #MAIN SCENARIO
32 Scenario: 1. The project leader can view a summary of registered work time pr. activity
33     Given the user logs in using initials "lasv"
34     When the user requests
35         ↪ a list of all worktime registrations for the project with project number "25001"
36     Then the worktime registration list contains 4 items
37
38 # ALTERNATIVE SCENARIO
39 Scenario: 1a. An employee
40     ↪ recieves an error message when attempting to view the summary of registered work time
41     Given the user logs in using initials "mila"
42     When the user requests
43         ↪ a list of all worktime registrations for the project with project number "25001"
44     Then the error
45         ↪ message "Kun projektlederen kan tilgå oversigten af arbejdstid for projektet" is given
46
47 Scenario: 1b. A project leader can only
48     ↪ view the summary of registered work time for the project to which the person is assigned
49     Given the user logs in using initials "mila"
50     And the user creates a project with title "Web development"
51     And the user takes the role as project leader on project "25002"
52     And the user logs in using initials "lasv"
53     When the user requests
54         ↪ a list of all worktime registrations for the project with project number "25002"
55     Then the error
56         ↪ message "Kun projektlederen kan tilgå oversigten af arbejdstid for projektet" is given
57
58 44
```

Listing 20: Cucumber feature: Se registreret arbejdstid på projektaktivitet (fortsat fra Listing 19)

```
45 Scenario: 1c. The project leader receives an error message if no work time has been registered
46   Given the user logs in using initials "mila"
47   And the user creates a project with title "Web development"
48   And the user takes the role as project leader on project "25002"
49   When the user requests
50     ↳ a list of all worktime registrations for the project with project number "25002"
51   Then the worktime registration list contains 0 items
```

Listing 21: Cucumber feature: Generér projektrapport (fortsætter på Listing 22)

```
1 Feature: Create project report
2 Description: User creates a report
3 Actors: User
4
5 #BACKGROUND
6 Background:
7   Given the date is 20.04.2025
8   And the user registers an employee with first name "Michael", last name "Laudrup"
9   And the user registers an employee with first name "Brian", last name "Laudrup"
10  And the user logs in using initials "mila"
11  And the user creates a project with title "TaskFusion"
12  And the user takes the role as project leader on project "25001"
13  And the user assigns the project
14    ↳ activity "AcceptanceTests" to project "25001" with startWeek "2506" and endWeek "2507"
15  And the user sets the time budget to 47 hours
16    ↳ on the project activity with the title "AcceptanceTests" and project number "25001"
17  And the user assigns the project
18    ↳ activity "UnitTests" to project "25001" with startWeek "2507" and endWeek "2508"
19  And the user sets the time budget to
20    ↳ 80 hours on the project activity with the title "UnitTests" and project number "25001"
21  And the user registers a work time of 6.5 hours to the project
22    ↳ activity with title "AcceptanceTests" in the project with project number "25001"
23  And the user registers a work time of 1 hours to the project
24    ↳ activity with title "AcceptanceTests" in the project with project number "25001"
25  And the user registers a work time of 3.5 hours to
26    ↳ the project activity with title "UnitTests" in the project with project number "25001"
27  And the user registers a work time of 2.5 hours to
28    ↳ the project activity with title "UnitTests" in the project with project number "25001"
29  And the user logs in using initials "brla"
30  And the user registers a work time of 2 hours to the project
31    ↳ activity with title "AcceptanceTests" in the project with project number "25001"
32  And the user registers a work time of 3 hours to the project
33    ↳ activity with title "AcceptanceTests" in the project with project number "25001"
34  And the user registers a work time of 5 hours to
35    ↳ the project activity with title "UnitTests" in the project with project number "25001"
36  And the user registers a work time of 7 hours to
37    ↳ the project activity with title "UnitTests" in the project with project number "25001"
38  And the user logs out
39
40 Scenario: 1a. User generates report
41   Given the user logs in using initials "mila"
42   When the user generates a report for project "25001"
43   Then the number of reports for project "25001" is 1
```

Listing 22: Cucumber feature: Generér projektrapport (fortsat fra Listing 21)

```
33 Scenario: 1b. User generates multiple reports
34     Given the user logs in using initials "mila"
35     And the date is 20.04.2025
36     And the user generates a report for project "25001"
37     And the date is 21.04.2025
38     And the user generates a report for project "25001"
39     Then the number of reports for project "25001" is 2
40
41 Scenario: 2a. Login is required to generate a report
42     Given the user generates a report for project "25001"
43     Then the error message "Login krævet" is given
44
45 Scenario: 2b. Project leader is required to generate a report
46     Given the user logs in using initials "mila"
47     And the user creates a project with title "FaskTusion"
48     When the user generates a report for project "25002"
49     Then the
50         ↳ error message "Projektet mangler en projektleder for at genererer rapporter" is given
51
52 Scenario: 2c. Only project leader can generate a report
53     Given the user logs in using initials "brla"
54     When the user generates a report for project "25001"
55     Then the error message "Kun projektlederen kan generere rapporter" is given
```

2 DISKUSSION: KRAVSPECIFIKATION

2.1. OPLÆGSMÆSSIGE OVERVEJELSER OG AFGRÆNSNINGER

2.1.1. En admin rolle Oplægget nævner som udgangspunkt ikke et krav om en administrator rolle, men derimod at det er et internt system og at der ikke er behov for et sikkerhedslag. Ofte er det oplagt at have en admin entitet, og i dette projekt kunne det som eksempel give mening til oprettelse af medarbejdere. Men i forbindelse med en kortlægning af projektet samt afgrænsning af funktioner, ser vi større værdi for kunden i at fokusere på de ønskede funktioner i stedet for at gætte på at de vil have en admin. Desuden kan en sådan rolle laves senere, hvis nødvendigt. At en gæst kan oprette en medarbejder er dermed et eksempel på brugen af K.I.S.S.¹ ved at anskue denne funktionalitet som en mock admin-klasse, der eksisterer udelukkende i forbindelse med udviklingen af arbejdstidsregistrering og projekthåndtering, de centrale ønsker.

2.1.2. UI og fokus på business logik Oplægget kræver en brugerflade, men giver frit lejde til hvorvidt denne skal være en GUI eller CLI. Vi ønsker at levere noget brugbart til kunden hurtigt, og have K.I.S.S. i fokus for vores beslutninger og afgrænsning. Fra tidlige leverancer kan vi bruge kundens feedback til at videreudvikle på softwareløsningen iterativt, og bedre kunne prioritere udvikling af funktioner løbende. Derfor har vi i første ikke noget grafisk bruger interface, men derimod et program der køres i et CLI. På et senere stadie, i samtale med kunden, kan en grafisk brugerflade implementeres.

2.1.3. Medarbejdere med samme navn For at tilgodese at medarbejdere kan hedde det samme vil medarbejder-objekter blive gemt ud fra deres initialer **som derfor skal være unikke.**

¹(Keep It Simple Stupid)

2.2. TEKNISKE OVERVEJELSER

2.2.1. Abstractions og compositions Disse to begreber bliver kun brugt i abstrakt forstand, da man i Java ikke har direkte kontrol over objekter. De kan konstrueres, men eksistere selv når objekter der peger på dem slettes.

Java har en garbage collector der jævnligt analyserer pointers i programmet og fjerner objekter der ikke bliver peget på.

2.2.2. Persistence For at gøre det muligt at gemme data i objekter og være sikker på at kun disse objekter konstrueres vil singletons blive brugt som indgang til gemt information. Dette kan optimeres ved at gemme data på filer, men dette har vi valgt ikke at fokusere på, for at få tid til funktionalitet.

2.2.3. Adskillelse af UI fra business logik UI'en er som nævnt tekstbaseret. Hele UI-laget er separeret fra business logikken igennem *Facades*, og vil kunne se objekter som *ModelView*-klasser der ikke kan ændre på underliggende data men blot læse disse.

3 PROGRAMDESIGN

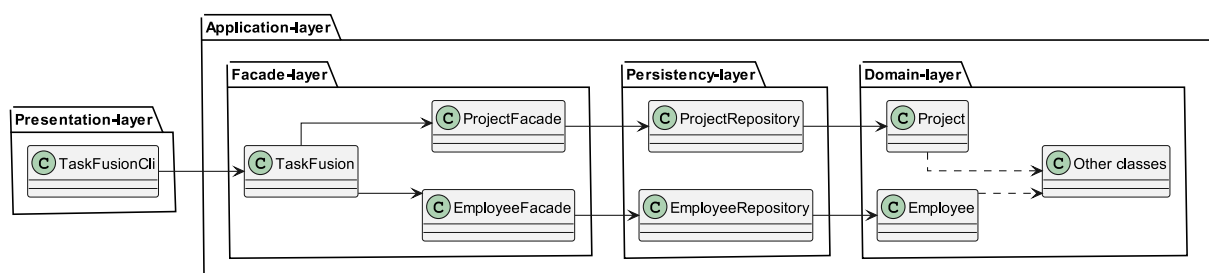
3.1. KLASSEDIAGRAM AF PROGRAMDESIGN

Programmets klasser inddeles i lag som ses på Figur 2. TaskFusionCLI opretter et TaskFusion objekt som opretter ProjectFacade og EmployeeFacade. Her kan TaskFusion sende metodekald til singletons:

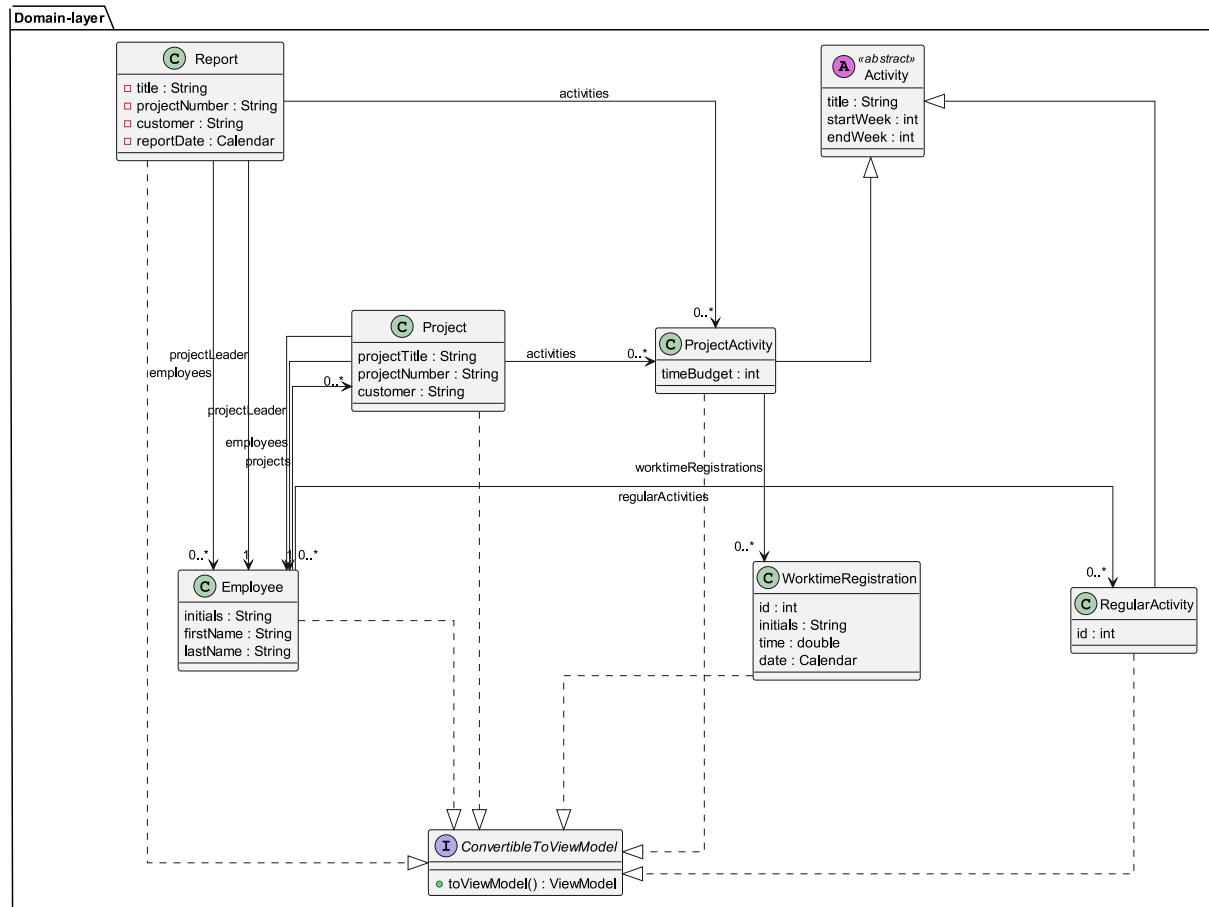
- ProjectRepository
- EmployeeRepository

Metodekaldene opretter og ændrer felter i domain laget, som ses på Figur 3. Skal data bruges i CLI'en hentes en *ModelViewModel* af et objekt, som CLI'en formaterer til brugerfladen.

Figur 2: TaskFusion klasser inddelt i lag

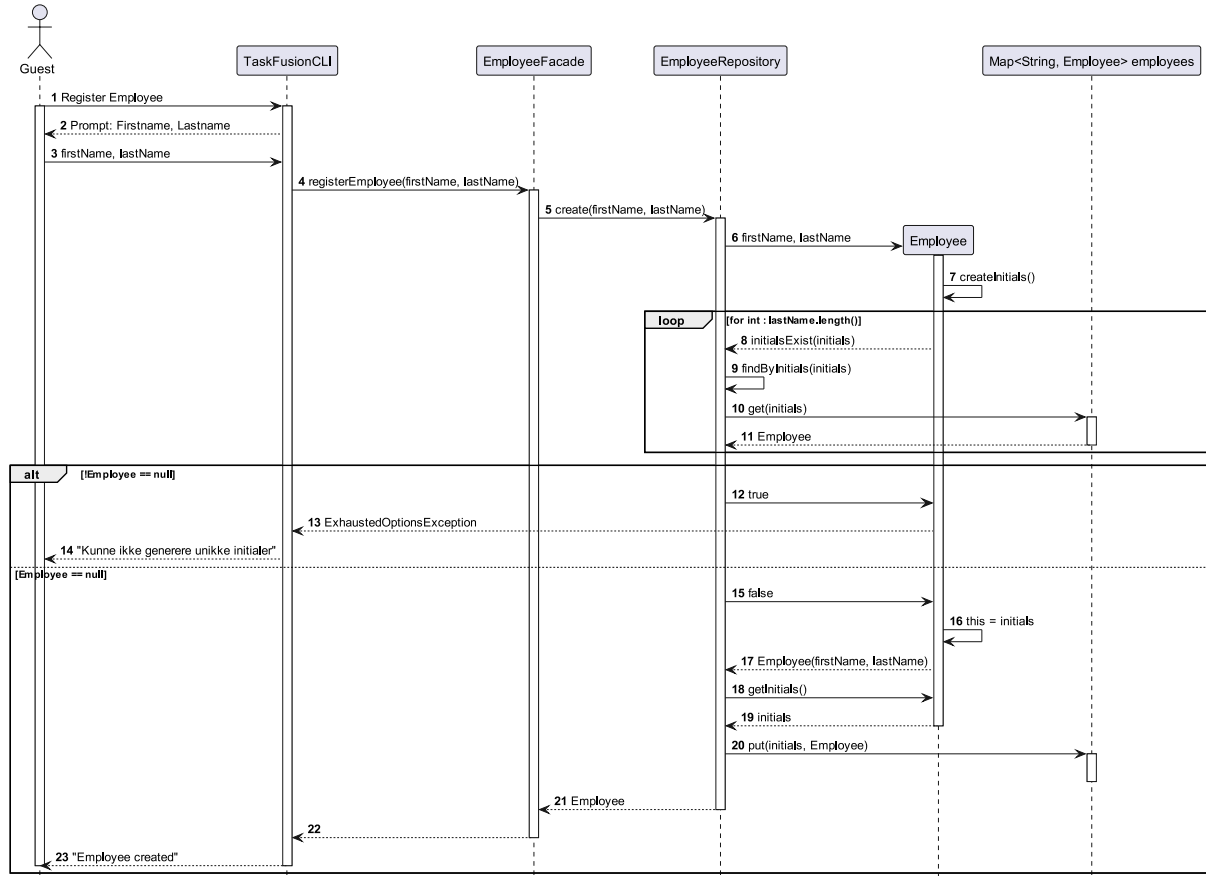


Figur 3: TaskFusion klasser i domain laget

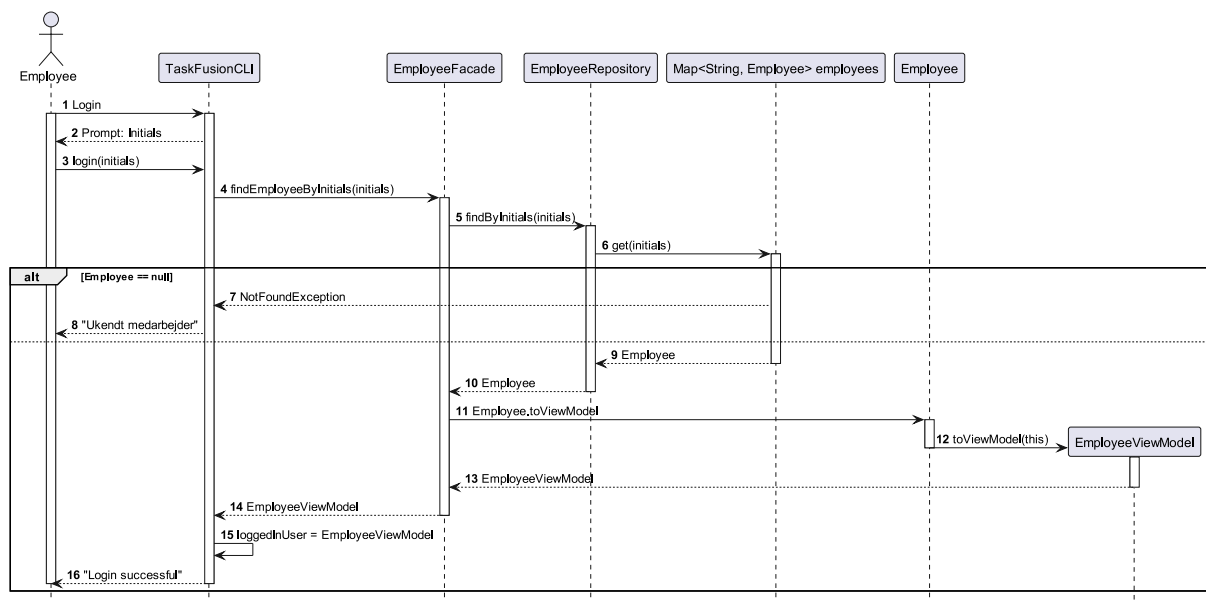


3.2. SEKVENSDIAGRAMMER

Figur 4: Sekvensdiagram: Opret medarbejder



Figur 5: Sekvensdiagram: Login



Figur 6: Sekvensdiagram: Logout

Figur 7: Sekvensdiagram: Opret projekt

Figur 8: Sekvensdiagram: Påtag projektlederrolle

Figur 9: Sekvensdiagram: Tildel medarbejder til projekt

Figur 10: Sekvensdiagram: Se medarbejdere tilknyttet et projekt

Figur 11: Sekvensdiagram: Opret projektaktivitet

Figur 12: Sekvensdiagram: Anfør tidsbudget på projektaktivitet

Figur 13: Sekvensdiagram: Opret fast aktivitet

Figur 14: Sekvensdiagram: Se fast aktivitet

Figur 15: Sekvensdiagram: Registrer arbejdstid

Figur 16: Sekvensdiagram: Se registreret arbejdstid på projektaktivitet

Figur 17: Sekvensdiagram: Generér projektrapport

4 DISKUSSION: PROGRAMDESIGN

I dette afsnit bearbejdes to ting kort:

1. Valg af datastrukturer
2. Valg af klassestrukturer

4.1. DATASTRUKTURER

I valg af datastrukturer er det vigtigt hvorledes vi henter og gemmer data. I programmet bliver medarbejdere og aktiviteter defineret med en unik streng, mens projekter bliver defineret med et løbenummer. Hvis man for nemheds skyld konverterer løbenummeret til en streng, er der mulighed for at alle tre objekter kan gemmes i Map strukturer. Dette gør det nemt at hente objekter med `.get(key)`, udføre operationer på objekterne og overskrive objekterne i Map'et med `.put(key, Object)`. Er det nødvendigt at iterere over et Map, kan man også nemt bruge Java's `.stream()` metode. Ønsker man at gemme brugt arbejdstid på en aktivitet er det derimod nemmest at gemme denne i en List, da arbejdstiden kun akkumuleres.

4.2. KLASSESTRUKTURER

Programmet skal holdes simpelt og objekter skal nødvendigvis eje hinanden på en simpel måde. Det er besluttet at en *Controller/Model*-klasse varetager programmets businessstruktur. Hvis klassen bliver for kompliceret kan der senere indsættes en *Viewer/Controller*-klasse som udelukkende varetager UI. Controller klassen indeholder Maps med projekter, medarbejdere og rapporter. Aktiviteter eksistere som en abstrakt klasse der nedarves til en fast aktivitet (f.eks. ferie), og projekt aktiviteter. De faster kan så ejes af et medarbejder objekt. Projektaktiviteter ejes af projekt objekter. Dermed bliver aktivitetsobjekter så ens som muligt, men ejes af de objekter der skal bruge dem. Med valget af MVC (Model-View-Controller)-arkitektur er der fare for at man som udvikler kan gøre controller-objekter til "gudeklasser", dog egner denne abstraktion sig særligt godt til planlægningsarbejdet, da man ved opmærksomhed på denne fare tvinges til at betragte cohesion og coupling endnu nærmere, end man måske ville have gjort uden den. Ligeledes deler den data og handlinger på de data naturligt (og ansvar), hvilket er en central idé i objektorienteret programmering. Endeligt er det et arkitekturmønster der naturligt passer på denne opgave jf. Softwarehuset's requirements; modellen er i vores tilfælde objekter der repræsenterer projektdata, viewet er vores brugergrænseflade og lader bl.a. Softwarehuset skabe overblik gennem rapporter, og kan vise hvilke medarbejdere er ledige til et projekt. Controlleren udbyder muligheden for at ændre objekterne (f.eks. til registrere arbejdstid, registrere ferie/sygdom og modifikation af projekter).

FIGURER

1	Use case diagrammer for programmet hvori de tre aktører inkluderet er Gæst, Medarbejder og Projektleder	2
2	TaskFusion klasser inddelt i lag	20
3	TaskFusion klasser i domain laget	21
4	Sekvensdiagram: Opret medarbejder	22
5	Sekvensdiagram: Login	22
6	Sekvensdiagram: Logout	23
7	Sekvensdiagram: Opret projekt	23
8	Sekvensdiagram: Påtag projektlederrolle	23
9	Sekvensdiagram: Tildel medarbejder til projekt	23
10	Sekvensdiagram: Se medarbejdere tilknyttet et projekt	23
11	Sekvensdiagram: Opret projektaktivitet	23
12	Sekvensdiagram: Anfør tidsbudget på projektaktivitet	23
13	Sekvensdiagram: Opret fast aktivitet	23
14	Sekvensdiagram: Se fast aktivitet	23
15	Sekvensdiagram: Registrer arbejdstid	23
16	Sekvensdiagram: Se registreret arbejdstid på projektaktivitet	23
17	Sekvensdiagram: Generér projektrapport	23

TABELLER

1	Use cases for programmet	3
---	--------------------------	---

LISTINGS

1	Cucumber feature: Opret medarbejder	3
2	Cucumber feature: Login	4
3	Cucumber feature: Logout	4
4	Cucumber feature: Opret projekt (fortsætter på Listing 5)	5
5	Cucumber feature: Opret projekt (fortsat fra Listing 4)	6
6	Cucumber feature: Påtag projektlederrolle	7
7	Cucumber feature: Tildel medarbejder til projekt	8
8	Cucumber feature: Se medarbejdere tilknyttet et projekt	9
9	Cucumber feature: Opret projektaktivitet som projektleder	9
10	Cucumber feature: Opret projektaktivitet som medarbejder (fortsætter på Listing 11)	10
11	Cucumber feature: Opret projektaktivitet som medarbejder (fortsat fra Listing 10)	11
12	Cucumber feature: Anfør tidsbudget på projektaktivitet	12
13	Cucumber feature: Opret fast aktivitet (fortsætter på Listing 14)	12
14	Cucumber feature: Opret fast aktivitet (fortsat fra Listing 13)	13
15	Cucumber feature: Se fast aktivitet	14
16	Cucumber feature: Registrer arbejdstid (fortsætter på Listing 17)	15
17	Cucumber feature: Registrer arbejdstid (fortsat fra Listing 16)	16
18	Cucumber feature: Se resterende arbejdstid	16
19	Cucumber feature: Se registreret arbejdstid på projektaktivitet (fortsætter på Listing 20)	17
20	Cucumber feature: Se registreret arbejdstid på projektaktivitet (fortsat fra Listing 19)	18
21	Cucumber feature: Generér projektrapport (fortsætter på Listing 22)	18
22	Cucumber feature: Generér projektrapport (fortsat fra Listing 21)	19