



# KRAVSPECIFIKATION & PROGRAMDESIGN

02161 SOFTWARE ENGINEERING 1


**Afleveringsgruppe 13:**

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[github.com/rwiuff/02161ExamProject](https://github.com/rwiuff/02161ExamProject) 

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## 1 KRAVSPESIFIKATION

### 1.1. INDLEDNING

Denne del af eksamensopgaven dokumenterer vores planlægningsproces, der skal tilvejebringe et tids/projektstyringsprogram der møder Softwarehuset A/S' ønsker. Det gøres ved hjælp af ideer og modeller fra Behavior- og Test Driven Development, der ved hjælp af brainstorming lader os gå fra kundeønsker til scenarier, fra scenarier til tests og fra tests til kode (tests og kode i næste rapport), alt sammen med rod i beskrivelsen af Softwarehusets ønsker.

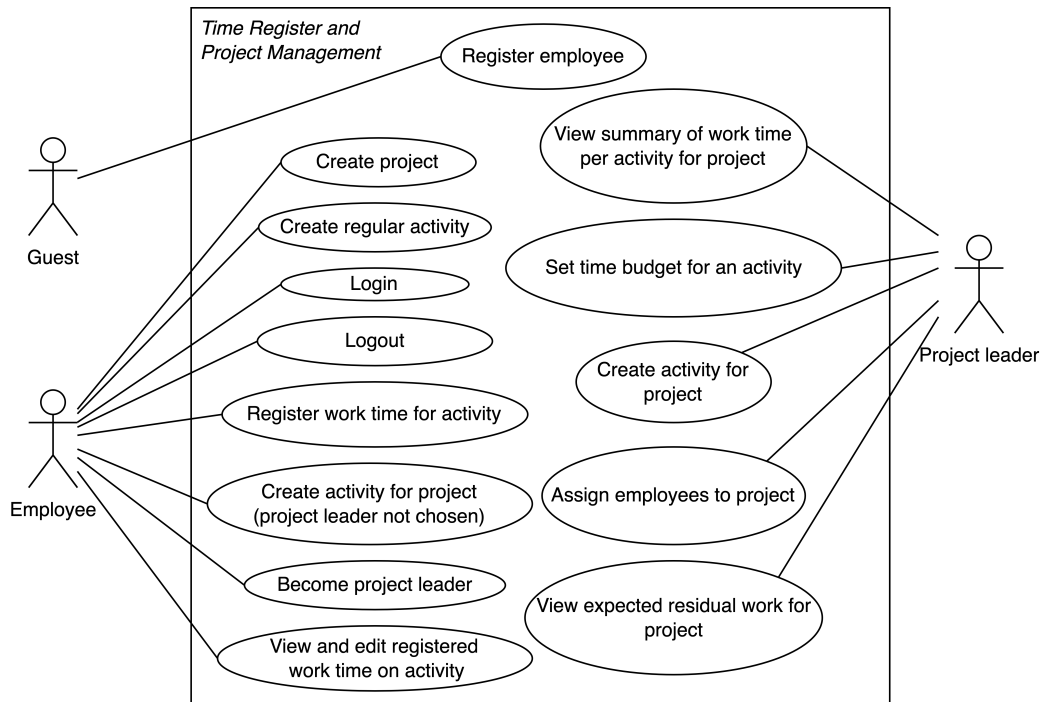
### 1.2. ORDLISTE

<b>Medarbejder</b>	<i>[Employee]</i> En medarbejder er en person ansat i Softwarehuset A/S, som er tildelt aktiviteter. En medarbejder kan udføre aktiviteter og registrere arbejdstid brugt på aktiviteter, uagtet om medarbejderen er tilknyttet aktiviteten. Hver medarbejder har et medarbejder ID.
<b>Projekt aktivitet</b>	<i>[Project activity]</i> En delopgave af et projekt. Hver aktivitet er tilknyttet en medarbejder.
<b>Fast aktivitet</b>	<i>[Regular activity]</i> Aktivitet der ikke kan pålægges et projekt. Feks. ferie, sygdom, kurser.
<b>Projekt</b>	<i>[Project]</i> Udviklingsarbejde udført for en kunde (ekstern) eller for Softwarehuset A/S (internt). Et projekt administreres af en projektleder og er inddelt i aktiviteter. Hvert projekt har et projektnummer.
<b>Kunde</b>	<i>[Customer]</i> En ekstern entitet som bestiller og er modtager af projekter.
<b>Projektleder</b>	<i>[Project leader]</i> En medarbejder der har ret til at oprette og tildele aktiviteter for et givent projekt.
<b>Softwarehuset A/S</b>	<i>[Softwarehuset A/S]</i> Entitet som er modtager af et projekt, hvis projektet er internt.
<b>Medarbejder initialer</b>	<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.
<b>Projektnummer</b>	<i>[Project number]</i> Identifikation for hvert enkelt projekt. Har formen årstal efterfulgt af et trecifret løbenummer. Feks. 23001
<b>Budgetteret tid</b>	<i>[Time budget]</i> En aktivitets estimerede antal hele timer.
<b>Arbejdstid</b>	<i>[Work time]</i> Mængde tid i inkremitter af halve timer, brugt på en aktivitet. Kan registreres af den medarbejder som har brugt arbejdstid på en given aktivitet.
<b>Start- og sluttid</b>	<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.

### 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 og hvilke sider der indeholder Cucumber features (Sider 3 til 16) og sekvensdiagrammer (Afsnit 3.2).

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



**Tabel 1:** Use cases for programmet

Detaljeret use case	Cucumber feature	Sekvensdiagram
Opret Medarbejder	Listing 1	Figur 4
Log in	Listing 2	Figur 5
Log ud	Listing 3	Figur 6
Opret projekt	Listing 4	Figur 7
Opret fast aktivitet	Listing 5	
Opret Aktivitet for projekt uden projektleder	Listings 6 og 7	Figurer 8 til 12
Opret Aktivitet for projekt med projektleder	Listing 8	Figur 13
Påtag projektleder stilling	Listing 9	Figur 15
Registrer arbejdstid på projekt aktivitet	Listing 10	
Se og rediger i registreret arbejdstid på aktivitet	Listings 11 og 12	
Se oversigt over registreret arbejdstid på aktivitet	Listing 13	
Anfør budgetteret tid til løsning af aktivitet	Listing 14	Figur 10
Tilknyt medarbejdere til projekt	Listing 15	
Se forventet restarbejde på projekt	Listing 16	

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#### 1.4. DETALJEREDE USE CASES

*Listing 1: Use case: 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
8     ↳ an employee with first first name "Michael", last name "Laudrup" and initials "mila"
9   Then an employee with first
10     ↳ name "Michael", last name "Laudrup" and initials "mila" exists in the application
11
12 Scenario: 2. Employee already exist
13   And the application has a
14     ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
15   When the user registers
16     ↳ an employee with first first name "Michael", last name "Laudrup" and initials "mila"
17   Then the error message "Medarbejder med initialer mila eksisterer allerede" is given
18
19 #ALTERNATIVE SCENARIOS
20 Scenario: 1a. First and last name is required to register an employee
21   When the user registers an employee with first name "", last name "" and initials "mila"
22   Then the error message "For- og/eller efternavn mangler" is given
23
24 Scenario: 1b. Initials is required to register an employee
25   When the user registers the
26     ↳ employee an employee with first name "Michael", last name "Laudrup" and initials ""
27   Then the error message "Initialer mangler" is given
28
29 Scenario: 2a. Employees with same name can be registered
30   And the application has a
31     ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
32   When the user registers
33     ↳ an employee with first name "Michael", last name "Laudrup" and initials "milb"
34   Then an employee with first
35     ↳ name "Michael", last name "Laudrup" and initials "milb" exists in the application
```

*Listing 2: Use case: Medarbejder log in*

```
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 application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9     When the user logs in using initials "mila"
10    Then the user with initials "mila" is logged in as an employee
11
12 Scenario: 2. Employee does not exist
13     Given the user logs in using initials "mila"
14     Then the error message "Ukendt medarbejder" is given
15
16 #ALTERNATIVE SCENARIOS
17 Scenario: 1a. Login is case insensitive
18     Given the application has a
19         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
20     When the user logs in using initials "MiLa"
21     Then the user with initials "mila" is logged in as an employee
```

*Listing 3: Use case: Medarbejder log ud*

```
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 application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9     And the user with initials "mila" is logged in as an employee
10    When the user logs out
11    Then none is logged in
```

Listing 4: Use case: Opret projekt

```
1 Feature: Creating a project
2 Description: An employee creates a project in the application
3 Actors: employee
4
5 #MAIN SCENARIOS
6 Scenario: 1. Creating a project
7     Given the application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9     And the user with initials "mila" is logged in as an employee
10    And the year is 2023
11    When the user creates a project with title "Projektplanlægning"
12    Then a project
13        ↳ with title "Projektplanlægning" with project number 23001 exists in the application
14
15 Scenario: 2. A project can have a customer
16     Given the application has a
17         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
18     And the user logs in using initials "mila"
19     And a project
20         ↳ with title "Projektplanlægning" with project number 23001 exists in the application
21     When the user sets customer "El-Giganten" on project 23001
22     Then the project 23001 has customer "El-Giganten"
23
24 Scenario: 3. A project can be an internal project
25     Given the application has a
26         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
27     And the user logs in using initials "mila"
28     And a project
29         ↳ with title "Projektplanlægning" with project number 23001 exists in the application
30     When the user sets the project as an internal project
31     Then the project is an internal project
32
33 Scenario: 4. A project can have a start week
34     Given the application has a
35         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
36     And the user logs in using initials "mila"
37     And a project
38         ↳ with title "Projektplanlægning" with project number 23001 exists in the application
39     When the user sets the start week to 2304
40     Then the project has start week 2304
41
42 #ALTERNATIVE SCENARIOS
43 Scenario: 1a. A guest is not able to create a project
44     Given none is logged in
45     And the year is 2023
46     When the user creates a project with title "Projektplanlægning"
47     Then the error message "Kun medarbejdere kan oprette et projekt" is given
48
49 Scenario: 1b. A title is required to create a project
50     Given the application has a
51         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
52     And the user logs in using initials "mila"
53     When the user creates a project with title ""
54     Then the error message "En projekttitel mangler" is given
```

*Listing 5: Use case: Opret fast aktivitet*

```
1 Feature: Creating a regular activity
2 Description: An employee creates a regular activity in the application
3 Actors: employee
4
5 #MAIN SCENARIOS
6 Scenario: 1. Creating a regular activity
7     Given the application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9     And the user logs in using initials "mila"
10    When the user creates the regular activity "Ferie" with start week 2304 and end week 2306
11    Then the
12        ↳ user has a regular activity with title "Ferie" with start week 2304 and end week 2306
13
14 #ALTERNATIVE SCENARIOS
15 Scenario: 1a. A guest is not able to create a regular activity
16     Given none is logged in
17     When the user creates the regular activity "Ferie" with start week 2304 and end week 2306
18     Then the error message "Kun medarbejdere kan oprette en fast aktivitet" is given
19
20 Scenario: 1b. A title is required to create a regular activity
21     Given the application has a
22         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
23     And the user logs in using initials "mila"
24     When the user creates the regular activity "" with start week 2304 and end week 2306
25     Then the error message "En titel mangler" is given
26
27 Scenario: 1c. A start week is required to create a regular activity
28     Given the application has a
29         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
30     And the user logs in using initials "mila"
31     When the user creates the regular activity "Ferie" with start week "" and end week 2306
32     Then the error message "En start uge mangler" is given
33
34 Scenario: 1d. An end week is required to create a regular activity
35     Given the application has a
36         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
37     And the user logs in using initials "mila"
38     When the user creates the regular activity "Ferie" with start week 2304 and end week ""
39     Then the error message "En slut uge mangler" is given
40
41 Scenario: 1e. Start week needs to be before end week
42     Given the application has a
43         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
44     And the user logs in using initials "mila"
45     When the user creates the regular activity "Ferie" with start week 2304 and end week 2303
46     Then the error message "Start uge skal være før slut uge" is given
47
48 Scenario: 1f. Same start and end week is allowed
49     Given the application has a
50         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
51     And the user logs in using initials "mila"
52     When the user creates the regular activity "Ferie" with start week 2304 and end week 2304
53     Then the
54         ↳ user has a regular activity with title "Ferie" with start week 2304 and end week 2304
```

*Listing 6: Use case: Opret projekt aktivitet for projekt uden projektleder. Fortsætter på Listing 7*

```
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 application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9     And the user logs in using initials "mila"
10    And a project with title "Video Game" with project number 23001 exists in the application
11
12 #MAIN SCENARIOS
13 Scenario: 1. Creating a project activity
14     When the user assigns the project activity "Graphics design" to project 23001
15     Then the
16         ↳ project with the project number 23001 has a project activity titled "Graphics design"
17
18 Scenario: 2. A time budget can be added to a project activity
19     And an activity
20         ↳ with the title "Graphics design" exists within the project with project number 23001
21     When the user sets the time budget to 50 hours
22         ↳ on the project activity with the title "Graphics design" and project number 23001
23     Then the project activity with
24         ↳ the title "Graphics design" and project number 23001 has a time budget of 50 hours
25
26 Scenario: 3. A start week can be set to a project activity
27     And an activity
28         ↳ with the title "Graphics design" exists within the project with project number 23001
29     When the user sets the start week to 2304 on the
30         ↳ project activity with title "Graphics design" on the project with project number 23001
31     Then the project
32         ↳ activity with the title "Graphics design" and project number 23001 has start week 2304
33
34 Scenario: 4. An end week can be set to a project activity
35     And an activity
36         ↳ with the title "Graphics design" exists within the project with project number 23001
37     When the user sets the end week to 2304 on the
38         ↳ project activity with title "Graphics design" on the project with project number 23001
39     Then the project
40         ↳ activity with title "Graphics design" and project number 23001 has end week 2304
41
42 #ALTERNATIVE SCENARIOS
43 Scenario: 1a. A guest is not able to create a project activity
44     Given none is logged in
45     When the user assigns the project activity "Graphics design" to project 23001
46     Then the error message "Login krævet" is given
47
48 Scenario: 1b. A project activity title is unique in a project
49     Given the user logs in using initials "mila"
50     And an activity
51         ↳ with the title "Graphics design" exists within the project with project number 23001
52     When the user assigns the project activity "Graphics design" to project 23001
53     Then the error message "Projekt aktivitet findes allerede" is given
```



*Listing 7: Use case: Opret projekt aktivitet for projekt uden projektleder. Fortsat fra Listing 6*

```
42 Scenario: 2a. A guest is not able to set a time budget on a project activity
43   Given none is logged in
44   And an activity with the title "Graphics design" exists within the project 23001
45   When the user sets the time budget to 50 hours
46     ↳ on the project activity with the title "Graphics design" and project number 23001
47   Then the error message "Login krævet" is given
48
49 Scenario: 3a. A guest is not able to set a start week on a project activity
50   Given none is logged in
51   And an activity
52     ↳ with the title "Graphics design" exists within the project with project number 23001
53   When the user sets the start week
54     ↳ to 2304 on the project activity with title "Graphics design" and project number 23001
55   Then the error message "Login krævet" is given
56
57 Scenario: 3b. A start week needs to be before or the same as the end week
58   Given the user logs in using initials "mila"
59   And an activity
60     ↳ with the title "Graphics design" exists within the project with project number 23001
61   When the user sets the start week to 2304 on the
62     ↳ project activity with title "Graphics design" on the project with project number 23001
63   And the user sets the end week to 2304 on the
64     ↳ project activity with title "Graphics design" on the project with project number 23001
65   Then the error message "Starttid skal være før eller ens med sluttid" is given
66
67 Scenario: 4a. A guest is not able to set an end week on a project activity
68   Given the user is logged in as "mila"
69   And an activity
70     ↳ with the title "Graphics design" exists within the project with project number 23001
71   When the user sets the end week to 2304 on project
72     ↳ activity with the title "Graphics design" on the project with project number 23001
73   Then the error message "Login krævet" is given
74
75 Scenario: 4b. An end week needs to be after or same as start week
76   Given the user is logged in as "mila"
77   And an activity
78     ↳ with the title "Graphics design" exists within the project with project number 23001
79   When the user sets the start week to 2304 and end week to 2303 on the project
80     ↳ activity with the title "Graphics design" on the project with project number 23001
81   Then the error message "Sluttid skal være efter eller ens med starttid" is given
```

*Listing 8: Use case: Opret projekt aktivitet for projekt med 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 application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9     And the application has a registered
10        ↳ employee with first name "Mette", last name "Frederiksen" and initials "mefr"
11    And a project with title "Video game" with project number 23001 exists in the application
12    And "mefr" takes the role as project leader on project 23001
13
14 #MAIN SCENARIOS
15 Scenario: 1. A project leader can create a project activity
16     Given the user logs in using initials "mefr"
17     When the user assigns the project activity "Graphics design" to project 23001
18     Then the
19         ↳ project with the project number 23001 has a project activity titled "Graphics design"
20
21 #ALTERNATIVE SCENARIOS
22 Scenario: 1a. An employee is not able to create a project activity
23     Given the user logs in using initials "mefr"
24     When the user assigns the project activity "Graphics design" to project 23001
25     Then the error message "Kun projektlederen kan redigere denne projekt aktivitet" is given
```

*Listing 9: Use case: Medarbejder udpeger sig som projektleder*

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

*Listing 10: Use case: Registrer arbejdstid på projekt aktivitet*

```
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 application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9     And a project with title "Video game" with project number 23001 exists in the application
10    And an activity
11        ↳ with the title "Graphics design" exists within the project with project number 23001
12    And the user logs in using initials "mila"
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
17         ↳ project 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 #ALTERNATIVE SCENARIOS
22 Scenario: 1.a Register worktime in half-hour increments
23     When the user registers a work time of 6.5 hours to the
24         ↳ project activity with title "Graphics design" in the project with project number 23001
25     Then the user has 6.5 hours of registered work time on the
26         ↳ project activity with title "Graphics design" in the project with project number 23001
27
28 Scenario: 1.b Project not found
29     When the user registers a work time of 6 hours to the
30         ↳ project activity with title "Graphics design" in the project with project number 23002
31     Then the error message "Ukendt projekt" is given
32
33 Scenario: 1.c Project activity not found
34     When the user registers a work time of 6 hours
35         ↳ to the project activity with title "Regndans" in the project with project number 23001
36     Then the error message "Ukendt projekt aktivitet" is given
```

Listing 11: Use case: Se og rediger i registreret arbejdstid på aktivitet. Fortsætter på Listing 12

```
1 Feature: View and edit registered work time on a project activity
2   Description: An employee wishes to view or edit registered work time on an activity
3   Actors: employee and guest
4
5 #BACKGROUND
6 Background:
7   Given the application has a
8     ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9   And a project with title "Vide game" with project number 23001 exists in the application
10  And an activity
11    ↳ with the title "Graphics design" exists within the project with project number 23001
12  And the employee with initials "mila" has registered 6 hours of work
13    ↳ time to the activity titled "Graphics design" in the project with project number 23001
14  And the employee with initials "mila" has registered 10 hours of work
15    ↳ time to the activity titled "Graphics design" in the project with project number 23001
16
17 #MAIN SCENARIOS
18 Scenario: 1. An employee can view a list of work time registrations for an activity
19   Given the user logs in using initials "mila"
20   When the list of work time registrations is requested
21     ↳ for the activity titled "Graphics design" in the project with project number 23001
22   Then a list containing 2 items with the values 6 and 10 is returned
23
24 Scenario: 2. An employee can view the total amount of registered work time for an activity
25   Given the user logs in using initials "mila"
26   When the total amount of registered work time is requested
27     ↳ for the activity titled "Graphics design" in the project with project number 23001
28   Then 16 hours is returned
29
30 Scenario: 3. An employee can edit the total amount of registered work time for an activity
31   Given the user logs in using initials "mila"
32   And the user edits the total amount of registered work time to 18 hours
33     ↳ for the activity titled "Graphics design" in the project with project number 23001
34   When the total amount of registered work time is requested
35     ↳ for the activity titled "Graphics design" in the project with project number 23001
36   Then 18 hours is returned
37
38 Scenario: 4. An employee can edit individual work time registrations for an activity
39   Given the user logs in using initials "mila"
40   And the user edits the first registered work time registration to 7 hours
41     ↳ for the activity titled "Graphics design" in the project with project number 23001
42   When the list of work time registrations is requested
43     ↳ for the activity titled "Graphics design" in the project with project number 23001
44   Then a list containing 2 items with the values 7 and 10 hours is returned
45
46 #ALTERNATIVE SCENARIOS
47 Scenario: 1a. Guests are unable to view the list of work time registrations for an activity
48   Given none is logged in
49   When the list of work time registrations is requested
50     ↳ for the activity titled "Graphics design" in the project with project number 23001
51   Then the error message "Login kræves" is given
52
53 Scenario:
54   ↳ 2a. Guests are unable to view the total amount of registered work time for an activity
55     Given none is logged in
56     When the total amount of registered work time is requested for
57       ↳ the project activity titled "Graphics design" in the project with project number 23001
58     Then the error message "Login kræves" is given
```

Listing 12: Use case: Se og rediger i registreret arbejdstid på aktivitet. Fortsat fra Listing 11

```
46 Scenario:
   ↳ 3a. Guests are unable to edit the total amount of registered work time for an activity
47   Given none is logged in
48   When the user edits the first registered work time registration to 7 hours
   ↳ for the activity titled "Graphics design" in the project with project number 23001
49   Then the error message "Login kræves" is given
50
51 Scenario: 4a. Guests are unable to edit individual work time registrations for an activity
52   Given none is logged in
53   When the user edits the total amount of registered work time
   ↳ for the activity titled "Graphics design" in the project with project number 23001
54   Then the error message "Login kræves" is given
55
56 Scenario: 1b. An employee wishes
   ↳ to view the list of work time registrations for an activity with no work time registered
57   Given the user logs in using initials "mila"
58   And an activity
   ↳ with the title "Implement physics" exists within the project with project number 23001
59   When the list of work time registrations is requested
   ↳ for the activity titled "Implement physics" in the project with project number 23001
60   Then
   ↳ the error message "Ingen arbejdstid er registreret for denne aktivitet endnu" is given
61
62 Scenario: 2b. An employee wishes to
   ↳ view the total amount of registered work time for an activity with no registered work time
63   Given the user logs in using initials "mila"
64   And an activity
   ↳ with the title "Implement physics" exists within the project with project number 23001
65   When the the total amount of registered work time is requested
   ↳ for the activity titled "Implement physics" in the project with project number 23001
66   Then
   ↳ the error message "Ingen arbejdstid er registreret for denne aktivitet endnu" is given
67
68 Scenario: 3b. An employee wishes to
   ↳ edit the total amount of registered work time for an activity with no registered work time
69   Given the user logs in using initials "mila"
70   And an activity
   ↳ with the title "Implement physics" exists within the project with project number 23001
71   When the user edits the total amount of registered work time to 18 hours
   ↳ for the activity titled "Implement physics" in the project with project number 23001
72   Then
   ↳ the error message "Ingen arbejdstid er registreret for denne aktivitet endnu" is given
73
74 Scenario: 4b. An employee wishes
   ↳ to edit individual work time registrations for an activity with no registered work time
75   Given the user logs in using initials "mila"
76   And an activity
   ↳ with the title "Implement physics" exists within the project with project number 23001
77   When the user edits the first registered work time registration to 7 hours
   ↳ for the activity titled "Implement physics" in the project with project number 23001
78   Then the error message "Ingen arbejdstid er registreret for denne aktivitet endnu"
```

*Listing 13: Use case: Se oversigt over registreret arbejdstid på aktivitet*

```
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 application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9     And the application has
10        ↳ a registered employee with first name "Lars", last name "Svendsen" and initials "lasv"
11    And a project with title "Video game" with project number 23001 exists in the application
12    And "lasv" takes the role as project leader on project 23001
13    And multiple activities
14        ↳ with registered work time for "mila" exists within the project titled "Video game"
15
16 #MAIN SCENARIO
17 Scenario: 1. The project leader can view a summary of registered work time pr. activity
18     Given the user logs in using initials "lasv"
19     And "lasv" is the project leader on project 23001
20     When "lasv" wishes to view a summary of the work time for the project titled "Video game"
21     Then a summary
22         ↳ of registered work time pr. activity under the project titled "Video game" is shown
23
24 #ALTERNATIVE SCENARIO
25 Scenario: 1a. An employee
26     ↳ receives an error message when attempting to view the summary of registered work time
27     When "mila" wishes to view a summary of the work time for the project titled "Video game"
28     Then the error
29         ↳ message "Kun projektlederen kan tilgå oversigten af arbejdstid for projektet" is given
30
31 Scenario: 1b. A project leader can only
32     ↳ view the summary of registered work time for the project to which the person is assigned
33     Given a project
34         ↳ with title "Web development" with project number 23002 exists in the application
35     When "lasv"
36         ↳ wishes to view a summary of the worktime for the project titled "Web development"
37     Then an error
38         ↳ message "Kun projektlederen kan tilgå oversigten af arbejdstid for projektet" is given
39
40 Scenario: 1c. The project leader receives an error message if no work time has been registered
41     When "lasv" wishes to view a summary of the worktime for the project "Video game"
42     Then
43         ↳ the error message "Ingen arbejdstid er registreret under dette projekt endnu" is given
```

*Listing 14: Use case: Budgetteret tid til aktivitet*

```
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 #MAIN SCENARIO
6 Scenario: Project manager assigns a time budget
7   Given the application has a
8     ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9   And a project
10    ↳ with title "Projektplanlægning" with project number 23001 exists in the application
11  And "mila" takes the role as project leader on project 23001
12  And an activity
13    ↳ with the title "Graphics design" exists within the project with project number 23001
14  And the user logs in using initials "mila"
15  And the user assigns a time budget of "32" hours to the activity titled "Graphics design"
16  Then the activity titled "Graphics design" has a time budget of "32" hours
17
18 #ALTERNATIVE SCENARIOS
19 Scenario: Employee assigns time buget
20   Given the application has a
21     ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
22   And a project
23     ↳ with title "Projektplanlægning" with project number 23001 exists in the application
24   And an activity
25     ↳ with the title "Graphics design" exists within the project with project number 23001
26   And the user logs in using initials "mila"
27   And the user assigns a time budget of "32" hours to the activity titled "Graphics design"
28   Then the activity titled "Graphics
29     ↳ design" returns the error message "Only project managers can assign timebudgets"
```



*Listing 15: Use case: Tilknyt 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 application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9         And a project with title "Video game" with project number 23001 exists in the application
10 #MAIN SCENARIO
11 Scenario: Project manager assigns an employee
12     Given the user logs in using initials "mila"
13     And "mila" takes the role as project leader on project 23001
14     And the application has
15         ↳ a registered employee with first name "Brian", last name "Laudrup" and initials "brla"
16     And "mila" assigns "brla" to the project titled "Video Game"
17     Then the employee "brla" is assigned to the project titled "Video Game"
18
19 #ALTERNATIVE SCENARIOS
20 Scenario: Employee assigns employee to project
21     Given the user is logged in as "mila"
22     And there is an employee
23         ↳ in the application with first name "Brian", last name "Laudrup" and initials "brla"
24     And "mila" assigns "brla" to the project titled "Video Game"
25     Then the project titled
26         ↳ "Video Game" returns the error message "Only project managers can assign employees"
27
28 Scenario: Employee doesn't exist
29     Given user is logged in as "mila"
30     And "mila" takes the role as project leader on project 23001
31     And "mila" assigns "brla" to the project titled "Video Game"
32     Then the project titled "Video Game" returns the error message "Employee not found"
```

*Listing 16: Use case: Hent restarbejde*

```
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 manager gets remaining time on activity
7     Given the application has a
8         ↳ registered employee with first name "Michael", last name "Laudrup" and initials "mila"
9     And a project with title "Video game" with project number 23001 exists in the application
10    And the user logs in using initials "mila"
11    And "mila" takes the role as project leader on project 23001
12    And an activity
13        ↳ with the title "Graphics design" exists within the project with project number 23001
14    And the user assigns a time budget of 32 hours to the activity titled "Graphics design"
15    And the user registers a work time of 6 hours to the
16        ↳ project activity with title "Graphics design" in the project with project number 23001
17    When the user gets the remaining time on "Graphics design"
18    Then the activity returns 26 hours
```

## 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 facilitet, 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. (*Keep It Simple Stupid*) 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 har ingen krav til bruger interface, men derimod rigeligt med krav til funktionalitet. 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 (*Command Line Interface*).

**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**.

### 2.2. TEKNISKE OVERVEJELSER

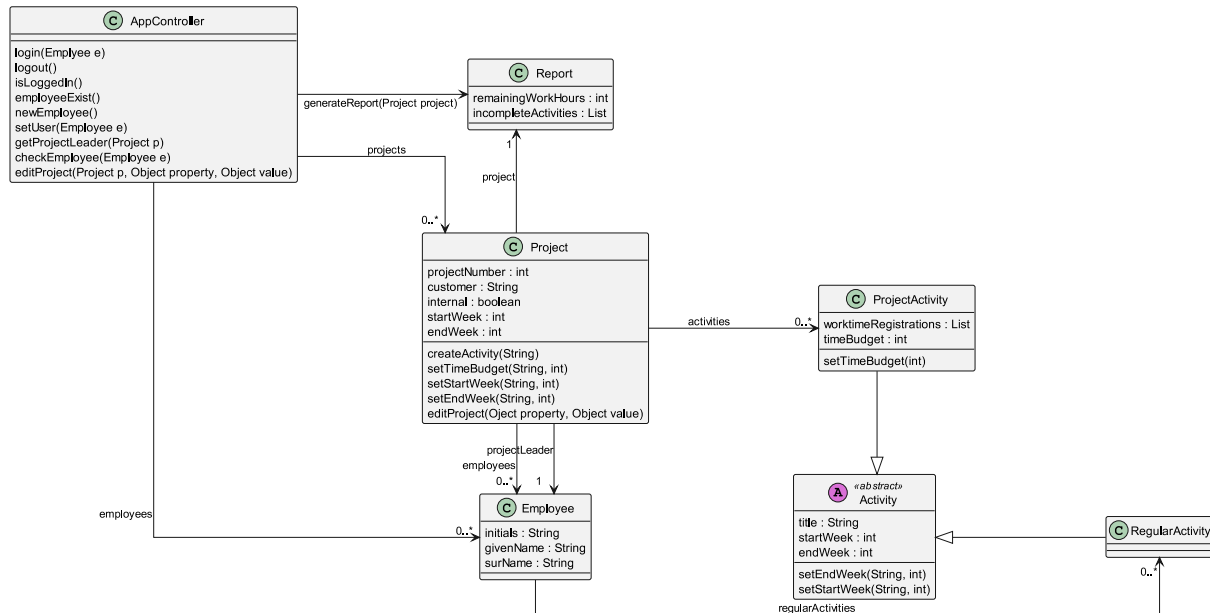
**2.2.1. Abstractions og compositions** Disse to begreber bliver kun brugt i abstrakt forstand, da man i Java ikke har direkte kontrol over objekter. De kan konstrueres, men eksistere selv når objekter der peger på dem slettes. Java har en garbage collector der jævnligt analyserer pointers i programmet og fjerner objekter der ikke bliver peget på.

**2.2.2. UI** UI'en er som nævnt tekstbaseret. Dette betyder at vi til at starte med ikke har en *Viewer*-klasse, da alt printes til konsollen. Bliver UI-delen for kompliceret kan en *Viewer*-klasse let implementeres.

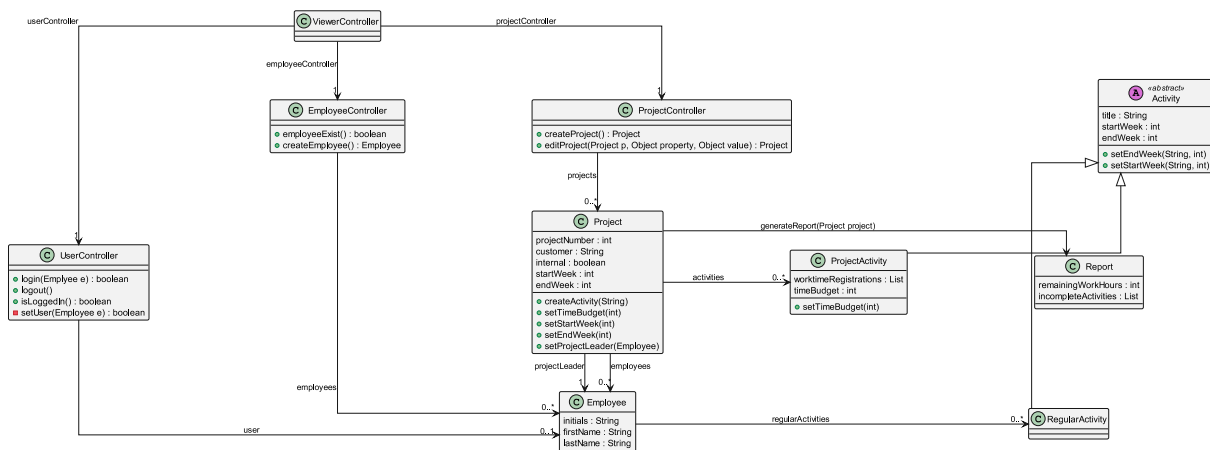
### 3 PROGRAMDESIGN

#### 3.1. KLASSEDIAGRAM AF PROGRAMDESIGN

Figur 2: Klassediagram over programmet

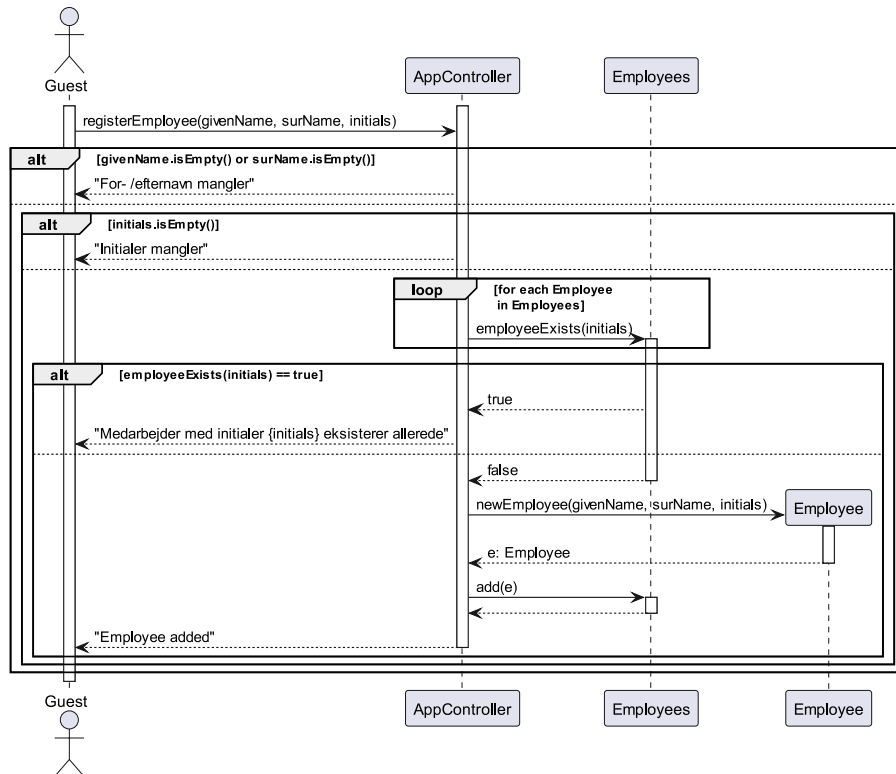


Figur 3: Klassediagram med MVC arkitektur

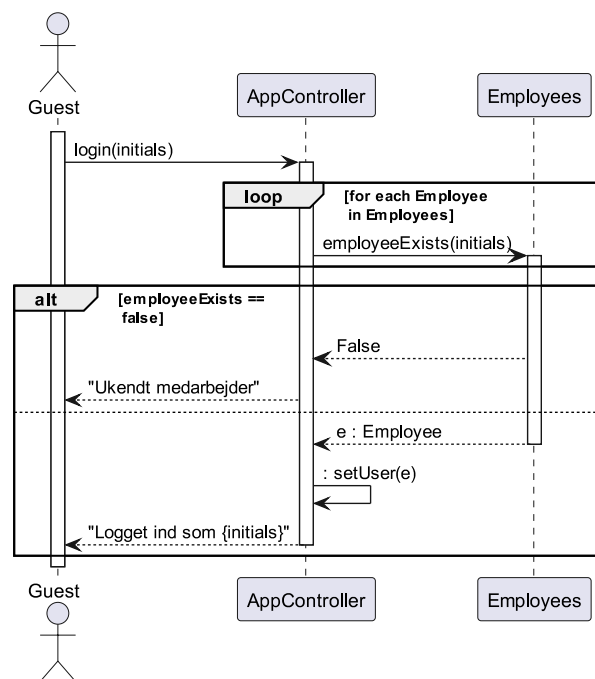


### 3.2. SEKVENSDIAGRAMMER

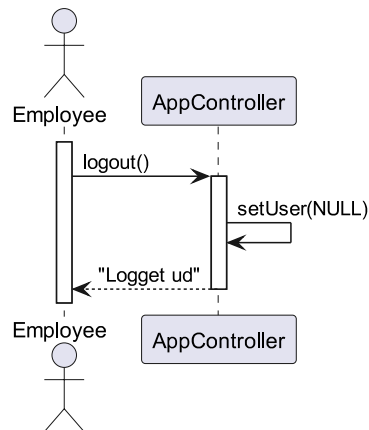
Figur 4: Sekvensdiagram: Opret medarbejder



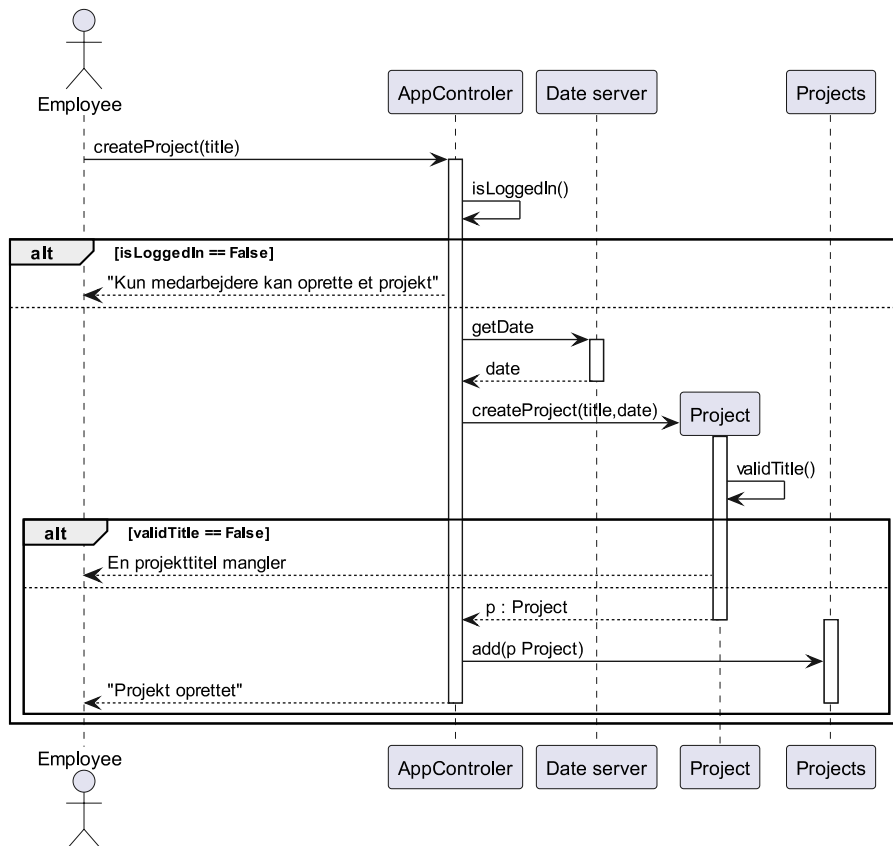
Figur 5: Sekvensdiagram: Medarbejder login



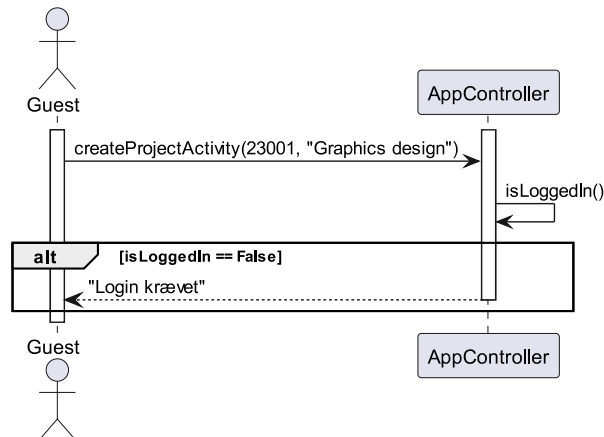
Figur 6: Sekvensdiagram: Medarbejder log ud



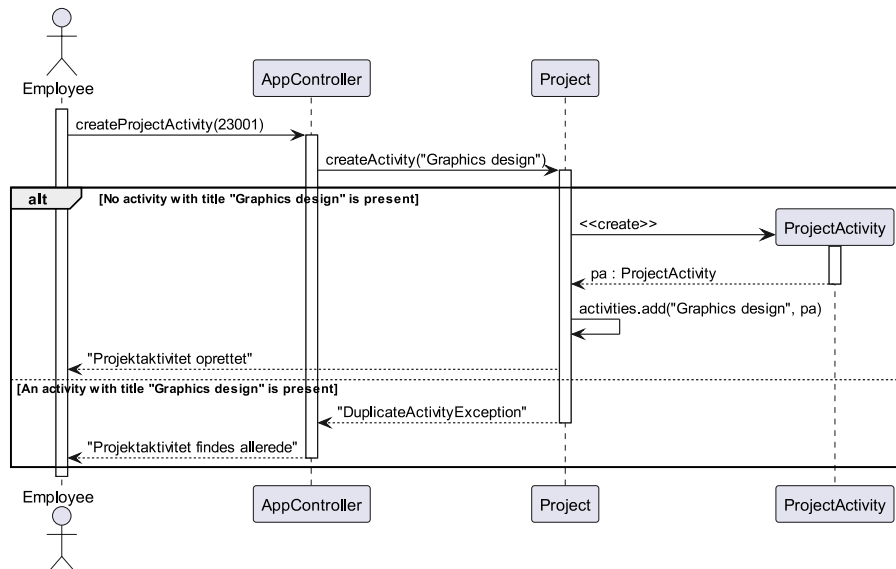
Figur 7: Sekvensdiagram: Opret projekt



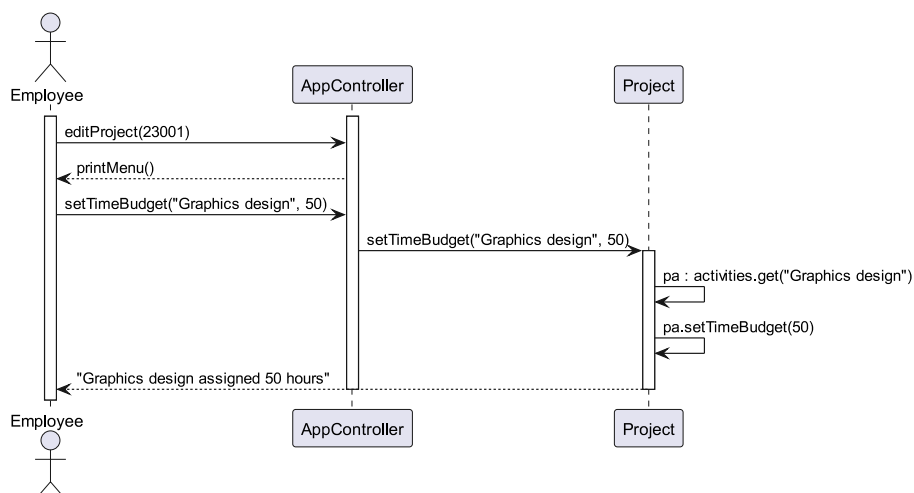
Figur 8: Sekvensdiagram: Forsøg på at oprette en projektaktivitet som gæst



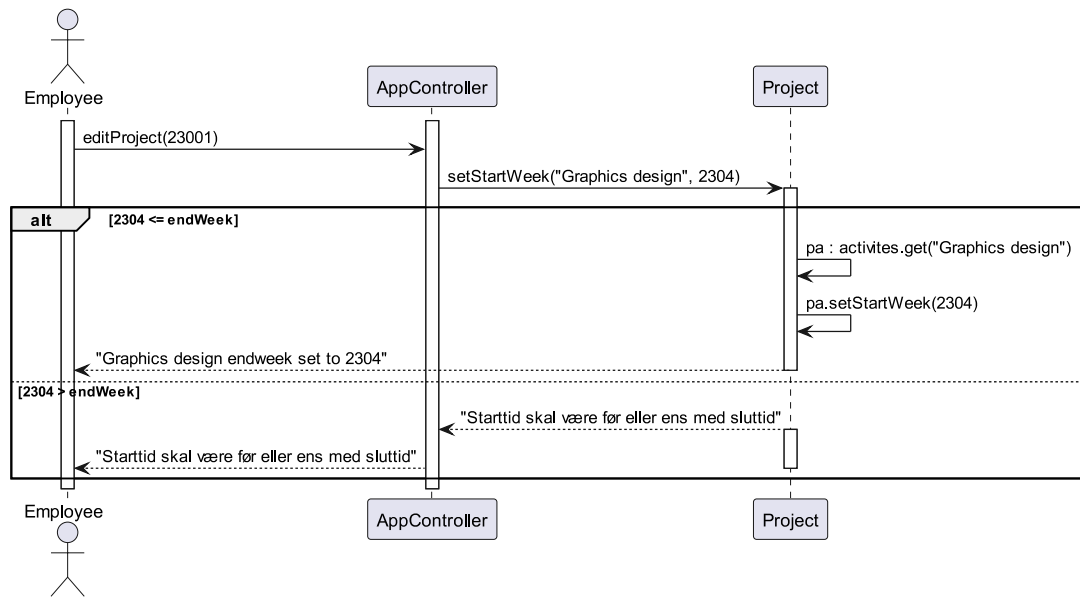
Figur 9: Sekvensdiagram: Forsøg på at oprette en projektaktivitet på projekt uden projektleder



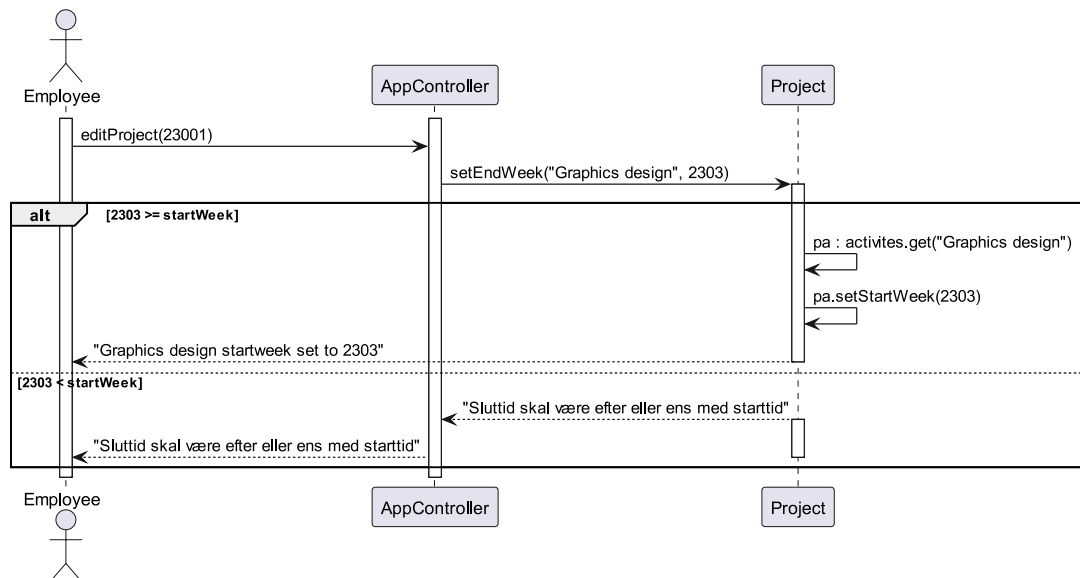
Figur 10: Sekvensdiagram: Forsøg på at fastsætte timebudget på projekt uden projektleder



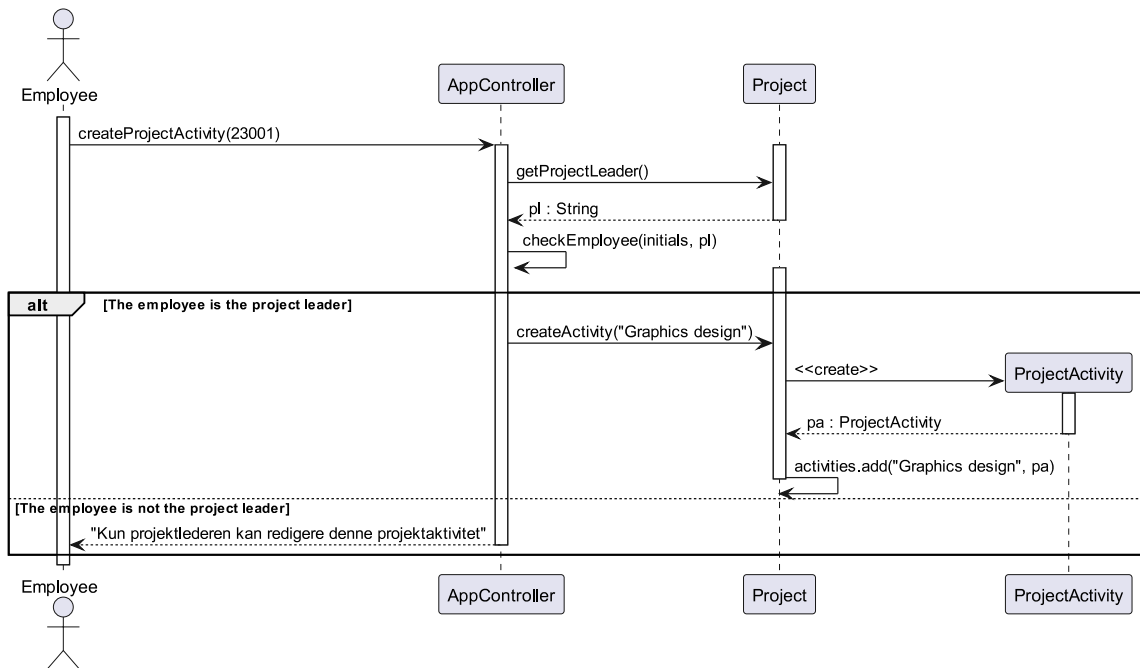
Figur 11: Sekvensdiagram: Forsøg på at fastsætte startuge på projekt uden projektleder



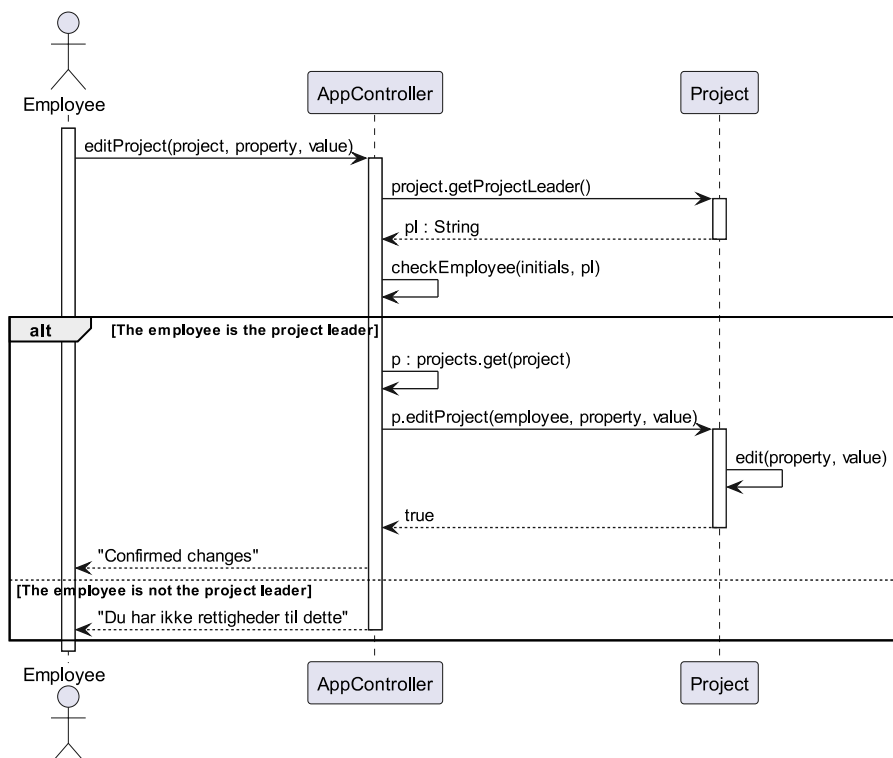
Figur 12: Sekvensdiagram: Forsøg på at fastsætte slutuge på projekt uden projektleder



Figur 13: Sekvensdiagram: Forsøg på at oprette en projektaktivitet på et projekt med en projektleder

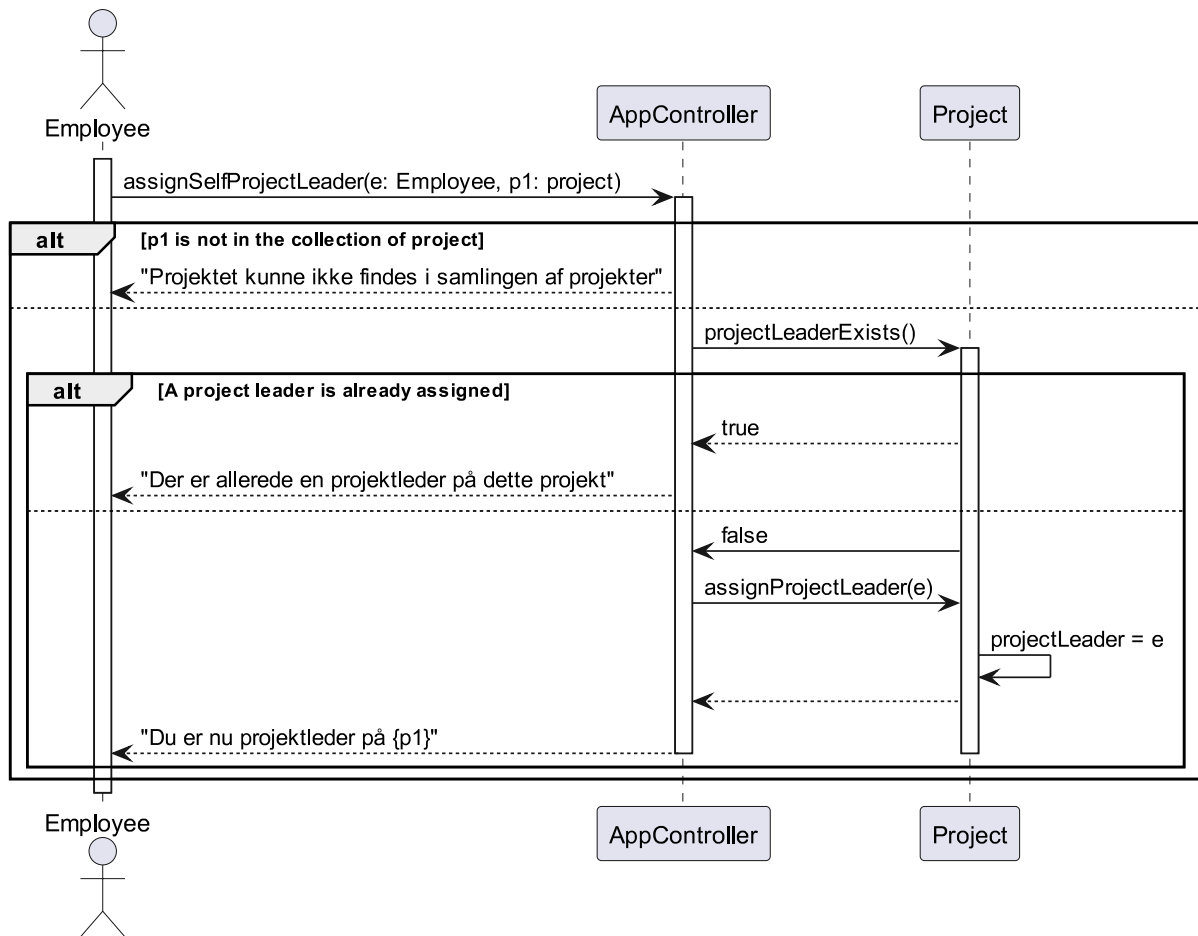


Figur 14: Sekvensdiagram: Rediger projekt





Figur 15: Sekvensdiagram: Medarbejder udpeger sig som projektleder



## 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 busniessstruktur. 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).

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