Appendix C - Use case descriptions

Manage accounts

<table>
<tr><td>Use case</td><td>Manage accounts</td></tr>
<tr><td>Summary</td><td>The actor can add and remove accounts from the system</td></tr>
<tr><td>Actor</td><td>Administrator</td></tr>
<tr><td>Precondition</td><td>The actor is logged in</td></tr>
<tr><td>Postcondition</td><td>An account has been added or removed from the system</td></tr>
<tr><td>Case scenarios</td><td>
Add an account:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The actor chooses to add a new account</td><td>2. The system displays a form with the email, password, first name, last name and role</td></tr>
<tr><td>3. The actor fills out the necessary information</td><td></td></tr>
<tr><td>4. The actor creates the account</td><td>5. The system validates the specified information</td></tr>
<tr><td></td><td>6. The system adds the account [E1, E2, E3, E4, E5]</td></tr>
<tr><td></td><td>7. The system displays a success message “Account successfully added”</td></tr>
</table>
View accounts:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The actor chooses to view all accounts</td><td>2. The system displays all accounts registered in the system</td></tr>
</table>
Remove an account:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1-2 Base sequence “View accounts”</td><td></td></tr>
<tr><td>3. The actor selects an account to remove</td><td>4. The system removes the account [E6]</td></tr>
<tr><td></td><td>5. The system displays a success message “Account successfully removed”</td></tr>
</table>
</td></tr>
<tr><td>Exception scenarios</td><td>At any time the actor can log out
1. The actor chooses to log out
2. The system reverts the changes
3. The system logs out the actor</td></tr>
</table>

	[E1] Invalid email when adding account 6. System displays an error message “Email not valid” 7. The base sequence continues from 3 **[E2] Invalid password length when adding account** 6. The system displays an error message “Enter a password with at least 6 characters” 7. The base sequence continues from 3 **[E3] Duplicate email address** 6. The system displays an error message “Email already exists” 7. The base sequence continues from 3 **[E4] Required fields missing** 6. The system displays an error message “Please fill in all the required fields” 7. The base sequence continues from 3 **[E5] The system fails to validate the information** 6. The system displays an error message “{information} not valid” 7. The base sequence continues from 3 **[E6] Administrator tries to remove their own account** 4. The system displays an error message “Cannot delete yourself” 5. The base sequence continues from 3
Note	The actor can terminate the process at any time If the application has no connection to the internet, the data already stored in the local database will be used to display the previous viewed information The email must: - contain “@” and “.” characters The password must: - contain at least 6 characters Covered requirements: 5, 31, 32, 33

Table 1 - “Manage accounts” use case description

Manage personal profile

<table>
<tr><td>Use case</td><td>Manage personal profile</td></tr>
<tr><td>Summary</td><td>The actor can view and edit their own personal account information</td></tr>
<tr><td>Actor</td><td>Employee</td></tr>
<tr><td>Precondition</td><td>The actor is logged in</td></tr>
<tr><td>Postcondition</td><td>The actor’s personal profile information or settings have been edited</td></tr>
<tr><td>Case scenarios</td><td>
View your profile information
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The actor chooses to view their profile information</td><td>2. The system displays the actor’s profile information</td></tr>
</table>
Edit your profile information
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1-2 Base sequence “View profile information”</td><td></td></tr>
<tr><td>3. The actor chooses to edit their profile information</td><td>4. The system displays a form with the first name, last name, email, password, picture</td></tr>
<tr><td>5. The actor enters values for their profile information</td><td></td></tr>
<tr><td>6. The actor edits their profile information</td><td>7. The system validates the specified information</td></tr>
<tr><td></td><td>8. The system updates the actor’s profile information [E1, E2, E3, E4, E5]</td></tr>
<tr><td></td><td>9. The system displays a success message “Information saved”</td></tr>
</table>
Manage personal settings
<table>
<tr><td>1. The actor chooses to manage their personal settings</td><td>2. The system displays the options (disable notifications and remove local storage)</td></tr>
<tr><td>3. The actor changes their personal settings</td><td>4. The system updates the specific settings [E6]</td></tr>
</table>
</td></tr>
<tr><td>Exception scenarios</td><td>
At any time the actor can log out
1. The actor chooses to log out
2. The system reverts the changes
3. The system logs out the actor

[E1] Invalid email when editing account
8. System displays an error message “Email not valid”
9. The base sequence continues from 3

[E2] Invalid password length when editing account
8. The system displays an error message “Enter a password with at least 6 characters”
9. The base sequence continues from 3
</td></tr>
</table>

	[E3] Duplicate email address 8. The system displays an error message “Email already exists” 9. The base sequence continues from 3 **[E4] Required fields missing** 8. The system displays an error message “Please fill in all the required fields” 9. The base sequence continues from 3 **[E5] The system fails to validate the information** 8. The system displays an error message “{information} not valid” 9. The base sequence continues from 3 **[E6] The system is removing local storage** 4. The system asks for the actor’s confirmation 5. The actor confirms [E7] 6. The local storage is removed 7. The use case ends **[E7] The actor does not confirm** 5. The use case ends
Note	The actor can terminate the process at any time If the application has no connection to the internet, the data already stored in the local database will be used to display the previous viewed information The email must: - contain “@” and “.” characters The password must: - contain at least 6 characters Covered requirements: 33, 34, 44, 54, 55

Table 2 - “Manage personal profile” use case description

Login

<table>
<tr><td>Use case</td><td>Login</td></tr>
<tr><td>Summary</td><td>The actor can log into the system in order to gain access to the system’s features</td></tr>
<tr><td>Actor</td><td>Guest</td></tr>
<tr><td>Precondition</td><td>The account is registered in the system</td></tr>
<tr><td>Postcondition</td><td>The actor is logged into their account</td></tr>
<tr><td>Case scenarios</td><td>Login:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The actor chooses to login</td><td>2. The system displays a form with the email and password</td></tr>
<tr><td>3. The actor fills out the necessary information</td><td></td></tr>
<tr><td>4. The actor logs in</td><td>5. The system validates the specified information</td></tr>
<tr><td></td><td>6. The actor is logged into the system [E1, E2, E3]</td></tr>
</table></td></tr>
<tr><td>Exception scenarios</td><td>[E1] Invalid credentials entered
6. The system displays an error message “Email not registered”
7. The base sequence continues from 1

[E2] Email/password combination does not match
6. The system displays an error message “Invalid email/password combination”
7. The base sequence continues from 1

[E3] Required fields missing
6. The system displays an error message “Please fill in all the required fields”
7. The base sequence continues from 1</td></tr>
<tr><td>Note</td><td>The actor can terminate a process at any time

If the user is in offline mode, no login and access to the system is provided.

Once logged in, the actor stays logged in until the actor chooses to log out - even if the application is closed.

Covered requirements: 6</td></tr>
</table>

Table 3 - “Login” use case description

Manage environments

<table>
<tr><td>Use case</td><td>Manage environments</td></tr>
<tr><td>Summary</td><td>The actor can view and edit an area’s measurement thresholds, view threshold changes based on a specific date and view measurements that exceeded set thresholds</td></tr>
<tr><td>Actor</td><td>Employee</td></tr>
<tr><td>Precondition</td><td>The actor is logged in</td></tr>
<tr><td>Postcondition</td><td>A threshold has been edited</td></tr>
<tr><td>Case scenarios</td><td>
Add thresholds:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The actor chooses to add thresholds</td><td>2. The system displays a collection of measurement types (temperature, humidity, CO_2, sound) as well as a collection of areas</td></tr>
<tr><td>3. The actor specifies a measurement type (temperature, humidity, CO_2, sound), an area as well as the values for the thresholds</td><td>4. The system validates the specified information</td></tr>
<tr><td></td><td>5. The system adds the specified thresholds for the given measurement type in the given area [E1, E2, E3]</td></tr>
<tr><td></td><td>6. The system displays a success message “Threshold successfully created!”</td></tr>
</table>
View thresholds:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The actor chooses to view thresholds</td><td>2. The system displays a collection of measurement types (temperature, humidity, CO_2, sound) as well as a collection of areas</td></tr>
<tr><td>3. The actor specifies a measurement type (temperature, humidity, CO_2, sound) as well as an area</td><td>4. The system displays the thresholds for the given measurement type in the given area</td></tr>
</table>
Edit a threshold:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1-4 Base sequence “View thresholds”</td><td></td></tr>
<tr><td>5. The actor enters values for the thresholds</td><td>6. The system validates the specified information</td></tr>
<tr><td></td><td>7. The system updates the specified threshold [E4, E5]</td></tr>
<tr><td></td><td>8. The system displays a success message “Threshold successfully edited!”</td></tr>
</table>
</td></tr>
</table>

View threshold changes:

Actor action	System responsibility
1. The actor specifies the date	2. The system displays the threshold changes on the given date [E6]

View measurements that exceeded set thresholds:

Actor action	System responsibility
1. The actor chooses to view exceeded measurements	2. The system displays a collection of measurement types (temperature, humidity, CO_2, sound), a collection of areas as well as a date
3. The actor specifies a measurement type (temperature, humidity, CO_2, sound), an area as well as a date	4. The system displays the exceeded measurements in the given area on the given date [E7]

Receive a notification:

Actor action	System responsibility
	1. The system displays a notification "Exceeded {measurement type} in area {area name}" [E8]

Exception scenarios

At any time the actor can log out
1. The actor chooses to log out
2. The system reverts the changes
3. The system logs out the actor

[E1] The system fails to validate the information
5. The system displays an error message "Please input valid {information}"
6. The base sequence continues from 3

[E2] The low threshold is higher than the high threshold
5. The system displays an error message "Threshold maximum value must be bigger than the minimum"
6. The base sequence continues from 3

[E3] Required fields missing
5. The system displays an error message "Cannot create threshold with no value"
6. The base sequence continues from 3

[E4] The system fails to validate the information
7. The system displays an error message "{measurement} threshold is not valid"
8. The base sequence continues from 5

[E5] There are no measurements matching the given measurement type, area and date
2. The system displays an error message "No data available"
3. The base sequence continues from 1

[E6] There are no measurements matching the given measurement type, area and date
4. The system displays an error message "No data available"
5. The base sequence continues from 3

[E7] The actor disabled receiving notifications
1. Use case ends

Note	The actor can terminate a process at any time If the application has no connection to the internet, the data already stored in the local database will be used to display the previous viewed information The temperature threshold must: - be between 10 and 35 The humidity threshold must: - be between 0 and 80 The CO_2 threshold must: - be between 150 and 2500 The sound threshold must: - be between 0 and 80 A notification is sent when a measurement exceeds the thresholds set on the specific IoT device, unless the setting is disabled Covered requirements: 15, 16, 17, 18, 19, 20, 21, 26, 33, 45, 46, 47, 48, 49, 50, 51, 52, 53

Table 4 - “Manage environments” use case description

View data analysis

<table>
<tr><td>Use case</td><td>View data analysis</td></tr>
<tr><td>Summary</td><td>The actor can view the latest measurements of an area
The employee can view the historical measurements of an area based on a specific date</td></tr>
<tr><td>Actor</td><td>Employee, Guest</td></tr>
<tr><td>Precondition</td><td>In order to view historical measurements, the actor must be logged in</td></tr>
<tr><td>Postcondition</td><td></td></tr>
<tr><td>Case scenarios</td><td>View latest measurement:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The actor chooses to view the latest data</td><td>2. The system displays a collection of measurement types (temperature, humidity, CO_2, sound) as well as a collection of areas</td></tr>
<tr><td>3. The actor specifies a measurement type (temperature, humidity, CO_2, sound) as well as an area</td><td>4. The system displays the latest measurement for the given measurement type in the given area</td></tr>
</table>
View historical measurements:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The employee chooses to view the historical data</td><td>2. The system displays a collection of measurement types (temperature, humidity, CO_2, sound), a collection of areas as well as a date</td></tr>
<tr><td>3. The employee specifies a measurement type (temperature, humidity, CO_2, sound), an area as well as a date</td><td>4. The system displays the historical measurements for the given measurement type in the given area on the given date [E1]</td></tr>
</table></td></tr>
<tr><td>Exception scenarios</td><td>At any time the actor can log out
1. The actor chooses to log out
2. The system reverts the changes
3. The system logs out the actor

[E1] There are no measurements matching the given measurement type, area and date
4. The system displays an error message “No data available”
5. The base sequence continues from 3</td></tr>
<tr><td>Note</td><td>The actor can terminate the process at any time

If the application has no connection to the internet, the data already stored in the local database will be used to display the previous viewed information

Covered requirements: 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 33</td></tr>
</table>

Table 5 - “View data analysis” use case description

Manage areas

<table>
<tr><td>Use case</td><td>Manage areas</td></tr>
<tr><td>Summary</td><td>The administrator can add, view, edit and remove areas</td></tr>
<tr><td>Actor</td><td>Administrator, Employee</td></tr>
<tr><td>Precondition</td><td>The actor is logged in</td></tr>
<tr><td>Postcondition</td><td>An area has been added, edited, removed or selected</td></tr>
<tr><td>Case scenarios</td><td>
Add an area:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The administrator chooses to add a new area</td><td>2. The system displays a form with the barn name, area name, (optional) description, number of pigs and the hardware id</td></tr>
<tr><td>3. The administrator fills out the necessary information</td><td></td></tr>
<tr><td>4. The administrator creates the area</td><td>5. The system validates the specified information [E1, E2, E3, E4]</td></tr>
<tr><td></td><td>6. The system adds the area</td></tr>
<tr><td></td><td>7. The system displays a success message “Area successfully added”</td></tr>
</table>
View an area:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1. The actor chooses to view the areas</td><td>2. The system displays a collection of areas of the barn</td></tr>
<tr><td>3. The actor specifies an area of the barn</td><td>4. The system displays the details of the specified area</td></tr>
</table>
Edit an area:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1-4 Base sequence “View area”</td><td></td></tr>
<tr><td>5. The administrator chooses to edit an area</td><td>6. The system displays a form with the area name, (optional) description, number of pigs and the hardware id</td></tr>
<tr><td>7. The administrator enters values for the area</td><td></td></tr>
<tr><td>8. The administrator saves the details</td><td>9. The system validates the specified information [E5, E6, E7, E8]</td></tr>
<tr><td></td><td>10. The system updates the specified area</td></tr>
<tr><td></td><td>11. The system displays a success message “Area successfully updated”</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td>

Remove an area:

<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td>1-4 Base sequence “View area”</td><td></td></tr>
<tr><td>5. The administrator selects an area to remove</td><td></td></tr>
<tr><td>6. The administrator removes the area</td><td>7. The system removes the area</td></tr>
<tr><td></td><td>8. The system displays a success message “Area successfully removed”</td></tr>
</table>

</td></tr>
<tr><td>Exception scenarios</td><td>

At any time the actor can log out
1. The actor chooses to log out
2. The system reverts the changes
3. The system logs out the actor

[E1] Duplicate area names
5. The system displays an error message “Area name already exists”
6. The base sequence continues from 3

[E2] Required fields missing
5. The system displays an error message “Please fill in all the required fields”
6. The base sequence continues from 3

[E3] The system fails to validate the information
5. The system displays an error message “Please input valid {information}”
6. The base sequence continues from 3

[E4] Duplicate hardware ids
5. The system displays an error message “Hardware id already exists”
6. The base sequence continues from 3

[E5] Duplicate area names
9. The system displays an error message “Area name already exists”
10. The base sequence continues from 7

[E6] Required fields missing
9. The system displays an error message “Please fill in all the required fields”
10. The base sequence continues from 7

[E7] The system fails to validate the information
9. The system displays an error message “Please input valid {information}”
10. The base sequence continues from 7

[E8] Duplicate hardware ids
9. The system displays an error message “Hardware id already exists”
10. The base sequence continues from 7

</td></tr>
<tr><td>Note</td><td>

The actor can terminate a process at any time

If no main display area is selected, the system will select one area as the main display area by default

If the application has no connection to the internet, the data already stored in the local database will be used to display the previous viewed information

Covered requirements: 33, 35, 36, 41, 42, 43

</td></tr>
</table>

Table 6 - “Manage areas” use case description

Control window

<table>
<tr><td>Use case</td><td>Control window</td></tr>
<tr><td>Summary</td><td>The window can open or close dependent on the measured temperature and the set thresholds</td></tr>
<tr><td>Actor</td><td>Temperature, Window</td></tr>
<tr><td>Precondition</td><td>A temperature threshold is set in the device</td></tr>
<tr><td>Postcondition</td><td>The position of the window is changed</td></tr>
<tr><td>Case scenarios</td><td>Operate window:
<table>
<tr><th>Actor action</th><th>System responsibility</th></tr>
<tr><td></td><td>1. The system compares the most recently measured temperature with the set threshold</td></tr>
<tr><td></td><td>2. The system changes the window’s position [E1]</td></tr>
<tr><td>3. The window position is changed</td><td></td></tr>
</table></td></tr>
<tr><td>Exception scenarios</td><td>[E1] The most recently measured temperature does not exceed any of the set thresholds
2. The use case ends</td></tr>
<tr><td>Note</td><td>If the most recently measured temperature does not exceed any of the set thresholds, the window position is unchanged

Covered requirements: 23, 24</td></tr>
</table>

Table 7 - “Control window” use case description