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Smart Inspection
Manual

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Contents

1 System Requirements

Android: at least version X.X
iOS: at least version X.X
Browser: tested with XX

2 Feature Description

2.1 Navigation bar

The back button *(arrow left)* is located next to the name of the current page in the navigation bar. The settings (→ 2.4 Settings) can be accessed via the context menu *(three dots)*.


2.2 Login

Login is possible with an email address and password. The login credentials are provided by an admin. If one already has an account, the password can be reset with the button *"Reset password"*. After authentication you get redirected to the home page (→ 2.3 Home page). If you are already logged in, you get automatically redirected to the home page (→ 2.3 Home page).
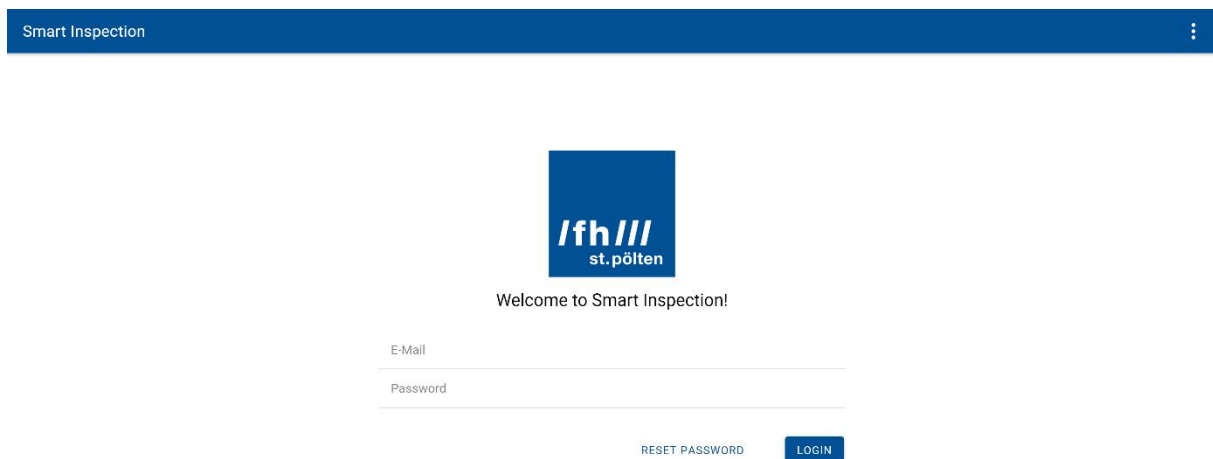

2.3 Home page

Multiple features can be accessed from the home page.

- *„Bridge List"* (→ 2.5.3 Bridge List)
- *„Inspection List"* (→ 2.6.3 Inspection List)
- *„New Object"* (→ 2.5.2 New Object/Edit Object)
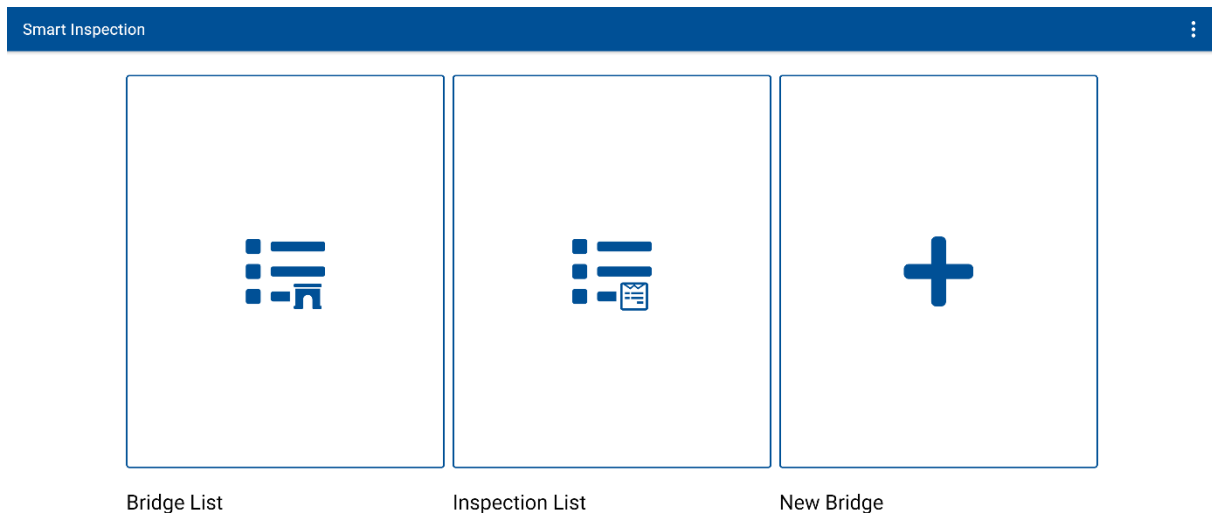
2.4 Settings

The settings can be accessed via the context menu (→ 2.1 Navigation bar). To change the language of the app, use the dropdown *"Language"* (German or English). The display name of the authenticated user can be changed by entering the new name and clicking save *(disc symbol)*. Click the Button *"Logout"* to logout of the app, you will then be redirected to the Login page (→ 2.2 Login).
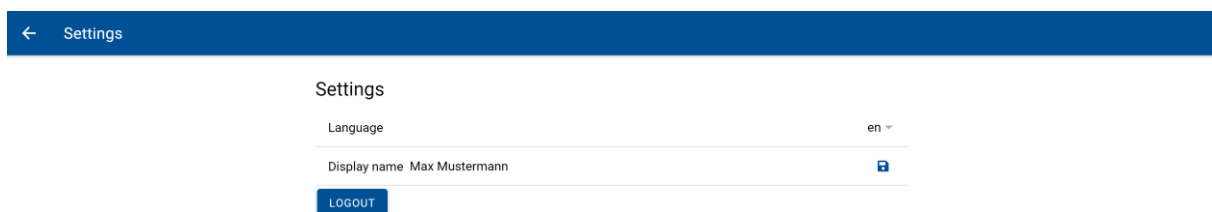
2.5 Bridge Object

2.5.1 Object overview

The top of the page contains basic Object properties like name, ID, material, … . Only properties, that have been added to the database, are shown. This includes, if available, the current Object Assessment. The buttons provide access to the following features:

- *„New Inspection"* (→ 2.6.2 New Inspection/Edit Inspection)
- *„Inspection List"* (→ 2.6.3 Inspection List)

- *„Damage/Defect List"* (→ 2.7.5 Damage/Defect List)
- *„Generate Report"* (→ 2.9 Reports)
- *„Edit Object"* (→ 2.5.2 New Object/Edit Object)
- *„Export as CSV"* (→ 2.10 CSV export)
- *„Request Object deletion"* (→ 2.5.4 Request object deletion)

2.5.2   New Object/Edit Object

The creation or editing of a Bridge Object consists of two pages. The first page *"Object Data"* contains all properties of an Object. The input fields are either text or dropdown fields, number values must be entered without an unit. The field *"Coordinates"* can be filled by either manually entering the coordinates or by clicking the button localization *(Localization symbol)* and using the current GNSS coordinates. Fields marked with an asterisk (*) are required fields. Click the button *"Object Documents →"* to get to the next page.

The page *"Object Documents"* is used for uploading various documents. Only image files are valid file types for the field *"Photo"*. For all other fields, image and .pdf files are valid file types. The maximum file size is 2MB. A file can be deleted with the delete button *(X symbol)*. Use the download button *(Download symbol)* to download an existing file. Click the button *"← Object Data"* to navigate to the previous page. Any changes get submitted after clicking the button *"Save"*. After submitting, you are navigated to the Object overview (→ 2.5.1 Object overview).

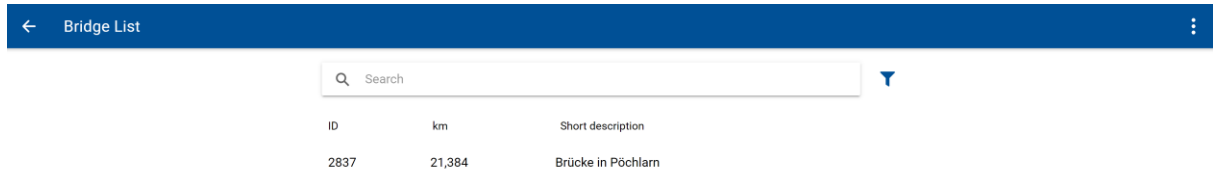### 2.5.3 Object List

The Object List contains all Bridge Objects. Click on an entry to open it (→ 2.5.1 Object overview). Greyed out entries are marked for deletion and cannot be accessed. Use the input field *"Search"* to search for an Object ID or chainage (enter value with comma), the input is applied immediately. Click the filter button *(Funnel symbol)* to select various filters. It is possible

to select multiple filters at once, the filters are applied immediately. Click the reset button *(Round arrow symbol)* to reset the filters. Click the button *"OK"* or close *(X symbol)* to get back to the Object List.

2.5.4 Request Object deletion

In order to delete an Bridge Object, you first have to request the deletion by confirming the dialog. After requesting the deletion an admin can either delete the Object permanently or restore it.
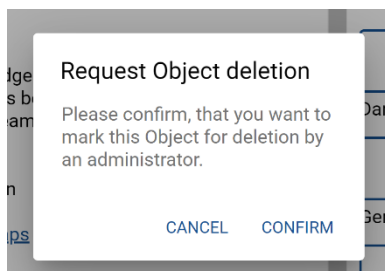
2.6 Inspection

2.6.1 Inspection overview

The top of the page contains Inspection properties like inspector, date, … . Only properties, that have been added to the database, are shown. The buttons provide access to the following features:

- *„New Damage/Defect"* (→ 2.7.2 New Damage/Defect)
- *„Damage/Defect List"* (→ 2.7.5 Damage/Defect List)
- *„Assessment"* (→ 2.8 Assessment)
- *„Edit Inspection"* (→ 2.6.2 New Inspection/Edit Inspection)

- *„Delete Inspection"* (→ 2.6.4 Delete Inspection)

2.6.2 New Inspection/Edit Inspection

Select an registered user via the dropdown in the field *"Inspector"*. Your display name can be changed in the settings (→ 2.4 Settings). All number values have to entered without an unit. Only image files are valid file types for the field *"Overview photo"*. The maximum file size is 2MB. A file can be deleted with the delete button *(X symbol)*. Use the download button *(Download symbol)* to download an existing file. Fields marked with an asterisk (*) are required fields. Any changes get submitted after clicking the button *"Save"*. After submitting, you are navigated to the Inspection overview (→ 2.6.1 Inspection overview).

2.6.3   Inspection List

Depending on if the Inspection List was opened from the home page or the Object overview, all Inspections or just the Inspections of the selected Bridge Object are shown. Open an Inspection by clicking the entry in the list (→ 2.6.1 Inspection overview). Use the input field *"Search"* to search for an Inspection date, the input is applied immediately. Click the filter button *(Funnel symbol)* to select various filters. It is possible to select multiple filters at once, the filters are applied immediately. Click the reset button *(Round arrow symbol)* to reset the filters. Click the button *"OK"* or close *(X symbol)* to get back to the Inspection List.
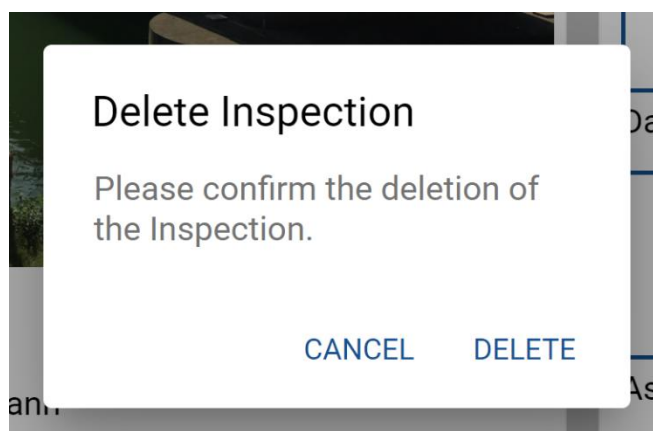

2.6.4   Delete Inspection

Delete an Inspection permanently by confirming the dialog. All Damages/Defects persist, but the Damage/Defect States related to the selected Inspection also get deleted.
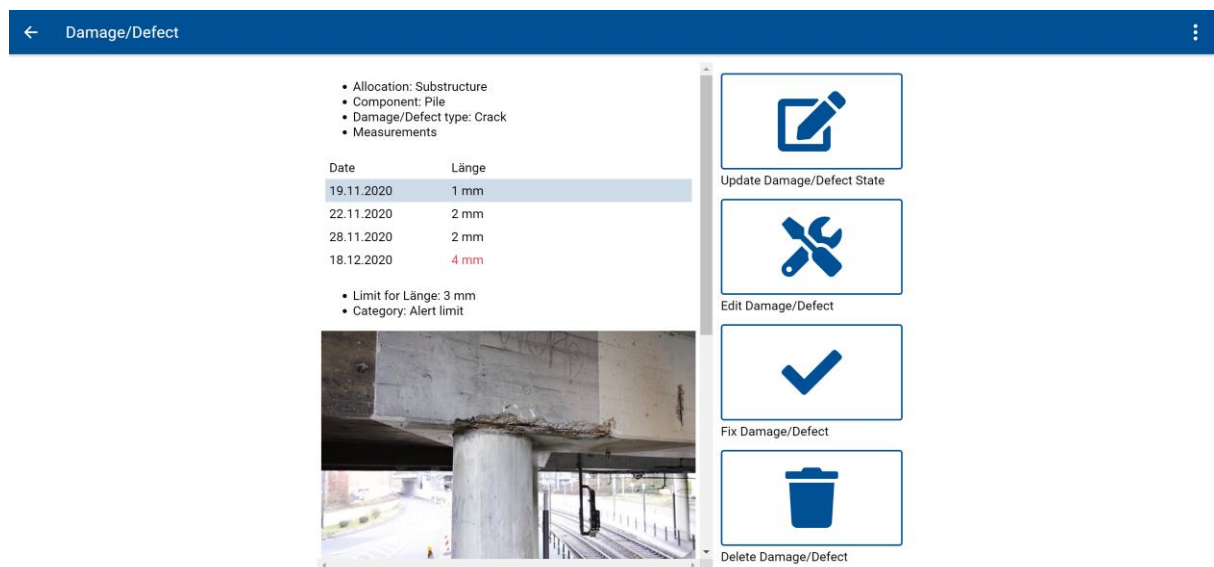
2.7 Damage/Defect

2.7.1 Damage/Defect overview

The top of the page contains Damage/Defect properties like Allocation, Component, … . Only properties, that have been added to the database, are shown. The table *"Measurements"* contains all Measurements for the selected Damage/Defect. If there is an Measurement for the selected Inspection, the corresponding row is highlighted in blue. If a value exceeds the set *"Limit"*, the text is displayed in red. Below, the localization on plans is shown if available.

The buttons provide access to the following features:
- *„Update Damage/Defect State"* (→ 2.7.4 Update Damage/Defect State)
- *„Edit Damage/Defect"* (→ 2.7.3 Edit Damage/Defect)
- *„Fix/Unfix Damage/Defect"* (→ 2.7.6 Fix/Unfix Damage/Defect)
- *„Delete Damage/Defect"* (→ 2.7.7 Delete Damage/Defect)

2.7.2   New Damage/Defect

The process of creating a new Damage/Defect corresponds to editing an Damage/Defect (→ 2.7.3 Edit Damage/Defect) followed by entering the State of the Damage/Defect (→ 2.7.4 Update Damage/Defect State).

2.7.3   Edit Damage/Defect

The input fields are either text or dropdown fields. Fields marked with an asterisk (*) are required fields. Click the Button at the bottom to navigate to the next page, where you can mark the location of an Damage/Defect on a plan. This depends on which plans have been uploaded (→ 2.5.2 New Object/Edit Object). If no plan was uploaded, click the button *"Save"* to finish the editing.

← Edit Damage/Defect	⋮

Damage/Defect Data

Allocation*	Substructure ▾
Component*	Pile ▾
Component detail	▦
Damage/Defect type*	Crack ▾
Type detail	
Location	

Location is only necessary when there are no plans.

Cause	
Description	

GROUND PLAN LOCATION →

Click on the plan to set the position of the Damage/Defect. Delete the marker by clicking the button *"Reset"*. Zoom in and out of the map with the buttons *"+"* and *"-"*. Loading complex .pdf documents can take some time. Use the buttons under the plan to navigate to the previous/next page. When editing, after clicking *"Save"* on the last page you are redirected to the overview (→ 2.7.1 Damage/Defect overview), when creating a new Damage/Defect you are redirected to the page Damage/Defect State Update (→ 2.7.4 Update Damage/Defect State).
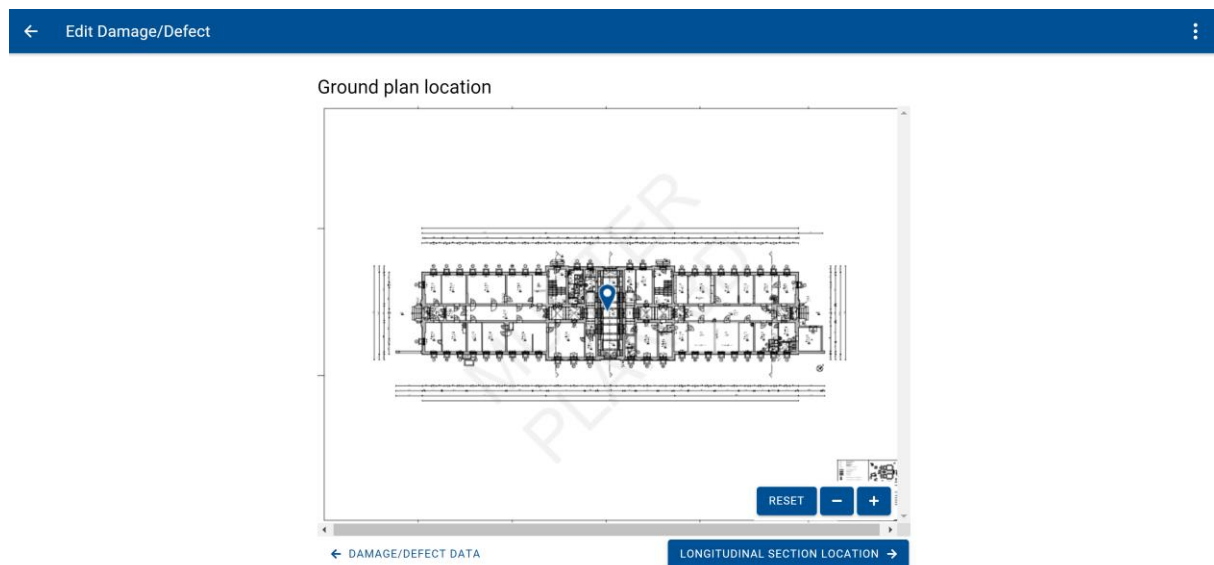
2.7.4 Update Damage/Defect State

Only image files are valid file types for the field *"Photo"*. The maximum file size is 2MB. A file can be deleted with the delete button *(X symbol)*. Use the download button *(Download symbol)* to download an existing file. To enter an measurement, the field *"Name"* has to be filled in. The field *"Value"* has to be filled in with a number, use the dropdown menu to the right so select an unit. The *"Limit"* only requires an number and an unit, there is no *"Limit"* for *"Measurement 2"*.

Fields marked with an asterisk (*) are required fields. If you select *"Immediate action limit"* as *"Category"*, an information e-mail is automatically sent to the system administration after saving. Click the button *"Save"* to save and get navigated to the Damage/Defect overview (→ 2.7.1 Damage/Defect overview).

2.7.5 Damage/Defect List

The Damage/Defect List contains all Damages/Defects for the selected Bridge Object. Click an entry to open the Damage/Defect (→ 2.7.1 Damage/Defect overview). If you accessed the list from the Object overview (→ 2.5.1 Object overview), the Damage/Defect State from the most recent Inspection is shown, if you accessed the list from the Inspection overview (→ 2.6.1 Inspection overview), the Damage/Defect State of the current Inspection is shown.

Entries with a green checkmark are marked as fixed. Entries with a red warning sign are marked with the *"Category" "Immediate action limit"*.

Use the input field *"Search"* to search for an Damage/Defect Number, the input is applied immediately. Click the filter button *(Funnel symbol)* to select various filters. It is possible to select multiple filters at once, the filters are applied immediately. Click the reset button *(Round arrow symbol)* to reset the filters. Click the button *"OK"* or close *(X symbol)* to get back to the Damage/Defect List.

Damage/Defect		Allocation	Damage/Defect type
#1	⚠	Substructure	Crack
#2	✓	Superstructure	Crack

2.7.6 Fix/Unfix Damage/Defect

A Damage/Defect can be marked as fixed/unfixed with these buttons.

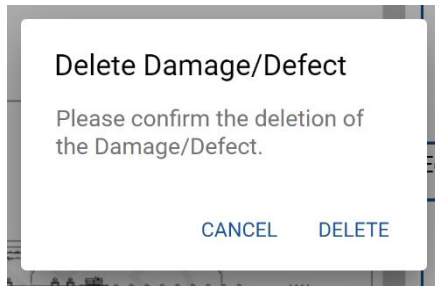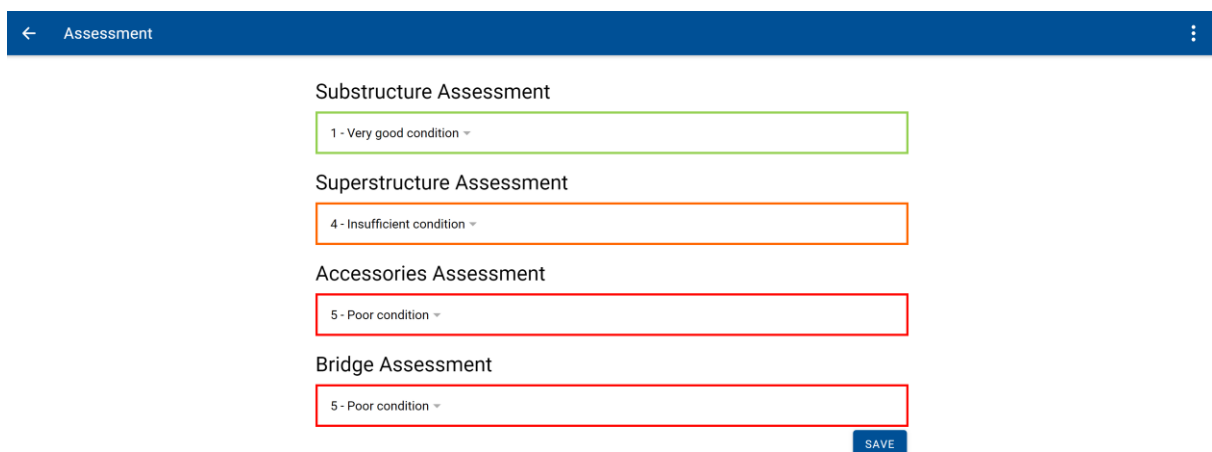Unfix Damage/Defect
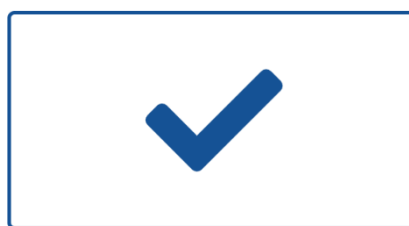
Fix Damage/Defect

2.7.7 Delete Damage/Defect

To permanently delete an Damage/Defect, confirm the dialog.

Delete Damage/Defect

Please confirm the deletion of
the Damage/Defect.

CANCEL   DELETE

2.8 Assessment

Assessments can be made as part of an Inspection. There are 4 Assessment categories: *„Substructure Assessment"*, *„Superstructure Assessment"*, *„Accessories Assessment"* and *„Bridge Assessment"*. Each category has to be assigned with a grade between 1 – 5. Click the button *"Save"* to save and get navigated back to the Inspection overview (→ 2.6.1 Inspection overview) If you assign a grade 5 in any category, an information e-mail is automatically sent to the system administration after saving.

← Assessment

Substructure Assessment

1 - Very good condition

Superstructure Assessment

4 - Insufficient condition

Accessories Assessment

5 - Poor condition

Bridge Assessment

5 - Poor condition

SAVE

2.9 Reports

The upper part of the page relates to creating new reports. You can either choose *"Object Report"* or *"Inspection Report"*. An *"Object Report"* contains all general Object data, the most recent Assessment and all Damages/Defects in their most recent State. An *"Inspection Report"* contains all general Object data, the Assessment of the selected Inspection, the Inspection properties and all Damages/Defect with their respective State of the selected Inspection. Use

the dropdown menu *"Language"* to select the language of the new Report. Click the button *"+ New Report"* to create the new Report.

The list below contains all created Reports, if a new Report is generated it shows up in this list. Click the button download *(Download symbol)* to open the .pdf-file. Click the button delete *(Trashcan symbol)* to irreversibly delete a Report.

2.10 CSV export

The CSV file is created immediately and will be downloaded. The CSV file contains the measurements of the Damages/Defects of the Bridge Object, but no further Object/Inspection data. The table has the following fields:

damage	ID of the Damage/Defect, *Integer*
isFixed	True, if the Damage/Defect is marked as fixed, *Boolean*
date	The date of the State/Inspection, *ISO-Date*
measurement1Name	Name of Measurement 1, *String*
measurement1	Value of Measurement 1 in mm, *Number*
limit	Value of the Limit for Measurement 1 in mm, *Number*
measurement2Name	Name of Measurement 2, *String*
measurment2	Value of Measurement 2 in mm, *Number*

3 Data structure
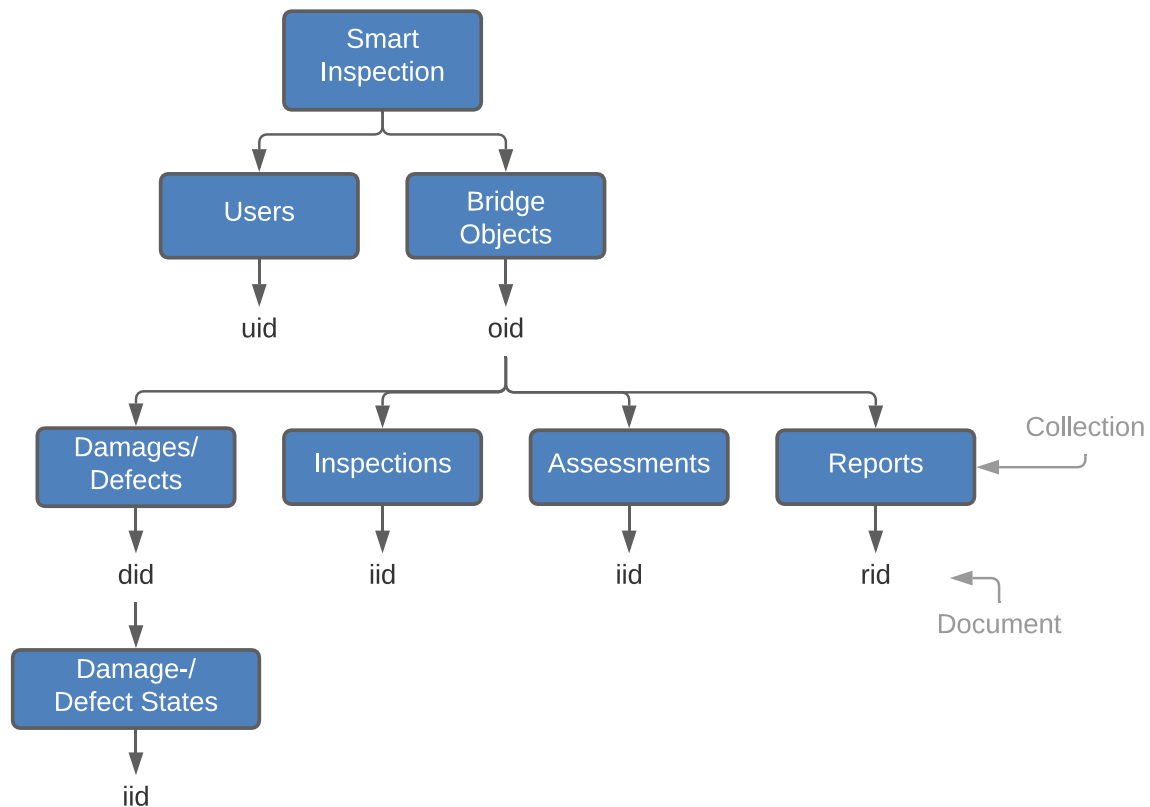
The root level contains the collection with all users and the collection with all Bridge Objects. A Bridge Object contains collections for Inspections, Damages/Defects, Assessments and Reports. Every Damage/Defect has an Collection for Damage/Defect States. All documents in the collections for Assessments and Damage/Defect States have names corresponding to Inspection documents. In the app itself, Damages/Defects and Assessments are hierarchically below Inspections, in the database however they are situated on the same level.

Every collection contains documents with IDs, that are named with the following pattern:

uid   User ID
oid   Object ID
iid   Inspection ID
did   Damage/Defect ID
rid   Report ID

4 Framework

This application was created with Ionic 5 and Vue.js 3. Google Firebase serves as the server side database, function environment and file storage.