BeREAL – 347-032

General description

BeREAL is a software application that functions as an add-on to the core Be10 calculation.

The use of Be10 as a starting point is interesting because of the complexity and precision of the Be10 calculations core algorithm.

Be10 calculations are also compiled for all buildings.

BeREAL will:

A. Create realistic forecasts of a building's energy consumption (conceptual design)
B. Serve as a more suitable energy optimization tool (conceptual design)
C. Act as an energy analysis tool, where the impact of user behavior is partially insulated (operational phase)

BeREAL is interesting because it can be used both in relation to the existing (newer) buildings and in relation to new constructions.

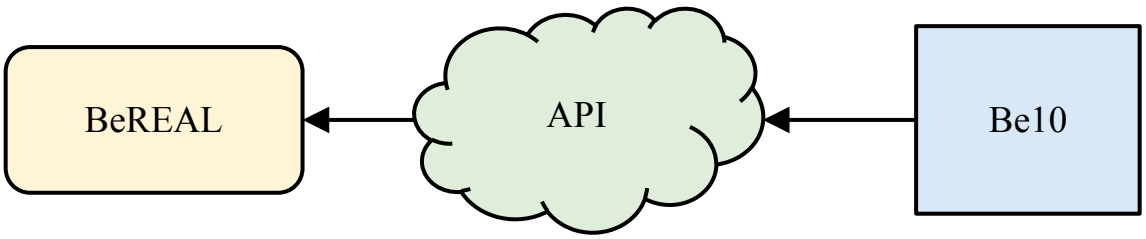
Platform

Be10 is an application build in C#.

Since BeREAL will be a web based application, running on PHP, an API also needs to be developed on top of the Be10, which serves as communication layer between Be10 and BeREAL.

Development of this API is also included in these specifications.

This API can also be used by other software applications which needs to connect to Be10, but that is not part of the current scope of the project.



Wireframes

The wireframes for the web application can be seen here:
http://app.mockflow.com/view/59da529d862e527e0b0eaab6213e6b9b

The wireframes are inseparable part of these specifications as most of the standard UI components are not enlisted in these specifications, so as to avoid duplicating instructions.

Development basic

Programing language

PHP & MySQL

Framework

Any of the popular and stable frameworks, like:

- Laravel 5
- Zend 1 / Zend 2
- Yii
- Symfony

External extensions

Any number of 3rd party plugins & addons - for example:

- Javascript plugins for date-picking calendar widgets
- Twitter Bootstrap styles and javascript
- etc.

Design

The design will be based on Twitter Bootstrap as a framework.

The application content area should be contained in maximum of 1200px frame.

Mobile support

Mobile devices are not supported/tested, but the web application is expected to be fully functional on smartphones and tablet.

Compatibility

Operating Systems

- Windows
- Mac OS X

Browsers

- Chrome (latest)
- Firefox (latest)
- Safari (latest)
- Internet Explorer 9+

Security

- No SSL security needed.
- Access to the web application will be done by login with email and password.

Documentation

Programming code

The code of the application should be commented inline. No other documentation needed in the initial phase.

Hosting

Development environment

Will be provided by the Provider.

LIVE environment

Will be provided by the Provider.

Testing

- Testing/QA is to be conducted by the customer and the provider in joint cooperation.

Maintenance and support

The provider will be responsible for the continued maintenance and development of the web application.

Pages and main functionality description

Login

Login is page is the default page when user visits the web application.

The user can login with his email and password.

He can also use the forgot password feature to reset his password by providing his email.

On this page is also the link to the About page, which the use can open to read about the web application.

Forgot password

A page to supply your email and receive instructions for resetting your password.

Forgot password confirmation

A page shown after user successfully resets his password on the Forgot password page.

About

A static text page.

Projects

This is the default page the user sees after logging in.

In the sidebar is a list of all projects and a link for starting creating a new project.

In the central area there is a list of all projects again and their last updated date.

Create project

When user presses the Create new project link in the sidebar, instead of a page, he is shown a lightbox popup where he can write the name of the new project.

Submitting the form, the project is created and the user is redirected to the Project details page.

Project details - overview

The default page when you open a project.

In the central area there is an image and a back button leading to the Projects page.

In the sidebar, the user can click one of these links to go to the corresponding sub-section in a project:

- Forecast

- Post-analysis

Project details - Forecast

This section contains three tabs where user can define his project.

Tab 1

This is the 1st tab from the three in creating/editing a project.

In this tab the user starts with:

- Upload the XML file containing the energy consumption results the user has got from the Be10 application.
- Choose the usage type of the building from the Anvendelse dropdown. Depending on the chosen type, a corresponding template of data will be loaded in and used for filling in some fields in the next tab2. The possible values for this dropdown here are:
    - Børnehave (= kindergarten)
    - Kontor (= office)
    - Plejehjem (= retirement home)
    - Andet (= other)
- Fill out the main details on the project like:
    - Name
    - Description
    - Comments
    - Building type (free input field)
- GPS coordinates of the building

Clicking Next, the user is redirected to the 2nd tab in the flow of creating/editing a project.

Tab 2

In this tab the user can fill in or rather adjust the input parameters for his building, so that BeREAL can calculate the energy consumption just as Be10 has done.

The columns in the form will be pre-filled for the user, but he can edit the values, if necessary.

There will be several columns:

- Parameter name
- Be10 - the value is taken from the uploaded XML in tab1 (the results from Be10)
- BeREAL - the value is taken from the static data template, which is corresponding to the chosen usage type of the building in tab1 ("Anvendelse" dropdown)
- Low - the value is taken from the static data template, which is corresponding to the chosen usage type of the building in tab1 ("Anvendelse" dropdown)
- High - the value is taken from the static data template, which is corresponding to the chosen usage type of the building in tab1 ("Anvendelse" dropdown)
- Notes

Clicking Next, for submitting the form, will initiate a series of calculations to be made by the application in order to provide the final result in tab 3. These calculations will be represented by a series of "correctional flows", which will iterate through the parameters, loop after each other, until finally outputting the final results:

- Usikkerhed grundet vejrdata - https://docs.google.com/drawings/d/1Be9Xrd1uHlJu-gfvamn1qiD2a0in8ZIC4iiRcaPZuOo/edit?usp=sharing
- Korrektion + usikkerhed af varmekapacitet - https://docs.google.com/drawings/d/16u-wp72eqFxgqY3Dns6I0wrtsLS5ZM1cqMA0EDD7oJ4/edit?usp=sharing
- Usikkerhed ved 2-lagsrude - https://docs.google.com/drawings/d/13DEgxXLp4GjpcedJSf98IGhazdmk8f6mmLCpwfBKVCU/edit?usp=sharing
- Usikkerhed for infiltration - https://docs.google.com/drawings/d/10DzhGRlrZoyiHzMbgMWb4mCcoC_qFXQ5lEV1urHSr5Y/edit?usp=sharing
- Usikkerhed for varmt brugsvand - https://docs.google.com/drawings/d/1qzZ8KwNAfGPwHxDJ7Ni6jBJfSTP8elYMYH0p5ZLvMbw/edit?usp=sharing
- Usikkerhed for opvarmningssetpunkt - https://docs.google.com/drawings/d/1Uu2JJLkbjFyTxWO7X78j86NQW0JpAYq5T_1PIBang-w/edit?usp=sharing

Tab 3

This tab will show several pieces of data to compare the results from Be10 to the ones (low, high) from BeREAL.

In the top there should be buttons for:

- Print - will print the whole page
- Export to Excel - will export the page's sections into Excel sheet (.xlsx)

Chart

A stacked bar-chart comparing different values from "Be10", "BeREAL min" and "BeREAL max".

In the bottom of the chart there should be two buttons:

- Save - will save the project, if it's a new one or any changes are made to it in editing
- Save As… - available in cases where you edit a project. The user can save the edited project as a new one, without affecting the original project.

Chart data table

This is just a table of the values represented in the chart.

Totals

This shows the total values for the project:

- Be10 total
- BeREAL total +/- uncertainty
- BeREAL minimum (total - uncertainty)
- BeREAL maximum (total + uncertainty)

Sensitivity data table

This table again shows the result values from Be10 and BeREAL, but it also has one additional column, showing the sensitivity of the different between the two values - basically serving as red/yellow/green flag for the user on where the biggest differences are.

All the columns in the table should be sortable.

Project details - Post-analysis

This section will basically serve as analysis of the expected energy consumptions (provided by BeREAL) and the actual energy consumptions of the building (provided by monitoring services).

These 3rd party monitoring services will be exporting the actual energy consumption data in files (CSV), which the user can then upload to this section and see how successfully BeREAL has predicted the energy consumption of his building.

There are two types of CSV monitoring reports:

- Heating - contains monthly values for the whole year
- Electricity usage - contains hourly values for the whole year

The client might decide to go for a little more advanced post-analysis (for more in-detailed visual comparison), in which case, the CSV monitoring reports will be a bit more advanced, as so:

- *Heating - contains HOURLY values for the whole year*
- *Electricity usage - contains hourly values for the whole year, but separated in several sections:*
    - *Ventilation*
    - *Cooling*
    - *Lightning*
    - *Pumps*

After the CSV files are uploaded, the application should show a chart like the one in the Forecast's 3rd tab, but with one additional bar stack, so all the stacks will be:

- Be10
- BeREAL minimum
- BeREAL maximum
- Actual usage - will not contain as many values in the stack as the others. It will have just two, but the important thing is to compare visually the totals.

Other functionality requirements

Error handling

All errors on form submission should be presented to the end-user with proper notification messages.

Form validation

All forms should be validated both client- and server side.

Content

Language

The user interface should be only in Danish.