



ReDREAM

change your energy

D2.4 Energy Social Network Cloud-based and User Dashboard of the Web Ecosystem

March 2022



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Lead beneficiary	RIMOND	
Responsible Authors	Stefano Converso, Hamed Abbasi Mofrad, Andreea Felicia Miroslav, Alessandro Acciarino	
Other authors/contributors	<i>RIMOND</i>	<i>Alberto Berretti, Daniele Nardone, Lorenzo Pirone</i>
	<i>STEMY</i>	<i>Carlos Becker, Carlos Vereterra, Alberto Castillo, Ada Pouseu, Sergio Diaz, Jaime Boal, Eugenio Pérez, Carlos Rodríguez</i>
	<i>SOULSIGHT</i>	<i>Juan Martino, Leonor Ruiz</i>
	<i>COMILLAS</i>	<i>Francisco Martín, Olga Rico, Ruben Rodríguez, Javier Matanza, Alvaro Sanchez, Badr Ghorbal</i>
	<i>ENER</i>	<i>María Regidor</i>
	<i>ZEZ</i>	<i>Mislav Kirac, Lin Herencic</i>
	<i>BWCE</i>	<i>Alison Turnbull, Pete Capener</i>
	<i>BIO</i>	<i>Andreas Ferrante</i>
	<i>CIVI</i>	<i>Alessandra Cassisi</i>
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Summary

ReDREAM Project

The energy market is rapidly transforming and so is the role of the consumer.

Yesterday's passive consumers can become central actors in future energy markets. This change will be possible if they are enabled to become active. This transformation is always referred to as becoming "prosumers", a combination of producer and consumer. As people –and SMEs, public administrations, and so on– become new "prosumers", energy markets can benefit from their new capability to generate energy, precisely map and communicate their consumption, including the possibility to modulate it and ultimately store it to serve the community.

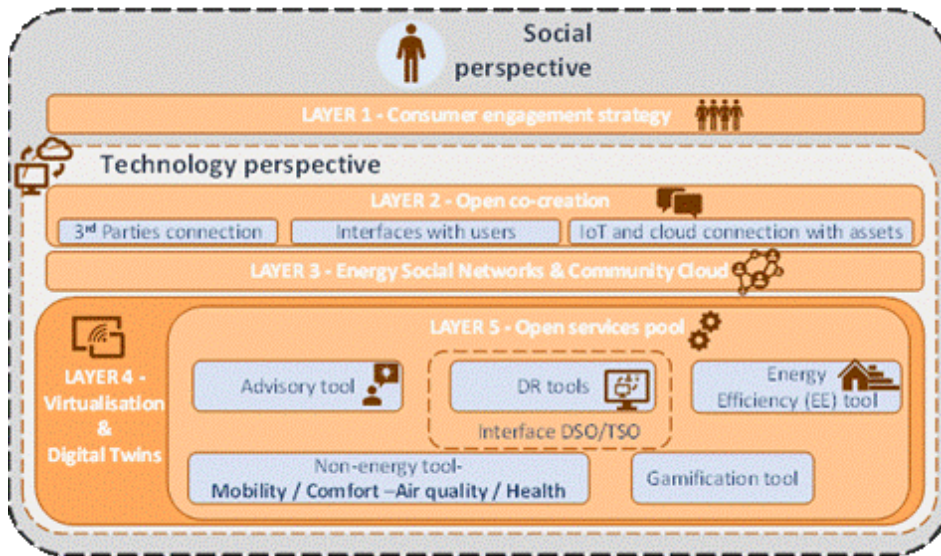
The ReDREAM project aims at establishing the conditions to enable the effective participation of consumers and prosumers in the energy market. These conditions are a combination of physical and digital interventions that helped develop a strategy for creating a value generation chain based on a "service-dominant logic" (SDL) in which services are exchanged and energy is one of them. This means a big move from the common perception of energy as "just a commodity". The project will foster the demand response tools and energy/non-energy services that enable consumers to participate in the "flexible" energy market, where prices, loads, production, and use patterns change constantly and need to be monitored and mapped, to gain efficiency in its management. This will lead to the establishment of a new concept: a connected user-centred energy ecosystem. In that sense, its "social" aspect becomes crucial: we would never have expected some years ago, to talk about "social" energy, and to work and imagine a social network focused, attached to it. But, in fact, we now deeply need it, and we have been happy to work on it. That is probably because more than saving money, or making systems more efficient, the goals that this project looks to achieve, we only get a full sense of our being in the world when our activity benefits others and put us in contact with them.

Summary of Deliverable

This deliverable presents the first version of the ReDREAM Energy Social Network, a platform included in the overall ecosystem that builds a space where users can interact with each other and reinforce their sense of belonging to the energy community.

The Energy Social Network service resides in Layer 3 of the ecosystem architecture, and as mentioned in deliverable D2.3 it is completely integrated into the main platform and can be accessed through the interface side menu.

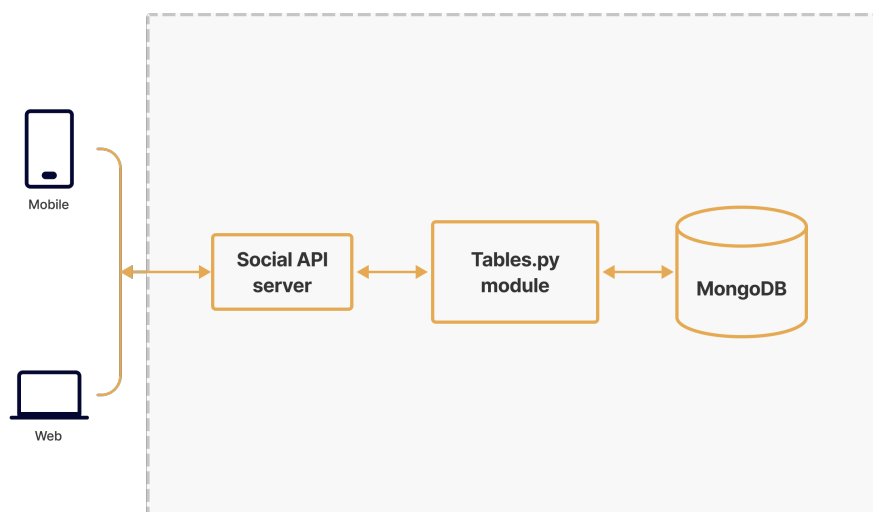




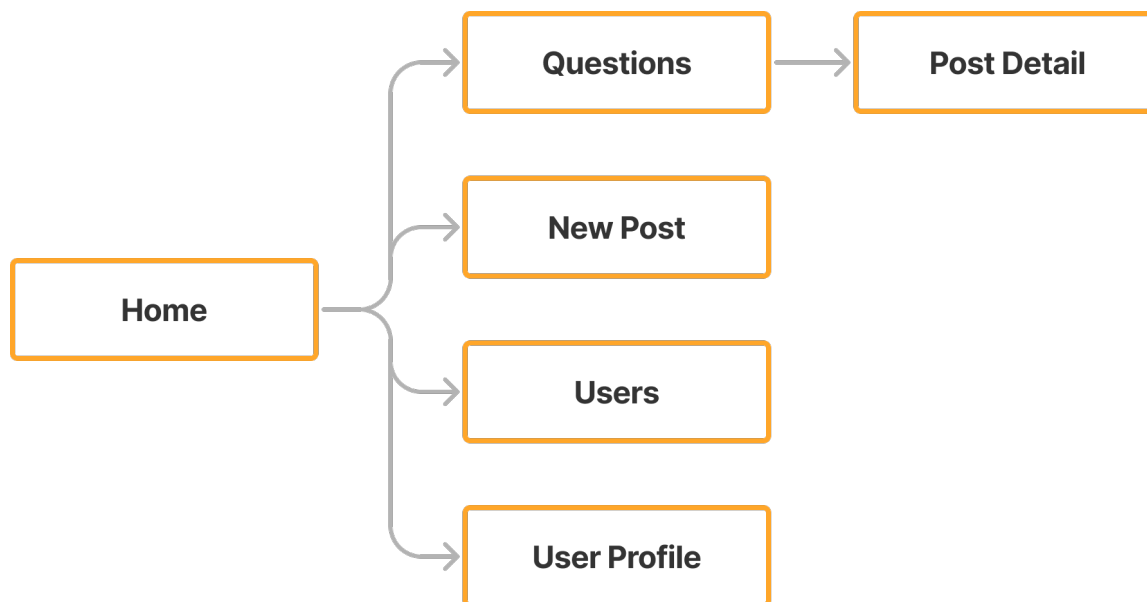
Nowadays people are not used to discussing energy-related topics, mostly because their knowledge about the subject is superficial as no one ever tried to engage people in such arguments simply and directly. The Energy Social Network aims to drive people to get involved in the discussion not by passively assimilating information about energy, but by actively participating in their community, by sharing their own experiences and exchanging views with other members.

To make this process easier but engaging at the same time, the ReDREAM Energy Social Network was structured as a Q&A forum where users could ask questions or help others find answers to their questions by sharing their experiences while being rewarded with virtual badges for engaging with the platform. Each user will be able to ask questions by writing posts and provide answers by commenting on them. The reliability of the answers is guaranteed by two factors:

- **The voting system:** users can upvote questions or answers they find useful and downvote the ones they don't deem helpful
- **Moderators:** moderators are special users that are in charge of verifying correct and useful answers



The back end of the service was built using python as the programming language and MongoDB as the database. A python module directly fetches data from the database and communicates with the API Server that was developed as a bridge between the front end and the back end of the application. The front end follows the main interface design and architecture: it was built as a single-page application with the Angular framework.



Following the website structure map, the pages of the interface that are described in depth in this Deliverable are:

- **Home:** home page where the user has an overview of their activity on the forum.
- **Questions:** questions feed where the user can see other users' posts and interact with them. They will also be able to filter posts based on different parameters such as the content of the posts or the presence of comments.
 - **Post detail:** page that contains all information about a post: content, comments, votes.
- **New Post:** Users will be able to write and publish a new post through this page.
- **Users:** page where users can search for other users in their community and see their public profiles.
- **User Profile:** page that displays all the information about a user. Each user can choose the level of privacy of their profile, meaning that they can select which data to share with other users and which data will remain private.

This deliverable thoroughly explains how the forum is structured, the mechanisms behind the reward system and the architecture of the platform.



Table of Acronyms

Acronyms	Description
AP(s)	Action Point(s)
API	Application Programming Interface
CA	Consortium Agreement
DB	Database
EC	European Commission
ECR	European Commission Reporting
GA	Grant Agreement
H2020	Horizon 2020 programme
LTP	Linked Third Party
NoSQL	Not Only SQL
PC	Project Coordinator
PMB	Project Management Board
PTC	Project Technical Committee
REST	Representational State Transfer
SPA	Single Page Application
SQL	Structured Query Language
WP(s)	Work Package(s)



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1 Introduction

This Deliverable is framed in task 1.1, which develops the foundations and skeleton of the energy ReDREAM user-centric ecosystem. The Ecosystem is formed by the following five structural layers, shown in **Error! Reference source not found.**:

1. Consumer engagement strategy: a holistic strategy to effectively engage the Consumer. This layer will be completed in T1.5.
2. Open co-creation: this layer is the entrance gate for consumers (app and webpage), installers (web), providers of energy technology (web), energy communities (web), scientific research (using open standard API) and energy resources (IoT). This layer will be completed in T2.2, T2.4 and T2.5.
3. Energy “social network”: an open place for consumers to share experiences and provide reliable and direct feedback. This layer will be completed in T2.3.
4. Virtualisation: it will generate new scenarios in the backend to help the advisory tool make decisions through a consumer digital twin emulating the Consumer’s behaviour with improvements. This layer will be completed in T2.6.
5. Open service pool with the catalogue of tools and services for the consumer grid. This layer contains the energy and non-energy services, gamification and advisory tool. This layer will be completed in WP3.

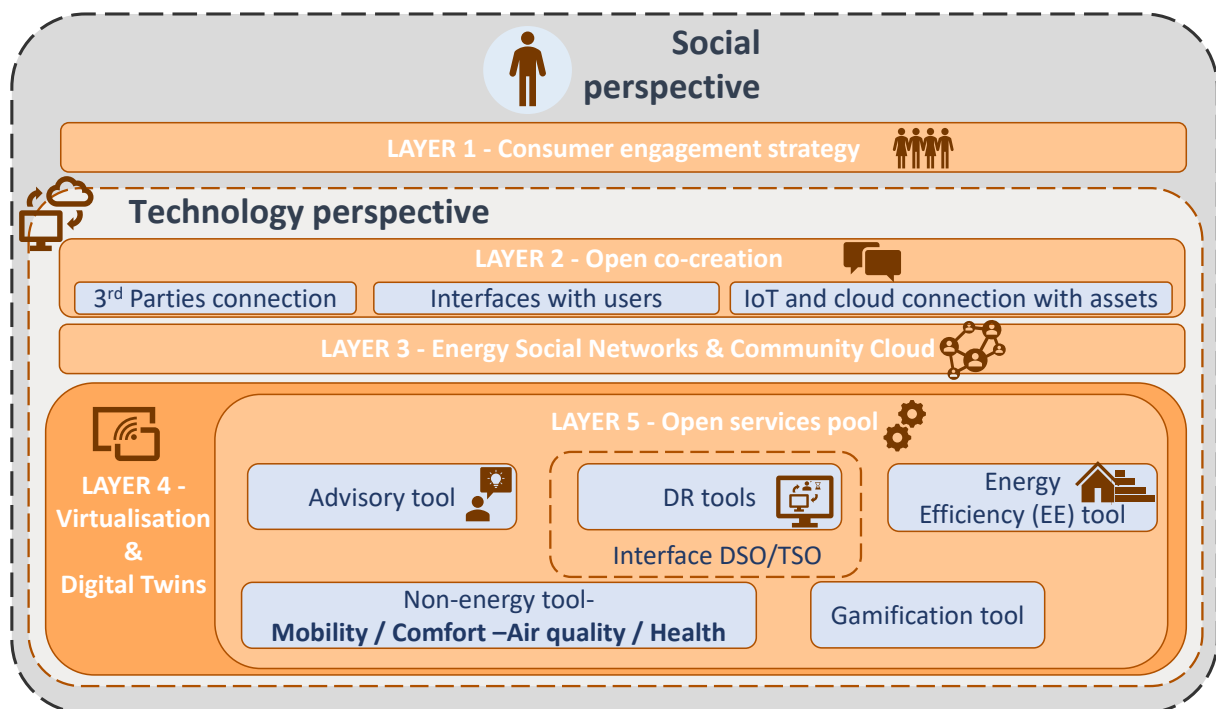


Figure 1 ReDREAM ecosystem

The different services are targeted all-around energy, its innovative process for delivery, distribution and use. Task 2.4 is dedicated to the development of the Energy Social Network.



As introduced earlier, the ReDREAM project aims to effectively move the consumer's (as a residential, industrial and commercial consumer) participation to the centre of the energy market through an open and co-creative ecosystem where all stakeholders will actively interact. This approach is achieved with the integration of several layers and can be considered somehow "fully" social, despite the specificity of the environment described in this Deliverable that develops a Q&A space for interaction on specific issues and topics.

The overall interface system, described in Deliverable D2.3, always shows the possibility to compare the personal behaviour with the community one, by simply switching a button. With similar methods, it is possible to compare personal behaviours with benchmarks, average users, and virtualize them.

The single ReDREAM user is always a member of a community, and the whole ecosystem structure, outlined in D1.1 and deployed now as a whole, shows data about their participation. How much these data on the overall behaviour must come to the surface, by respecting privacy and also the necessity of people not to feel overwhelmed has been a constant source of debate during the project's conception and its development. This is behind the choice, fully explicated in D1.1, to not duplicate existing social platforms with a fully new one developed exclusively around energy but to rely on the ecosystem as a whole, and add a social root to all its parts. Discussion is open and the flexibility of the system technical structure allows to eventually make more "emergence" to social aspects in the parts where more data from users or a larger community dynamic will be supported by data evidence.

One of the goals of the ReDREAM project is to encourage the establishment of energy communities and strengthen the sense of *community* for each member. One of the fundamental tools to achieve such a goal is the Energy Social Network, conceived in this case as a platform embedded in the ReDREAM ecosystem that promotes the interaction between users to make them feel like they are part of something meaningful and not alone in the process of the energy transition.

To do so we provided a space for users to confer about anything energy-related: the peculiarity of the platform is that the users are free to open any kind of discussion by writing a post as long as they categorize it through the use of tags. As will be further explained in the next sections, tags are crucial to specify the topic of a post in order to be able to classify the posts and let the users filter the ones they see in their feed.

The social platform was designed following the five design principles described in D1.1. For instance, the interface is minimal and keeps the same look and feel as the rest of the platform to follow the simplicity principle and the personalization principle is followed by letting users choose what kind of posts they want in their feed using filters.

Moreover, our ambition is to let users be able to interact not only with the energy community they are part of but also with users belonging to other energy communities, to encourage the broadening of the group of people discussing the topic of energy. Therefore, as the project evolves, we'll explore all of the possibilities to do so in future versions of the system.



2 Energy social network

The ReDREAM Energy Social Network is a place where ReDREAM users can ask questions and share knowledge about energy-related topics that is organized as a forum, hence we will refer to it as *Social Forum* throughout this document and in the platform itself.

The forum has a Q&A structure where any user of the ecosystem can:

- Create a new post/thread (ask questions) and be able to edit or delete it eventually
- Comment on any post (provide answers)
- Reply to comments
- Upvote (like) or downvote (dislike) posts and comments
- Filter posts by tags or specific properties

All these functionalities will be explained in detail in the **Website structure** section.

2.1 Software architecture

As stated in D2.3, the interfaces for the Social Forum are embedded in the ReDREAM platform described in said deliverable, which was developed as a Single Page Application (SPA) through the use of the web framework Angular. Having developed the front end as a SPA with the objective to make it communicate with different services, the best choice for the communication between the front end and the back end was through a REST API.

A REST API is an API (Application Programming Interface) that conforms to the design principles of the REST, or Representational State Transfer architectural style (IBM Cloud Education, 2021).

The back end of the service was developed in Python and is distributed in four main files:

- **redream_config.py**: the configuration file containing database (DB) information, API information
- **redream_social_api.py**: the API server
- **redream_social.py**: a module defining all the functions used in redream_social_api.py
- **Tables.py**: a module based on MongoDB which implements all the needed data structures. Everything could be migrated to a different DB just by reimplementing the APIs provided in this module.

The chosen database is MongoDB, a NoSQL DB that allows to dynamically manage data without having to first define a strict schema. Of course, an initial schema must always be defined to be able to properly handle the data enclosed in the DB, but it is a much more flexible solution compared to the more traditional SQL databases that require a strictly defined schema beforehand which is very difficult to change with an already started development process.

The API server was developed ad hoc for the ReDREAM project using the Python web framework and asynchronous networking library *Tornado* that allowed to easily structure the API and establish the connection between the front-end application and the database.



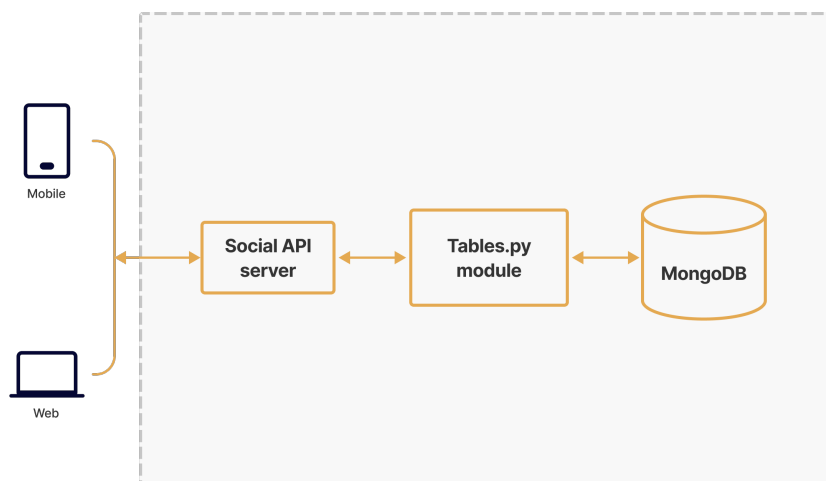


Figure 2 Architecture of the service

2.2 Users and Authentication

For this service, there will be two types of users. The first type is local (Moderator) users, whose database is local and stored in MongoDB and whose identity is kept in a signed cookie. The second type is consumer-users, whose data is at Stemy's.

A cookie is a small piece of data that the web server sends to the user's web browser, where it will be stored and used for future requests. It is typically used to tell if two requests come from the same browser, for example, to keep a user logged in (MDN contributors, 2022).

However, cookies are not secure and can be easily modified by clients. To prevent that, *signed cookies* are used. Signed cookies contain the encoded value of the cookie in addition to a timestamp and a hash-based message authentication code (HMAC) signature (Tornado Authors, 2019).

The Moderator users of the Social Forum will be able to verify the answers given by the users (see the Posts section) and delete or edit posts if they consider it necessary. They would also be responsible for opening a new thread dedicated to each challenge developed in the Gamification tool described in D3.7, where users of the ecosystem could discuss their progress in the challenges.

All prosumers that use the social network are users of the ReDREAM ecosystem. To access the social network the user needs to first access the platform itself, so the authentication will be handled by Stemy as described in D2.6. To briefly summarize the process:

1. The user will log in through the interface Login form and will be authenticated through Stemy's authentication system with a username and password;
2. The front end will receive a token from Stemy which will be stored locally in the browser
3. The token is passed along in every request made to the Social Forum API;
4. The Social Forum back-end checks if the token is valid by sending a request to Stemy's *getProsumers* endpoint, if the token is valid the endpoint will return the prosumer ID associated with the token, if not it will return 401 Unauthorized status.

Moderator users will log in through the same form, but they will need to check the "Log in as Social Moderator" checkbox so they will only have access to the Social Forum instead of the whole platform.



When the Social API receives a request, it first checks the presence of a valid cookie. If so, the user is identified as a Moderator user and redirected to the Forum. Otherwise, the back end will look for an Authorization token and submit it to Stemy to get the prosumer ID.

If this fails, or there is no Authorization token, the request to the page is rejected as unauthorized and the user will be prompted to double-check their credentials. (Figure 3)

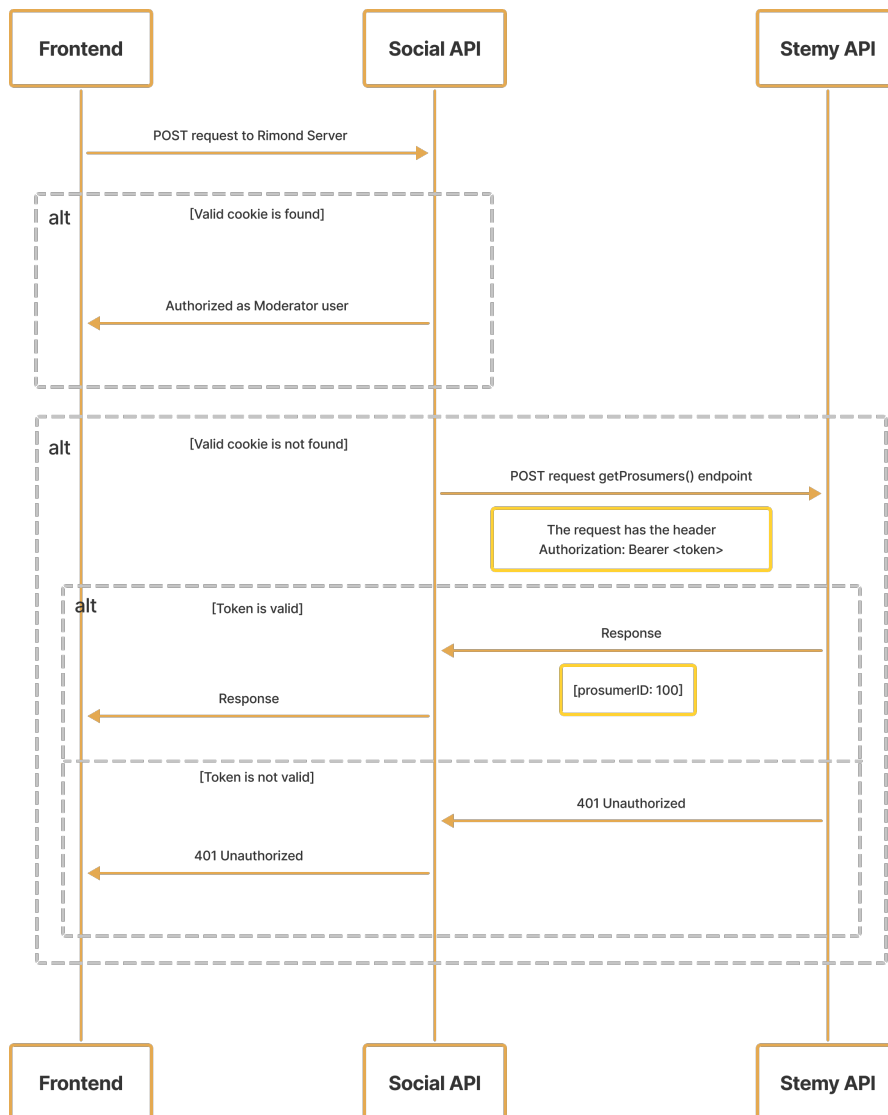


Figure 3 Authorization flow

2.3 Rewarding system

To engage and encourage users to interact with the platform, we aimed for a gamified approach through the development of a reward system based on earning badges.

A badge is a virtual reward that can be obtained by a user when they perform certain actions within the forum. The badges of the ReDREAM Social Forum are split into three levels (gold, silver, bronze), the level of the badge depends on the number of times a set of actions is performed.

Current badges are:



Action	Badge name	Bronze	Silver	Gold
Received upvote on a question	<i>Nice Question</i>	Received 2 upvotes	Received 5 upvotes	Received 10 upvotes
Received upvote on an answer	<i>Nice Answer</i>	Received 2 upvotes	Received 5 upvotes	Received 10 upvotes
Upvoted/Downvoted question or answer	<i>Critic</i>	Voted on 2 questions/answers	Voted on 5 questions/answers	Voted on 10 questions/answers
Asked question	<i>Curious</i>	Asked 1 question	Asked 3 questions	Asked 5 questions
Answered question	<i>Community Helper</i>	Answered 1 question	Answered 3 questions	Answered 5 questions

Table 1: Current badges for the social forum reward system

Other badges can be added to the list in future versions and the current ones can be adjusted based on the users’ interactions with the platform.

As shown in Table 1, each badge has a name that is used to differentiate the badges from one another based on the action performed by the user. Each time an action is performed the required number of times, the user will earn a new badge that will be displayed on their profile page (see User profile), as seen in Figure 4.

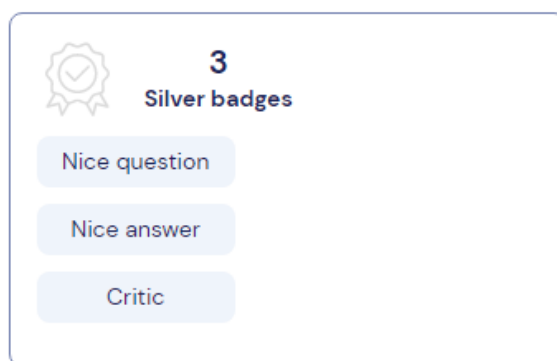


Figure 4 Badges summary shown in the user profile



2.4 Website structure

As mentioned at the beginning of this document, the Social Network for the ReDREAM ecosystem takes the form of a Q&A Forum.

There are three main sections in the side menu of the Forum, as shown in Figure 5: *Home*, *Questions*, *Users*. A FAQ section was also planned in the first phases of the development process, but it was considered unnecessary to have two FAQ sections (one in the forum, one on the main platform). As an alternative, we decided to only keep the FAQ page in the main platform and use the forum to sustain it, by periodically updating the FAQ with the most asked questions on the social forum.

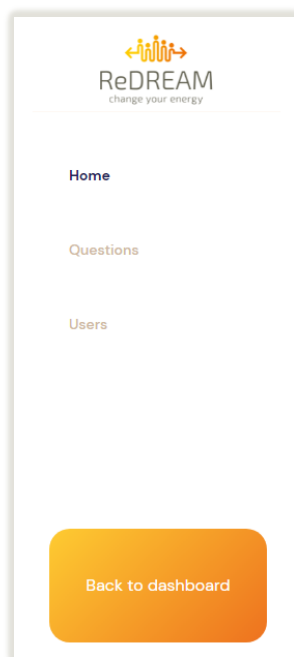


Figure 5 Social Forum Menu

The Forum is easily accessible through the main menu of the platform, therefore we deemed it necessary to also provide a way to return to the dashboard via the orange button positioned at the bottom of the menu.



2.4.1 Homepage

The Homepage displays an overview of the user's activity on the Forum.

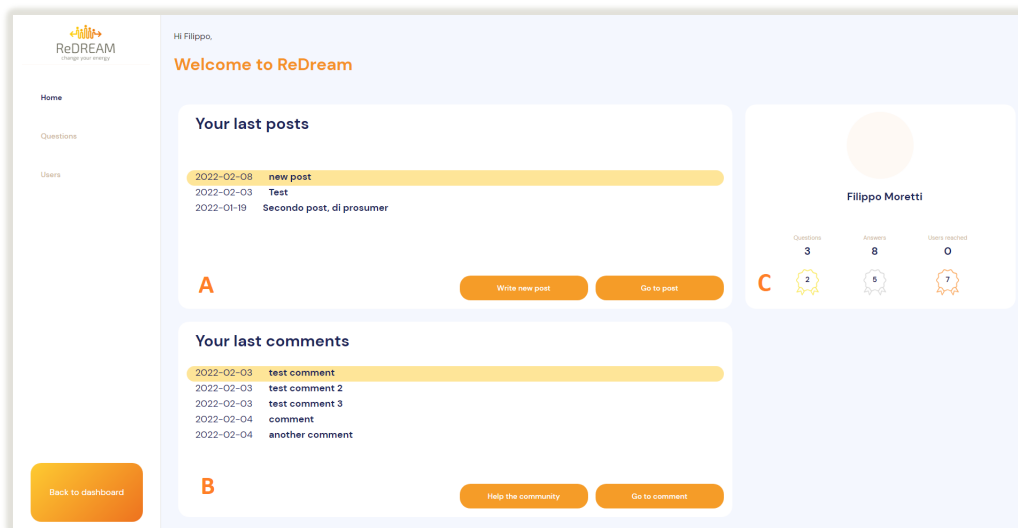


Figure 6 Homepage

In detail:

- **Card A:** This card displays the last posts of the user. The user will be able to select a post from the list and access the *Post Detail* page for that specific post by clicking the “Go to post” button. The “Write new post” button redirects to the “New Post” page. If the user has not written any posts a message encouraging him/her to write a post will be shown and the only available button will be the “Write new post” one.
- **Card B:** This card displays the last comments of the user. The user will be able to select a comment from the list and access the *Post Detail* page for the post the comment belongs to by clicking the “Go to comment” button. The “Help the community” button redirects to the “Questions” page, where the user could be helpful to other prosumers of their community by answering their questions. If the user has not written any comments a message encouraging him/her to comment on other posts will be shown and the only available button will be the “Help the community” one.
- **Card C (Figure 7):** This card displays an overview of the user profile on the Forum. It summarizes the number of posts and comments the user has ever published on the Forum, the number of reached users, meaning the number of users they have interacted with through their comments and the summary of the earned badges. Here the yellow circle represents the gold badges, the grey circle symbolises the silver badge and the orange one stands for the bronze badge. By clicking on their name, the user will be redirected to their Forum personal profile (User profile).



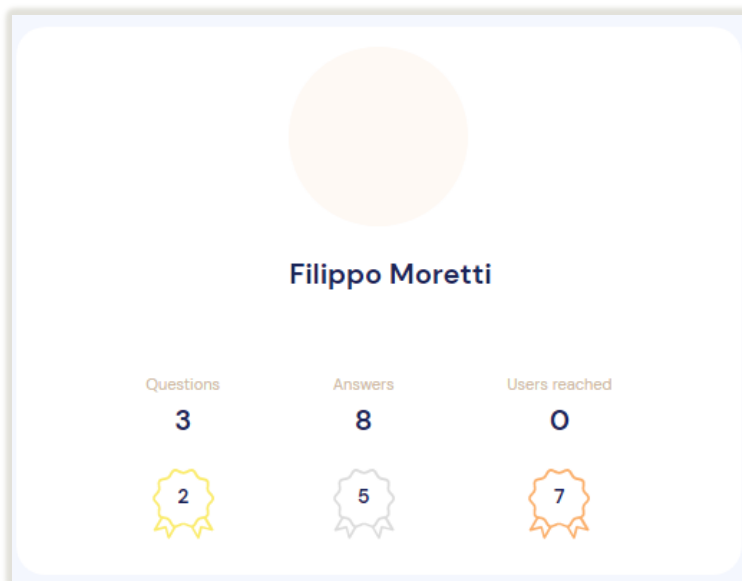


Figure 7 Detail of profile summary card

2.4.2 Posts

The main part of the Forum is located on the *Questions* page (Figure 8). In this section of the web application, the user will be able to see all the posts written by members of the community and interact with them.

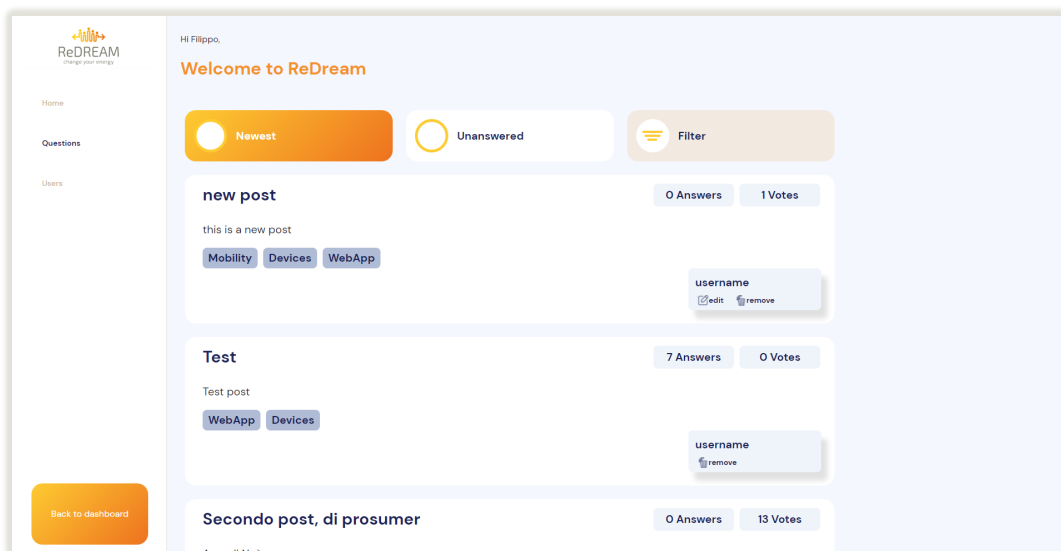


Figure 8 Questions feed

The structure of the page is the following: on the top part three buttons allow the user to filter the posts they see by certain parameters; underneath these buttons, each post preview is contained in a card that displays:

- Post title
- Preview of the content of the post (first 500 characters)
- Post tags



- Number of answers (or comments)
- Number of total votes (sum of upvotes and downvotes)
- Overview of the profile of the user that wrote the post

If a post was written by the currently logged-in user, in the overview of the user profile two buttons will grant the user the possibility to edit the post (if it does not have any comments yet) and delete it. On the other hand, if the post was written by another user they will only see the username of the original poster and their badges (if said person chose to share it), as shown in Figure 9. By clicking on the username, the user will be redirected to that user's public profile.



Figure 9 User overview preview on post

By clicking on a tag, the page will automatically filter the posts by the selected tag and only display the posts containing it, as in Figure 10.

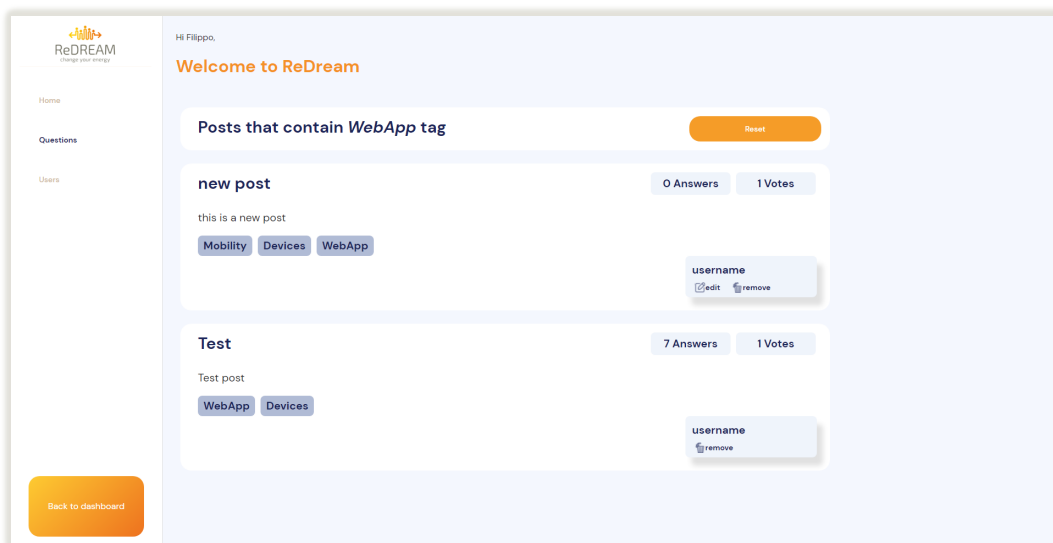


Figure 10 Posts filtered by tag

About filters, as previously mentioned, the users will be able to filter the displayed posts by using the three buttons at the top of the page. Using Figure 8 as a reference, the first button is the only one that allows the user to see all of the posts ordered by newest post; the second button filters the posts and only displays the unanswered ones, that is to say, the posts that did not receive any comments. The third button, the "Filters" one, will trigger the display of two additional cards (Figure 11).



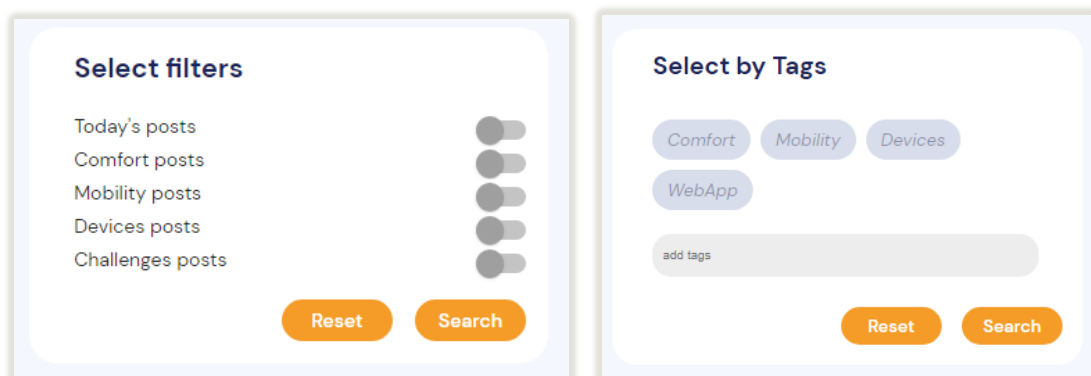


Figure 11 “Select filters” and “Select by Tags” cards

Through the “*Select filters*” card the user will be able to filter the viewed posts by selecting one of the slide toggles proposed, in detail, the current filters are:

- Posts published today
- Posts that contain the *Comfort* tag
- Posts that contain the *Mobility* tag
- Posts that contain the *Devices* tag
- Posts that contain the *Challenges* tag

Additional filters may be added to the list or could replace some of the filters currently based on tags that can be also reached through the “*Select by Tags*” card, where users can filter the posts based on tags by typing their desired tags and/or tag combinations (i.e. if they want to look for posts about charging posts they could look for posts that contain both the *Mobility* tag and the *Devices* tag).

In all the above-described situations, where the posts displayed in the feed are filtered, there always will be a *Reset* button that will reset all the filters and go back to displaying all posts ordered by the newest posts first.

Besides the filters, another feature that could be implemented in the next versions of the service is an “*OrderBy*” function that could allow the user to order the displayed posts differently according to their preferences (newest, most popular, number of upvotes, etc).

By clicking on a post title the user will be redirected to the *Post Detail* page (Figure 12). Here the whole content of the post will be displayed as well as the number of upvotes and downvotes and the comments received on the post.



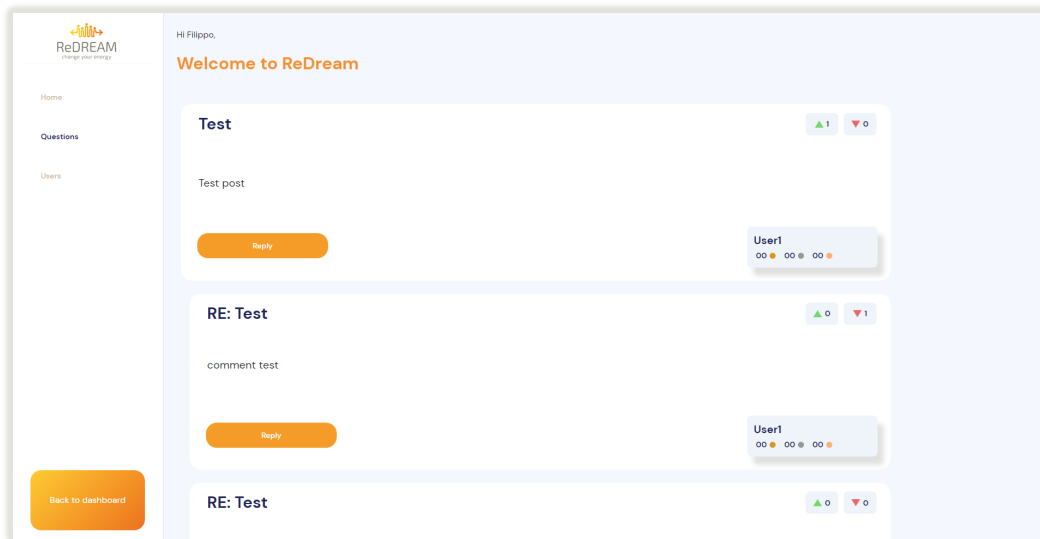


Figure 12 Post Detail page

On this page the users will be able to interact with each other by commenting on the post, replying to other comments and/or upvoting or downvoting the post or the comments by clicking on the buttons in the top-right corner. (Figure 13)

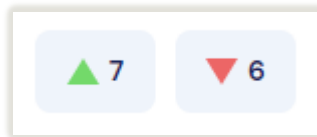


Figure 13 Upvote and Downvote buttons

By clicking on the “Reply” button on each card the user will trigger the appearance of a new card containing a textbox where they could write their comment, as shown in Figure 14.

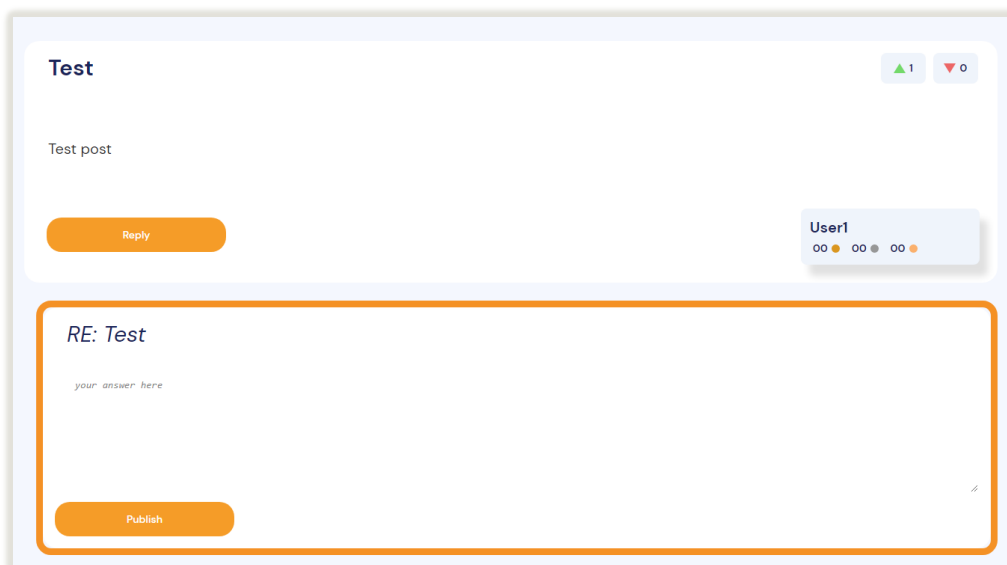


Figure 14 Add a comment



Upvotes and Downvotes were implemented mainly to assure a certain quality of the contents of the forum by letting the users themselves establish what they consider useful and what not. Another tool that will be used to guarantee the aforementioned quality standard and to build trust among users is the verification of the answers by a “Moderator” user that would weekly check the answers to the most relevant questions and mark the best ones (in terms of correctness) as *verified*. A verified answer is graphically characterized by a green frame around the card that contains the answer and a green checkmark under the title (Figure 15).

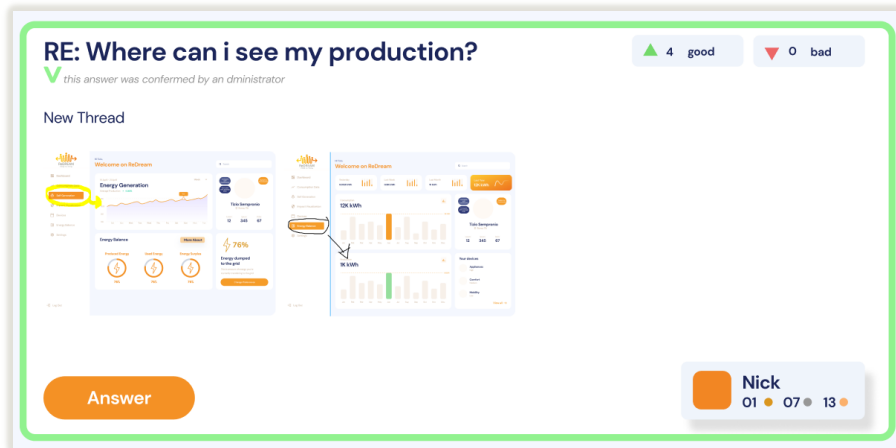


Figure 15 Example of verified answer

Moderators will have access to a slightly different version of the interface, where they will be capable of verifying the answers given by users through a specific button displayed on each comment, as shown in Figure 16. They will also have some extra privileges compared to normal users, such as editing and deleting posts of other users if they consider it necessary.

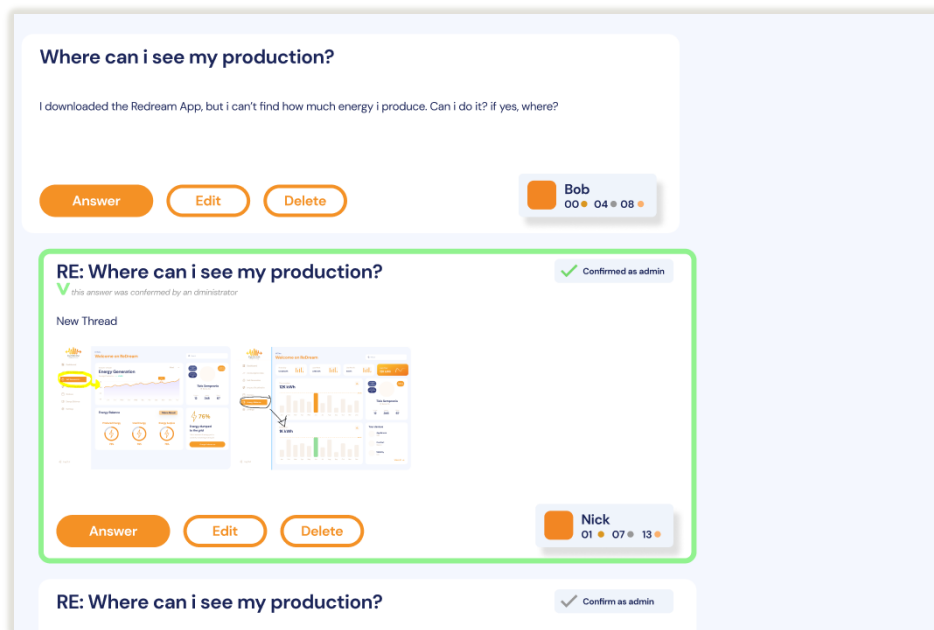


Figure 16 Moderator version of the interface

To write a new post the user needs to get to the *New Post* page by clicking the “write new post” button on the homepage and fill all the required information in the form (Figure 17).



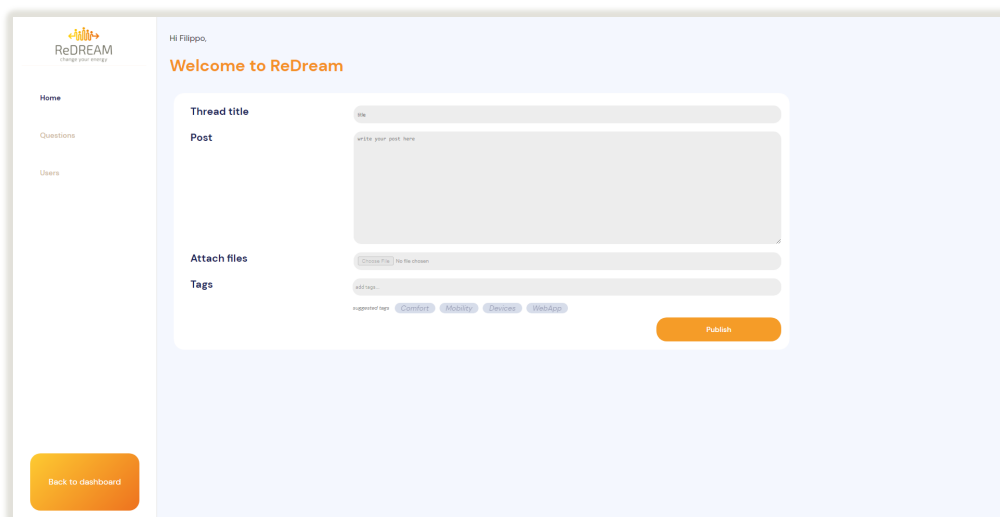


Figure 17 New Post page

The title, the post content and the tags are mandatory, whereas the attachments may be omitted. The tag section allows the user to choose between the predefined suggested tags or to write their own ones. As previously observed, the tags are a fundamental tool in order to keep the information categorized and to let users easily find what they look for if they have any specific questions, so the predefined ones will evolve based on feedback from users.

2.4.3 Users

On the *Users* page (Figure 18) the user can find a list of all the users in their flex community and search for specific users by their nickname through a search bar. If they click on one of the results they will be redirected to the selected user’s profile and see the information that said user decided to share with the community.

The list of users can be ordered by newest members, name and popularity (defined based on the number of interactions with the community through the social forum).

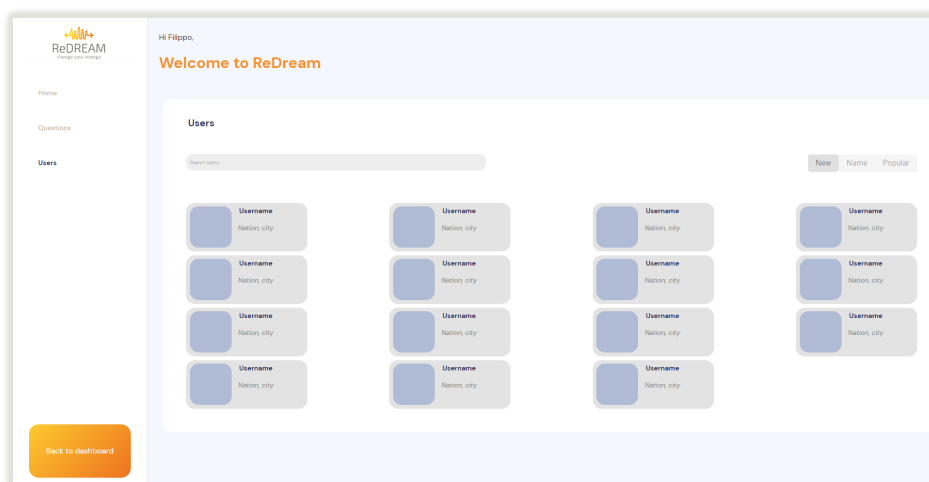


Figure 18 Users page



2.4.4 User profile

The *User Profile* page displays all relevant information about the user’s activity on the Forum that could be publicly displayed. The page is composed of two cards: the first one presents the user’s data such as Stats (number of posts, comments, and users reached), a personal description, and details about the number of badges and the types of badges the user has earned.

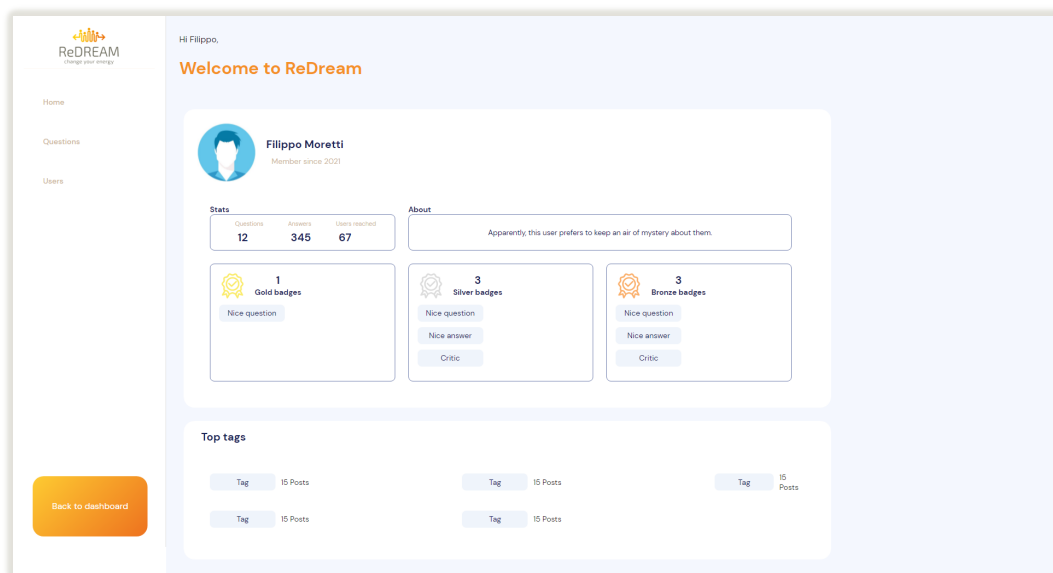


Figure 19 User Profile page

The second card shows an outline of the user’s most used tags. By clicking on one of the tags the user would be redirected to the *Questions* page with an active filter for the selected tag (Figure 10). All the data displayed on this page can be hidden or publicly displayed based on the user’s choices. To meet privacy requirements and the personalization design principle, each user can choose which data to share with their community and which not through the settings pages of the main platform, as described in D2.3. If the user chooses not to display some data, their public profile would be automatically filled similarly to what can be seen in the “*About*” section of Figure 19.

3 References

- IBM Cloud Education. (2021, April 6th). *What is a REST API?* Retrieved from ibm.com:
<https://www.ibm.com/cloud/learn/rest-apis>
- MDN contributors. (2022, January 20th). *Using HTTP cookies*. Retrieved from mdn web docs:
<https://developer.mozilla.org/en-US/docs/Web/HTTP/Cookies>
- Tornado Authors. (2019, December 23). *Authentication and security*. Retrieved from Tornado Web Server: <https://www.tornadoweb.org/en/stable/guide/security.html>

