LABAP Project - MyPics

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Contents

1 Initial idea

Interactive dashboard to look for images uploaded by other users.

1.1 System objectives

- Show the dashboard with most popular images and images uploaded by followed users
- Manage user authentication
- Show a page related to users' profiles containing all the images uploaded by them
- Allow users to upload, search and see images
- Allow users to follow other users to easily access their user profile and images

1.2 Distributed Software Application with Containerization

- **Front-end layer**:
  - Login/registration page
  - Homepage
  - User profile page
  - User settings page
  - Image visualization page with description and comments
  - Image upload page
- **API gateway**: to take an application user's request, route it to one or more backend services, gather the appropriate data and deliver it to the user in a single, combined package
- **Logic layer**:
  - Microservice for user management: handles registration/authentication/access to the user profile
  - Microservice for notifications: allows the user to be notified about new likes or new comments on his images and new followers
  - Microservice for images management: handles the upload and deletion of images
  - Microservice for social part: allows the user to like/comment/save an image and follow another user
  - Microservice for search: handles the search of an image or an user
- **Persistence layer**: NoSQL database

Each element of this list represents a different Docker container of the system and all the containers are orchestrated using Docker Compose.

1.3 Potential Users

- People interested in discovering images from people that they follow
- People interested in uploading and sharing images

1.4 Use Cases

- User can register to the app
- User can login into the app
- User can search for an image
- User can search for an user
- User can visualize the home page containing most popular images and the images published by followed users
- User can upload an image
- User can save an image
- User can remove an uploaded image
- User can like an image
- User can comment an image
- User can get notified if another user likes one of its images
- User can get notified if another user leave a comment on one of its images
- User can get notified for a new follower
- User can follow/unfollow another user
- User can access its own profile to visualize his images and the ones that he saved from other users
- User can access its own profile to manage it
- User can access another user profile to view his details and his published images
- User can logout
- User can delete its account

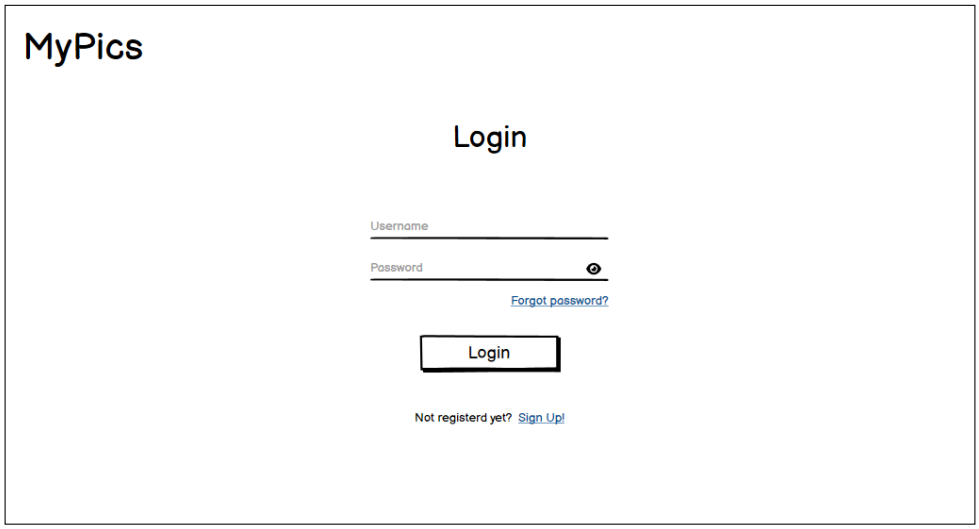
2 User stories and mockups

2.1 Sign-up

AS A	I WANT TO	SO THAT I CAN	ADDED BY
Guest	Register to the system	Create my profile	Everyone

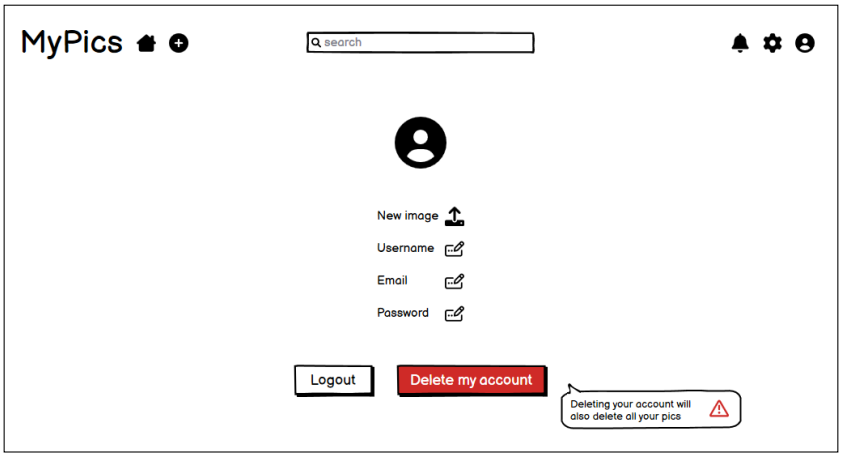
2.2 Login

AS A	I WANT TO	SO THAT I CAN	ADDED BY
Non-logged registered user	Login into the system	Use system's services	Everyone



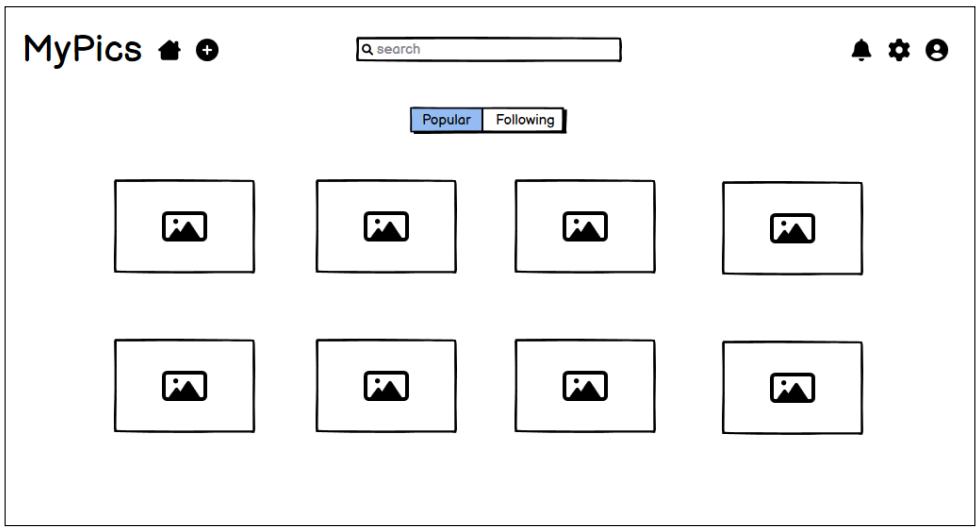
2.3 User settings

AS A	I WANT TO	SO THAT I CAN	ADDED BY
Logged registered user	Logout from the system	Login as another user	Everyone
Logged user	Delete my profile	No longer access the system	Everyone
Logged user	Access my profile settings	Manage it	Everyone



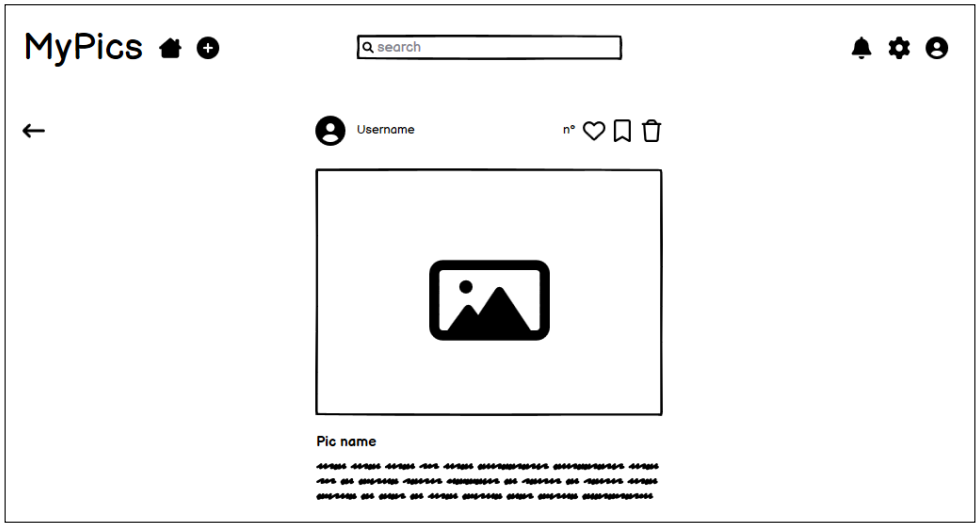
2.4 Main

AS A	I WANT TO	SO THAT I CAN	ADDED BY
Logged user	Access the homepage	Discover the most popular images	Everyone
Logged user	Access the homepage	Discover images published by followed users	Everyone
Logged user	Search for images	Visualize them	Everyone
Logged user	Search for other users	Visualize their profile and their images	Everyone
Logged user	Get notified	Know if another user liked or commented one of my image or followed me	Everyone
Logged user	Access other user's profile page	Visualize his details and published images	Everyone
Logged user	Visualize image	Visualize its details and comments	Everyone



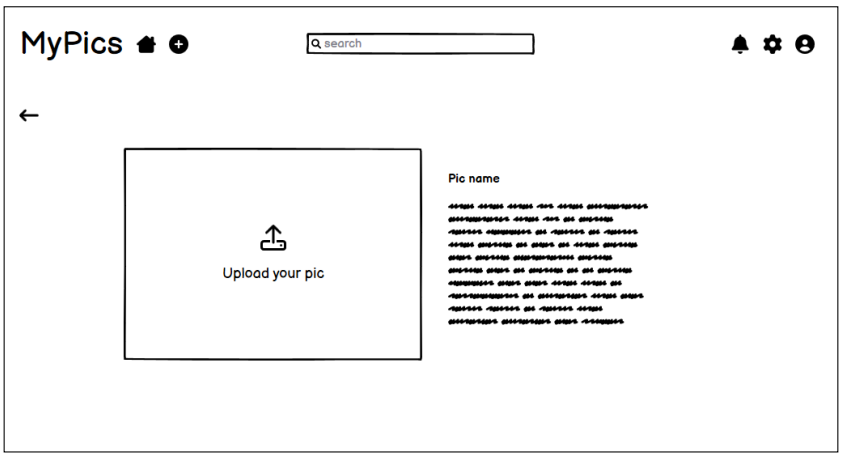
2.5 Pic

AS A	I WANT TO	SO THAT I CAN	ADDED BY
Logged user	Like an image	Express my appreciation about it	Everyone
Logged user	Save an image	Discover the most popular images	Everyone
Logged user	Remove an uploaded image	Deny to other users to visualize it	Everyone



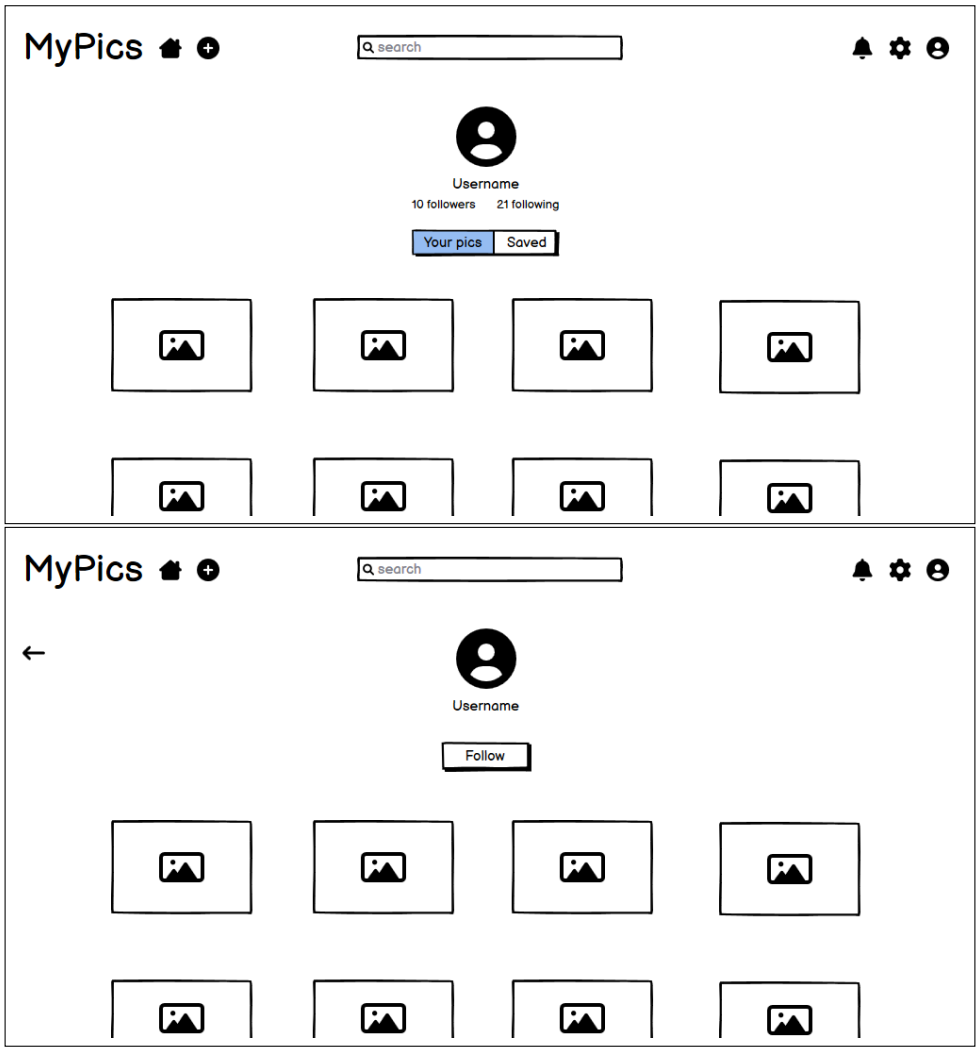
2.6 Upload pic

AS A	I WANT TO	SO THAT I CAN	ADDED BY
Logged user	Upload an image	Share it with other users	Everyone



2.7 User profile

AS A	I WANT TO	SO THAT I CAN	ADDED BY
Logged user	Access my profile	Visualize all my published images	Everyone
Logged user	Access my profile	Visualize all my saved images	Everyone
Logged user	Access user profile	Visualize followers/followed users	Everyone
Logged user	Follow another user	Stay updated about his new images	Everyone



3 Effort estimation

3.1 Function Points

No.	Module	Function Name	Description	Type	DET	RET / FTR	Complexity	FP	Remarks	Adjust %	FP adjusted
1	User	User	Model stored to represent the users	ILF	5	1	Low	7			**7**
2	Post	Post	Model stored to represent the posts	ILF	5	1	Low	7			**7**
3	Comment	Comment	Model stored to represent the comments	ILF	3	1	Low	7			**7**
4	Notification	Notification	Model stored to represent the notifications	ILF	3	1	Low	7			**7**
5	Login	Login	Login to the application	EI	2	1	Low	3			**3**
6	Sign up	Sign up	Sign up to the application	EI	3	1	Low	3			**3**
7	Main Page	Show popular images	Shows popular images published on MyPics	EQ	5	2	Low	3			**3**
8	Main Page	Show followed users' images	Shows images published by followed users	EQ	5	2	Low	3			**3**
9	Search	Search	Seach for images published on MyPics or users	EQ	6	2	Average	4			**4**
10	Pic	Visualize pic	Show image with its details	EO	15	3	Average	5			**5**
11	Pic	Add pic	Publish image on MyPics	EI	6	2	Average	4			**4**
12	Pic	Delete pic	Delete published image from MyPics	EI	1	1	Low	3			**3**
13	Pic	Add/Remove like	User add/remove like on post	EI	2	2	Low	3			**3**
14	Pic	Add comment	User add comment on post	EI	5	3	High	6			**6**
15	Pic	Delete comment	User delete previously published on post	EI	1	1	Low	3			**3**
16	Pic	Save pic	User save an image	EI	2	2	Low	3			3
17	Profile	Show published images	Show images on user profile	EQ	5	2	Low	3			**3**
18	Profile	Show saved images	Show saved images on user profile	EQ	5	2	Low	3			**3**
19	Profile	Follow/Unfollow user	User follow/unfollow another user	EI	2	1	Low	3			**3**
20	Profile	Visualize followers	Show list of followers	EO	4	1	Low	4			**4**
21	Profile	Visualize followed users	Show list of followed users	EO	4	1	Low	4			**4**
22	Profile settings	Update profile pic	Update profile pic	EI	2	1	Low	3			**3**
23	Profile settings	Update username	Update username	EI	2	1	Low	3			**3**
24	Profile settings	Update email	Update email	EI	2	1	Low	3			**3**
25	Profile settings	Update password	Update password	EI	2	1	Low	3			**3**
26	Profile settings	Delete account	Delete account registered on MyPics	EI	1	1	Low	3			**3**
27	Notification	Show notifications	Show notifications of received likes, comments and follows	EQ	6	3	Average	4			**4**
28	Notification	Update notification	Update not read notification to read notification	EI	2	1	Low	3			**3**
29	Notification	Add notification	Add notification on database	EI	5	3	High	6			**6**

Unadjusted FP	**116**

Considering Java as main language, this is equivalent to 6148 SLOC.

3.2 CoCoMo II

COCOMO II - Constructive Cost Model

Monte Carlo Risk: Off
Auto Calculate: Off

Software Size Sizing Method: Function Points

Unadjusted Function Points: 116 Language: Java

Software Scale Drivers

Precedentedness	Nominal	Architecture / Risk Resolution	Nominal	Process Maturity	Low
Development Flexibility	Very High	Team Cohesion	Very High		

Software Cost Drivers

Product		Personnel		Platform	
Required Software Reliability	Low	Analyst Capability	High	Time Constraint	Nominal
Data Base Size	Nominal	Programmer Capability	High	Storage Constraint	Nominal
Product Complexity	Nominal	Personnel Continuity	Very High	Platform Volatility	Nominal
Developed for Reusability	Nominal	Application Experience	Nominal	**Project**	
Documentation Match to Lifecycle Needs	Nominal	Platform Experience	Nominal	Use of Software Tools	Very High
		Language and Toolset Experience	Nominal	Multisite Development	Extra High
				Required Development Schedule	Nominal

Maintenance Off

Software Labor Rates

Cost per Person-Month (Dollars): 2000

Calculate

Results

Software Development (Elaboration and Construction)

Effort = 7.2 Person-months
Schedule = 6.8 Months
Cost = $14359

Total Equivalent Size = 6148 SLOC
Effort Adjustment Factor (EAF) = 0.35

Staffing Profile

Your project is too small to display a staffing profile due to truncation.

Acquisition Phase Distribution

Phase	Effort (Person-months)	Schedule (Months)	Average Staff	Cost (Dollars)
Inception	0.4	0.8	0.5	$862
Elaboration	1.7	2.5	0.7	$3446
Construction	5.5	4.2	1.3	$10913
Transition	0.9	0.8	1.0	$1723

Software Effort Distribution for RUP/MBASE (Person-Months)

Phase/Activity	Inception	Elaboration	Construction	Transition
Management	0.1	0.2	0.5	0.1
Environment/CM	0.0	0.1	0.3	0.0
Requirements	0.2	0.3	0.4	0.0
Design	0.1	0.6	0.9	0.0
Implementation	0.0	0.2	1.9	0.2
Assessment	0.0	0.2	1.3	0.2
Deployment	0.0	0.1	0.2	0.3

4 System architecture

The system architecture is based on microservices, each running on its own Docker container and each accessing its own data. These containers are orchestrated through Docker Compose.

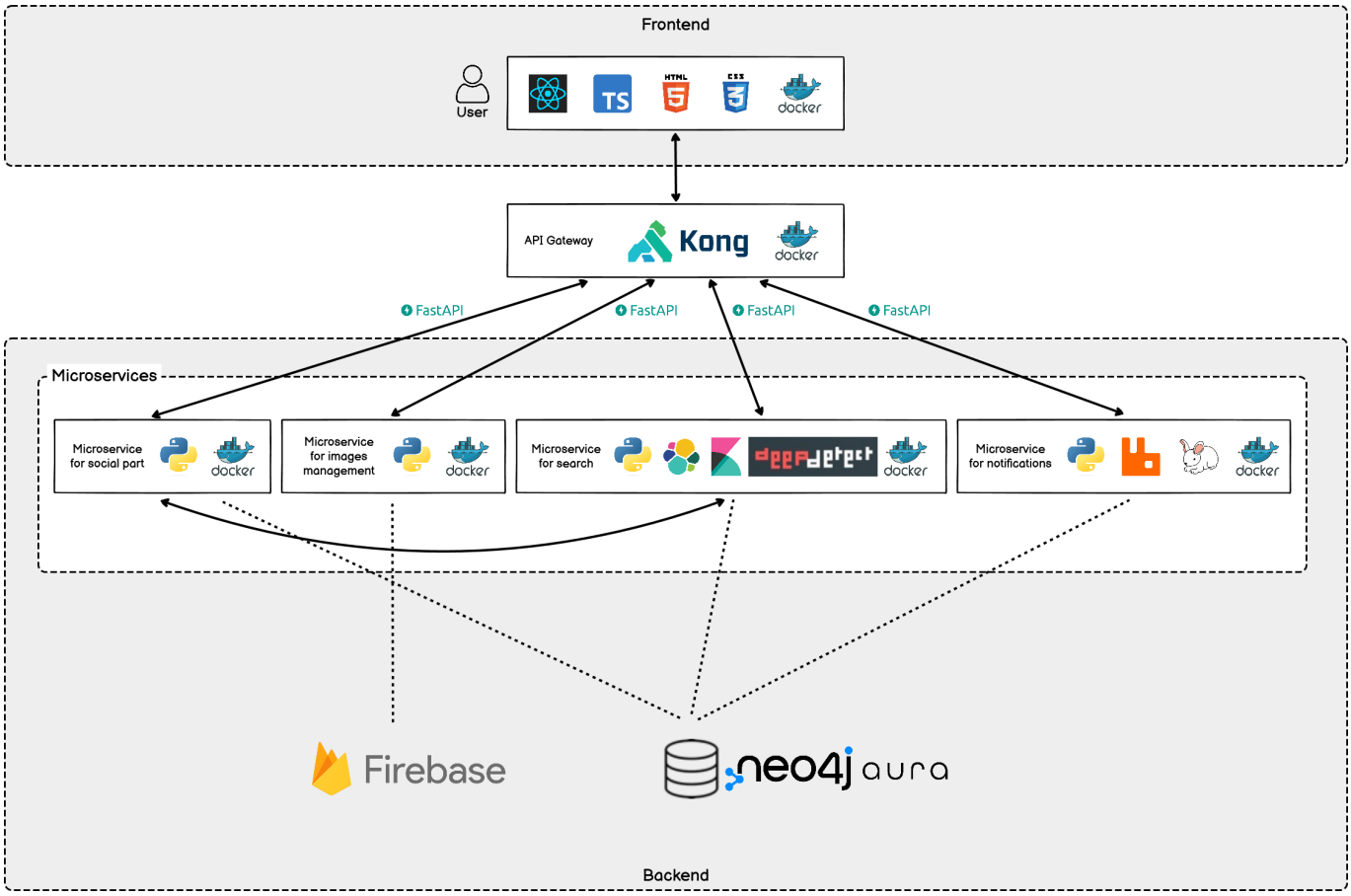


Figure 1: Overview of system architecture

- **Frontend:** developed in React (based on TypeScript, HTML and CSS). Users interact with the system through this layer.
- **API Gateway:** we use Kong Gateway which is a lightweight, fast, and flexible cloud-native API gateway that serves as a reverse proxy that lets us manage, configure, and route requests to our APIs exposed by the microservices.
- **Microservice for social part:** exposes APIs to manage all social aspects of the system (i.e. user registration, likes, comments, new posts).
- **Microservice for images management:** exposes APIs to upload images on the Firebase cloud storage.
- **Microservice for search:** we use Elasticsearch as search engine and Kibana, which provides search and data visualization capabilities for data indexed in Elasticsearch. Moreover we use Deepdetect deep learning platform which offers pre-trained models for classifing images' based on represented subjects and to be able to search for images based on them through Elasticsearch.
- **Microservice for notifications:** we use RabbitMQ message oriented middleware through CloudAMQP, which provides managed RabbitMQ servers in the cloud, in order to be able to access all the different queues in the cloud from any device.

- **Database:** we use Neo4j NoSQL graph database in order to store all the system data. In particular we use Neo4j AuraDB that offers a database instance in the cloud with which all the above mentioned microservices can communicate.

We developed the backend microservices using Python and all of them expose a REST interface that leverages on FastAPI framework.

5 Sprint analytics

Each sprint lasts 14 days (2 weeks).

5.1 Sprint 1: 10/10/2022 - 21/10/2022

TASK TITLE	TASK OWNER	AMOUNT OF WORK IN HOURS			SPRINT	START DATE	DUE DATE	DURATION
		ESTIMATE	COMPLETED	REMAINING				
Project formalization		31	33	-2	1			
Ideas brainstorming	Everyone	6	6	0	1	10/10/2022	11/10/2022	2
Research of information	Everyone	6	6	0	1	12/10/2022	14/10/2022	3
Project planning	Everyone	10	12	-2	1	12/10/2022	18/10/2022	7
Scope and goal settings	Everyone	4	4	0	1	18/10/2022	18/10/2022	1
Technical architecture sketching	Everyone	3	3	0	1	19/10/2022	19/10/2022	1
Project proposal	Everyone	2	2	0	1	20/10/2022	20/10/2022	1

5.2 Sprint 2: 06/02/2023 - 17/02/2023

TASK TITLE	TASK OWNER	AMOUNT OF WORK IN HOURS			SPRINT	START DATE	DUE DATE	DURATION
		ESTIMATE	COMPLETED	REMAINING				
Project draft		17	16	1	2			
User stories	Everyone	4	4	0	2	06/02/2023	07/02/2023	2
Mockups	Everyone	6	5	1	2	07/02/2023	08/02/2023	2
Function point & CoCoMo	Everyone	4	4	0	2	09/02/2023	09/02/2023	1
Product backlog	Everyone	3	3	0	2	10/02/2023	10/02/2023	1
Documentation	Everyone	3	3	0	2	10/02/2023	10/02/2023	1
Front-end		113	123	-10	2,3,4,5,6			
React initial setup	Everyone	4	6	-2	2	13/02/2023	14/02/2023	2
Welcome page	Ficorella	2	2	0	2	15/02/2023	16/02/2023	2
Sign-in page	Ficorella	3	3	0	2	16/02/2023	17/02/2023	2
Forgot password page	Sisti	3	3	0	2	15/02/2023	16/02/2023	2
Sign-up page	Sisti	3	3	0	2	16/02/2023	17/02/2023	2
Homepage	Turbessi	5	6	-1	2	15/02/2023	17/02/2023	3
App-bar	Everyone	3	3	0	2	17/02/2023	17/02/2023	1

5.3 Sprint 3: 20/02/2023 - 03/03/2023

TASK TITLE	TASK OWNER	AMOUNT OF WORK IN HOURS			SPRINT	START DATE	DUE DATE	DURATION
		ESTIMATE	COMPLETED	REMAINING				
Back-end & API Gateway		40	44	-4	3,4,5			
FastAPI initial setup	Everyone	7	7	0	3	20/02/2023	21/02/2023	2
Kong Gateway initial setup	Everyone	7	10	-3	3	22/02/2023	24/02/2023	3
Neo4j & Firebase initial setup	Everyone	4	4	0	3	27/02/2023	27/02/2023	1
Social microservice 1st version	Sisti	8	8	0	3	28/02/2023	02/03/2023	3
Firebase microservice	Ficorella	5	5	0	3	28/02/2023	01/03/2023	2
Front-end		113	123	-10	2,3,4,5,6			
User profile page	Ficorella	5	5	0	3	02/03/2023	03/03/2023	2
User settings page	Sisti	3	3	0	3	03/03/2023	03/03/2023	1
Post page	Turbessi	5	5	0	3	28/02/2023	01/03/2023	2
New post page	Turbessi	4	5	-1	3	02/03/2023	03/03/2023	2

5.4 Sprint 4: 06/03/2023 - 17/03/2023

TASK TITLE	TASK OWNER	AMOUNT OF WORK IN HOURS			SPRINT	START DATE	DUE DATE	DURATION
		ESTIMATE	COMPLETED	REMAINING				
Back-end & API Gateway		40	44	-4	3,4,5			
DeepDetect initial setup	Everyone	9	10	-1	4	06/03/2023	08/03/2023	3
Elasticsearch & Kibana initial setup	Everyone	9	11	-2	4	09/03/2023	13/03/2023	5
Search microservice	Ficorella	5	5	0	4	14/03/2023	15/03/2023	2
Images indicization microservice	Sisti	5	5	0	4	14/03/2023	15/03/2023	2
Social microservice 2nd version	Turbessi	5	5	0	4	14/03/2023	15/03/2023	2
Front-end		113	123	-10	2,3,4,5,6			
Search results page	Ficorella, Sisti	7	7	0	4	16/03/2023	17/03/2023	2
Comments section	Turbessi	4	4	0	4	16/03/2023	17/03/2023	2

5.5 Sprint 5: 20/03/2023 - 31/03/2023

TASK TITLE	TASK OWNER	AMOUNT OF WORK IN HOURS			SPRINT	START DATE	DUE DATE	DURATION
		ESTIMATE	COMPLETED	REMAINING				
Back-end & API Gateway		40	44	-4	3,4,5			
RabbitMQ initial setup through CloudAMQP	Everyone	8	10	-2	5	20/03/2023	22/03/2023	3
Notifications microservice	Sisti, Turbessi	8	11	-3	5	23/03/2023	27/03/2023	5
Social microservice final version	Ficorella	6	6	0	5	28/03/2023	30/03/2023	3
Front-end		113	123	-10	2,3,4,5,6			
Notifications section	Ficorella	3	3	0	5	30/03/2023	31/03/2023	2
Alert pop-ups	Sisti	2	2	0	5	29/03/2023	30/03/2023	2
Followers/following section	Turbessi	3	3	0	5	30/03/2023	31/03/2023	2

5.6 Sprint 6: 03/04/2023 - 14/04/2023

TASK TITLE	TASK OWNER	AMOUNT OF WORK IN HOURS			SPRINT	START DATE	DUE DATE	DURATION
		ESTIMATE	COMPLETED	REMAINING				
Front-end		113	123	-10	2,3,4,5,6			
Connect to backend through endpoints	Everyone	10	10	0	6	03/04/2023	05/04/2023	3
Containerization		22	25	-3	6			
Dockerfiles creation	Everyone	10	13	-3	6	06/04/2023	10/04/2023	5
Docker containers setup	Everyone	7	7	0	6	11/04/2023	12/04/2023	2
Integrate front-end as docker container	Everyone	5	5	0	6	13/04/2023	14/04/2023	2

6 Burndown data

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
PLAN	201	198	194	191	188	184	181	178	174	171	168	164	161	157	154	151	147	144	141	137
ESTIMATE	201	198	195	189	184	177	169	161	158	156	156	153	150	147	143	137	135	131	126	119
HRS COMPLETED	3	3	6	5	7	8	8	3	2	0	3	3	3	4	6	2	4	5	7	8
HRS REMAINING	198	195	189	184	177	169	161	158	156	156	153	150	147	143	137	135	131	126	119	111

DAY	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
PLAN	134	131	127	124	121	117	114	111	107	104	101	97	94	90	87	84	80	77	74	70
ESTIMATE	111	108	104	101	97	94	90	82	75	67	59	56	53	49	46	42	38	30	23	18
HRS COMPLETED	3	4	3	4	3	4	8	7	8	8	3	3	4	3	4	4	8	7	5	6
HRS REMAINING	108	104	101	97	94	90	82	75	67	59	56	53	49	46	42	38	30	23	18	12

DAY	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
PLAN	70	67	64	60	57	54	50	47	44	40	37	34	30	27	23	20	17	13	10	7	3
ESTIMATE	18	12	9	5	2	-2	-6	-9	-11	-14	-20	-23	-26	-30	-33	-38	-42	-46	-50	-53	-55
HRS COMPLETED	6	3	4	3	4	4	3	2	3	6	3	3	4	3	5	4	4	4	3	2	3
HRS REMAINING	12	9	5	2	-2	-6	-9	-11	-14	-20	-23	-26	-30	-33	-38	-42	-46	-50	-53	-55	-58

- **Total estimated hours:** 201
- **Total completed hours:** 216
- **Total remaining hours:** -15
- **Total days:** 60
- **Average estimated hours per day:** 3.35

7 Burndown chart