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Paix – Travail – Patrie
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Specification document

INNOVAFRICA

Work

1. INFO 4178 : Software Engineering I

Team

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I. TOPIC

In Africa, finding a job has become a major challenge due to the small number of opportunities available compared to the growing number of jobseekers. This challenge is exacerbated by the lack of access to reliable information on job opportunities in the various regions of the continent.

According to the International Labour Organisation, the unemployment rate in sub-Saharan Africa is around 6%. However, the majority of jobs available are unskilled or low-skilled, partly due to poor access to higher education and limited exposure to employment opportunities. As a result, although many Africans are employed, around 70% of the workforce in sub-Saharan Africa is in vulnerable employment. This is well above the global average of 46% in vulnerable employment.

II. RESEARCH PROBLEM

In Africa, the challenge of finding a job is compounded by a lack of opportunities and reliable information. Unemployment remains high, with unskilled jobs predominating. As a result, a large proportion of the workforce is in vulnerable employment, highlighting the need to create more quality employment opportunities and improve access to higher education.

III. GENERAL OBJECTIVE

The overall aim of this application is to reduce unemployment in Africa by creating an efficient system for matching job supply and demand. It aims to encourage entrepreneurship, promote professional opportunities and stimulate employment. The economic benefits of this application include creating new job opportunities, improving recruitment efficiency, facilitating business connections,

providing access to accurate information on job opportunities, and promoting economic inclusion.

A. Specific objectives

- Encouraging entrepreneurship: The application will provide a space for project owners to present their entrepreneurial initiatives. This will encourage the creation of new businesses, the promotion of innovation and economic growth.
- Increasing recruitment efficiency: The application will simplify the recruitment process for businesses, allowing them to publish job vacancies and receive applications directly via the platform. This will save time and resources, while making it easier to find qualified talent.
- Boosting employment: By facilitating the connection between employers and jobseekers, the application will create new employment opportunities, reducing unemployment and promoting economic inclusion.
- Facilitating business connections: The app will also act as a professional network, fostering connections and partnerships between businesses, institutions and investors. This can lead to fruitful business collaborations, investment opportunities and a strengthening of the entrepreneurial ecosystem.

IV. SYSTEM REQUIREMENTS

A. Functional requirements

Modules	Descriptions
Gestion des utilisateurs	la plateforme permet aux utilisateurs d'effectuer les tâches suivantes:

	• s'inscrire et se connecter (directement sur la plateforme ou via les réseaux sociaux) • se déconnecter • consulter et modifier son profil
Gestion des publications	• faire des publications • consulter la liste de ses publications • modifier/supprimer une publication dont on est l'auteur • afficher la liste de ses publications • consulter le profil de l'auteur d'une publication • afficher les commentaires d'une publication • discuter (chat) avec l'auteur d'une publication • commenter une publication • répondre aux commentaires d'une publication • liker une publication • envoyer des notifications (lors d'un commentaire ou d'un like) • consulter une publication (afficher les détails) • réagir sur une publication • Ajouter une publication en favoris • partager une publication • télécharger les médias (images) d'une publication • suivre un étudiant
Gestion des projets	• marqué un projet investi et inversement • afficher les projet investis • rechercher un projet

B. Non-functional requirements

Besoins non fonctionnels	Description
Responsivité	la plateforme s'adapte à tout type d'appareil sur lequel il fonctionne
Fiabilité	les informations entrées par les utilisateurs sont vérifiées
Performance/Efficacité	le temps de reponse a une requete dans la plateforme est optimal quel qu'en soit le nombre d'utilisateurs connecté
Portabilité	la plateforme est accessible sur tout appareil disposant d'un navigateur
Utilisabilité	The application adapts to the user without any effort on their part (clear and easy to use)
Scalability	Design the application to support an increase in the number of users and data without compromising performance
Security	Implementing robust security measures to protect users' personal data.

V. Application of Scrum

A. Presentation of scrum team

Our SCRUM team consists of five members. We have a :

- Scrum Master who serves as the project leader.

- Three developers specialising in Front-End and Back-End development, and
- Product Owner who is both the project initiator and an active team member.

As part of our project, our team is divided up as follows.

Rôle	**Membre**
Scrum master	BTOMPE TCHEUFFA MICHEL RUFIN
Product owner	DJEUMENI DJOMBISSIE LEVINNE
Membre : Backend developper	NOUTCHEU LIBERT JORAN
	NDEMAFO NKENANG FLAVIE
Membre : Frontend developper	DJEUMENI DJOMBISSIE LEVINNE
	NGUEPI FOUELEFACK CHRISTIAN

B. Description of how you have applied Scrum to your specific project

1. Explanation of how Sprints were carried out

Our sprints generally last between one week, depending on the nature and complexity of the features to be developed. At the start of each sprint, we hold a planning meeting where we define the objectives and the features to be delivered. The team then works on the tasks assigned during the sprint, following the principles of iterative and incremental development.

2. **Team organisation and roles**

Our team is organised in a collaborative and autonomous way. The Scrum Master is responsible for facilitating the SCRUM process, resolving obstacles and ensuring compliance with SCRUM principles and practices. Developers are responsible for implementing functionality, working closely with the Product Owner who defines product requirements and priorities.

3. **Daily scrum Agenda**

During our daily scrum, we address the three key questions: "What did I accomplish yesterday?", "What do I plan to accomplish today?", and "What obstacles or problems did I encounter?". Each team member shares their answers succinctly, promoting transparency and team synchronisation.

4. **Scrum conflict resolution**

In the event of conflicts or differences within the team, we encourage open and constructive communication. We favour dialogue and the search for mutually acceptable solutions. The Scrum Master plays an essential role in facilitating conflict resolution and ensuring that the team maintains a collaborative working environment.

5. **Scrum workflow management**

To manage the workflow, we use a SCRUM project management tool that allows us to visualise the different tasks and their status (to do, in progress, completed). This helps us track the project's progress and adjust our planning accordingly.

6. **Product Backlog**

Id	User stories	Acceptance criteria	Priority	Initial Estimate (Hour	Adjustment Factor	Adjustement Estim

				s)		ation
A	As a user of the system, i should be able to create an account in order to have access to the system functionnalities	When a user of the system creates an account, they are provided with various options that enables them perform functionalities based on their role in the system	5	8		
B	As a user of the system, i should be able to hav access to my profile page in order to verify and modify my informations	When th user of the system is on her session, he can click on profil icon	3	10	1.5	15
C	As an User of the system, i will able to deconnect in order to close my session	When a user of the system is on her session, whe can click on botton “Disconnect” The system redirect on home page	5	1	0	1
	En tant que utilisateur, je dois être capable de publier mon projet	Quand un utilisateur est dans sa session, il peut cliquer sur le bouton poster un projet ensuite le systeme lui donne la possibilité de sélectionner son projet. Une fois selectionner le projet est poster	13	14	1.5	21
D	En tant que utilisateur, je dois	Quand un utilisateur est dans sa session,	3	5	1.5	7.5

	être capable de consulter la liste de mes différentes publications	une liste deroulante de ses differentes publication s’affiche				
E	En tant que utilisateur, je dois être capable d’avoir accès à la plateforme dans le but de m’informer sur le site et de créer / se connecter à mon compte	L'utilisateur doit pouvoir accéder à la plateforme via une URL. Une fois dans la page d’accueil, présenter les informations clés sur la plateforme et ses fonctionnalités lui sont présentés ainsi que la possibilité de créer son compte et de se connecter.	2	10	1.5	15
F	En tant qu'utilisateur je dois pouvoir commenter un post afin de faire connaître mon opinion	L'utilisateur doit être connecté à son compte pour pouvoir commenter un post. Sur la page du post, il doit y avoir une section dédiée pour les commentaires. L'utilisateur doit pouvoir saisir son commentaire dans un champ de texte. Une fois le commentaire soumis, il doit apparaître immédiatement sous le post.	13	8	1.5	12
G	En tant	L'investisseur doit être	8	10	1	10

	qu'Investisseur je dois pouvoir lancer un salon de chat avec un étudiant afin de discuter de son projet	connecté à son compte pour pouvoir lancer un salon de chat. Sur le profil de l'étudiant, il doit y avoir une option pour lancer un salon de chat. L'investisseur doit pouvoir sélectionner un étudiant spécifique avec lequel il souhaite discuter. Une fois le salon de chat lancé, l'investisseur et l'étudiant doivent pouvoir échanger des messages en temps réel. Le salon de chat doit être privé et accessible uniquement à l'investisseur et à l'étudiant concerné.				

7. Sprint Backlog

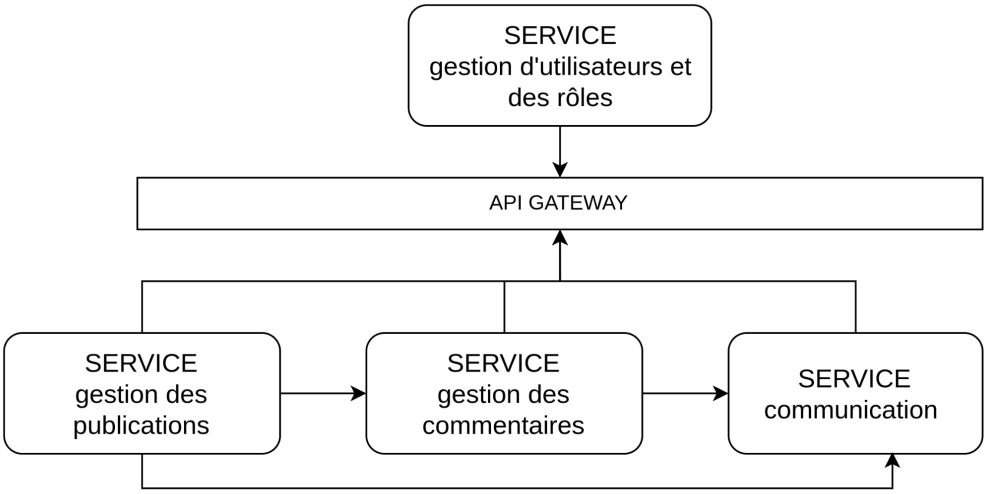
Release	Sprint	ID of User Stories	Period
Release 1 : User management	Sprint 1	A, B, C	02th June - 16th June
Release 2 : Publications Management	Sprint 2	D, E, A, B	17th June- 24th June
Release 3:	Sprint 3	F	25th June - 02 July

Communication Management	Sprint 4	G	03 July - 10 july

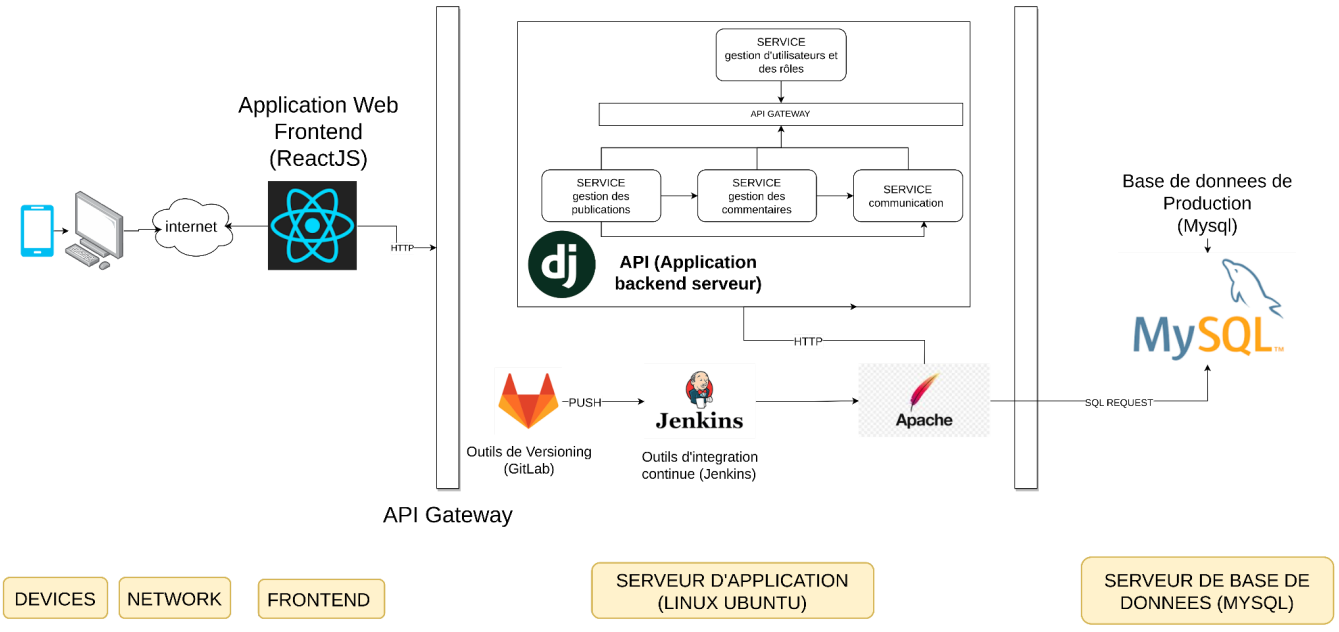
VI. Methodology

A. Architecture of our system

1. Logical Architecture Diagram



2. Technical Architecture Diagram



3. Description of Architecture

We opted for a service-oriented architecture.
Service Oriented Architecture (SOA) is an architectural style that enables modular and flexible software systems to be designed using independent services that communicate with each other via standardised protocols.

In our project, the SOA approach is used by dividing the different functionalities of the application into distinct services that can be developed, deployed and updated independently. Here's how SOA is implemented in your project:

User interface: The front-end of the application is developed using React JS, which creates a responsive and user-friendly user interface. The user interface communicates with the back-end services via APIs.

- User management service: This service manages user-related functionalities, such as creating accounts, logging in, customising profiles and so on. It exposes HTTP endpoints to allow the user interface to communicate with it and uses standardised protocols such as REST for communication.
- Publications management Service: This service is responsible for managing the publications of the application's projects. It provides functions such as creating, modifying and deleting a publication. It also exposes HTTP endpoints to allow interaction with other parts of the system.
- Comments service: This service manages comments on publications. It exposes HTTP endpoints to allow users to publish, modify and delete comments. It is also responsible for retrieving comments associated with a given publication.
- Communication service: This service enables communication between users via a chatbot in real time, including the launch of private chat rooms between an investor and a student. It uses real-time communication protocols such as WebSockets to enable instant interaction.

All these services communicate with each other using standardised protocols, such as HTTP, to exchange data. The services are developed, deployed and

managed independently using the GitLap tool, making it easy to maintain and upgrade the application.

4. Architectural Drivers

- **Extensibility**: SOA enables extensibility by isolating functionality into distinct services that can be modified or added to independently.
- **Modularity**: SOA promotes modularity by allowing services to operate autonomously while communicating with each other via well-defined interfaces.
- **Reusability**: Autonomous services can be used in other applications or integrated into other systems compatible with the defined interfaces.
- **Scalability**: With SOA, each service can be scaled individually to meet specific performance and capacity requirements.

B. Actors and Use cases

1. Actors

- Utilisateur: est un visiteur de la plateforme
- Etudiant: est un utilisateur qui est a la recherche d'investissement sur ses différents projets
- Investisseur est un utilisateur qui cherche un projet sur lequel il peut investir.

2. List the use cases by actor

Acteurs	Cas d'utilisation
Utilisateur	• s'inscrire • se connecter

Etudiant	• consulter et modifier son profil • discuter (chat) avec l'auteur d'une publication • commenter une publication • répondre aux commentaire d'une publication • faire des publications • modifier une publication dont on est l'auteur • supprimer une publication dont on est l'auteur • consulter la liste de ses publications
Investisseur	• se connecter • discuter (chat) avec l'auteur d'une publication • commenter une publication • répondre aux commentaire d'une publication • liker une publication • marqué un projet investi et inversement • suivre un étudiant • réagir sur un projet • Ajouter un projet en favoris

3. Description of use cases using text formalism

Cas d'utilisation	Description
S'inscrire	**But** : créer un compte afin d'avoir accès à certaines fonctionnalités **Précondition** : aucune **Postcondition** : nouveau compte créé **Acteur** : visiteur **Déclencheur**: cliquer sur le bouton "S'inscrire"

	Scénario: Le visiteur clique sur “S’inscrire”, il est redirigé vers une page où il renseigne les informations demandées puis validez.
Se connecter	**But** : Accéder à certaines fonctionnalités **Précondition** : être inscrit **Postcondition** : Accès à des services particulier **Acteurs** : Enseignant, Administrateur **Déclencheur**: cliquer sur le bouton “Se connecter” **Scénario**: L’acteur clique sur “Se connecter”, un modal lui est affiché où il remplit son login et son password puis valide. **cas d’échec**: pas de compte trouvé
Commenter des projets	**But** : Ajouter des commentaires aux projets **Précondition** : être connecté **Postcondition** : nouveau commentaire ajouté **Acteurs** : Étudiants, Investisseur **Déclencheur** : Cliquer sur commenter **Scénario**: l’acteur cliquez sur le bouton commenter, la zone de texte s’affiche, il entre son commentaire puis cliquez sur envoyer
Ajouter un projet	**But** : publier un nouveau projet sur la plateforme **Précondition** : être connecté en tant qu'étudiant **Postcondition** : nouveau projet ajouté

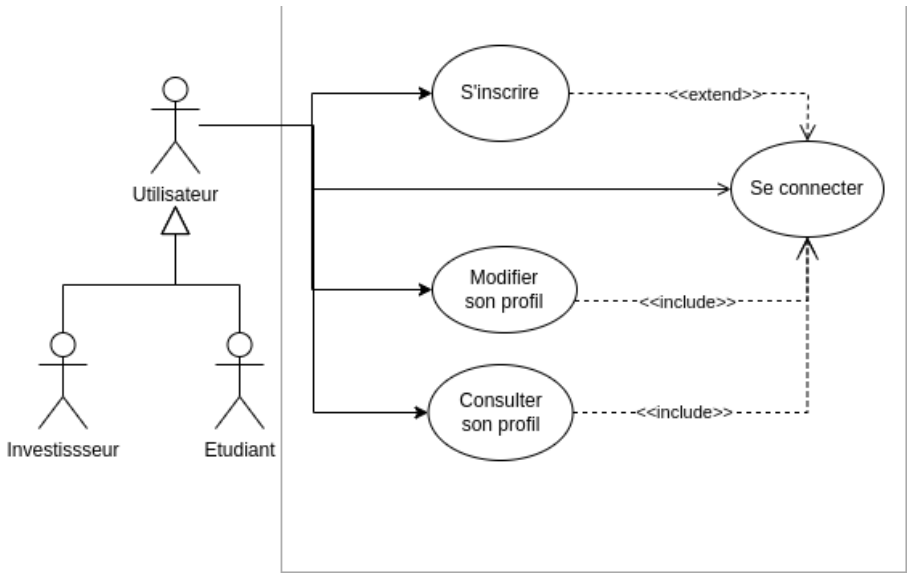
	Acteur : étudiant **Déclencheur** : cliquer sur “Create a post” **Scénario**: l’etudiant clique sur ‘create a post, un modal apparaît il renseigne les informations de son projet puis cliquez sur publier **cas d’échec** : tous les champs obligatoire ne sont pas remplis
Chatter	**But** : discuter en privé entre un étudiant et un investisseur **Précondition** : chat lancer par un investisseur **Postcondition** : discussion privé possible entre un etudiant et un utilisateur **Acteurs** : Etudiant, investisseur **Déclencheur** : cliquer sur discuter (investisseur), cliquer sur un message pour entrer dans le chat (etudiant) **Scénario**: l’investisseur créer un salon de chat en cliquant sur discuter, le nom du salon apparaît sur la page d'accueil de l’etudiant et il peut rejoindre le salon en cliquant dessus **cas d’échec** : aucun

C. Model of system

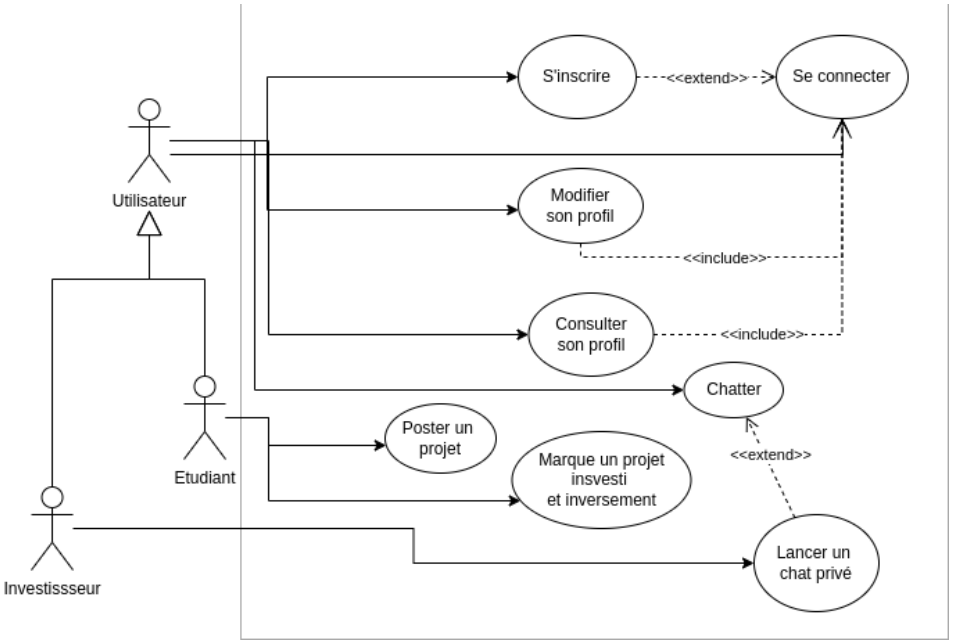
1. Model UML

a) Use case diagram

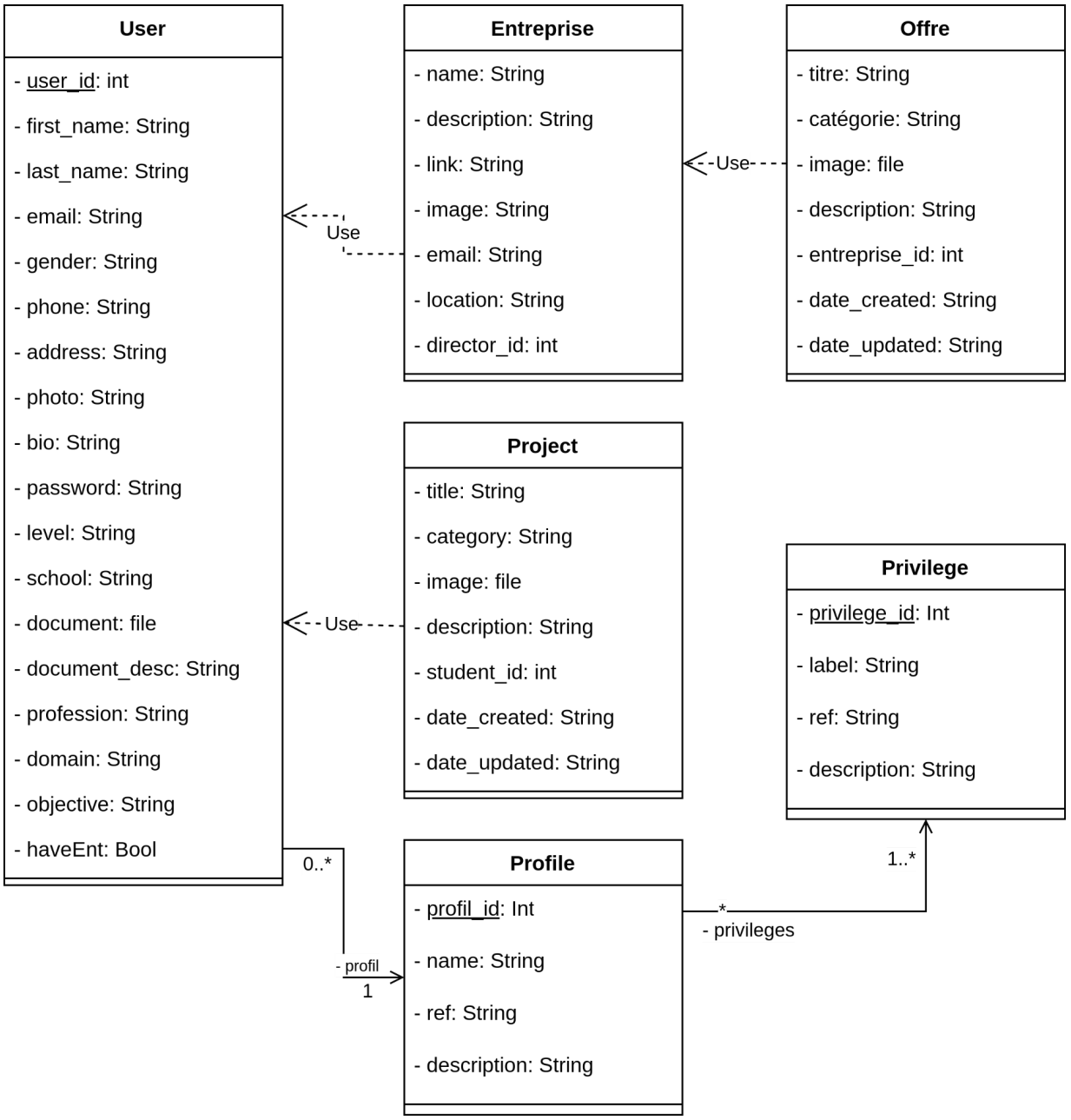
- Module 1 :User Management



- Module 2 : Publication Management



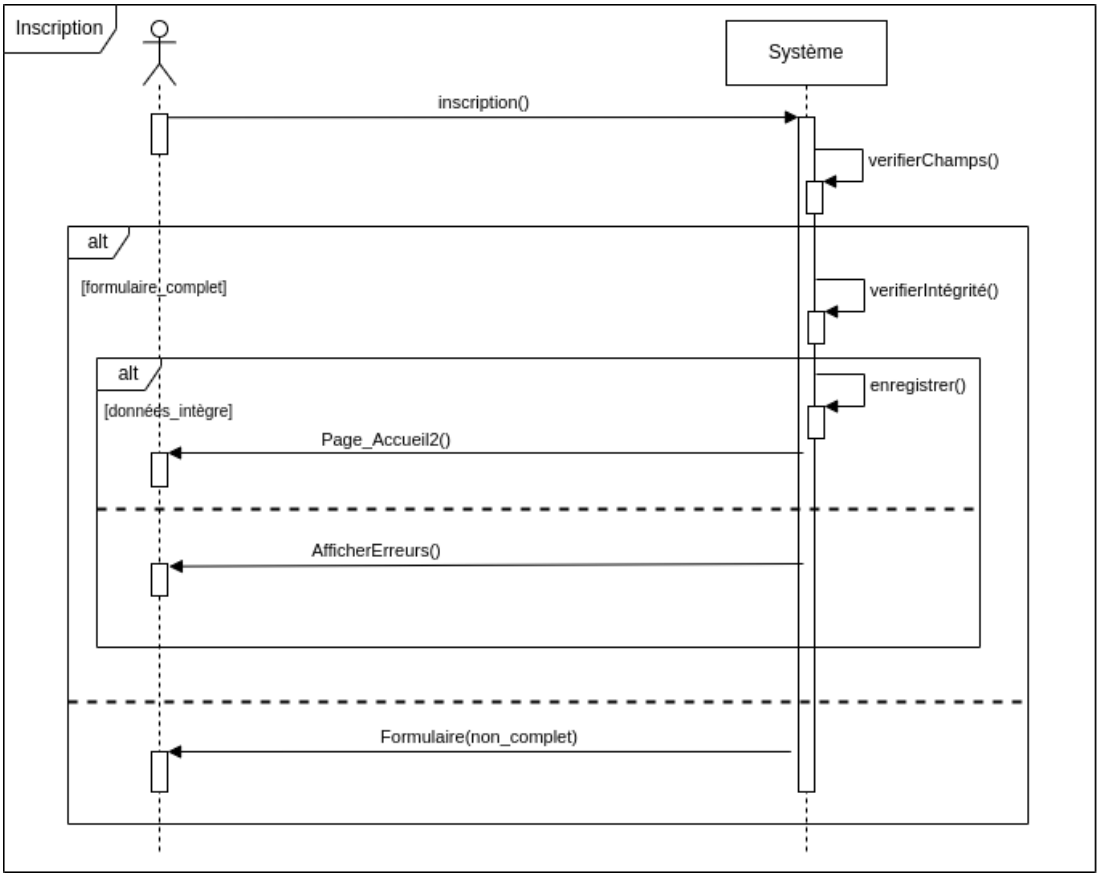
b) Class diagram



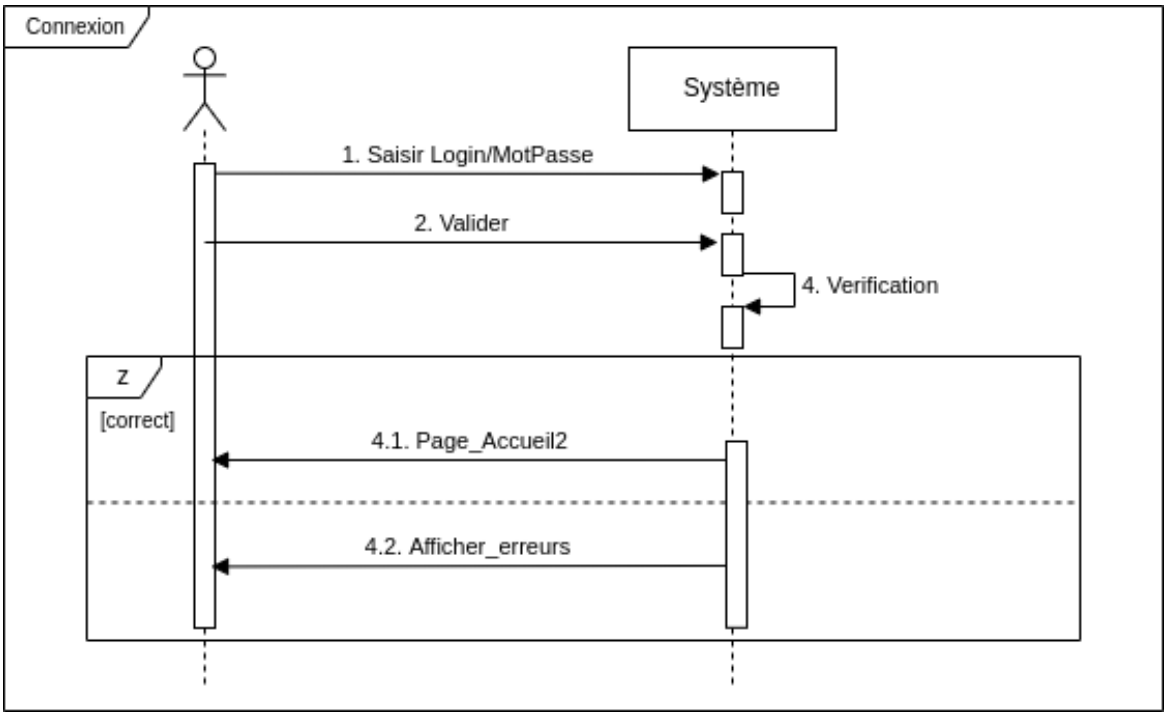
c) Sequence diagram

- Describe use cases using sequence diagrams

  - S’inscrire



- Se connecter



2. Modèle mathématique

Our system consists of connecting students with projects with potential investors (entrepreneurs, companies, etc.). Our model will use the concept of matrices for matching..
Either:

- E the set of n students:
  E = [e0, e1, e2, ... en]
- P all m projects of the students : P = [p0, p1, p2, ... pn]
- I l'ensemble des k investisseurs: I = [i0, i1, i2, ... ik].

La correspondance entre les étudiants et leur projets est donnée par la matrice **MatchEP(E, P) = EP = E * P =** $T([e0,\ e1,\ \ldots\ en])$ * $[p0\ p1\ p2\ \ldots\ pm]$ avec n = m
Le matching entre EP et les potentiels investisseurs est donnée par la matrice **MatchEPI(I, EP) = I * EP =** $[i0,\ i1,\ \ldots\ ik]\ \ *\ \ EP$ avec k = n

3. Algorithmes

There are several algorithms that can be used for selecting a project from a set of projects with graphs, depending on the specific requirements and constraints of the problem. Principle:

Multi-Criteria Decision Making (MCDM): This approach involves defining a set of criteria that are relevant to the project selection problem (e.g., cost, duration, risk, return on investment) and assigning weights to each criterion based on their relative importance. Projects are then evaluated based on their performance on each criterion, and a weighted sum or other aggregation method is used to rank them and select the best one.

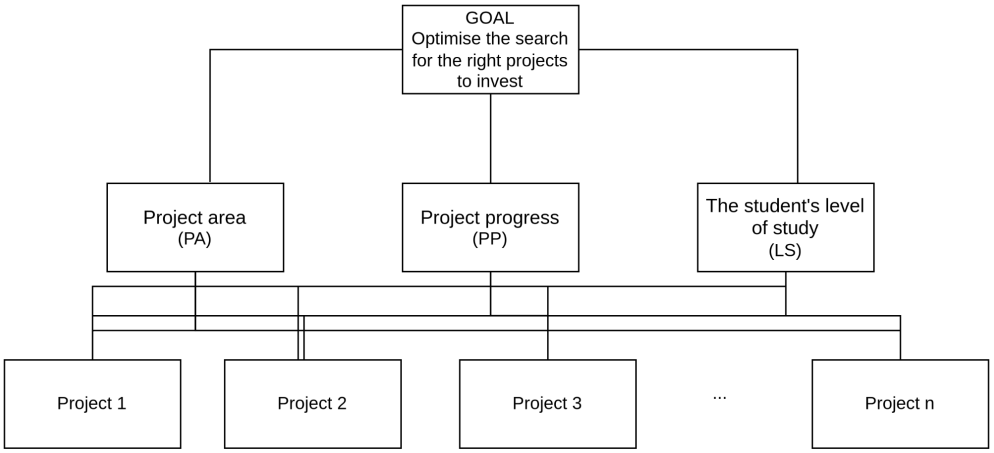
4. Analytical Hierarchical process (AHP) algorithm applied to your project

The Analytical Hierarchy Process (AHP) can be applied in our project to optimise the search for the right projects to invest in by considering the following criteria:

- Project area: This criterion assesses the nature of the project, whether it is an IT, financial or other area. It is useful for determining the relevance and appropriateness of the project in relation to the overall objective.

- Project progress: This criterion assesses the degree of completion of the project. It determines whether the project is fully functional or whether it is still under development, for example at 50% completion. This allows the maturity of the project to be taken into account in the assessment.

- The student's level of study (project owner): This criterion evaluates the level of study of the student who is the project owner. It can be used to determine the student's expertise, skills and ability to carry out the project successfully. This may influence the perception of the feasibility and potential success of the project.



Hierachical Model

On based on these criteria, we will draw the table of pairwise comparison matrix.

Relative scale of preference for the criteria
1 – Equal importance
3 – Moderate importance
5 – Strong importance

7 – Very strong importance
9 – Extreme importance
2,4,6,8 intermediate values
1/3,1/5,1/7,1/9 Inverse values

	PA	PP	LS
PA	1	1/3	2
PP	3	1	5
LS	1/2	1/5	1

CI (Coherence Indice) : 0.003 RI (Tandom Inconsistance) : 0.58 CR (Consistance Ratio) = 0.005 < 0.10