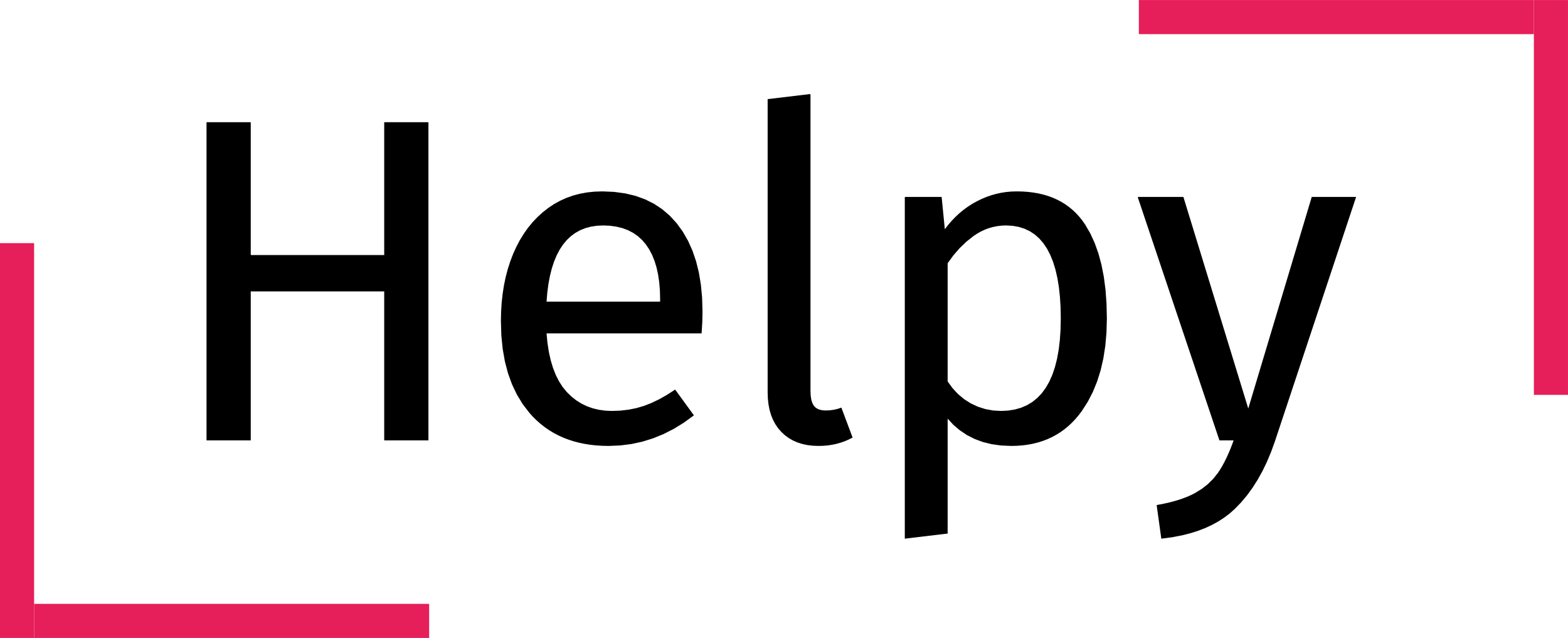
****

Modèle Logique de Données : fonctionnalités avancées

J'ai converti le modèle conceptuel de données en modèle logique de données pour l'application Helpy. Ce modèle logique définit précisément :

1. Toutes les tables avec leurs attributs
2. Les types de données appropriés pour PostgreSQL
3. Les contraintes d'intégrité (PRIMARY KEY, FOREIGN KEY, CHECK)
4. Les actions référentielles (ON DELETE CASCADE/SET NULL)
5. Les valeurs par défaut pour les champs pertinents

J'ai organisé les tables par sections fonctionnelles pour faciliter la compréhension du modèle:

* Tables principales (utilisateurs, compétences)
* Système d'entraide
* Activités et événements
* Forum
* Ressources et services locaux
* Système de communication
* Notifications et logs
* Projets collaboratifs
* Services municipaux
* Gamification et statistiques
* Support hors-ligne et multi-appareils
* Enquêtes de satisfaction

Ce modèle logique peut être utilisé directement comme base pour créer le schéma de base de données PostgreSQL en utilisant Sequelize comme ORM.

**Tables principales**

**USER**

* id INT PRIMARY KEY
* email VARCHAR(255) NOT NULL UNIQUE
* password\_hash VARCHAR(255) NOT NULL
* first\_name VARCHAR(100) NOT NULL
* last\_name VARCHAR(100) NOT NULL
* birth\_date DATE
* address VARCHAR(255)
* gps\_coordinates POINT
* phone VARCHAR(20)
* profile\_picture VARCHAR(255)
* registration\_date TIMESTAMP NOT NULL
* account\_verified BOOLEAN DEFAULT FALSE
* interface\_preferences JSON
* two\_factor\_authentication BOOLEAN DEFAULT FALSE
* help\_points INT DEFAULT 0
* status VARCHAR(20) DEFAULT 'active' CHECK (status IN ('active', 'inactive', 'suspended'))

**SKILL**

* id INT PRIMARY KEY
* name VARCHAR(100) NOT NULL
* description TEXT
* category VARCHAR(50)

**USER\_SKILL**

* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* skill\_id INT NOT NULL REFERENCES SKILL(id) ON DELETE CASCADE
* level INT NOT NULL CHECK (level BETWEEN 1 AND 5)
* PRIMARY KEY (user\_id, skill\_id)

**NOTIFICATION\_PREFERENCES**

* user\_id INT PRIMARY KEY REFERENCES USER(id) ON DELETE CASCADE
* message\_notif BOOLEAN DEFAULT TRUE
* activity\_notif BOOLEAN DEFAULT TRUE
* help\_notif BOOLEAN DEFAULT TRUE
* forum\_notif BOOLEAN DEFAULT TRUE
* email\_notif BOOLEAN DEFAULT TRUE
* sms\_notif BOOLEAN DEFAULT TRUE
* push\_notif BOOLEAN DEFAULT TRUE
* quiet\_hours\_start TIME
* quiet\_hours\_end TIME

**TRUST\_CIRCLE**

* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* contact\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* date\_added DATE NOT NULL
* access\_level VARCHAR(20) NOT NULL CHECK (access\_level IN ('basic', 'urgent', 'complete'))
* PRIMARY KEY (user\_id, contact\_id)

**Système d'entraide**

**HELP\_REQUEST**

* id INT PRIMARY KEY
* creator\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* title VARCHAR(255) NOT NULL
* description TEXT NOT NULL
* creation\_date TIMESTAMP NOT NULL
* needed\_date TIMESTAMP NOT NULL
* estimated\_duration INT
* location VARCHAR(255)
* gps\_coordinates POINT
* category VARCHAR(50)
* recurring BOOLEAN DEFAULT FALSE
* frequency VARCHAR(50)
* status VARCHAR(20) NOT NULL CHECK (status IN ('open', 'assigned', 'completed', 'cancelled'))
* points\_offered INT NOT NULL

**HELP\_OFFER**

* id INT PRIMARY KEY
* request\_id INT NOT NULL REFERENCES HELP\_REQUEST(id) ON DELETE CASCADE
* helper\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* offer\_date TIMESTAMP NOT NULL
* message TEXT
* status VARCHAR(20) NOT NULL CHECK (status IN ('pending', 'accepted', 'rejected'))

**SERVICE\_COMPLETED**

* id INT PRIMARY KEY
* request\_id INT NOT NULL REFERENCES HELP\_REQUEST(id) ON DELETE CASCADE
* helper\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* completion\_date TIMESTAMP NOT NULL
* actual\_duration INT
* creator\_comment TEXT
* helper\_comment TEXT
* creator\_rating INT CHECK (creator\_rating BETWEEN 1 AND 5)
* helper\_rating INT CHECK (helper\_rating BETWEEN 1 AND 5)
* points\_exchanged INT NOT NULL

**Activités et événements**

**ACTIVITY**

* id INT PRIMARY KEY
* creator\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* title VARCHAR(255) NOT NULL
* description TEXT NOT NULL
* start\_date TIMESTAMP NOT NULL
* end\_date TIMESTAMP NOT NULL
* location VARCHAR(255)
* gps\_coordinates POINT
* max\_spots INT
* category VARCHAR(50)
* recurring BOOLEAN DEFAULT FALSE
* frequency VARCHAR(50)
* reduced\_mobility\_access BOOLEAN DEFAULT FALSE
* difficulty\_level VARCHAR(20) CHECK (difficulty\_level IN ('easy', 'medium', 'hard'))
* cost DECIMAL(10,2)
* status VARCHAR(20) NOT NULL CHECK (status IN ('planned', 'ongoing', 'completed', 'cancelled'))
* weather\_requirements VARCHAR(255)
* transport\_options TEXT

**ACTIVITY\_REGISTRATION**

* activity\_id INT NOT NULL REFERENCES ACTIVITY(id) ON DELETE CASCADE
* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* registration\_date TIMESTAMP NOT NULL
* status VARCHAR(20) NOT NULL CHECK (status IN ('confirmed', 'pending', 'cancelled'))
* attendance\_confirmed BOOLEAN DEFAULT FALSE
* PRIMARY KEY (activity\_id, user\_id)

**Forum**

**FORUM\_CATEGORY**

* id INT PRIMARY KEY
* name VARCHAR(100) NOT NULL
* description TEXT
* parent\_category\_id INT REFERENCES FORUM\_CATEGORY(id) ON DELETE CASCADE

**FORUM\_TOPIC**

* id INT PRIMARY KEY
* category\_id INT NOT NULL REFERENCES FORUM\_CATEGORY(id) ON DELETE CASCADE
* author\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* title VARCHAR(255) NOT NULL
* creation\_date TIMESTAMP NOT NULL
* pinned BOOLEAN DEFAULT FALSE
* status VARCHAR(20) NOT NULL CHECK (status IN ('open', 'closed'))
* views INT DEFAULT 0

**FORUM\_MESSAGE**

* id INT PRIMARY KEY
* topic\_id INT NOT NULL REFERENCES FORUM\_TOPIC(id) ON DELETE CASCADE
* author\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* content TEXT NOT NULL
* creation\_date TIMESTAMP NOT NULL
* modification\_date TIMESTAMP
* solution\_message BOOLEAN DEFAULT FALSE

**Ressources et services locaux**

**RESOURCE**

* id INT PRIMARY KEY
* title VARCHAR(255) NOT NULL
* content TEXT NOT NULL
* type VARCHAR(50) NOT NULL CHECK (type IN ('article', 'tutorial', 'guide'))
* category VARCHAR(50)
* creation\_date TIMESTAMP NOT NULL
* update\_date TIMESTAMP
* author\_id INT NOT NULL REFERENCES USER(id) ON DELETE SET NULL
* admin\_validated BOOLEAN DEFAULT FALSE

**LOCAL\_SERVICE**

* id INT PRIMARY KEY
* name VARCHAR(255) NOT NULL
* category VARCHAR(50)
* address VARCHAR(255)
* gps\_coordinates POINT
* phone VARCHAR(20)
* website VARCHAR(255)
* description TEXT
* hours VARCHAR(255)
* senior\_friendly BOOLEAN DEFAULT FALSE

**SERVICE\_RATING**

* service\_id INT NOT NULL REFERENCES LOCAL\_SERVICE(id) ON DELETE CASCADE
* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* rating INT NOT NULL CHECK (rating BETWEEN 1 AND 5)
* comment TEXT
* rating\_date TIMESTAMP NOT NULL
* PRIMARY KEY (service\_id, user\_id)

**Système de communication**

**CONVERSATION**

* id INT PRIMARY KEY
* type VARCHAR(20) NOT NULL CHECK (type IN ('private', 'group'))
* creation\_date TIMESTAMP NOT NULL
* title VARCHAR(255)

**CONVERSATION\_PARTICIPANT**

* conversation\_id INT NOT NULL REFERENCES CONVERSATION(id) ON DELETE CASCADE
* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* date\_added TIMESTAMP NOT NULL
* administrator BOOLEAN DEFAULT FALSE
* last\_access TIMESTAMP
* PRIMARY KEY (conversation\_id, user\_id)

**MESSAGE**

* id INT PRIMARY KEY
* conversation\_id INT NOT NULL REFERENCES CONVERSATION(id) ON DELETE CASCADE
* sender\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* content TEXT NOT NULL
* send\_date TIMESTAMP NOT NULL
* type VARCHAR(20) NOT NULL CHECK (type IN ('text', 'image', 'document', 'location', 'call'))
* read BOOLEAN DEFAULT FALSE

**VIDEO\_CALL**

* id INT PRIMARY KEY
* conversation\_id INT NOT NULL REFERENCES CONVERSATION(id) ON DELETE CASCADE
* initiator\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* start\_date TIMESTAMP NOT NULL
* end\_date TIMESTAMP
* status VARCHAR(20) NOT NULL CHECK (status IN ('ongoing', 'completed', 'missed'))

**Notifications et logs**

**NOTIFICATION**

* id INT PRIMARY KEY
* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* type VARCHAR(50) NOT NULL
* content TEXT NOT NULL
* creation\_date TIMESTAMP NOT NULL
* read BOOLEAN DEFAULT FALSE
* action\_link VARCHAR(255)

**ACTIVITY\_LOG**

* id INT PRIMARY KEY
* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* action\_type VARCHAR(50) NOT NULL
* description TEXT
* action\_date TIMESTAMP NOT NULL
* ip\_address VARCHAR(45)
* device VARCHAR(255)

**Projets collaboratifs**

**COLLABORATIVE\_PROJECT**

* id INT PRIMARY KEY
* title VARCHAR(255) NOT NULL
* description TEXT NOT NULL
* creator\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* creation\_date TIMESTAMP NOT NULL
* status VARCHAR(20) NOT NULL CHECK (status IN ('in preparation', 'active', 'completed'))
* category VARCHAR(50)

**PROJECT\_MEMBER**

* project\_id INT NOT NULL REFERENCES COLLABORATIVE\_PROJECT(id) ON DELETE CASCADE
* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* role VARCHAR(20) NOT NULL CHECK (role IN ('creator', 'coordinator', 'participant'))
* join\_date TIMESTAMP NOT NULL
* PRIMARY KEY (project\_id, user\_id)

**PROJECT\_TASK**

* id INT PRIMARY KEY
* project\_id INT NOT NULL REFERENCES COLLABORATIVE\_PROJECT(id) ON DELETE CASCADE
* title VARCHAR(255) NOT NULL
* description TEXT
* creation\_date TIMESTAMP NOT NULL
* due\_date TIMESTAMP
* status VARCHAR(20) NOT NULL CHECK (status IN ('to do', 'in progress', 'completed'))
* assignee\_id INT REFERENCES USER(id) ON DELETE SET NULL

**Services municipaux**

**MUNICIPAL\_EVENT**

* id INT PRIMARY KEY
* title VARCHAR(255) NOT NULL
* description TEXT NOT NULL
* start\_date TIMESTAMP NOT NULL
* end\_date TIMESTAMP NOT NULL
* location VARCHAR(255)
* gps\_coordinates POINT
* organizer VARCHAR(255)
* contact VARCHAR(255)
* official\_link VARCHAR(255)

**URBAN\_ISSUE\_REPORT**

* id INT PRIMARY KEY
* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* category VARCHAR(50) NOT NULL
* description TEXT NOT NULL
* address VARCHAR(255)
* gps\_coordinates POINT
* report\_date TIMESTAMP NOT NULL
* status VARCHAR(20) NOT NULL CHECK (status IN ('reported', 'in progress', 'resolved'))
* city\_reference VARCHAR(100)

**Gamification et statistiques**

**USER\_STATISTICS**

* user\_id INT PRIMARY KEY REFERENCES USER(id) ON DELETE CASCADE
* services\_provided INT DEFAULT 0
* services\_received INT DEFAULT 0
* activities\_participated INT DEFAULT 0
* activities\_organized INT DEFAULT 0
* forum\_messages INT DEFAULT 0
* total\_help\_points INT DEFAULT 0
* network\_size INT DEFAULT 0

**BADGE**

* id INT PRIMARY KEY
* name VARCHAR(100) NOT NULL
* description TEXT
* icon VARCHAR(255)
* category VARCHAR(20) NOT NULL CHECK (category IN ('help', 'participation', 'contribution'))
* level INT NOT NULL CHECK (level BETWEEN 1 AND 5)

**USER\_BADGE**

* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* badge\_id INT NOT NULL REFERENCES BADGE(id) ON DELETE CASCADE
* achievement\_date TIMESTAMP NOT NULL
* PRIMARY KEY (user\_id, badge\_id)

**Support hors-ligne et multi-appareils**

**OFFLINE\_USER**

* user\_id INT PRIMARY KEY REFERENCES USER(id) ON DELETE CASCADE
* cached\_data JSON
* last\_sync TIMESTAMP NOT NULL

**USER\_DEVICE**

* id INT PRIMARY KEY
* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* device\_type VARCHAR(50) NOT NULL
* device\_name VARCHAR(100)
* operating\_system VARCHAR(50)
* notification\_token VARCHAR(255)
* last\_connection TIMESTAMP NOT NULL

**Enquêtes de satisfaction**

**SATISFACTION\_SURVEY**

* id INT PRIMARY KEY
* title VARCHAR(255) NOT NULL
* description TEXT
* start\_date TIMESTAMP NOT NULL
* end\_date TIMESTAMP NOT NULL
* active BOOLEAN DEFAULT TRUE

**SURVEY\_RESPONSE**

* survey\_id INT NOT NULL REFERENCES SATISFACTION\_SURVEY(id) ON DELETE CASCADE
* user\_id INT NOT NULL REFERENCES USER(id) ON DELETE CASCADE
* responses JSON NOT NULL
* response\_date TIMESTAMP NOT NULL
* PRIMARY KEY (survey\_id, user\_id)

**Notes sur l'implémentation**

1. Tous les types POINT sont spécifiques à PostgreSQL pour les coordonnées GPS
2. Les champs JSON sont utilisés pour stocker des données structurées variables
3. Des contraintes CHECK sont ajoutées pour garantir l'intégrité des données
4. Des valeurs par défaut sont définies pour les champs communs
5. Des contraintes ON DELETE CASCADE ou SET NULL sont ajoutées selon la logique métier
6. Toutes les clés primaires et étrangères sont indexées pour optimiser les performances