HBnB Technical Documentation (Part 1)

📌 **Purpose:** This technical document consolidates the main architecture diagrams and explanatory notes for **HBnB (Part 1)**.
Goal: Use it as an implementation blueprint, with clear layer responsibilities, domain model relationships, and API interaction flows across the **Presentation**, **Business Logic**, and **Persistence** layers.

1. Introduction

HBnB is a simplified Airbnb-like application designed to manage **Users**, **Places**, **Reviews**, and **Amenities** through a REST API. In **Part 1**, the focus is on defining a clean architecture and a consistent domain model that can be implemented and extended without mixing responsibilities across layers.

Why this document exists: when multiple contributors implement endpoints and models in parallel, small inconsistencies in validation, ownership, and persistence rules can quickly cause bugs.

Scope of this document

- A **high-level packaging diagram** describing the layered architecture and connectors.
- A **Business Logic class diagram** describing the entities, shared base behavior, and relationships.
- **Sequence diagrams** for key API calls, with step-by-step explanations, Mermaid references, **control flow** (alt/opt), and **HTTP status codes**.

How to use it

- Use the diagrams to keep **layer responsibilities** consistent (Presentation vs Business Logic vs Persistence).
- Use the class diagram to enforce **business rules** (validation, ownership, multiplicity) in the correct layer.
- Use the sequence diagrams as a reference for **expected control flow** and **error handling**.

> 🧠 Note: Mermaid diagrams are references for structure and behavior.

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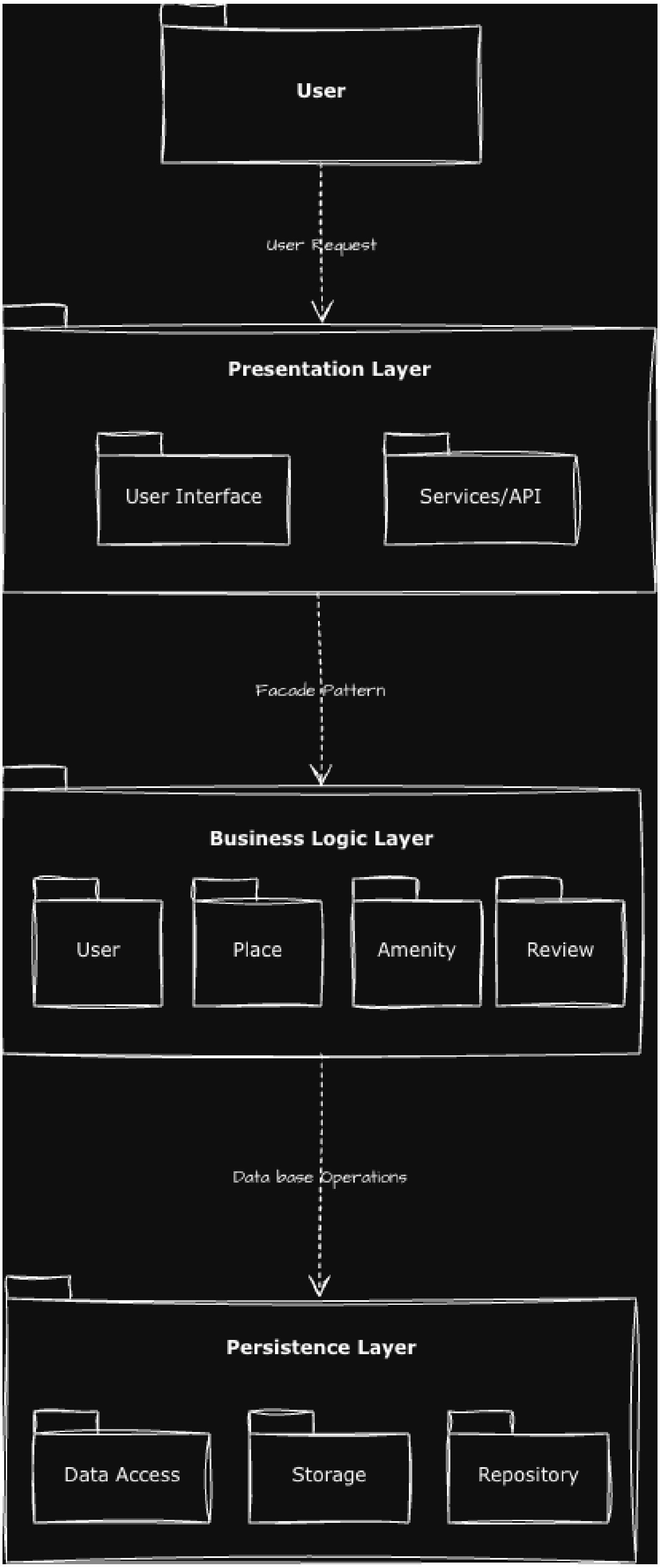
2. High-Level Packaging (Architecture Overview)

> 🧭 Reminder: this is a conceptual overview (layers + responsibilities), not a line-by-line implementation diagram.


User
User Request
Presentation Layer
User Interface
Services/API
Facade Pattern
Business Logic Layer
User
Place
Amenity
Review
Data base Operations
Persistence Layer
Data Access
Storage
Repository

2.1 Purpose of the diagram

This diagram illustrates the high-level architecture of the HBnB application. It shows the three main layers and how they interact, from the initial user request to persistence operations and back.

2.2 Key components

1. **Presentation Layer (top layer)**
   - **User Interface:** handles user interactions and displays information.
   - **Services / API:** manages HTTP requests and responses, and exposes API endpoints.
   - **Role:** entry point for client interactions, validates input at the HTTP boundary, and formats output.
2. **Facade Pattern (connector)**
   - Provides a simplified interface between the Presentation and Business Logic layers.
   - Reduces coupling by hiding the internal complexity of the business layer.
   - Offers a unified set of methods for the API to call.
3. **Business Logic Layer (middle layer)**
   - Contains the core business entities:
     - **User**
     - **Place**
     - **Amenity**
     - **Review**
   - **Role:** implements business rules, validations, and core application logic.
4. **Database Operations (connector)**
   - Represents the communication between Business Logic and Persistence.
   - Covers CRUD operations and data transactions.

5. **Persistence Layer (bottom layer)**
    - **Data Access:** provides methods to access stored data (queries, lookups, persistence helpers).
    - **Repository:** abstracts data access behind a consistent interface.
    - **Storage:** manages the underlying database.
    - **Role:** handles all data storage and retrieval operations.

2.3 Design decisions and rationale

Keywords: layered architecture, **Facade**, **Repository**, **separation of concerns**, **testability**

- **Three-layer architecture**
    - Separates concerns, improves maintainability, and supports testing and scalability.
- **Facade pattern**
    - Simplifies the interface for the API layer and reduces dependencies.
- **Repository pattern**
    - Keeps SQL out of business logic, improves modularity, and supports mocking during tests.

2.4 Why the arrows are dashed ("transparent")

The diagram uses **dashed arrows** to represent **logical flow and dependency direction**, not a literal implementation detail.

- Requests flow **top** → **down** across layers.
- Responses flow **bottom** → **up**.
- Dashed arrows avoid implying tight coupling or direct method calls between layers.

2.5 Data flow description

1. User request → user makes a request through the UI or API.
2. Presentation layer → receives and validates the request.

3. Facade → routes the request to the appropriate business logic.
4. Business logic → applies business rules and executes the use case.
5. Database operations → translates business needs into data operations.
6. Persistence layer → executes storage and retrieval.
7. Response → data flows back up to the user.

2.6 How this fits into the overall architecture

This layered architecture is meant to keep the system predictable as it grows:

- **Separation of concerns:** each layer has a single responsibility.
- **Maintainability:** changes in one layer have minimal impact on others.
- **Testability:** layers can be tested independently (mock the Facade/Repository).
- **Scalability:** layers can be scaled based on demand.
- **Security:** business logic and data access are protected behind the API boundary.
- **Flexibility:** easier to modify or replace individual components over time.

2.7 Benefits of this design

- Clear boundaries between responsibilities.
- Easier to understand and navigate the codebase.
- Uses standard patterns (Facade, Repository) familiar to most developers.
- Supports future enhancements without rewriting the entire stack.
- Reduces complexity through abstraction and consistent interfaces.

3. Business Logic Layer (Class Diagram)

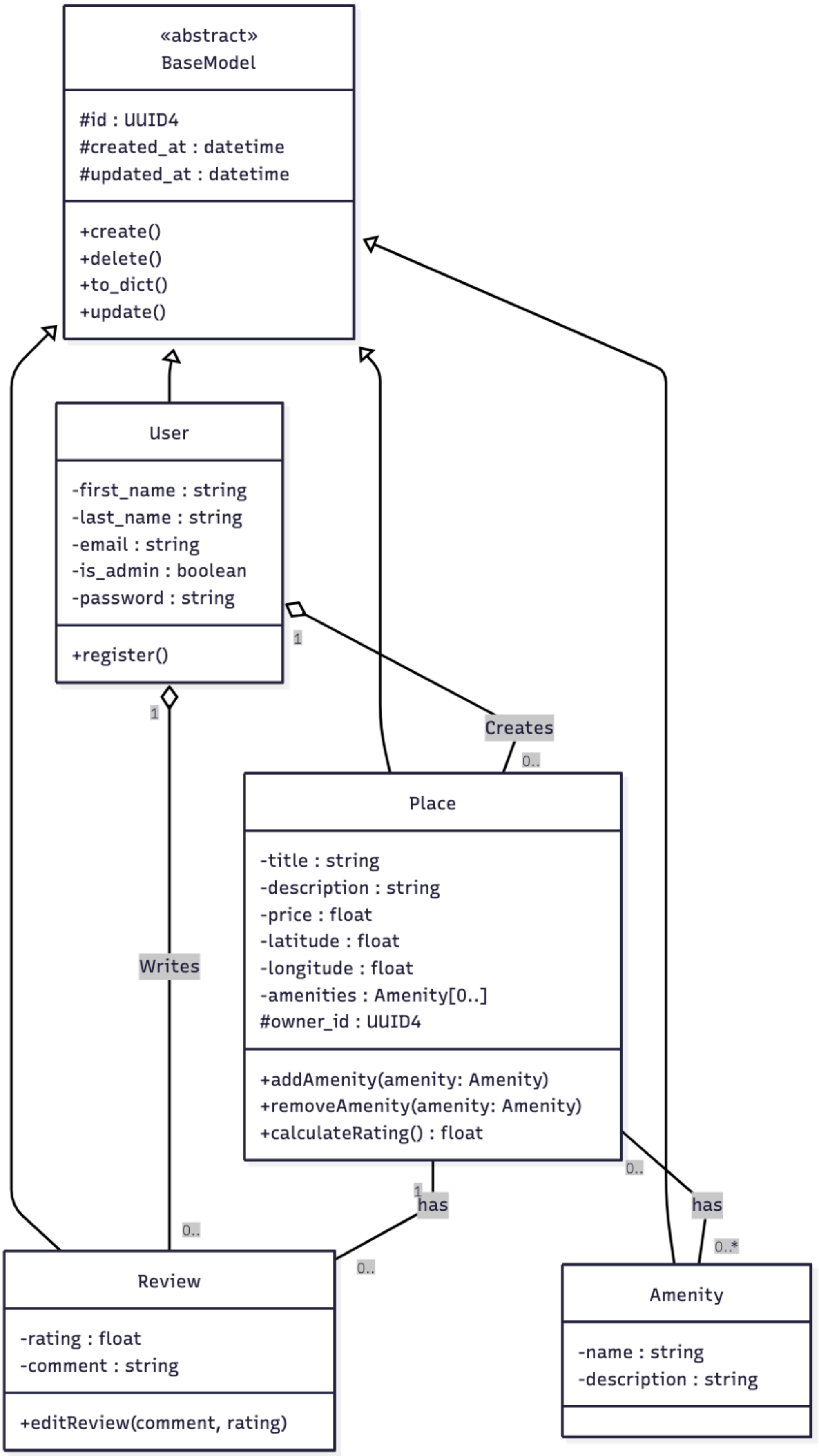
This section presents the detailed class diagram for the Business Logic Layer, explaining the entities, their attributes, methods, and relationships.

Key idea: entities inherit shared behavior from BaseModel, and relationships encode ownership and multiplicity (1, 0..*).

3.1 Class Diagram

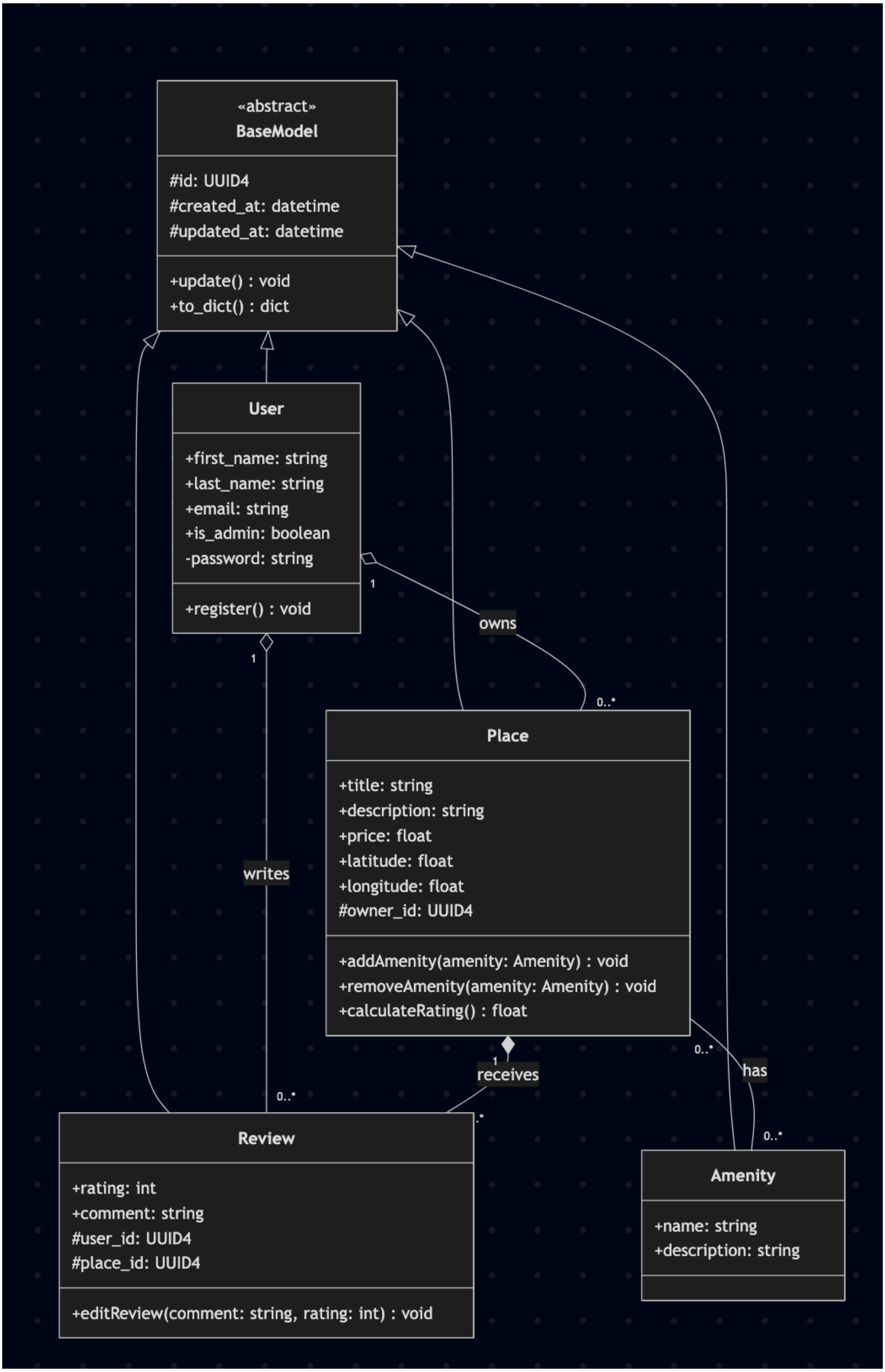
This is a *living* diagram. We keep the first version for traceability, then we iterate as we discover improvements during implementation.

3.1.1 Version 1 (Initial draft)


«abstract»
BaseModel
#id : UUID4
#created_at : datetime
#updated_at : datetime
+create()
+delete()
+to_dict()
+update()
User
-first_name : string
-last_name : string
-email : string
-is_admin : boolean
-password : string
+register()
1
1
Creates
0..
Writes
Place
-title : string
-description : string
-price : float
-latitude : float
-longitude : float
-amenities : Amenity[0..]
#owner_id : UUID4
+addAmenity(amenity: Amenity)
+removeAmenity(amenity: Amenity)
+calculateRating() : float
0..
1
has
0..
has
0..*
0..
Review
-rating : float
-comment : string
+editReview(comment, rating)
Amenity
-name : string
-description : string

```
classDiagram
    direction TB
    class BaseModel {
        #id : UUID4
        #created_at : datetime
        #updated_at : datetime
        +create()
        +delete()
        +to_dict()
        +update()
    }
    class User {
        -first_name : string
        -last_name : string
        -email : string
        -is_admin : boolean
        -password : string
        +register()
    }
    class Place {
        -title : string
        -description : string
        -price : float
        -latitude : float
        -longitude : float
        -amenities : Amenity[0..]
        #owner_id : UUID4
        +addAmenity(amenity: Amenity)
        +removeAmenity(amenity: Amenity)
        +calculateRating() float
    }
    class Review {
        -rating : float
        -comment : string
        +editReview(comment, rating)
    }
    class Amenity {
        -name : string
        -description : string
    }
    <<abstract>> BaseModel
    BaseModel <|-- User
    BaseModel <|-- Place
    BaseModel <|-- Review
    BaseModel <|-- Amenity
    User "1" o-- "0.." Place : Creates
    User "1" o-- "0.." Review : Writes
    Place "1"-- "0.." Review : has
    Place "0.." -- "0..*" Amenity : has
```

3.1.2 Version 2 (Revised / current)


«abstract»
BaseModel
#id: UUID4
#created_at: datetime
#updated_at: datetime
+update() : void
+to_dict() : dict
User
+first_name: string
+last_name: string
+email: string
+is_admin: boolean
-password: string
+register() : void
1
owns
0..*
1
writes
0..*
Place
+title: string
+description: string
+price: float
+latitude: float
+longitude: float
#owner_id: UUID4
+addAmenity(amenity: Amenity) : void
+removeAmenity(amenity: Amenity) : void
+calculateRating() : float
1
receives
.*
0..*
has
0..*
Review
+rating: int
+comment: string
#user_id: UUID4
#place_id: UUID4
+editReview(comment: string, rating: int) : void
Amenity
+name: string
+description: string

```
classDiagram
    direction TB

    class BaseModel {
        <<abstract>>
        #id: UUID4
        #created_at: datetime
        #updated_at: datetime
        +update() void
        +to_dict() dict
    }

    class User {
        +first_name: string
        +last_name: string
        +email: string
        +is_admin: boolean
        -password: string
        +register() void
    }

    class Place {
        +title: string
        +description: string
        +price: float
        +latitude: float
        +longitude: float
        #owner_id: UUID4
        +addAmenity(amenity: Amenity) void
        +removeAmenity(amenity: Amenity) void
        +calculateRating() float
    }

    class Review {
        +rating: int
        +comment: string
        #user_id: UUID4
        #place_id: UUID4
        +editReview(comment: string, rating: int) void
    }

    class Amenity {
        +name: string
        +description: string
    }

    BaseModel <|-- User
    BaseModel <|-- Place
    BaseModel <|-- Review
    BaseModel <|-- Amenity

    User "1" o-- "0..*" Place : owns
    User "1" o-- "0..*" Review : writes
    Place "1" *-- "0..*" Review : receives
    Place "0..*" -- "0..*" Amenity : has
```

3.1.3 What changed

1. **Abstract syntax**
    - We moved `<<abstract>>` *inside* `BaseModel` because that is how Mermaid expects it.
2. **`create()` / `delete()`**
    - While implementing, we realized CRUD lives in the Persistence layer (repo/storage).
    - So `create()` and `delete()` do not belong in the Business Logic class diagram, and we removed them.
3. **Method signatures**
    - We added parameter and return types everywhere to make the contract clearer.
4. **Amenities redundancy**
    - The Place ↔ Amenity relationship already shows the link, so we removed the `amenities` attribute to avoid duplication.

5. **Review ownership**
    - We added `user_id` and `place_id` to `Review` so it is obvious what a review belongs to.
6. **Rating type**
    - We switched `rating` from `float` to `int` because ratings are typically 1–5.
7. **Cardinality + wording**
    - We fixed the `0..*` multiplicities and used clearer labels (`owns`, `writes`, `receives`).
8. **Lifecycle**
    - We kept Place → Review as composition to reflect cascade delete.
9. **Visibility (access from other classes)**
    - We discussed it and switched several attributes to **public (+)** so other classes can access them when needed.
    - We kept sensitive fields like `password` as **private (-)**.

3.2 BaseModel (Abstract Class)

BaseModel is an abstract class (<<abstract>>). It cannot be instantiated directly and serves as a parent class. All entities inherit from it.

Protected attributes (#)

- `id` (UUID4): universal unique identifier (version 4). Guarantees uniqueness even in distributed systems.
- `created_at` (datetime): creation timestamp for traceability.
- `updated_at` (datetime): last update timestamp (updated on each save).

Public methods (+)

- `to_dict()`: serializes the object for JSON/API responses.
- `update()`: modifies attributes and refreshes `updated_at`.

> Note: persistence CRUD methods like `create()` / `delete()` are handled in the Persistence layer (Repository/Storage), so they are not part of the Business Logic diagram.

Design principle: centralizing these members in BaseModel applies DRY (Don't Repeat Yourself).

3.3 Entity Descriptions

3.3.1 User

Represents a platform user.

Attributes

- `first_name` (string): user first name.
- `last_name` (string): user last name.
- `email` (string): login identifier (unique, valid format).
- `is_admin` (boolean): access control flag.
- `password` (string): stored as a hashed value.

Method

- `register()`: handles registration logic (email uniqueness, format validation, password hashing).

3.3.2 Place

Represents an accommodation listing with geolocation data.

Attributes

- `title` (string): listing title.
- `description` (string): listing description.
- `price` (float): nightly price (must be > 0).
- `latitude` (float): GPS latitude.
- `longitude` (float): GPS longitude.
- Amenities are associated through a **many-to-many** relationship (see Place ↔ Amenity).
- `owner_id` (UUID4): reference to the owning user.

Methods

- `addAmenity()` / `removeAmenity()`: manage the many-to-many relationship with Amenity.
- `calculateRating()`: aggregates Review ratings to compute the average.

3.3.3 Review

Models a user review on a place.

Attributes

- `rating` (int): numeric score (typically 1–5).
- `comment` (string): review text.

Method

- `editReview(comment, rating)`: edits an existing review.

3.3.4 Amenity

Represents an equipment or feature (Wi-Fi, pool, parking).

Attributes

- `name` (string): amenity name.
- `description` (string): amenity description.

3.4 Relationships

3.4.1 Inheritance (Generalization)

All entities inherit from BaseModel. Each entity automatically includes the id, timestamps, and shared helper methods (like `to_dict()` and `update()`).

3.4.2 User → Place (Aggregation)

A User (1) can create 0..* Places. Aggregation shows a weak "has-a" relationship.

3.4.3 Place → Review (Composition)

A Place (1) owns 0..* Reviews. If a place is deleted, its reviews should be deleted as well (cascade delete).

3.4.4 User → Review

A User (1) can write 0..* Reviews.

3.4.5 Place ↔ Amenity (Many-to-Many)

A Place can have many amenities and an Amenity can belong to many places. In persistence, this requires a junction table (association table).

3.4.6 UML Visibility Notation

- `+` Public: accessible from any class.
- `-` Private: accessible only within the class.
- `#` Protected: accessible within the class and its subclasses.

3.4.7 Relationship notation (arrows and diamonds)

This diagram uses standard UML relationship symbols. Understanding these symbols is important because they express **ownership**, **lifecycle**, and **multiplicity**.

- **Inheritance / Generalization** (`<|--`)
  - Meaning: *is-a* relationship (child class inherits from parent).
  - In the diagram: `User`, `Place`, `Review`, and `Amenity` inherit common fields and helper methods from `BaseModel` (ex: `to_dict()`, `update()`).
- **Association** (`--`)
  - Meaning: generic *is-related-to* relationship (no ownership implied).
  - In this model: Place ↔ Amenity is many-to-many and neither side "owns" the other.
  - In the diagram: used for **Place** ↔ **Amenity**.
- **Aggregation** (`o--`, open diamond)
  - Meaning: weak *has-a* relationship (the child can exist independently).
  - In this model, think of it as "linked to" / "owned by" without strict lifecycle dependency.
  - In the diagram:

        - `User "1" o-- "0..*" Place`: a user can own many places.
        - `User "1" o-- "0..*" Review`: a user can write many reviews.
- **Composition** (`*--`, filled diamond)
    - Meaning: strong ownership (the child lifecycle depends on the parent).
    - In this model: reviews do not make sense without the place they belong to.
    - In the diagram:
        - `Place "1" *-- "0..*" Review`: deleting a place deletes its reviews too (**cascade delete**).
- **Multiplicity / Cardinality** (e.g., `"1"`, `"0..*"`)
    - Meaning: how many instances can participate in the relationship.
    - Quick read:
        - `"1"` means exactly one.
        - `"0..*"` means zero or more.
        - So `User "1" o-- "0..*" Place` = one user can have zero or many places.

3.5 Business rules implied by the model

Keywords: UUID4, **uniqueness**, **referential integrity**, **cascade delete**, **many-to-many**, **junction table**

These constraints are not fully expressed by UML alone, but they are implied by the attributes/methods and are typically enforced in the Business Logic layer (and sometimes also at the database level).

- **Identity and audit fields (all entities)**
    - Each entity has a unique `id` (UUID4).
    - `created_at` is set once at creation.
    - `updated_at` changes on each update.
- **User**
    - `email` must be **unique** (no two users share the same email).
    - `email` must have a **valid format**.

    - `password` must be **hashed** before storage.
    - `is_admin` controls authorization for admin-only actions.
- **Place**
    - `price` must be **> 0**.
    - `latitude` and `longitude` should be validated as real-world coordinates.
    - `owner_id` must reference an existing user (referential integrity).
- **Review**
    - `rating` should be constrained to an accepted range (for example **1–5**), and type should be consistent.
    - Business constraint commonly enforced: **one review per user per place** (prevents duplicates).
- **Relationships and persistence-level constraints**
    - **Place → Review composition** often implies **cascade delete** (deleting a place deletes its reviews).
    - **Place ↔ Amenity many-to-many** requires a **junction table** (for example `place_amenities(place_id, amenity_id)`), usually with a unique constraint on the pair.

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4. Conventions Used in Sequence Diagrams

4.1 Layer responsibilities (quick reminder)

- **User (Client):** sends HTTP requests and receives responses.
- **API (Presentation):** request validation, auth checks (when required), routing, and HTTP status mapping.
- **Model (Business Logic):** domain rules, validations, orchestration of use cases.
- **Persistence:** database operations and transaction management.

4.2 Why SQL is not shown in sequence diagrams

Database work is represented using abstract methods (for example, `find_by_id()` or `check_duplicate_review()`) to avoid leaking storage details into the business logic representation.

4.3 Mermaid syntax cheatsheet

Syntax	Meaning	Example
`participant A`	Declare participant (an actor/service shown in the diagram: client, API, model/service, DB, etc.)	`participant User`
`A->>B`	Call (solid arrow)	`User->>API: POST /api/register`
`A-->>B`	Return (dashed arrow)	`API-->>User: HTTP 201`
`activate A` / `deactivate A`	Activation bar	`activate API`
`A->>A`	Self-call	`Model->>Model: validate()`
`alt ... else ... end`	If/else (branching)	Success vs error path
`opt ... end`	Optional block (only runs if condition is met)	Amenities provided

5. API Interaction Flow (Sequence Diagrams)

Each section below includes the Mermaid code and a step-by-step explanation of the flow.

5.1 User Registration (POST /api/register)

5.1.1 What this diagram represents

This diagram models how a new user creates an account:

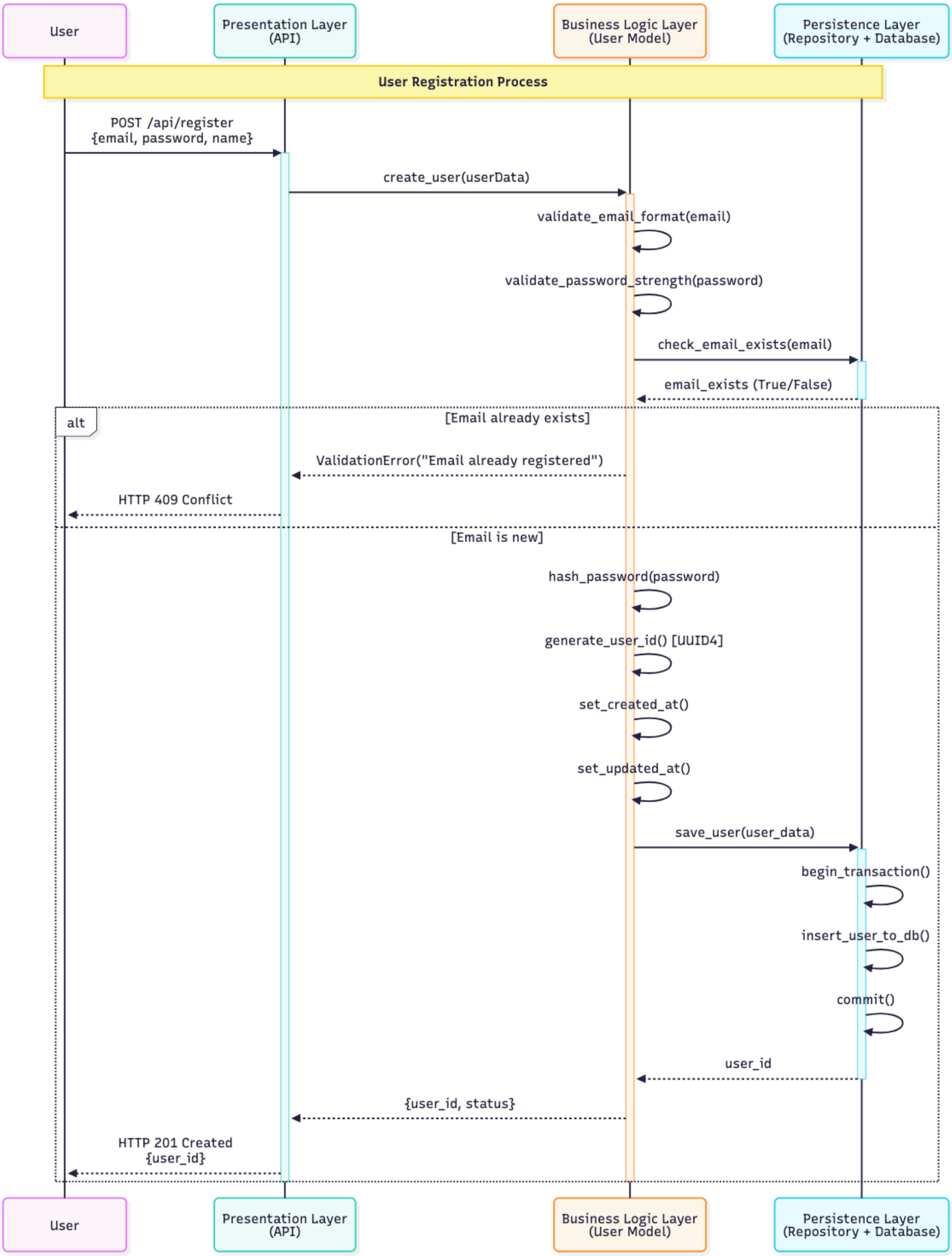
- Input is validated.
- Email uniqueness is checked.
- A user record is saved using a transaction.
- The new user id is returned.

5.1.2 Participants

- **User**
- **API (Presentation Layer)**
- **UserModel (Business Logic Layer)**
- **Persistence (Repository + Database)**

5.1.3 Mermaid code

```
sequenceDiagram
    participant User
    participant API as Presentation Layer<br/>(API)
    participant UserModel as Business Logic Layer<br/>(UserModel)
    participant Persistence as Persistence Layer<br/>(Repository + Database)

    Note over User,Persistence: User Registration Process

    User->>API: POST /api/register<br/>{email, password, name}
    activate API

    API->>UserModel: create_user(userData)
    activate UserModel

    UserModel->>UserModel: validate_email_format(email)
    UserModel->>UserModel: validate_password_strength(password)

    UserModel->>Persistence: check_email_exists(email)
    activate Persistence
    Persistence-->>UserModel: email_exists (True/False)
    deactivate Persistence

    alt Email already exists
        UserModel-->>API: ValidationError("Email already registered")
        API-->>User: HTTP 409 Conflict
    else Email is new
        UserModel->>UserModel: hash_password(password)
        UserModel->>UserModel: generate_user_id() [UUID4]
        UserModel->>UserModel: set_created_at()
        UserModel->>UserModel: set_updated_at()

        UserModel->>Persistence: save_user(user_data)
        activate Persistence
        Persistence->>Persistence: begin_transaction()
        Persistence->>Persistence: insert_user_to_db()
        Persistence->>Persistence: commit()
        Persistence-->>UserModel: user_id
        deactivate Persistence

        UserModel-->>API: {user_id, status}
        API-->>User: HTTP 201 Created<br/>{user_id}
    end

    deactivate UserModel
    deactivate API
```


User
Presentation Layer (API)
Business Logic Layer (User Model)
Persistence Layer (Repository + Database)
User Registration Process
POST /api/register {email, password, name}
create_user(userData)
validate_email_format(email)
validate_password_strength(password)
check_email_exists(email)
email_exists (True/False)
alt
[Email already exists]
ValidationError("Email already registered")
HTTP 409 Conflict
[Email is new]
hash_password(password)
generate_user_id() [UUID4]
set_created_at()
set_updated_at()
save_user(user_data)
begin_transaction()
insert_user_to_db()
commit()
user_id
{user_id, status}
HTTP 201 Created {user_id}
User
Presentation Layer (API)
Business Logic Layer (User Model)
Persistence Layer (Repository + Database)

5.1.4 Step-by-step explanation

- **Client request**
  - User calls `POST /api/register` with `{email, password, name}`.
- **API boundary checks (Presentation)**

    - Check required fields.
    - Normalize input (trim email, optional lower-case).
    - If payload invalid → `400 Bad Request`.
- **Business call**
    - API calls `UserModel.create_user(userData)`.
- **Business validations (Business)**
    - Validate email format.
    - Validate password strength.
    - Optional: validate name rules.
    - If invalid → API returns `400 Bad Request`.
- **Uniqueness check (Persistence)**
    - `Persistence.check_email_exists(email)`.
    - If email already exists → `409 Conflict`.
- **Build user entity (Business)**
    - Hash password.
    - Generate UUID.
    - Set timestamps.
- **Persist (transaction) (Persistence)**
    - Begin transaction.
    - Insert user.
    - Commit.
    - On DB error → rollback → `500 Internal Server Error`.
- **Response**
    - Return `201 Created` with `{user_id}`.

Notes

- `409` = conflict with existing state (not a bad payload).
- In a real DB, email should still be unique at the DB level too.

5.2 Place Creation (POST /api/places)

5.2.1 What this diagram represents

This diagram shows how an authenticated user creates a new place:

- Token validation happens in the API layer.
- Place validation happens in the business layer.
- Persistence saves the place and optionally links amenities in one transaction.

5.2.2 Step-by-step explanation

- **Client request**
  - User calls `POST /api/places` with `{auth_token, title, description, price, latitude, longitude, amenities}`.
- **Auth gate (API)**
  - Validate token.
  - If invalid → `401 Unauthorized`.
- **Business call**
  - API calls `PlaceModel.create_place(placeData)`.
- **Business validations**
  - Validate title.
  - Validate `price > 0`.
  - Validate coordinates.
  - Optional: validate amenities list (format, no duplicates).
  - If invalid → `400 Bad Request`.
- **Build place entity**
  - Generate `place_id`.
  - Set `owner_id` from token.
  - Set timestamps.
- **Persist (transaction) (Persistence)**

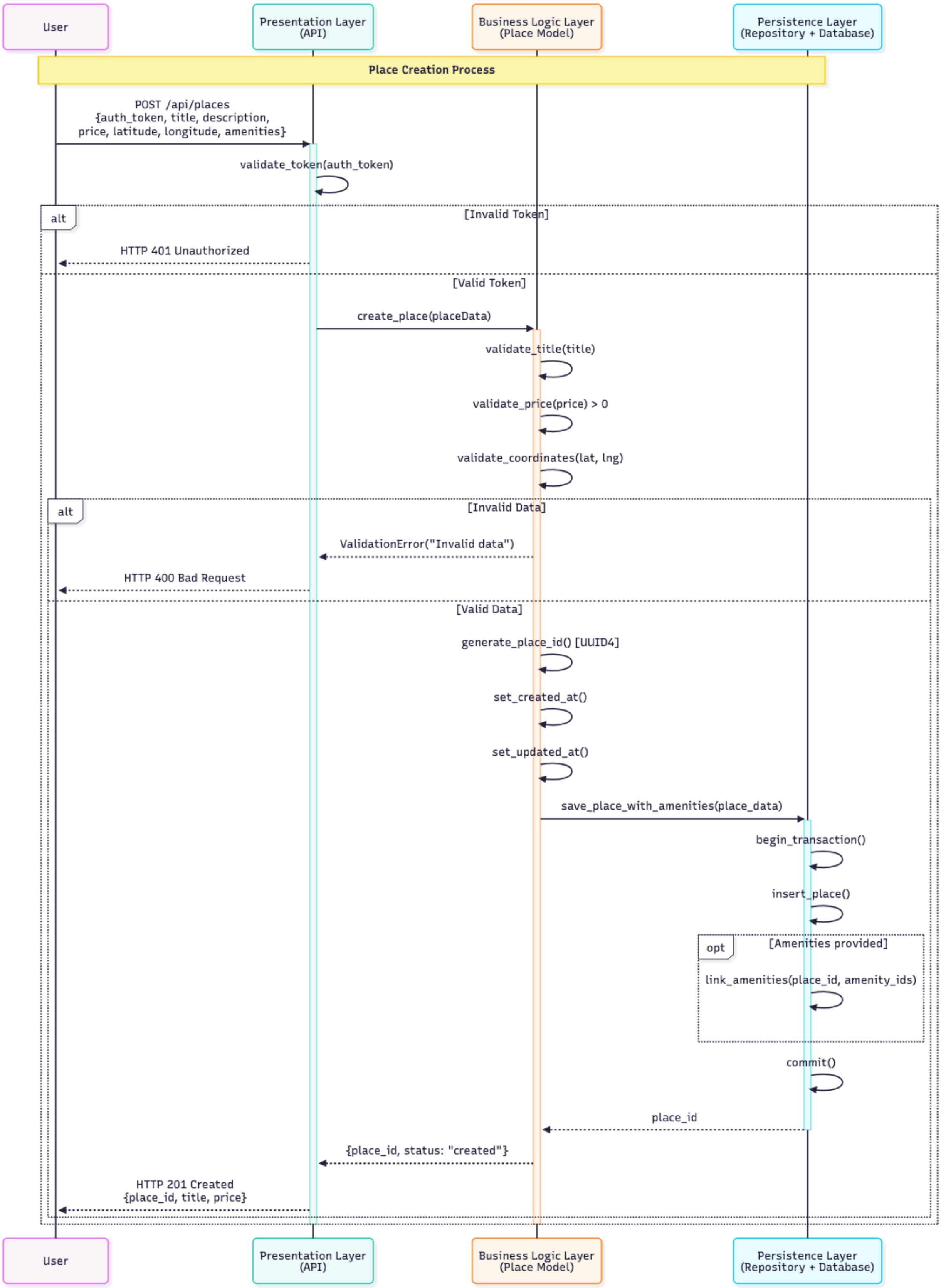
  - Insert place.
  - If amenities provided → link via association table.
  - Commit.
- **Response**
  - Return `201 Created` with `{place_id, title, price}`.

Notes

- If you validate amenity IDs, you can return `400` (invalid reference) or `404` (amenity not found) depending on your conventions.

5.2.3 Mermaid code

```
sequenceDiagram
    participant User
    participant API as Presentation Layer<br/>(API)
    participant PlaceModel as Business Logic Layer<br/>(Place Model)
    participant Persistence as Persistence Layer<br/>(Repository + Database)

    Note over User,Persistence: Place Creation Process

    User->>API: POST /api/places<br/>{auth_token, title, description,<br/>price, latitude, longitude, amenities}
    activate API

    API->>API: validate_token(auth_token)

    alt Invalid Token
        API-->>User: HTTP 401 Unauthorized

    else Valid Token
        API->>PlaceModel: create_place(placeData)
        activate PlaceModel

        PlaceModel->>PlaceModel: validate_title(title)
        PlaceModel->>PlaceModel: validate_price(price) > 0
        PlaceModel->>PlaceModel: validate_coordinates(lat, lng)

        alt Invalid Data
            PlaceModel-->>API: ValidationError("Invalid data")
            API-->>User: HTTP 400 Bad Request

        else Valid Data
            PlaceModel->>PlaceModel: generate_place_id() [UUID4]
            PlaceModel->>PlaceModel: set_created_at()
            PlaceModel->>PlaceModel: set_updated_at()

            PlaceModel->>Persistence: save_place_with_amenities(place_data)
            activate Persistence
            Persistence->>Persistence: begin_transaction()
            Persistence->>Persistence: insert_place()

            opt Amenities provided
                Persistence->>Persistence: link_amenities(place_id, amenity_ids)
            end

            Persistence->>Persistence: commit()
            Persistence-->>PlaceModel: place_id
            deactivate Persistence

            PlaceModel-->>API: {place_id, status: "created"}
            API-->>User: HTTP 201 Created<br/>{place_id, title, price}
        end
    end
    deactivate PlaceModel
    deactivate API
```



User
Presentation Layer (API)
Business Logic Layer (Place Model)
Persistence Layer (Repository + Database)
Place Creation Process
POST /api/places {auth_token, title, description, price, latitude, longitude, amenities}
validate_token(auth_token)
alt
[Invalid Token]
HTTP 401 Unauthorized
[Valid Token]
create_place(placeData)
validate_title(title)
validate_price(price) > 0
validate_coordinates(lat, lng)
alt
[Invalid Data]
ValidationError("Invalid data")
HTTP 400 Bad Request
[Valid Data]
generate_place_id() [UUID4]
set_created_at()
set_updated_at()
save_place_with_amenities(place_data)
begin_transaction()
insert_place()
opt
[Amenities provided]
link_amenities(place_id, amenity_ids)
commit()
place_id
{place_id, status: "created"}
HTTP 201 Created {place_id, title, price}
User
Presentation Layer (API)
Business Logic Layer (Place Model)
Persistence Layer (Repository + Database)

5.3 Review Submission (POST /api/reviews)

5.3.1 What this diagram represents

This diagram shows review submission with the most critical transaction:

- Authentication gate.
- Input validation.
- Duplicate check.
- Transaction inserts a review and updates place average rating atomically.

5.3.2 Step-by-step explanation

- **Client request**
  - User calls `POST /api/reviews` with `{auth_token, place_id, rating, comment}`.
- **Auth gate (API)**
  - Validate token.
  - If invalid → **`401 Unauthorized`**.
- **Business call**
  - API calls `ReviewModel.create_review(reviewData)`.
- **Business validations**
  - Validate rating in **1–5**.
  - Validate comment rules.
  - If invalid → **`400 Bad Request`**.
- **Duplicate protection**
  - `Persistence.check_duplicate_review(user_id, place_id)`.
  - If already reviewed → **`409 Conflict`**.
- **Build review entity**
  - Generate `review_id`.
  - Set timestamps.
  - Attach `user_id` + `place_id`.

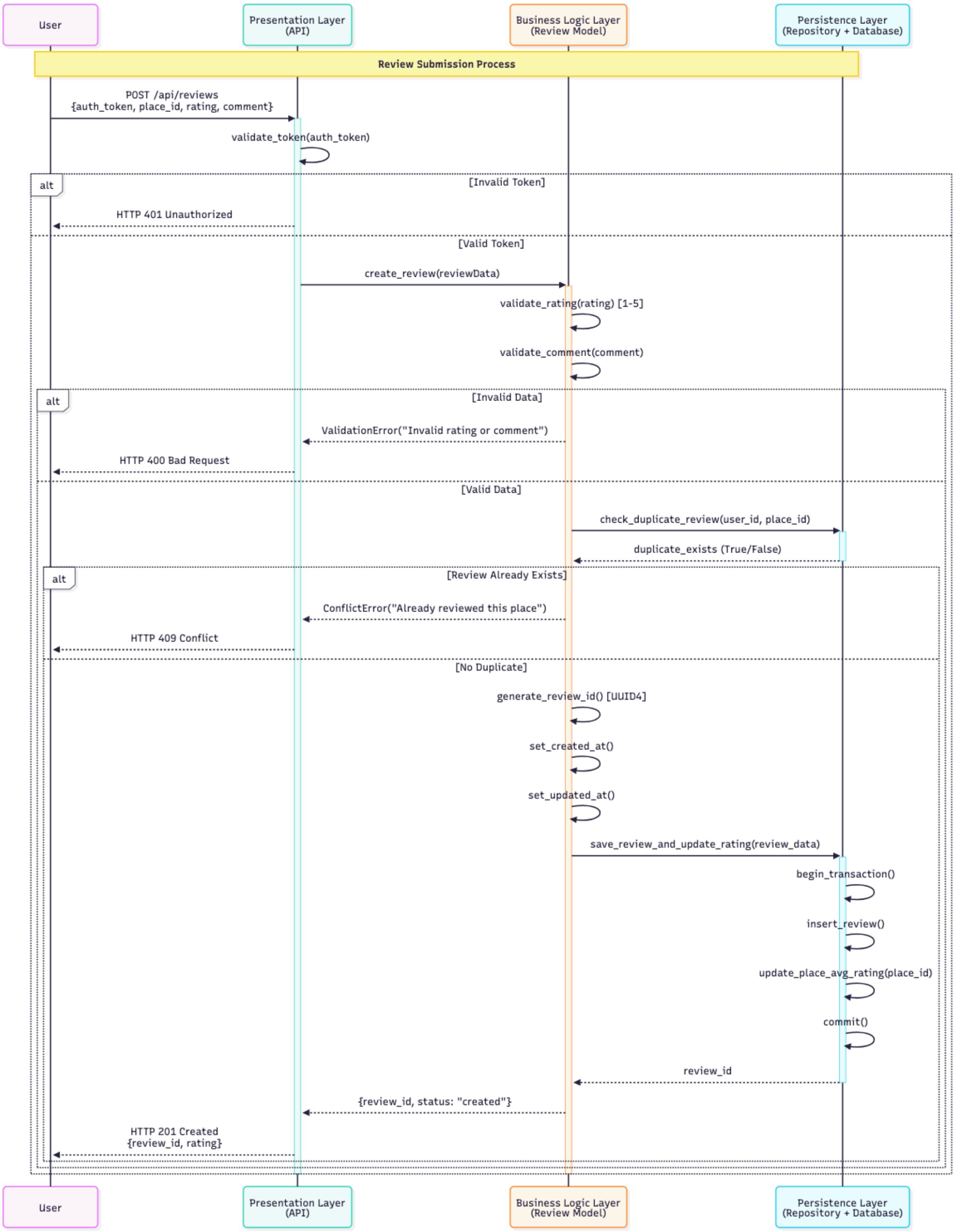
- **Persist atomically (transaction) (Persistence)**
  - Insert review.
  - Update place average rating (if you store a cached avg).
  - Commit.
  - On failure → rollback → `500 Internal Server Error`.
- **Response**
  - Return `201 Created` with `{review_id, rating}`.

Notes

- You can also check that the place exists first; if not → `404 Not Found`.

5.3.3 Mermaid code

```
sequenceDiagram
    participant User
    participant API as Presentation Layer<br/>(API)
    participant ReviewModel as Business Logic Layer<br/>(Review Model)
    participant Persistence as Persistence Layer<br/>(Repository + Database)

    Note over User,Persistence: Review Submission Process

    User->>API: POST /api/reviews<br/>{auth_token, place_id, rating, comment}
    activate API

    API->>API: validate_token(auth_token)

    alt Invalid Token
        API-->>User: HTTP 401 Unauthorized

    else Valid Token
        API->>ReviewModel: create_review(reviewData)
        activate ReviewModel
        ReviewModel->>ReviewModel: validate_rating(rating) [1-5]
        ReviewModel->>ReviewModel: validate_comment(comment)

        alt Invalid Data
            ReviewModel-->>API: ValidationError("Invalid rating or comment")
            API-->>User: HTTP 400 Bad Request

        else Valid Data
            ReviewModel->>Persistence: check_duplicate_review(user_id, place_id)
            activate Persistence
            Persistence-->>ReviewModel: duplicate_exists (True/False)
            deactivate Persistence

            alt Review Already Exists
                ReviewModel-->>API: ConflictError("Already reviewed this place")
                API-->>User: HTTP 409 Conflict

            else No Duplicate
                ReviewModel->>ReviewModel: generate_review_id() [UUID4]
                ReviewModel->>ReviewModel: set_created_at()
                ReviewModel->>ReviewModel: set_updated_at()

                ReviewModel->>Persistence: save_review_and_update_rating(review_data)
                activate Persistence
                Persistence->>Persistence: begin_transaction()
                Persistence->>Persistence: insert_review()
                Persistence->>Persistence: update_place_avg_rating(place_id)
                Persistence->>Persistence: commit()
                Persistence-->>ReviewModel: review_id
                deactivate Persistence

                ReviewModel-->>API: {review_id, status: "created"}
                API-->>User: HTTP 201 Created<br/>{review_id, rating}
            end
        end
    end

    deactivate ReviewModel
    deactivate API
```


User
Presentation Layer (API)
Business Logic Layer (Review Model)
Persistence Layer (Repository + Database)
Review Submission Process
POST /api/reviews {auth_token, place_id, rating, comment}
validate_token(auth_token)
alt
[Invalid Token]
HTTP 401 Unauthorized
[Valid Token]
create_review(reviewData)
validate_rating(rating) [1-5]
validate_comment(comment)
alt
[Invalid Data]
ValidationError("Invalid rating or comment")
HTTP 400 Bad Request
[Valid Data]
check_duplicate_review(user_id, place_id)
duplicate_exists (True/False)
alt
[Review Already Exists]
ConflictError("Already reviewed this place")
HTTP 409 Conflict
[No Duplicate]
generate_review_id() [UUID4]
set_created_at()
set_updated_at()
save_review_and_update_rating(review_data)
begin_transaction()
insert_review()
update_place_avg_rating(place_id)
commit()
review_id
{review_id, status: "created"}
HTTP 201 Created {review_id, rating}
User
Presentation Layer (API)
Business Logic Layer (Review Model)
Persistence Layer (Repository + Database)

5.4 Fetching Places (GET endpoints)

5.4.1 What this diagram represents

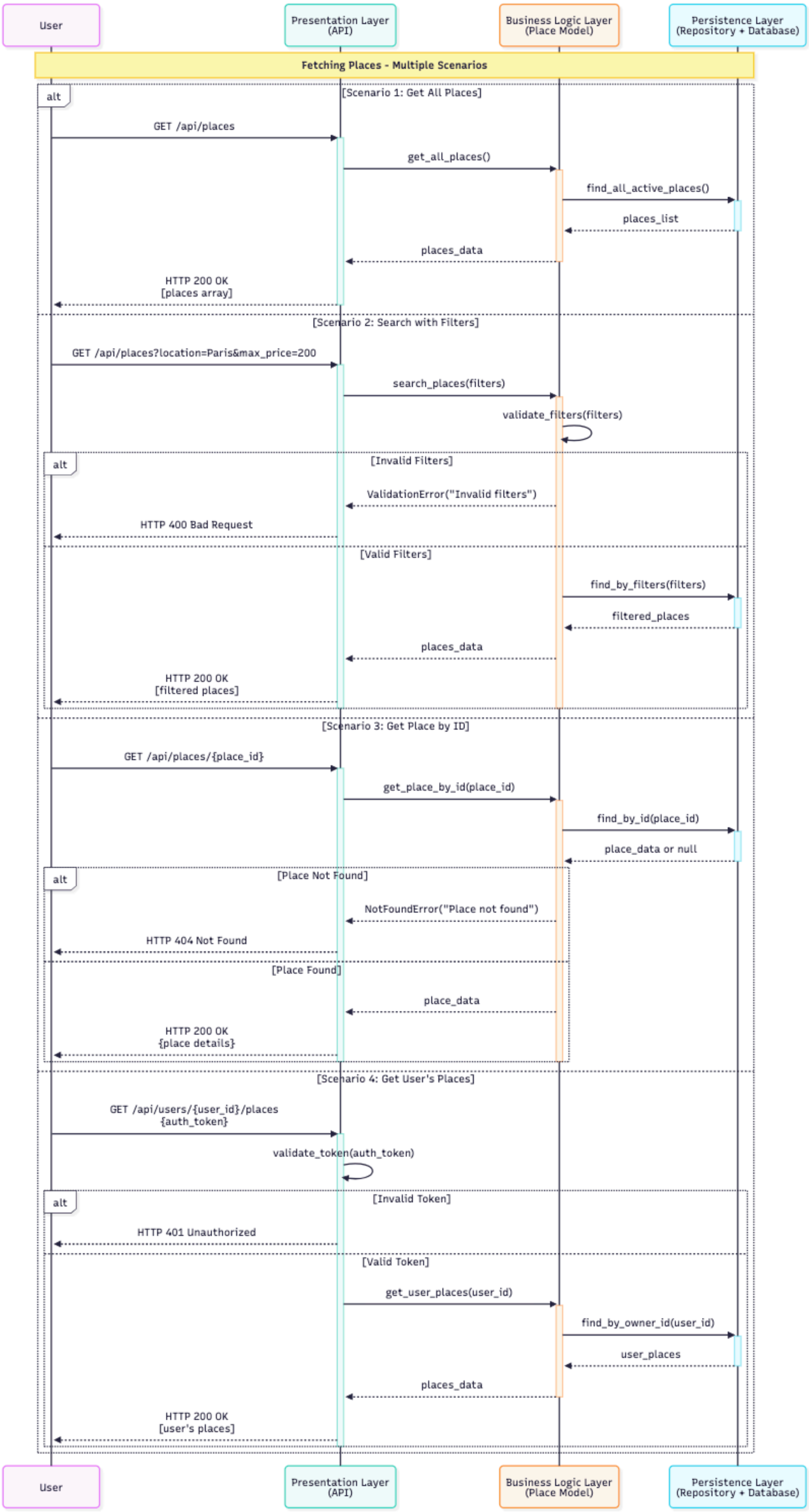
This diagram groups four read-only scenarios:

- List all places.

- Search with filters.
- Get a place by id.
- Get a user’s owned places (private, requires auth).

5.4.2 Mermaid code

```
sequenceDiagram
    participant User
    participant API as Presentation Layer<br/>(API)
    participant PlaceModel as Business Logic Layer<br/>(Place Model)
    participant Persistence as Persistence Layer<br/>(Repository + Database)

    Note over User,Persistence: Fetching Places - Multiple Scenarios

    alt Scenario 1: Get All Places
        User->>API: GET /api/places
        activate API
        API->>PlaceModel: get_all_places()
        activate PlaceModel
        PlaceModel->>Persistence: find_all_active_places()
        activate Persistence
        Persistence-->>PlaceModel: places_list
        deactivate Persistence
        PlaceModel-->>API: places_data
        deactivate PlaceModel
        API-->>User: HTTP 200 OK<br/>[places array]
        deactivate API

    else Scenario 2: Search with Filters
        User->>API: GET /api/places?location=Paris&max_price=200
        activate API
        API->>PlaceModel: search_places(filters)
        activate PlaceModel
        PlaceModel->>PlaceModel: validate_filters(filters)

        alt Invalid Filters
            PlaceModel-->>API: ValidationError("Invalid filters")
            API-->>User: HTTP 400 Bad Request

        else Valid Filters
            PlaceModel->>Persistence: find_by_filters(filters)
            activate Persistence
            Persistence-->>PlaceModel: filtered_places
            deactivate Persistence
            PlaceModel-->>API: places_data
            API-->>User: HTTP 200 OK<br/>[filtered places]
        end
        deactivate PlaceModel
        deactivate API

    else Scenario 3: Get Place by ID
        User->>API: GET /api/places/{place_id}
        activate API
        API->>PlaceModel: get_place_by_id(place_id)
        activate PlaceModel
        PlaceModel->>Persistence: find_by_id(place_id)
        activate Persistence
        Persistence-->>PlaceModel: place_data or null
        deactivate Persistence

        alt Place Not Found
            PlaceModel-->>API: NotFoundError("Place not found")
            API-->>User: HTTP 404 Not Found

        else Place Found
            PlaceModel-->>API: place_data
            API-->>User: HTTP 200 OK<br/>{place details}
        end
        deactivate PlaceModel
        deactivate API

    else Scenario 4: Get User's Places
        User->>API: GET /api/users/{user_id}/places<br/>{auth_token}
        activate API

        API->>API: validate_token(auth_token)

        alt Invalid Token
            API-->>User: HTTP 401 Unauthorized

        else Valid Token
            API->>PlaceModel: get_user_places(user_id)
            activate PlaceModel
            PlaceModel->>Persistence: find_by_owner_id(user_id)
            activate Persistence
            Persistence-->>PlaceModel: user_places
            deactivate Persistence
            PlaceModel-->>API: places_data
            deactivate PlaceModel
            API-->>User: HTTP 200 OK<br/>[user's places]
        end
        deactivate API
    end
```


User
Presentation Layer (API)
Business Logic Layer (Place Model)
Persistence Layer (Repository + Database)
Fetching Places - Multiple Scenarios
alt
[Scenario 1: Get All Places]
GET /api/places
get_all_places()
find_all_active_places()
places_list
places_data
HTTP 200 OK [places array]
[Scenario 2: Search with Filters]
GET /api/places?location=Paris&max_price=200
search_places(filters)
validate_filters(filters)
alt
[Invalid Filters]
ValidationError("Invalid filters")
HTTP 400 Bad Request
[Valid Filters]
find_by_filters(filters)
filtered_places
places_data
HTTP 200 OK [filtered places]
[Scenario 3: Get Place by ID]
GET /api/places/{place_id}
get_place_by_id(place_id)
find_by_id(place_id)
place_data or null
alt
[Place Not Found]
NotFoundError("Place not found")
HTTP 404 Not Found
[Place Found]
place_data
HTTP 200 OK {place details}
[Scenario 4: Get User's Places]
GET /api/users/{user_id}/places {auth_token}
validate_token(auth_token)
alt
[Invalid Token]
HTTP 401 Unauthorized
[Valid Token]
get_user_places(user_id)
find_by_owner_id(user_id)
user_places
places_data
HTTP 200 OK [user's places]
User
Presentation Layer (API)
Business Logic Layer (Place Model)
Persistence Layer (Repository + Database)

5.4.3 Step-by-step explanation

▼ Scenario 1: Get all places (public)

- User calls `GET /api/places`.
- API calls `PlaceModel.get_all_places()`.
- Business applies rules (example: only active places).
- Persistence returns the list (via `find_all_active_places()`).
- API returns **`200 OK`** with `[places]`.

▼ Scenario 2: Search with filters (public)

- User calls `GET /api/places?...`.
- API parses query params.
- Business validates filters.
- If filters invalid → **`400 Bad Request`**.
- Else Persistence returns filtered list (via `find_by_filters(filters)`).
- API returns **`200 OK`** with `[filtered places]`.

▼ Scenario 3: Get one place by id (public)

- User calls `GET /api/places/{place_id}`.
- API validates `{place_id}`.
- Persistence returns place or null.
- If not found → **`404 Not Found`**.
- Else → **`200 OK`** with `{place details}`.

▼ Scenario 4: Get a user's places (private)

- User calls `GET /api/users/{user_id}/places` with `auth_token`.
- API validates token.
- If token invalid → **`401 Unauthorized`**.
- Optional: if token user cannot access this `user_id` → **`403 Forbidden`**.
- Else Persistence returns owned places (via `find_by_owner_id(user_id)`).
- API returns **`200 OK`** with `[user's places]`.

Notes

- `400` = request format/filters invalid.
- `401` = not authenticated.
- `403` = authenticated but not allowed.
- `404` = resource not found.

Summary

✅

What the architecture enforces

- HBnB follows a **3-layer design** (**Presentation** → **Business Logic** → **Persistence**) with a **Facade** to reduce coupling.
- The **Presentation layer** is responsible for request parsing, auth checks, and mapping business errors to **HTTP status codes**.
- The **Business Logic layer** owns validation and domain rules. It should not leak SQL or storage details.
- The **Persistence layer** centralizes CRUD operations and transactions, enabling easier testing and swapping storage implementations.

What the domain model enforces

- Core entities are **User**, **Place**, **Review**, and **Amenity**, inheriting shared behavior from **BaseModel** (UUID + timestamps + common helpers).
- Relationships define ownership and expected lifecycle behavior:
  - **User** → **Place**: 1 to 0..* (creates)
  - **User** → **Review**: 1 to 0..* (writes)
  - **Place** → **Review**: 1 to 0..* (**composition**, so reviews are deleted when a place is deleted)
  - **Place** ↔ **Amenity**: 0..* to 0..* (many-to-many via a junction table)

What the API flows cover

- **POST /api/register**: validates input, checks email uniqueness, creates the user, returns `201` or an error code.
- **POST /api/places**: requires auth, validates place data, creates the place, returns `201` or an error code.
- **POST /api/reviews**: requires auth, validates the review, prevents duplicates, creates the review, returns `201` or an error code.

- **GET /api/places**: read-only flows (list, filtered search, by id, user-owned when applicable).

Project Info

📦 Team

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- **Yohnny Marcellus**

Codebase

- Repository: `holbertonschool-hbnb`
- Directory: `part1`