

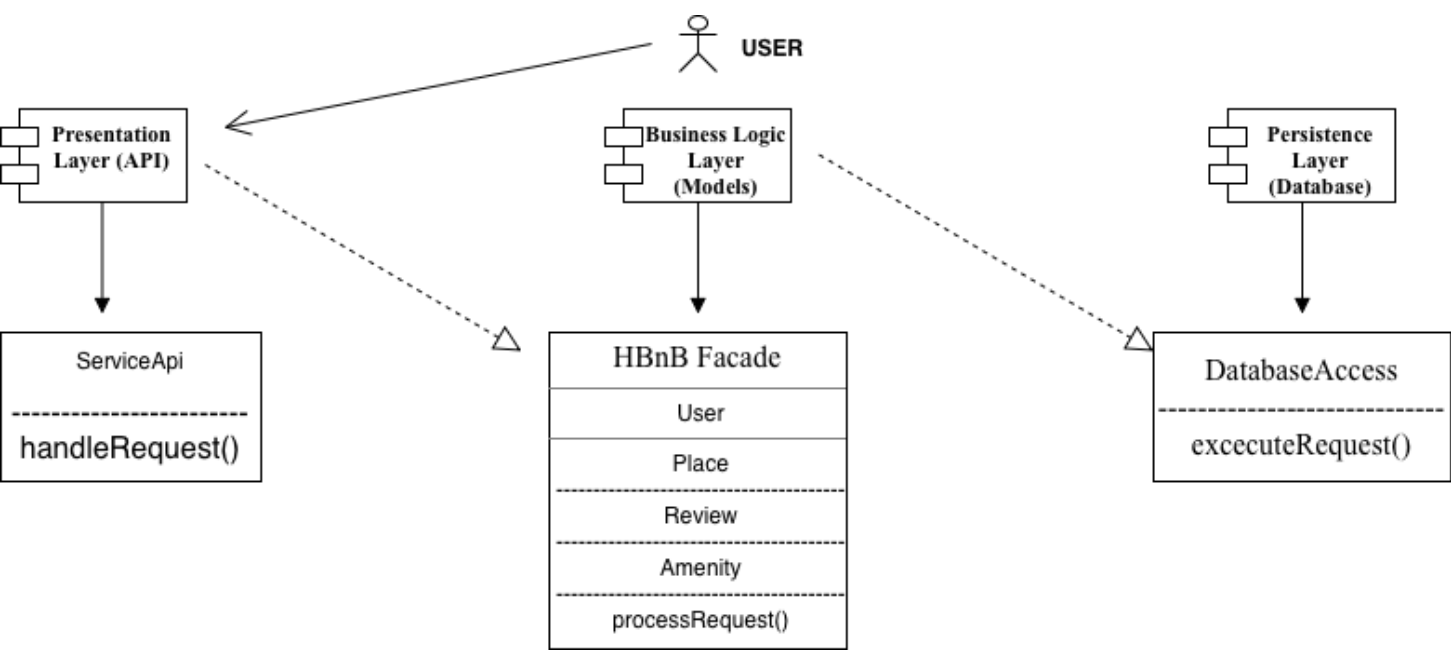
# HBnB Evolution: Complete Technical Documentation

## 1. Introduction

This document serves as the comprehensive architectural blueprint for the **HBnB application**. Its purpose is to detail the system's design across three levels of abstraction: high-level package organization, detailed object-oriented business logic, and real-time API interaction flows. This guide ensures a consistent implementation process, adhering to modularity and separation of concerns.

## 2. High-Level Architecture

The HBnB application follows a **Three-Layer Architecture** supported by the **Facade Pattern**. This ensures a clear separation of concerns, where each layer only communicates with the one directly below it.



### Layer Responsibilities

- **Presentation Layer (API):** Managed by the `ServiceApi` component. It receives user requests and executes `handleRequest()`, serving as the interface between the client and the application logic.
- **Business Logic Layer (Models):** Orchestrated by the `HBnB Facade`. It manages core entities (`User`, `Place`, `Review`, `Amenity`) and handles the system logic via `processRequest()`.
- **Persistence Layer (Database):** Controlled by `DatabaseAccess`. It executes `executeRequest()`

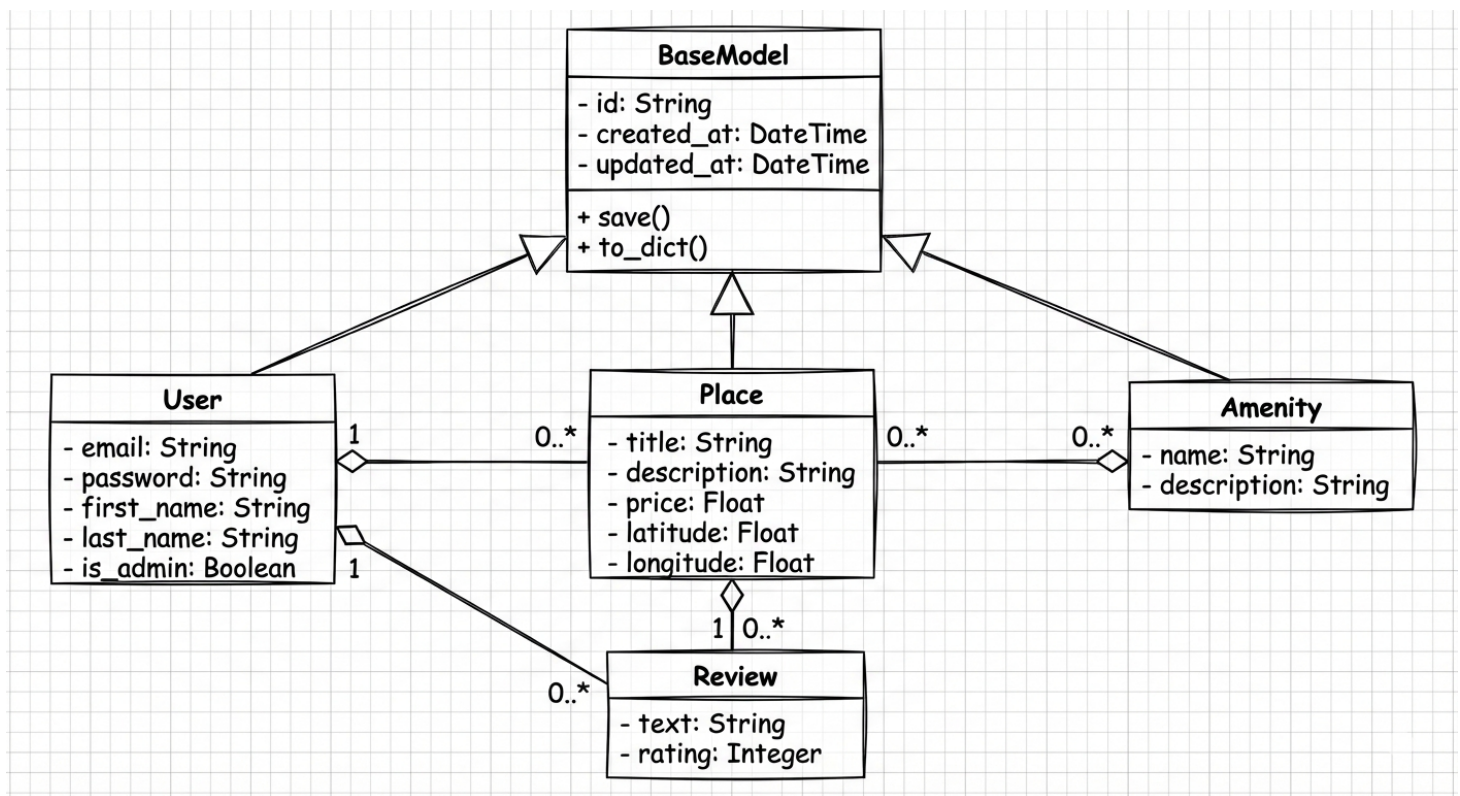
to interact with the database engine while abstracting storage details from the higher layers.

## Facade Pattern Rationale

The **HBnB Facade** acts as a single entry point for the Presentation Layer. This decouples the API from the internal models, ensuring that changes to individual business rules do not break the API controllers.

## 3. Business Logic Layer

This section details the internal structure of the Business Logic layer, focusing on core entities and their object-oriented relationships.



## Entity Descriptions

- **BaseModel:** The parent class for all entities. It provides a unique identifier (**UUID4**) and audit timestamps (`created_at`, `updated_at`) for every object.
- **User:** Represents individuals (Owners/Guests) with attributes like `email`, `password`, and `is_admin`.
- **Place:** Represents rental properties, storing data such as `title`, `price`, and coordinates.
- **Review:** Feedback left by users for places, including a `text` field and a `1-5 rating`.
- **Amenity:** Features like WiFi or AC, linked to places.

## Relationships and Multiplicity

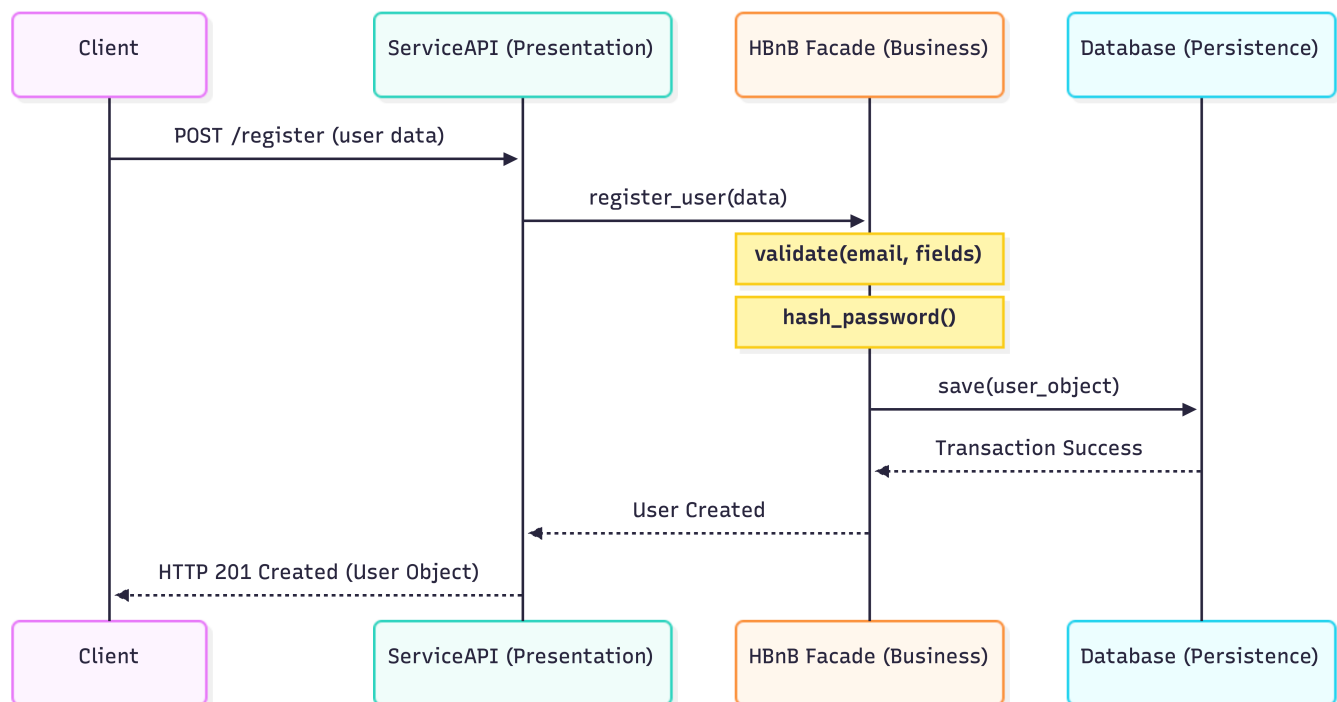
- **Inheritance:** All core entities (User, Place, Review, Amenity) inherit from **BaseModel**.
- **User to Place (1:N):** An owner can list multiple places.
- **Place to Review (1:N):** A place can receive multiple pieces of feedback.
- **Place to Amenity (N:N):** Places can have many amenities, and amenities can apply to many places.

## 4. API Interaction Flow

These sequence diagrams illustrate the communication between the layers for critical system operations.

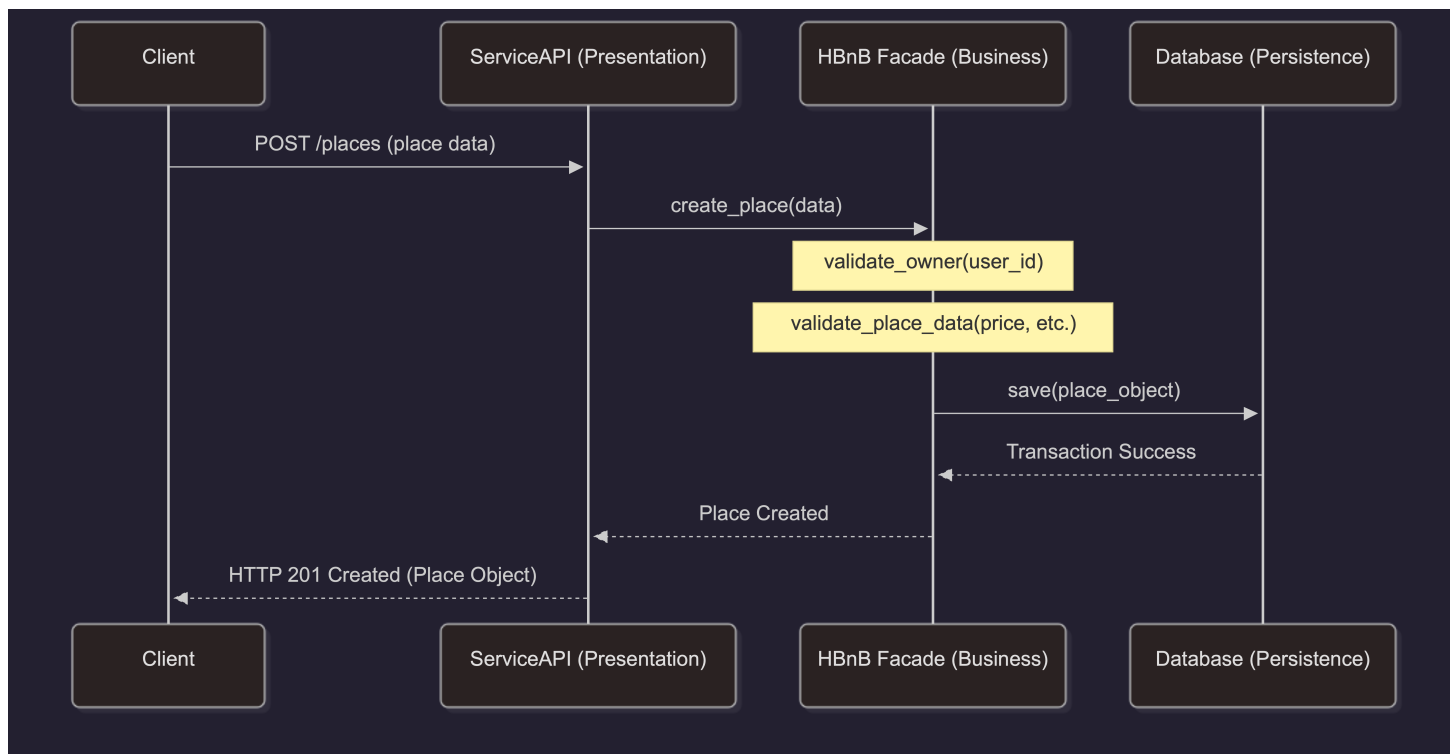
### I. User Registration

**Purpose:** To securely register a new user. The **HBnB\_Facade** validates input and hashes passwords before the **Database** commits the record.



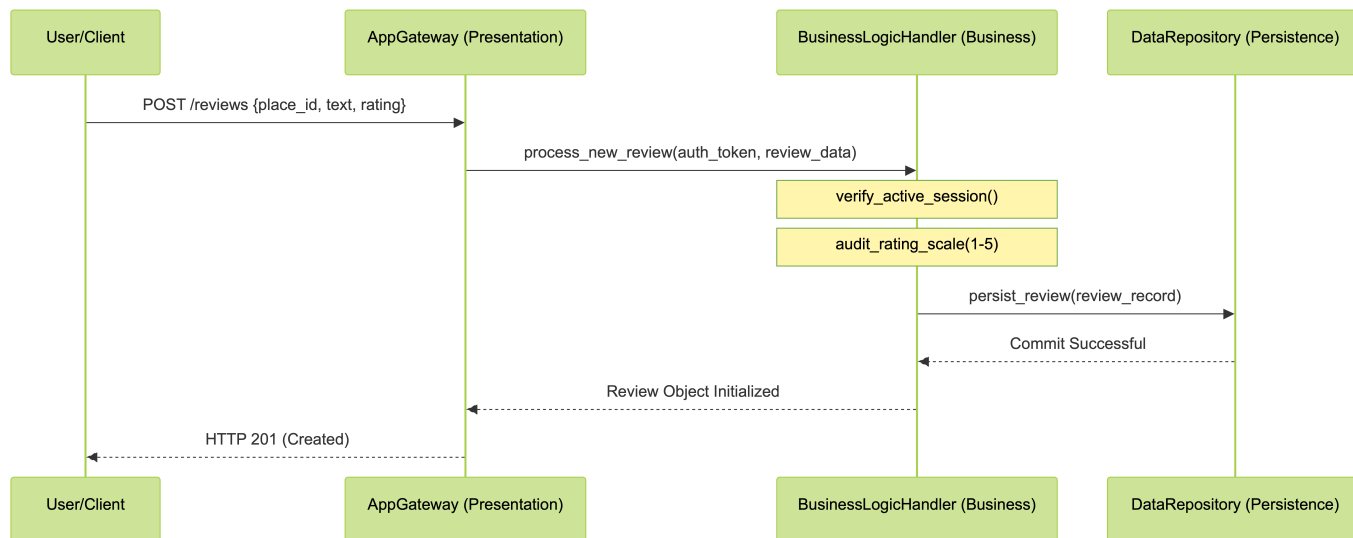
### II. Place Creation

**Purpose:** To allow authorized users to list properties. The Logic layer verifies owner existence and data integrity before storage.



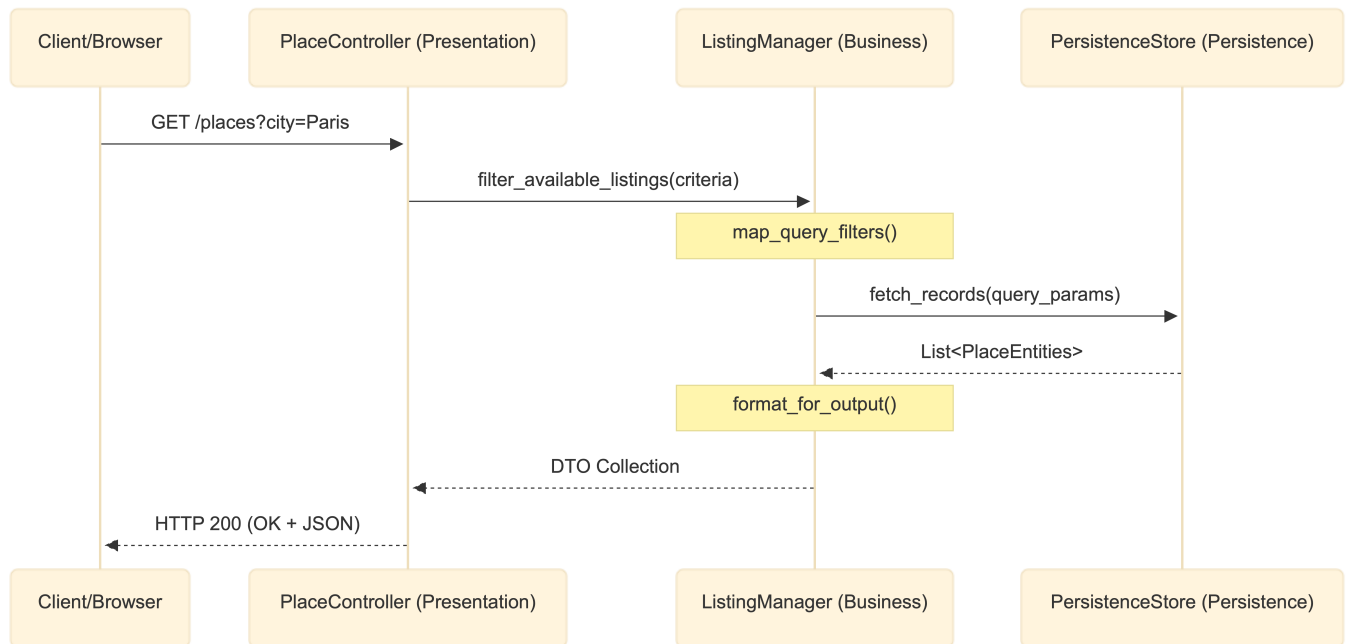
### III. Review Submission

**Purpose:** To record feedback. The **BusinessLogicHandler** checks rating scales and ensures the user is authorized before saving to the **DataRepository**.



### IV. Fetching a List of Places

**Purpose:** To retrieve properties based on filters. The **ListingManager** processes criteria and queries the **PersistenceStore** to return data.



## 5. Design Decisions & Compilation Summary

- **UUID4 Identification:** All entities use UUID4 to prevent ID collisions and ensure security by making IDs non-enumerable.
- **Architecture Strategy:** The three-layer approach allows the database or UI to be swapped without rewriting the core business rules.
- **Validation Centralization:** All business rules are enforced in the Logic layer (Facade) to prevent corrupt data from reaching the Persistence store.