CONCEPTION PHASE

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Brief Description:

The goal of the Airbnb Database System project is to create and put into place a reliable database architecture that will enable the features of a platform for managing accommodations that is comparable to Airbnb. Using MySQL Workbench (see (Krogh, 2020) for Entity-Relationship Modeling (ERM) and Excel to create the data dictionary, the project places a focus on faster booking procedures, effective host-guest communication, and user-preference-driven individualized suggestions. The first step was analyzing and collecting system requirements, defining user roles (guests, hosts, and administrators), outlining the actions that go along with each position, and figuring out what information and features were needed. To help with the design of the ERM, these needs were painstakingly recorded.

Users, properties, reservations, messages, access levels, and their relationships were all well defined in the carefully constructed ERM. To ensure data integrity and standardization, relationships were created to indicate linkages between entities, and attributes were carefully defined to capture important information. Later, tables for every item were created and foreign key constraints were applied for referential integrity when the database structure was put into practice in MySQL Workbench. To record properties, data types, and descriptions for future use, a data dictionary built on Excel was created concurrently. To sum up, this phase provides a structured database model that complies with system requirements, laying the foundation for the Airbnb Database System.

1. Requirement Specification: Database for Airbnb Use Case

1) Roles of Users

- Hosts: They oversee reservations and list properties.
- Guests: They look for properties, reserve them, and write reviews.
- Managers: They keep an eye on the platform, handling conflicts and making sure rules are followed.

2) Actions:

- Guests: Search for properties based on criteria, reserve accommodations for selected dates, and provide feedback on stays
- Hosts: Add properties with details and availability, confirm bookings, communicate with guests, and address guest reviews.
- Administrators: Handle registrations and account issues, moderate and update property listings, implement updates, and resolve disputes.

3) Data

- User: Details such as account status, role, email, and name.
- Property: Information on the location, features, cost, and availability.
- Reservation: Consists of visitor, venue, dates, and payment details.
- Review: Includes reviewer information, content, and rating.
- Messaging System: Enables hosts and guests to communicate about bookings and inquiries.
- Search and Recommendation: Helps users find accommodations matching their preferences and location.
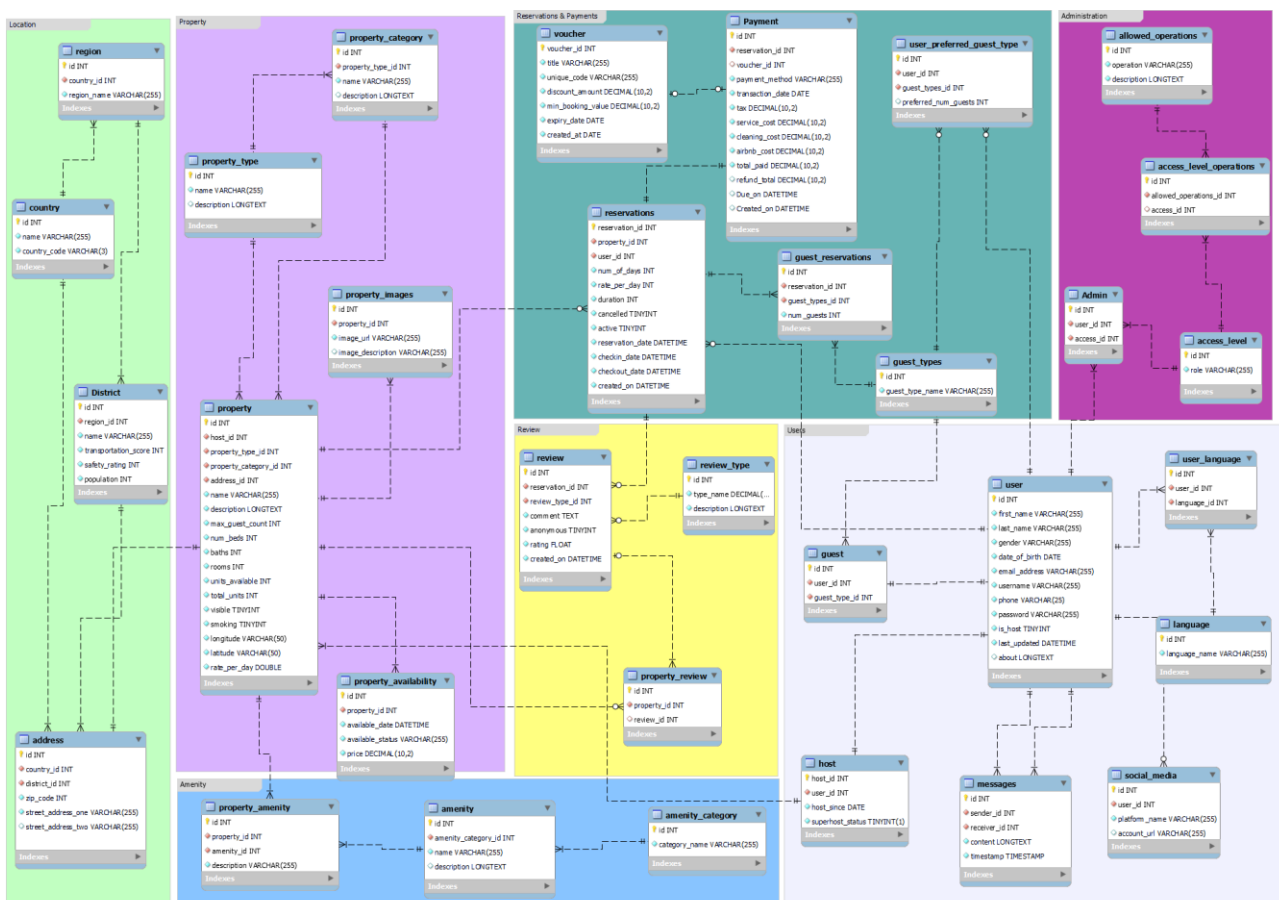
4) Functions

- Search: Enable guests to find properties.
- Booking: Allow guests to book accommodation and hosts to manage bookings.
- Messaging: Facilitate communication between guests and hosts.

- Review: Allow guests to leave reviews and hosts to respond.
- Administrative: Provide moderators tools for managing users, listings, and platform operations.

2. Entity-Relationship Model

Figure 1

Enhanced ER diagram for an Airbnb database system.

Note. Own representation created by MySQL workbench.

3. Data Dictionary

Figure 2

Enhanced Data Dictionary for an Airbnb database system.

schema_nm	table_nm	obj_typ	ord	is_key	column_nm	data_typ	nullable	column_descr
airbnb	access_level	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for each access level.
airbnb	access_level	TBL	2		role	varchar(255)	NOT NULL	The name of the role associated with a specific access level.
airbnb	access_level_operations	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for each access level operation mapping.
airbnb	access_level_operations	TBL	2	FK	allowed_operations_id	int(10)	NOT NULL	Foreign key referencing the identifier of the allowed operation.
airbnb	access_level_operations	TBL	3	FK	access_id	int(10)	NULL	Foreign key referencing the identifier of the access level.
airbnb	address	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for each address entry.
airbnb	address	TBL	2	FK	country_id	int(10)	NOT NULL	Foreign key referencing the identifier of the country in which the address is located.
airbnb	address	TBL	3	FK	district_id	int(10)	NOT NULL	Foreign key referencing the identifier of the district in which the address is located.
airbnb	address	TBL	4		zip_code	varchar(20)	NULL	The postal code associated with the address.
airbnb	address	TBL	5		street_address_one	varchar(255)	NOT NULL	The primary street address (usually includes building number and street name).
airbnb	address	TBL	6		street_address_two	varchar(255)	NULL	An optional second line for the street address (can include apartment, suite, unit, building, floor, etc.).
airbnb	admin	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for admin records.
airbnb	admin	TBL	2	FK	user_id	int(10)	NOT NULL	Foreign key referencing user ID.
airbnb	admin	TBL	3	FK	access_id	int(10)	NOT NULL	Foreign key referencing access ID.
airbnb	allowed_operations	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for allowed operations.
airbnb	allowed_operations	TBL	2		operation	varchar(255)	NOT NULL	Operation allowed in the system.
airbnb	allowed_operations	TBL	3		description	longtext(4294967295)	NOT NULL	Description of the operation.
airbnb	amenity	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for amenities.
airbnb	amenity	TBL	2	FK	amenity_category_id	int(10)	NOT NULL	Foreign key referencing amenity categories.
airbnb	amenity	TBL	3		name	varchar(255)	NOT NULL	Name of the amenity.
airbnb	amenity	TBL	4		description	longtext(4294967295)	NULL	Description of the amenity.
airbnb	amenity_category	TBL	1	PK,UK	id	int(10)	NOT NULL	Unique identifier for amenity categories.
airbnb	amenity_category	TBL	2		category_name	varchar(255)	NOT NULL	Name of the amenity category.
airbnb	country	TBL	1	PK,UK	id	int(10)	NOT NULL	Unique identifier for each country record.
airbnb	country	TBL	2		name	varchar(255)	NOT NULL	Name of the country.
airbnb	country	TBL	3		country_code	varchar(3)	NOT NULL	Country code.
airbnb	district	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for each district.
airbnb	district	TBL	2	FK	region_id	int(10)	NOT NULL	Foreign key referencing region ID.
airbnb	district	TBL	3		name	varchar(255)	NOT NULL	Name of the district.
airbnb	district	TBL	4		transportation_score	int(10)	NOT NULL	Transportation score for the district.
airbnb	district	TBL	5		safety_rating	int(10)	NOT NULL	Safety rating of the district.
airbnb	district	TBL	6		population	int(10)	NOT NULL	Population of the district.
airbnb	guest	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for guest records.
airbnb	guest	TBL	2	FK	user_id	int(10)	NOT NULL	Foreign key referencing user ID.
airbnb	guest	TBL	3	FK	guest_type_id	int(10)	NOT NULL	Foreign key referencing guest type ID.
airbnb	guest_reservations	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for guest reservations.
airbnb	guest_reservations	TBL	2	FK	reservation_id	int(10)	NOT NULL	Foreign key referencing reservation ID.
airbnb	guest_reservations	TBL	3	FK	guest_types_id	int(10)	NOT NULL	Foreign key referencing guest type ID.
airbnb	guest_reservations	TBL	4		num_guests	int(10)	NOT NULL	Number of guests for a reservation.
airbnb	guest_types	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for each guest type record.
airbnb	guest_types	TBL	2		guest_type_name	varchar(255)	NOT NULL	Name of the guest type.
airbnb	host	TBL	1	PK	host_id	int(10)	NOT NULL	Unique identifier for each host record.
airbnb	host	TBL	2	FK,UK	user_id	int(10)	NOT NULL	Foreign key and unique key referencing user ID.
airbnb	host	TBL	3		host_since	date(3)	NOT NULL	Date when the user became a host.
airbnb	host	TBL	4		superhost_status	tinyint(3)	NOT NULL	Boolean indicating superhost status.
airbnb	language	TBL	1	PK,UK	id	int(10)	NOT NULL	Unique identifier for each language record.
airbnb	language	TBL	2		language_name	varchar(255)	NOT NULL	Name of the language.
airbnb	messages	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for each message record.
airbnb	messages	TBL	2	FK	sender_id	int(10)	NOT NULL	Identifier of the user who sent the message.
airbnb	messages	TBL	3	FK	receiver_id	int(10)	NOT NULL	Identifier of the user who received the message.
airbnb	messages	TBL	4		content	longtext(4294967295)	NOT NULL	Content of the message.
airbnb	messages	TBL	5		timestamp	timestamp(4)	NOT NULL	Time when the message was sent.
airbnb	payment	TBL	1	PK	id	int(10)	NOT NULL	Unique identifier for each payment record.
airbnb	payment	TBL	2	FK	reservation_id	int(10)	NOT NULL	Identifier of the booking related to the transaction.
airbnb	payment	TBL	3	FK	voucher_id	int(10)	NULL	Identifier of the voucher used in the transaction.
airbnb	payment	TBL	4		payment_method	varchar(255)	NOT NULL	Payment method used in the transaction.

airbnb	payment	TBL	5	transaction_date	date(3)	NOT NULL	Date when the transaction was made.
airbnb	payment	TBL	6	tax	decimal(10,2)	NOT NULL	Tax amount in the transaction.
airbnb	payment	TBL	7	service_cost	decimal(10,2)	NOT NULL	Service charge in the transaction.
airbnb	payment	TBL	8	cleaning_cost	decimal(10,2)	NOT NULL	Cleaning charge in the transaction.
airbnb	payment	TBL	9	airbnb_cost	decimal(10,2)	NOT NULL	Airbnb charge in the transaction.
airbnb	payment	TBL	10	total_paid	decimal(10,2)	NOT NULL	Total amount paid.
airbnb	payment	TBL	11	refund_total	decimal(10,2)	NULL	Total refund amount.
airbnb	payment	TBL	12	Due_on	datetime(8)	NULL	Due date for payment.
airbnb	payment	TBL	13	Created_on	datetime(8)	NULL	Date when the transaction was created.
airbnb	property	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each property record.
airbnb	property	TBL	2 FK	host_id	int(10)	NOT NULL	Identifier of the host associated with the property.
airbnb	property	TBL	3 FK	property_type_id	int(10)	NOT NULL	Identifier of the property type.
airbnb	property	TBL	4 FK	property_category_id	int(10)	NOT NULL	Identifier of the property category.
airbnb	property	TBL	5 FK	address_id	int(10)	NOT NULL	Identifier of the address associated with the property.
airbnb	property	TBL	6	name	varchar(255)	NOT NULL	Name of the property.
airbnb	property	TBL	7	description	longtext(4294967295)	NOT NULL	Description of the property.
airbnb	property	TBL	8	max_guest_count	int(10)	NOT NULL	Maximum number of guests allowed in the property.
airbnb	property	TBL	9	num_beds	int(10)	NOT NULL	Number of beds available in the property.
airbnb	property	TBL	10	baths	int(10)	NOT NULL	Number of bathrooms available in the property.
airbnb	property	TBL	11	rooms	int(10)	NOT NULL	Number of rooms in the property.
airbnb	property	TBL	12	units_available	int(10)	NOT NULL	Number of units available for booking.
airbnb	property	TBL	13	total_units	int(10)	NOT NULL	Total number of units in the property.
airbnb	property	TBL	14	visible	tinyint(3)	NOT NULL	Visibility status of the property.
airbnb	property	TBL	15	smoking	tinyint(3)	NOT NULL	Smoking policy of the property.
airbnb	property	TBL	16	longitude	varchar(50)	NOT NULL	Longitude coordinate of the property location.
airbnb	property	TBL	17	latitude	varchar(50)	NOT NULL	Latitude coordinate of the property location.
airbnb	property	TBL	18	rate_per_day	double(22)	NOT NULL	Rate per day for renting the property.
airbnb	property_amenity	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each property amenity record.
airbnb	property_amenity	TBL	2 FK	property_id	int(10)	NOT NULL	Identifier of the property associated with the amenity.
airbnb	property_amenity	TBL	3 FK	amenity_id	int(10)	NOT NULL	Identifier of the amenity associated with the property.
airbnb	property_amenity	TBL	4	description	varchar(255)	NOT NULL	Description of the property amenity.
airbnb	property_availability	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each property availability record.
airbnb	property_availability	TBL	2 FK	property_id	int(10)	NOT NULL	Identifier of the property associated with availability.
airbnb	property_availability	TBL	3	available_date	datetime(8)	NOT NULL	Date when the property is available.
airbnb	property_availability	TBL	4	available_status	varchar(255)	NOT NULL	Availability status of the property.
airbnb	property_availability	TBL	5	price	decimal(10,2)	NOT NULL	Price for booking the property on the available date.
airbnb	property_category	TBL	1 PK,UK	id	int(10)	NOT NULL	Unique identifier for each property category record.
airbnb	property_category	TBL	2 FK	property_type_id	int(10)	NOT NULL	Identifier of the property type associated with the category.
airbnb	property_category	TBL	3	name	varchar(255)	NOT NULL	Name of the property category.
airbnb	property_category	TBL	4	description	longtext(4294967295)	NULL	Description of the property category.
airbnb	property_images	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each property image record.
airbnb	property_images	TBL	2 FK	property_id	int(10)	NOT NULL	Identifier of the property associated with the image.
airbnb	property_images	TBL	3	image_url	varchar(255)	NOT NULL	URL of the property image.
airbnb	property_images	TBL	4	image_description	varchar(255)	NULL	Description of the property image.
airbnb	property_review	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each property review record.
airbnb	property_review	TBL	2 FK	property_id	int(10)	NOT NULL	Identifier of the property associated with the review.
airbnb	property_review	TBL	3 FK	review_id	int(10)	NULL	Identifier of the review associated with the property.
airbnb	property_type	TBL	1 PK,UK	id	int(10)	NOT NULL	Unique identifier for each property type record.
airbnb	property_type	TBL	2	name	varchar(255)	NOT NULL	Name of the property type.
airbnb	property_type	TBL	3	description	longtext(4294967295)	NULL	Description of the property type.
airbnb	region	TBL	1 PK,UK	id	int(10)	NOT NULL	Unique identifier for each region record.
airbnb	region	TBL	2 FK	country_id	int(10)	NOT NULL	Identifier of the country associated with the region.
airbnb	region	TBL	3	region_name	varchar(255)	NOT NULL	Name of the region.
airbnb	reservations	TBL	1 PK	reservation_id	int(10)	NOT NULL	Unique identifier for each reservation record.
airbnb	reservations	TBL	2 FK	property_id	int(10)	NOT NULL	Identifier of the property associated with the reservation.
airbnb	reservations	TBL	3 FK	user_id	int(10)	NOT NULL	Identifier of the user associated with the reservation.
airbnb	reservations	TBL	4	num_of_days	int(10)	NOT NULL	Number of days for which the property is reserved.

airbnb	reservations	TBL	5	rate_per_day	int(10)	NOT NULL	Rate per day for renting the property.
airbnb	reservations	TBL	6	duration	int(10)	NOT NULL	Duration of the reservation.
airbnb	reservations	TBL	7	cancelled	tinyint(3)	NOT NULL	Indicates if the reservation is cancelled.
airbnb	reservations	TBL	8	active	timestamp(4)	NOT NULL	Indicates the time that the reservation is active.
airbnb	reservations	TBL	9	reservation_date	datetime(8)	NOT NULL	Date of reservation.
airbnb	reservations	TBL	10	checkin_date	datetime(8)	NOT NULL	Date of check-in for the reservation.
airbnb	reservations	TBL	11	checkout_date	datetime(8)	NOT NULL	Date of check-out for the reservation.
airbnb	reservations	TBL	12	created_on	datetime(8)	NOT NULL	Date when the reservation was created.
airbnb	review	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each review record.
airbnb	review	TBL	2 FK	reservation_id	int(10)	NOT NULL	Identifier of the reservation associated with the review.
airbnb	review	TBL	3 FK	review_type_id	int(10)	NOT NULL	Identifier of the review type.
airbnb	review	TBL	4	comment	text(65535)	NOT NULL	Comment associated with the review.
airbnb	review	TBL	5	anonymous	tinyint(3)	NOT NULL	Indicates if the review is anonymous.
airbnb	review	TBL	6	rating	float(12)	NOT NULL	Rating given in the review.
airbnb	review	TBL	7	created_on	datetime(8)	NOT NULL	Date when the review was created.
airbnb	review_type	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each review type record.
airbnb	review_type	TBL	2	type_name	varchar(255)	NOT NULL	Name of the review type.
airbnb	review_type	TBL	3	description	longtext(4294967295)	NOT NULL	Description of the review type.
airbnb	social_media	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each social media record.
airbnb	social_media	TBL	2 FK	user_id	int(10)	NOT NULL	Identifier of the user associated with the social media account.
airbnb	social_media	TBL	3	platform_name	varchar(255)	NULL	Name of the social media platform.
airbnb	social_media	TBL	4	account_url	varchar(255)	NULL	URL of the social media account.
airbnb	user	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each user.
airbnb	user	TBL	2	first_name	varchar(255)	NOT NULL	First name of the user.
airbnb	user	TBL	3	last_name	varchar(255)	NOT NULL	Last name of the user.
airbnb	user	TBL	4	gender	varchar(255)	NOT NULL	Gender of the user.
airbnb	user	TBL	5	date_of_birth	date(3)	NOT NULL	Date of birth of the user.
airbnb	user	TBL	6 UK	email_address	varchar(255)	NOT NULL	Unique email address of the user.
airbnb	user	TBL	7 UK	username	varchar(255)	NOT NULL	Unique username chosen by the user.
airbnb	user	TBL	8	phone	varchar(25)	NOT NULL	Phone number of the user.
airbnb	user	TBL	9	password	varchar(255)	NOT NULL	Encrypted password of the user.
airbnb	user	TBL	10	is_host	tinyint(3)	NOT NULL	Indicates if the user is a host.
airbnb	user	TBL	11 UK	last_updated	datetime(8)	NOT NULL	Date when the user profile was last updated.
airbnb	user	TBL	12	about	longtext(4294967295)	NULL	Brief description or bio of the user.
airbnb	user_language	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each user language.
airbnb	user_language	TBL	2 FK	user_id	int(10)	NOT NULL	Foreign key referencing the user table to associate language with a user.
airbnb	user_language	TBL	3 FK	language_id	int(10)	NOT NULL	Foreign key referencing the language table to specify the language.
airbnb	user_preferred_guest_type	TBL	1 PK	id	int(10)	NOT NULL	Unique identifier for each user's preferred guest type.
airbnb	user_preferred_guest_type	TBL	2 FK	user_id	int(10)	NOT NULL	Foreign key referencing the user table to associate the preference with a user.
airbnb	user_preferred_guest_type	TBL	3 FK	guest_types_id	int(10)	NULL	Foreign key referencing the guest_types table to specify the preferred guest type.
airbnb	user_preferred_guest_type	TBL	4	preferred_num_guests	int(10)	NULL	Number of preferred guests specified by the user.
airbnb	voucher	TBL	1 PK,UK	voucher_id	int(10)	NOT NULL	Unique identifier for each voucher.
airbnb	voucher	TBL	2	title	varchar(255)	NOT NULL	Title or name of the voucher.
airbnb	voucher	TBL	3	unique_code	varchar(255)	NOT NULL	Unique code assigned to the voucher.
airbnb	voucher	TBL	4	discount_amount	decimal(10,2)	NOT NULL	Amount of discount offered by the voucher.
airbnb	voucher	TBL	5	min_booking_value	decimal(10,2)	NOT NULL	Minimum booking value required to use the voucher.
airbnb	voucher	TBL	6	expiry_date	date(3)	NOT NULL	Date when the voucher expires.
airbnb	voucher	TBL	7	created_at	date(3)	NOT NULL	Date when the voucher was created.

Note. Own representation created by excel.

References

Krogh, J. W. (2020). MySQL workbench. In *Apress eBooks* (pp. 199–226). https://doi.org/10.1007/978-1-4842-5584-1_11