

Phase 1 – Concept Documents

Airbnb Database model requirements analysis – Tom Schmaeling

In this short paper we will analyze the web application Airbnb to try and imitate the database model it uses for its many functionalities.

When imitating the Airbnb database model, it is crucial to provide robust support scalability, ensuring the system can handle vast amounts of data, user profiles, and transactions. Additionally, flexibility in schema design is vital to accommodate diverse property types, amenities, allowing seamless modifications to adapt to changing business requirements and user needs.

To achieve this, we will start by studying and researching the Airbnb website as well as the assignment text, as it also contains some relevant information about the application. While doing so we will note down relevant user groups and dynamic information that is used by the applications' functionalities.

By first walking through the most common use cases of the website we can identify multiple entities right away, the following list is the result after a simple "walk-through" of the website and noting all relevant entities in a mostly chronological order:

- Users
- Hosts
- Guests
- Addresses
- Emergency Contacts
- Property listings
- Property type
- Property categories
- Property amenities
- Reviews
- Ratings
- Images
- Wishlist
- Trip History
- Reservations / Bookings
- Chats
- Messages

What role some of these entities play in the application and what attributes might be relevant is listed in more detail below.

Once these entities have been noted down, it is essential to figure out how these entities might relate to each other so we can document their relationships as well as start thinking about the cardinalities of said relationships.

As the process is an iterative one, changes to entities or relationships are quite common during this step. The result should be cohesive, easily understandable and provide the template for implementation is the second phase.

The main problem this database is facing is how we structure the property listings and its different elements as well as the users and bookings and transactions. These are the most important entities in the database and will form the basis for the other tables.

Roles / User Groups

As noted in the assignment there are two main categories of users, hosts and guests. These two groups differ somewhat, in that they share most of their attributes but the requirements (NOT NULL) of such some attributes change depending on which type of user it is.

Generally, a Host is required to upload a profile image, personal information, a description and bank information to receive payments.

Guests, on the other hand, need to upload a government ID and credit card information. Important to note here is that a booking can only have one guest. Other guests are still handled through the booking guest user and are handled by the “number of guests” attribute.

We will use the joined subclass table strategy for this purpose. The reasoning for the “duplicate” attributes in guest and host is the difference in requirements.

Property-Listings

The term property-listings refers to the many different properties offered from hosts to guests on the website. Looking at the filters, we can see that a property has a type, such as house, apartment, guesthouse, or hotel and may also have multiple categories, such as cabin, tiny homes, mansions, etc.

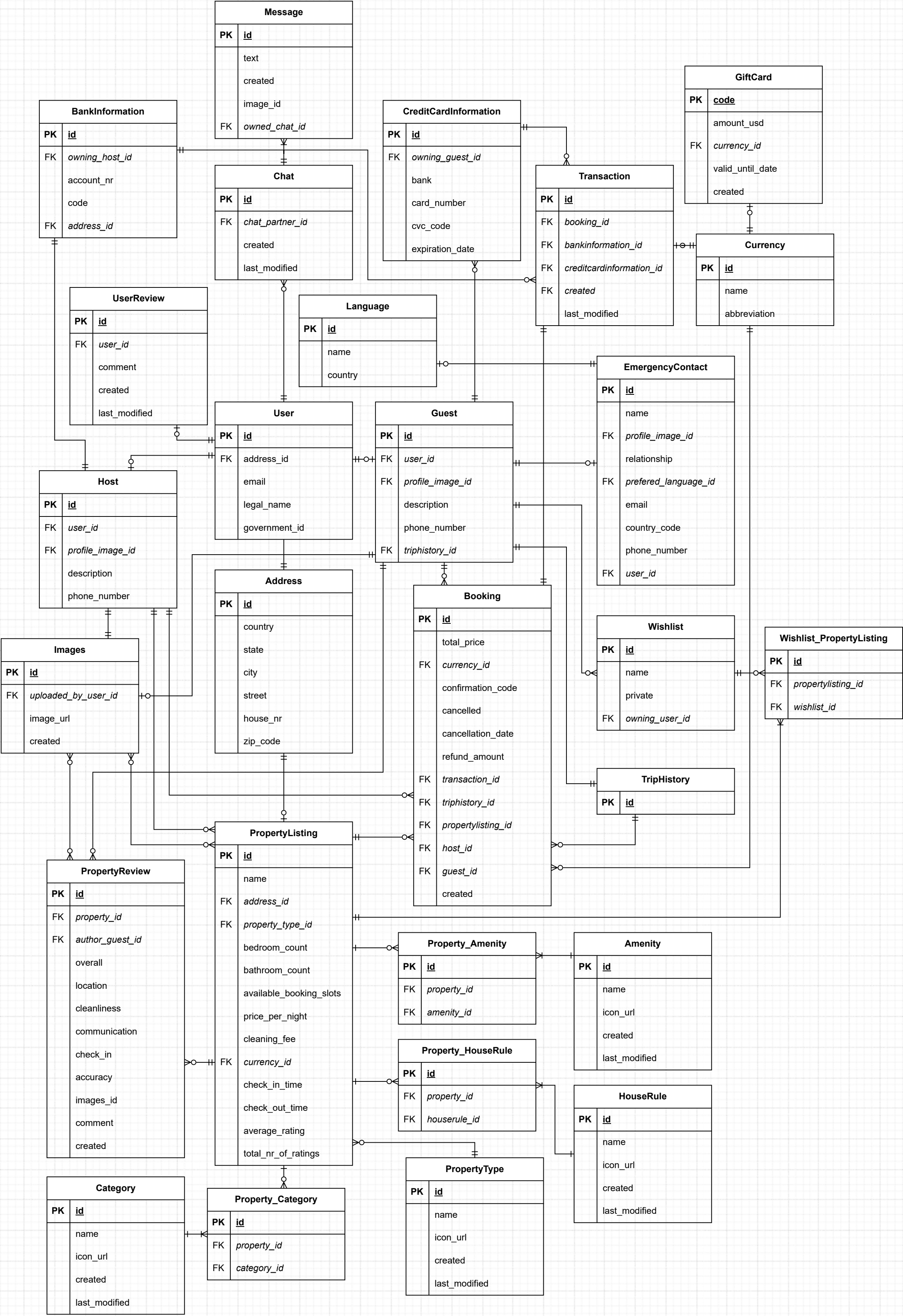
When looking at a listing we see that there are images, a name, an address, prices per night (including cleaning fee, Airbnb service fee and taxes), reviews, descriptions, amenities and a calendar that displays the available times for booking. The host is also displayed on the property listing page.

Bookings

A booking, also called reservation lists the nightly and total price, the number of guests, a confirmation code, the timeframe (start and end date), etc. More specific payment information as well as other relevant information is stored in the transaction entity.

Addresses

The addresses in Airbnb are made up of country, state or region, and city. The street / house number are also part of the address but are not relevant when first filtering through the property listings.



Location	Attribute Name	Data Type	Constraint
Address	address_id	INT	AUTO_INCREMENT PRIMARY KEY
Address	country	VARCHAR(128)	NOT NULL
Address	state	VARCHAR(128)	NOT NULL
Address	city	VARCHAR(128)	NOT NULL
Address	street	VARCHAR(128)	NOT NULL
Address	house_nr	INT	NOT NULL
Address	zip_code	INT	NOT NULL
Address	address_type	VARCHAR(32)	
User	user_id	INT	AUTO_INCREMENT PRIMARY KEY
User	address_id	INT	FOREIGN KEY
User	email	VARCHAR(128)	NOT NULL
User	legal_name	VARCHAR(64)	NOT NULL
User	governmentid_image_id	INT	
Guest	guest_id	INT	AUTO_INCREMENT PRIMARY KEY
Guest	user_id	INT	FOREIGN KEY UNIQUE NOT NULL
Guest	profile_image_id	INT	FOREIGN KEY UNIQUE NOT NULL
Guest	guest_description	TEXT	
Guest	phone_number	VARCHAR(16)	NOT NULL
Guest	triphistory_id	INT	FOREIGN KEY
Host	host_id	INT	AUTO_INCREMENT PRIMARY KEY
Host	user_id	INT	FOREIGN KEY UNIQUE NOT NULL
Host	profile_image_id	INT	FOREIGN KEY UNIQUE NOT NULL
Host	host_description	TEXT	NOT NULL
Host	phone_number	VARCHAR(16)	
Image	image_id	INT	AUTO_INCREMENT PRIMARY KEY
Image	uploaded_by_user_id	INT	FOREIGN KEY NOT NULL
Image	image_url	VARCHAR(1024)	NOT NULL
Image	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP
UserReview	userreview_id	INT	AUTO_INCREMENT PRIMARY KEY
UserReview	user_id	INT	FOREIGN KEY NOT NULL
UserReview	author_user_id	INT	FOREIGN KEY NOT NULL
UserReview	comment	VARCHAR(2000)	
UserReview	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP

UserReview	last_modified	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
PropertyListing	propertylisting_id	INT	AUTO_INCREMENT PRIMARY KEY
PropertyListing	owning_host_id	INT	FOREIGN KEY NOT NULL
PropertyListing	name	VARCHAR(255)	FOREIGN KEY NOT NULL
PropertyListing	address_id	INT	FOREIGN KEY UNIQUE NOT NULL
PropertyListing	property_type_id	INT	FOREIGN KEY
PropertyListing	bedroom_count	INT	
PropertyListing	bathroom_count	INT	
PropertyListing	available_booking_slots	INT	
PropertyListing	price_per_night	DECIMAL(10,2)	
PropertyListing	currency_id	INT	FOREIGN KEY NOT NULL DEFAULT 1
PropertyListing	check_in_time	TIME	DEFAULT '14:00'
PropertyListing	check_out_time	TIME	DEFAULT '10:00'
PropertyListing	average_rating	DECIMAL(2,1)	DEFAULT 0
PropertyListing	total_nr_of_ratings	INT	DEFAULT 0
PropertyReview	propertyreview_id	INT	AUTO_INCREMENT PRIMARY KEY
PropertyReview	property_id	INT	FOREIGN KEY NOT NULL
PropertyReview	author_guest_id	INT	FOREIGN KEY NOT NULL
PropertyReview	cleanliness_score	INT	
PropertyReview	accuracy_score	INT	
PropertyReview	check_in_score	INT	
PropertyReview	communication_score	INT	
PropertyReview	location_score	INT	
PropertyReview	value_score	INT	
PropertyReview	comment	VARCHAR(2000)	
PropertyReview	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP
Property_Category	property_category_id	INT	AUTO_INCREMENT PRIMARY KEY
Property_Category	name	VARCHAR(255)	FOREIGN KEY
Property_Category	icon_url	VARHCAR(1024)	FOREIGN KEY
Category	category_id	INT	AUTO_INCREMENT PRIMARY KEY
Category	name	VARHCAR(255)	
Category	icon_url	VARCHAR(1024)	
Category	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP
Category	last_modified	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP

Property_Amenity	property_amenity_id	INT	AUTO_INCREMENT PRIMARY KEY
Property_Amenity	property_id	INT	FOREIGN KEY
Property_Amenity	amenity_id	INT	FOREIGN KEY
Amenity	amenity_id	INT	AUTO_INCREMENT PRIMARY KEY
Amenity	name	VARCHAR(255)	
Amenity	icon_url	VARCHAR(1024)	
Amenity	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP
Amenity	last_modified	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
Property_HouseRule	property_houserule_id	INT	AUTO_INCREMENT PRIMARY KEY
Property_HouseRule	property_id	INT	FOREIGN KEY
Property_HouseRule	houserule_id	INT	FOREIGN KEY
HouseRule	houserule_id	INT	AUTO_INCREMENT PRIMARY KEY
HouseRule	name	VARCHAR(255)	
HouseRule	icon_url	VARCHAR(1024)	
HouseRule	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP
HouseRule	last_modified	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
PropertyType	propertytype_id	INT	AUTO_INCREMENT PRIMARY KEY
PropertyType	name	VARCHAR(255)	
PropertyType	icon_url	VARCHAR(1024)	
PropertyType	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP
PropertyType	last_modified	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
Booking	booking_id	INT	AUTO_INCREMENT PRIMARY KEY
Booking	total_price	DECIMAL(10,2)	NOT NULL
Booking	currency_id	INT	FOREIGN KEY DEFAULT 1
Booking	booking_start_date	TIMESTAMP	NOT NULL
Booking	booking_end_date	TIMESTAMP	NOT NULL CHECK (booking_end_date > booking_start_date) *added via trigger.sql
Booking	confirmation_code	VARCHAR(16)	NOT NULL
Booking	cancelled	BOOLEAN	NOT NULL
Booking	cancellation_date	DATE	
Booking	refund_amount	DECIMAL(10,2)	
Booking	propertylisting_id	INT	FOREIGN KEY NOT NULL
Booking	host_id	INT	FOREIGN KEY NOT NULL
Booking	guest_id	INT	FOREIGN KEY NOT NULL
Booking	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP

Wishlist	wishlist_id	INT	AUTO_INCREMENT PRIMARY KEY
Wishlist	name	VARCHAR(255)	NOT NULL
Wishlist	private	BOOLEAN	NOT NULL DEFAULT TRUE
Wishlist	owning_user_id	INT	FOREIGN KEY NOT NULL
Wishlist_PropertyListing	wishlist_propertylisting_id	INT	AUTO_INCREMENT PRIMARY KEY
Wishlist_PropertyListing	propertylisting_id	INT	FOREIGN KEY
Wishlist_PropertyListing	wishlist_id	INT	FOREIGN KEY
EmergencyContact	emergencycontact_id	INT	AUTO_INCREMENT PRIMARY KEY
EmergencyContact	name	VARCHAR(255)	NOT NULL
EmergencyContact	relationship	VARCHAR(255)	
EmergencyContact	prefered_language_id	INT	FOREIGN KEY DEFAULT 1
EmergencyContact	email	VARCHAR(255)	
EmergencyContact	country_code	VARCHAR(32)	
EmergencyContact	phone_number	VARCHAR(15)	NOT NULL
EmergencyContact	owning_user_id	INT	FOREIGN KEY NOT NULL
Language	language_id	INT	AUTO_INCREMENT PRIMARY KEY
Language	name	VARCHAR(32)	NOT NULL
Language	country	VARCHAR(32)	
Currency	currency_id	INT	AUTO_INCREMENT PRIMARY KEY
Currency	name	VARCHAR(64)	NOT NULL
Currency	abbreviation	VARCHAR(3)	
GiftCard	giftcard_code	VARCHAR(16)	PRIMARY KEY
GiftCard	amount	DECIMAL(10,2)	NOT NULL
GiftCard	currency_id	INT	FOREIGN KEY NOT NULL DEFAULT 1
GiftCard	valid_until_date	TIMESTAMP	NOT NULL
GiftCard	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP
Transaction	transaction_id	INT	AUTO_INCREMENT PRIMARY KEY
Transaction	booking_id	INT	FOREIGN KEY NOT NULL
Transaction	bankinformation_id	INT	FOREIGN KEY
Transaction	creditcardinformation_id	INT	FOREIGN KEY
Transaction	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP
Transaction	last_modified	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
CreditCardInformation	creditcardinformation_id	INT	AUTO_INCREMENT PRIMARY KEY
CreditCardInformation	owning_guest_id	INT	FOREIGN KEY NOT NULL

CreditCardInformation	bank	VARCHAR(128)	NOT NULL
CreditCardInformation	card_number	VARCHAR(64)	NOT NULL
CreditCardInformation	cvc_code	VARCHAR(3)	NOT NULL
CreditCardInformation	expiration_date	DATE	NOT NULL
BankInformation	bankinformation_id	INT	AUTO_INCREMENT PRIMARY KEY
BankInformation	owning_host_id	INT	FOREIGN KEY
BankInformation	name	VARCHAR(128)	NOT NULL
BankInformation	account_nr	VARCHAR(32)	NOT NULL
BankInformation	code	VARCHAR(64)	NOT NULL
BankInformation	address_id	INT	FOREIGN KEY NOT NULL
Chat	chat_id	INT	AUTO_INCREMENT PRIMARY KEY
Chat	chat_partner_id	INT	FOREIGN KEY
Chat	owner_user_id	INT	FOREIGN KEY
Chat	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP
Chat	last_modified	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
Message	message_id	INT	AUTO_INCREMENT PRIMARY KEY
Message	text	TEXT	
Message	image_id	INT	FOREIGN KEY
Message	author_user_id	INT	FOREIGN KEY
Message	owning_chat_id	INT	FOREIGN KEY
Message	created	TIMESTAMP	NOT NULL DEFAULT CURRENT_TIMESTAMP