AIRBNB DATABASE PRESENTATION

PHASE 2 - IMPLEMENTATION

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TABLE OF CONTENTS

INTRODUCTION

This presentation is a part of phase 2 and intends to provide extensive documentation of the database structure, it's tables, relationships and constraints, as well as explain the provided test cases, and their results.

We will first explain the changes to the concept, the overall structure and elements of the database before examining each of the 27* tables that make up the database.

*One table has been removed; all changes can be found on the following slide.

I encourage the reader to run the test commands in their own environment for better readability, source code will be provided in phase 3.. any of the statements that are referred to but are not part of this presentation are very simple and are omitted without losing context. (usually simple select all test statements)

CHANGES

- I have decided to remove the triphistory table. The idea behind the table was to improve the access to the bookings of a guest for easier access. There is however not a significant enough improvement to justify the redundancy.
- There have been some adjustments to the attribute distribution of the user, guest and host tables after reflecting the requirements/constraints of the individual attributes.
- Small additional changes include:
  - The primary key's now have more descriptive names.
  - Addresses now have an 'address_type' attribute
  - User attribute "government_id' was changed to 'governmentid_image_id'
  - Messages now have an 'author_user_id' attribute
  - Bookings no longer have the 'transaction_id' attribute
  - PropertyListing now has the 'owning_host_id' attribute
  - PropertyReview attributes have changed to better align with the AirBnB app.
  - Currency attribute 'amount_usd' was changed to 'amount'
  - BankInformation now has a 'name' attribute for the bank's name

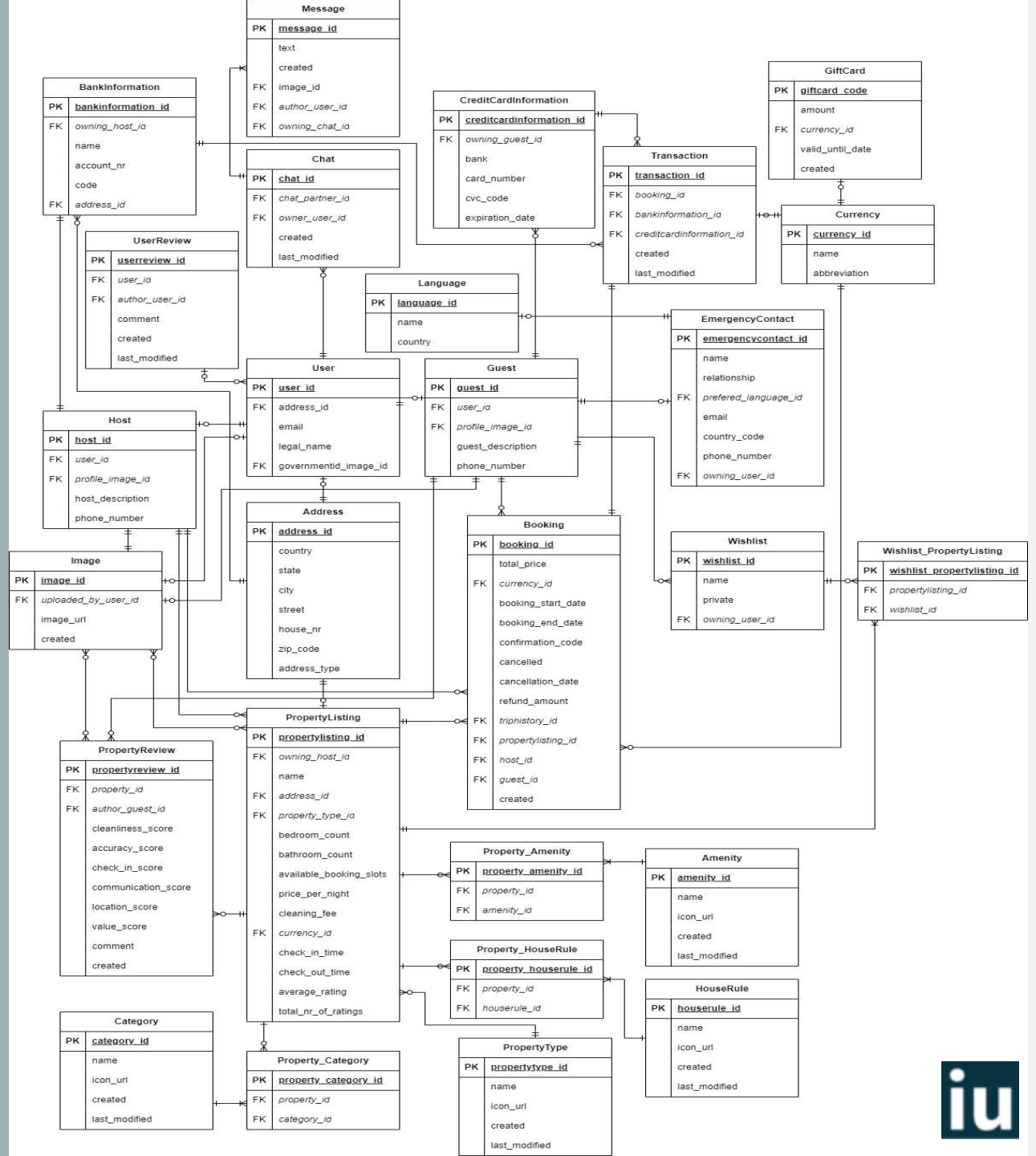
STRUCTURE

There are two main “blocks” of information the database needs to support: Users and Properties.

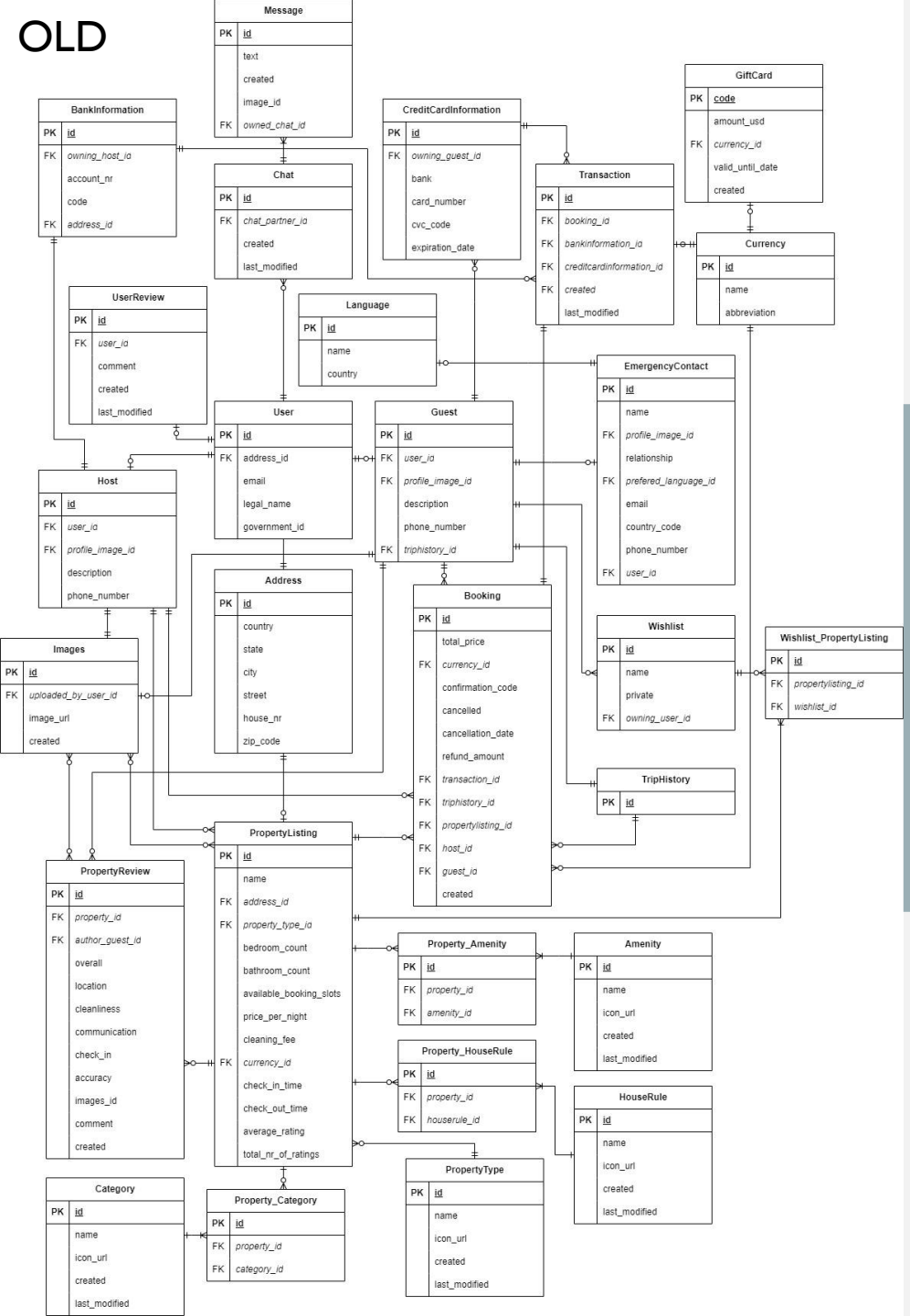
There are multiple tables facilitating each of these data sets, and their attributes.

The two categories of users, ‘guest’ and ‘host’ share a base ‘user’ class, creating a joined subclass table strategy.

The ‘PropertyListing’ table includes relevant attributes for the properties offered on the page, multiple of which use N:M relations and therefore need to be normalized via additional tables.

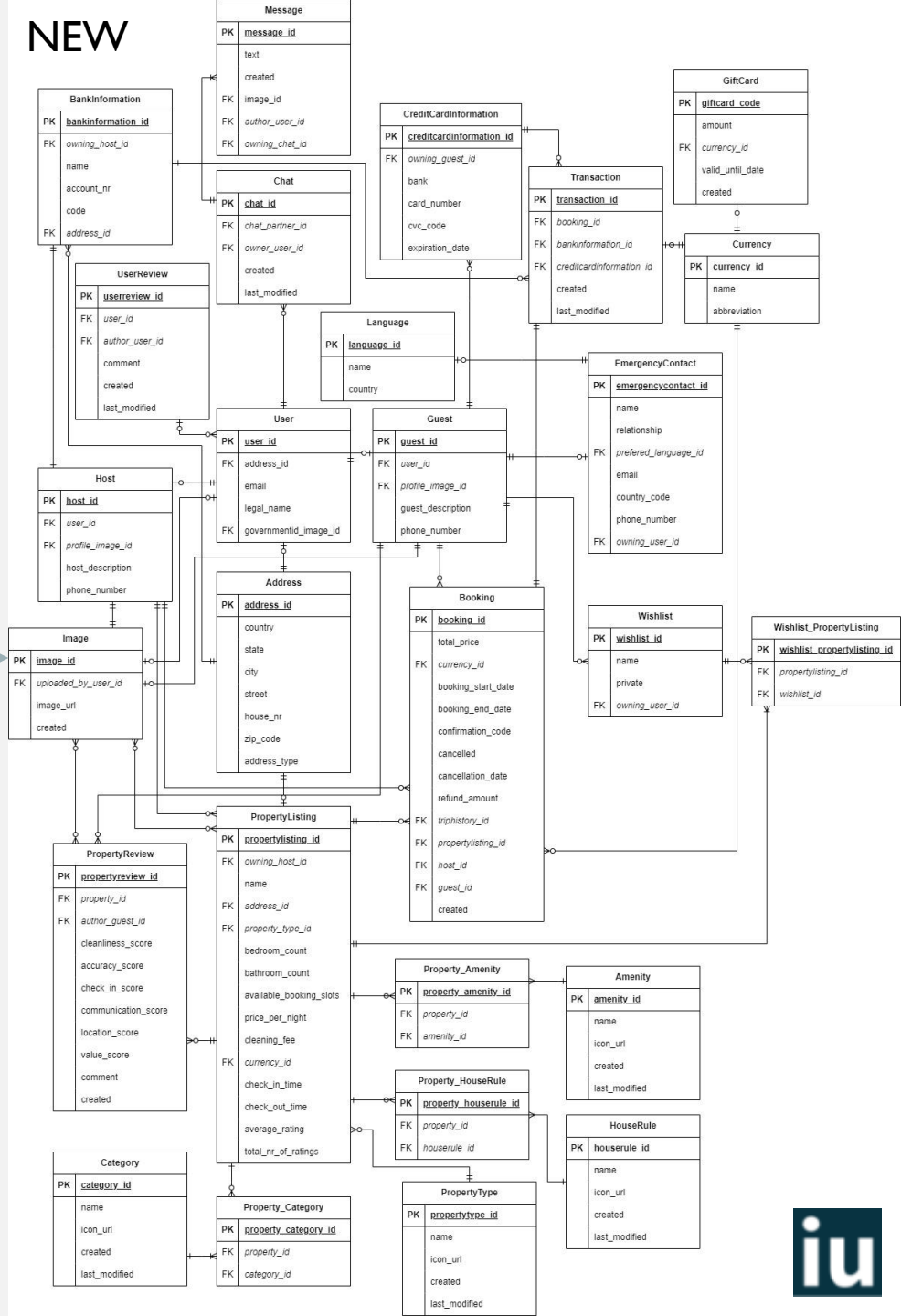


OLD



STRUCTURE CHANGES OVERVIEW

NEW



```
mysql> SELECT COUNT(*) FROM User;
+----------+
| COUNT(*) |
+----------+
|       40 |
+----------+
1 row in set (0.01 sec)
```

COUNT

TABLE - USER

```
27  CREATE TABLE User (
28      user_id INT AUTO_INCREMENT PRIMARY KEY,
29      address_id INT, /*FK*/
30      email VARCHAR(128) NOT NULL,
31      legal_name VARCHAR(64) NOT NULL,
32      governmentid_image_id INT
33  );
```

```
263 /* Users constraints */
264 ALTER TABLE User
265 ADD CONSTRAINT fk_user_address
266 FOREIGN KEY (user_id)
267 REFERENCES Address(address_id)
268 ON DELETE CASCADE ON UPDATE RESTRICT;
```

User	
PK	user_id
FK	address_id
	email
	legal_name
FK	governmentid_image_id

*code line indicator in screenshots may differ slightly compared to the source file.

Tested via ‘Guest’ and ‘Host’ test cases
Insert statements are part of ‘Guest’/’Host’ transaction.

- The User is the base/super class for all users and holds attributes any user will have.
- The ‘address_id’ is a foreign key that references the address table.
- The ‘governmentid_image_id’ is a foreign key that references the image table.
- This table is tested via the host and guest tables which can be seen in the following two slides.

```
mysql> SELECT COUNT(*) FROM Guest;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

TABLE - GUEST

- The ‘user_id’ attribute refers to the base class.
- ‘profile_image_id’ references the id of an image that can be loaded to display the users profile image. It refers to the image table.
- The test case is meant to test the relationship between the ‘Guest’ table/class and its super class ‘User’. As well as testing other relevant relationships via all the foreign keys.

INSERT

```sql
User, Guest, EmergencyContact, CreditCardInformation, Address (SQL Transaction)

Using a transaction for these insert statement means that we can use ROLLBACK to revert all changes
in case one or more querries fail.
We use a transaction for this because the data is cloesly related to each other.

* i will only comment the first transaction as the rest follow the same schematic
*/
-- Guest 1
-- start the transaction
START TRANSACTION;

-- Insert Guest's Address into Address table
INSERT INTO Address (country, state, city, street, house_nr, zip_code, address_type)
VALUES ("Germany", "Hessen", "Frankfurt", "Musterstraße", 1, "60306", "guest");
-- Retrieve the auto-generated address_id
SET @address_id = LAST_INSERT_ID();

-- Insert user data into User table, using the retrieved address_id
INSERT INTO User (address_id, email, legal_name)
VALUES (@address_id, "max.musterman@example.com", "Max Musterman");
-- Retrieve the auto-generated user_id
SET @user_id = LAST_INSERT_ID();

-- Insert Image of government id, using example link
INSERT INTO Image (uploaded_by_user_id, image_url)
VALUES (@user_id, "https://airbnb.com/images/governmentid_image1.jpg");
-- Retrieve image_id of goverment id picture
SET @image_governid_id = LAST_INSERT_ID();
-- Insert image_id of government id picture into the created user entry, linking them (this replaces NULL)
UPDATE User SET governmentid_image_id = @image_governid_id WHERE user_id = @user_id;

-- Insert profile image data into the Image table using example URL and retrieved user_id
INSERT INTO Image (uploaded_by_user_id, image_url)
VALUES (@user_id, "https://airbnb.com/images/profile_image1.jpg");
-- Retrieve the auto-generated image_id
SET @image_profile_id = LAST_INSERT_ID();

-- Insert into EmergencyContact table
INSERT INTO EmergencyContact (name, relationship, prefered_language_id, email, country_code, phone_number, owning_user_id)
VALUES ("Anna Mustermann", "Family", 4, "anna@example.com", "+49", "123456789", @user_id);
-- Retrieve the auto-generated emergencycontact_id
SET @emergencycontact_id = LAST_INSERT_ID();

-- Insert into Guest table using retreived user and image ids.
INSERT INTO Guest (user_id, profile_image_id, guest_description, phone_number)
VALUES (@user_id, @image_profile_id, "Hello i am Max, a 41 years old digital nomand. I love traveling...", "+49987654321");

-- Retrieve the auto-generated guest_id
SET @guest_id = LAST_INSERT_ID();

-- Insert into CreditCardInformation table
INSERT INTO CreditCardInformation (owning_guest_id, bank, card_number, cvc_code, expiration_date)
VALUES (@guest_id, "Sparda Bank", "3353422819762527", "123", "2026-10-31");

-- commit the transaction
COMMIT;
```

CREATE

```sql
CREATE TABLE Guest (
    guest_id INT AUTO_INCREMENT PRIMARY KEY,
    user_id INT UNIQUE NOT NULL, /*FK*/
    profile_image_id INT UNIQUE, /*FK*/
    guest_description TEXT,
    phone_number VARCHAR(16) NOT NULL
);
```

```sql
/* Guest constraints */
ALTER TABLE Guest
ADD CONSTRAINT fk_guest_user
FOREIGN KEY (user_id)
REFERENCES User(user_id)
ON DELETE CASCADE ON UPDATE RESTRICT;

ALTER TABLE Guest
ADD CONSTRAINT fk_guest_image
FOREIGN KEY (profile_image_id)
REFERENCES Image(image_id)
ON DELETE CASCADE ON UPDATE RESTRICT;
```

Test Case

```sql
/* relevant guest data
- it could be argued that this view should be based on the guest_id instead of the user_id but this
is an easy change and depends on how the view is to be used in practice
- as it is this view serves as a demonstration for how the connected data can be querried by comprosin
a complex select statement into a view for easier use.
*/
CREATE VIEW iu_userguest_view AS
SELECT
    U.user_id,
    U.legal_name,
    U.email,
    A.country,
    A.state,
    A.city,
    A.street,
    A.house_nr,
    A.zip_code,
    G.guest_description,
    G.phone_number,
    IProfile.image_url AS profile_image_url,
    IGovernID.image_url AS governmentid_image_url,
    EC.name AS emergency_contact_name,
    EC.relationship AS emergency_contact_relationship,
    EC.email AS emergency_contact_email,
    EC.country_code AS emergency_contact_country_code,
    EC.phone_number AS emergency_contact_phone_number,
    CCI.bank AS credit_card_bank,
    CCI.card_number AS credit_card_number,
    CCI.cvc_code AS credit_card_cvc,
    CCI.expiration_date AS credit_card_expiration_date
FROM
    User U
JOIN Address A ON U.address_id = A.address_id
JOIN Guest G ON U.user_id = G.user_id
JOIN Image IProfile ON G.profile_image_id = IProfile.image_id
JOIN Image IGovernID ON U.governmentid_image_id = IGovernID.image_id
LEFT JOIN EmergencyContact EC ON U.user_id = EC.owning_user_id
LEFT JOIN CreditCardInformation CCI ON G.guest_id = CCI.owning_guest_id;

-- usage of view
SELECT * FROM iu_userguest_view WHERE user_id = 1;
```

Guest	
PK	guest_id
FK	*user_id*
FK	*profile_image_id*
	guest_description
	phone_number

```
mysql> SELECT * FROM iu_userguest_view WHERE user_id = 1;
| user_id | legal_name   | email                     | country | state  | city      | street       | house_nr | zip_code | guest_description                                                  | phone_number | profile_image_url                            | governmentid_imag
e_url | emergency_contact_name | emergency_contact_relationship | emergency_contact_email | emergency_contact_country_code | emergency_contact_phone_number | credit_card_bank | credit_card_number | credit_card_cvc | credit_card_expiration_date |
|       1 | Max Musterman | max.musterman@example.com | Germany | Hessen | Frankfurt | Musterstraße |        1 | 60306    | Hello i am Max, a 41 years old digital nomand. I love traveling... | +49987654321 | https://airbnb.com/images/profile_image1.jpg | https://airbnb.co
m/images/governmentid_image1.jpg | Anna Mustermann | Family | anna@example.com | +49 | 123456789 | Sparda Bank | 3353422819762527 | 123 | 2026-10-31 |
1 row in set (0.00 sec)
```

TABLE - HOST

COUNT

```
mysql> SELECT COUNT(*) FROM Host;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

- The 'user_id' attribute refers back to the base class.
- 'profile_image_id' references the id of an image that can be loaded to display the users profile image.
  - The reasoning for having this attribute in both subclasses is that it is only required, or 'NOT NULL' for Hosts.
- The test case is very similar to that of the previous guest class, adjusting where relevant relationships change compared to the previous slide. This should ensure that all the data for single user that is stored in multiple tables is properly connected.

INSERT

```sql
/*
User, Host, Image, BankInformation, Address (SQL Transaction)

the structure of the host insert statements is very similar to the guest as they share a lot of similaritities

* i will only comment the first transaction as the rest follow the same schematic
*/
-- Host 1
START TRANSACTION;

/* Address for the Host, saved for later use */
INSERT INTO Address (country, state, city, street, house_nr, zip_code, address_type)
VALUES ("United Kingdom", "England", "London", "123 Main St", 123, "SW1A 1AA", "host");
SET @address_id = LAST_INSERT_ID();

/* User (super) class of the Host, saved for later use  */
INSERT INTO User (address_id, email, legal_name)
VALUES (@address_id, "william.turner@hotmail.com", "William Turner");
SET @user_id = LAST_INSERT_ID();

/* Profile Image of the Host, saved for later use */
INSERT INTO Image (uploaded_by_user_id, image_url)
VALUES (@user_id, "https://airbnb.com/images/governmentid_image21.jpg");
SET @image_governmentid_id = LAST_INSERT_ID();
UPDATE User SET governmentid_image_id = @image_governmentid_id WHERE user_id = @user_id;

/* government id image of the Host (User) */
INSERT INTO Image (uploaded_by_user_id, image_url)
VALUES (@user_id, "https://airbnb.com/images/profile_image21.jpg");
SET @image_profile_id = LAST_INSERT_ID();

/* Host data, using the previously inserted data */
INSERT INTO Host (user_id, profile_image_id, host_description, phone_number)
VALUES (@user_id, @image_profile_id, "Host description for host 1", "9876123469");
SET @host_id = LAST_INSERT_ID();

/* Bank Address - this information should likely be inserted differently in an actual production environment, but this works for now */
INSERT INTO Address (country, state, city, street, house_nr, zip_code, address_type)
VALUES ("United Kingdom", "England", "London", "456 Oak St", 456, "SW1A 1AA", "bank");
SET @bankaddress_id = LAST_INSERT_ID();

/* BankInformaion data, using the previously inserted address data */
INSERT INTO BankInformation (owning_host_id, name, account_nr, code, address_id)
VALUES (@host_id, "Barclays Bank plc", "9876543229", "123", @bankaddress_id);

COMMIT;
```

CREATE

```sql
CREATE TABLE Host (
    host_id INT AUTO_INCREMENT PRIMARY KEY,
    user_id INT UNIQUE NOT NULL, /*FK*/
    profile_image_id INT UNIQUE NOT NULL, /*FK*/
    host_description TEXT NOT NULL,
    phone_number VARCHAR(16)
);
```

```sql
/* Host constraints */
ALTER TABLE Host
ADD CONSTRAINT fk_host_user
FOREIGN KEY (user_id)
REFERENCES User(user_id)
ON DELETE CASCADE ON UPDATE RESTRICT;

ALTER TABLE Host
ADD CONSTRAINT fk_host_image
FOREIGN KEY (profile_image_id)
REFERENCES Image(image_id)
ON DELETE CASCADE ON UPDATE RESTRICT;
```

Test Case

```sql
/* relevant host data
- it could be argued that this view should be based on the host_id instead of the user_id but this
is an easy change and depends on how the view is to be used in practice
- as it is this view serves as a demonstration for how the connected data can be querried by comprosing
a complex select statement into a view for easier use.
*/
CREATE VIEW iu_userhost_view AS
SELECT
    U.user_id,
    U.legal_name,
    U.email,
    A.country,
    A.state,
    A.city,
    A.street,
    A.house_nr,
    A.zip_code,
    H.host_description,
    H.phone_number,
    IProfile.image_url AS profile_image_url,
    IGovernID.image_url AS governmentid_image_url,
    BI.account_nr AS bank_account_nr,
    BI.code AS bank_code,
    BI.address_id AS bank_address_id,
    BIA.country AS bank_address_country
FROM
    User U
JOIN Address A ON U.address_id = A.address_id
JOIN Host H ON U.user_id = H.user_id
JOIN Image IProfile ON H.profile_image_id = IProfile.image_id
JOIN Image IGovernID ON U.governmentid_image_id = IGovernID.image_id
LEFT JOIN BankInformation BI ON H.host_id = BI.owning_host_id
JOIN Address BIA ON BI.address_id = BIA.address_id;

-- usage example of view
SELECT * FROM iu_userhost_view WHERE user_id = 21;
```

Host	
PK	host_id
FK	*user_id*
FK	*profile_image_id*
	host_description
	phone_number

mysql> SELECT * FROM iu_userhost_view WHERE user_id = 21;

user_id	legal_name	email	country	state	city	street	house_nr	zip_code	host_description	phone_number	profile_image_url	governmentid_image_url	bank_account_nr	bank_code	bank_address_id	bank_address_country
21	William Turner	william.turner@hotmail.com	United Kingdom	England	London	123 Main St	123	SW1A 1AA	Host description for host 1	9876123469	https://airbnb.com/images/profile_image21.jpg	https://airbnb.com/images/governmentid_image21.jpg	9876543229	123	22	United Kingdom

1 row in set (0.00 sec)

```
mysql> SELECT COUNT(*) FROM UserReview;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

TABLE - USERREVIEW

INSERT

```sql
/* UserReview
- The UserReview is written by a host to the profile of a guest who stayed at their property
- The author therefore has to be a host, while the user the review is written to has to be a guest
- There are no other restrictions except that both id's have to be valid
*/
-- UserReview 1
INSERT INTO UserReview (user_id, author_user_id, comment)
VALUES (1, 21, "They were a lovely guest, we hope to meet you again some time!");
```

CREATE

```sql
CREATE TABLE UserReview (
    userreview_id INT AUTO_INCREMENT PRIMARY KEY,
    user_id INT NOT NULL, /*FK*/
    author_user_id INT NOT NULL, /*FK*/
    comment VARCHAR(2000),
    created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,
    last_modified TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP,

    FOREIGN KEY (user_id) REFERENCES User(user_id),
    FOREIGN KEY (author_user_id) REFERENCES User(user_id)
);
```

- The ‘UserReview’ table holds all the reviews given on users.
- These are comments left by hosts on the guest pages and are different from reviews left by guests on the property listing.
- The comment attribute holds the user created written text.
- User and author_user ids and timestamps are also saved.
- The test case tests the content and relationship of user reviews and users by returning all data entries of user reviews for a given user.

Test Case

```sql
/* UserReview data from related to explicit user
- quite simple as the userreview shares the attribute 'user_id' which can be used for a natural join,
otherwise a left join on user_id could be used when only specific data is desired
*/
CREATE VIEW iu_userreviews_from_user_view AS
SELECT *
FROM User
NATURAL JOIN UserReview;
/* another test example for only the UserReview data without User data:
SELECT UR.*
FROM User
NATURAL JOIN UserReview UR;
*/

-- usage example of view
SELECT * FROM iu_userreviews_from_user_view WHERE user_id = 1;
```

UserReview	
PK	userreview_id
FK	user_id
FK	author_user_id
	comment
	created
	last_modified

```
mysql> SELECT * FROM iu_userreviews_from_user_view WHERE user_id = 1;
+---------+------------+-------------------------+------------+-----------------------+----------------+----------------+-----------------------------------------------------------+---------------------+---------------------+
| user_id | address_id | email                   | legal_name | governmentid_image_id | userreview_id | author_user_id | comment                                                   | created             | last_modified       |
+---------+------------+-------------------------+------------+-----------------------+----------------+----------------+-----------------------------------------------------------+---------------------+---------------------+
|       1 |          1 | max.musterman@example.com | Max Musterman |                     1 |              1 |             21 | They were a lovely guest, we hope to meet you again some time! | 2024-01-08 10:03:57 | 2024-01-08 10:03:57 |
|       1 |          1 | max.musterman@example.com | Max Musterman |                     1 |              2 |             23 | There were no problems, and they left the property clean and in order. | 2024-01-08 10:03:57 | 2024-01-08 10:03:57 |
|       1 |          1 | max.musterman@example.com | Max Musterman |                     1 |              3 |             24 | Thanks for your stay!                                     | 2024-01-08 10:03:57 | 2024-01-08 10:03:57 |
+---------+------------+-------------------------+------------+-----------------------+----------------+----------------+-----------------------------------------------------------+---------------------+---------------------+
3 rows in set (0.00 sec)
```

```
mysql> SELECT COUNT(*) FROM Address;
+----------+
| COUNT(*) |
+----------+
|       80 |
+----------+
1 row in set (0.02 sec)
```

COUNT

TABLE - ADDRESS

CREATE

```sql
CREATE TABLE Address (
    address_id INT AUTO_INCREMENT PRIMARY KEY,
    country VARCHAR(128) NOT NULL,
    state VARCHAR(128) NOT NULL,
    city VARCHAR(128) NOT NULL,
    street VARCHAR(128) NOT NULL,
    house_nr INT NOT NULL,
    zip_code VARCHAR(10) NOT NULL,
    address_type VARCHAR(32)
);
```

Address	
PK	address_id
	country
	state
	city
	street
	house_nr
	zip_code
	address_type

Tested and inserted via multiple other test cases.
Please refer to one of the user classes for an example

- The address attributes themselves are self-explanatory in meaning.
- The reasoning for the selection of attributes is the categorization or search user flow on the AirBnB website.
- An address can be used by either users, properties (listings) or banks.
- This table is tested is a part of many other tables and is therefore already tested more than enough. There is still a simple select all test to check for completeness of content in the test.sql file.

```
mysql> SELECT COUNT(*) FROM Image;
+----------+
| COUNT(*) |
+----------+
|       85 |
+----------+
1 row in set (0.01 sec)
```

COUNT

TABLE - IMAGE

CREATE

```sql
CREATE TABLE Image (
    image_id INT AUTO_INCREMENT PRIMARY KEY,
    uploaded_by_user_id INT NOT NULL, /*FK*/
    image_url varchar(1024) NOT NULL,
    created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,

    FOREIGN KEY (uploaded_by_user_id) REFERENCES User(user_id)
);
```

Image	
PK	image_id
FK	uploaded_by_user_id
	image_url
	created

Tested and inserted via multiple other test cases.
Please refer to one of the user classes for an example

- This table assumes that the images themselves are stored by a cloud storage provider for example.
- This means that the attribute itself can be of type VARCHAR instead of having to save the image as a BLOB, which is inefficient.
- The Table also stores the id of the user that uploaded the image.
- The ‘created’ attribute is defaulted to the current timestamp, meaning it shows the time the image was uploaded.
- Like the ‘Address’ table, the ‘Image’ table is also part of many other tables, meaning that the relationships of this table are already thoroughly tested. There is, again, still a select all test to check for completeness of content.

```
mysql> SELECT COUNT(*) FROM Currency;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.02 sec)
```

COUNT

TABLE - CURRENCY

CREATE

```sql
CREATE TABLE Currency (
    currency_id INT AUTO_INCREMENT PRIMARY KEY,
    name VARCHAR(64) NOT NULL,
    abbreviation VARCHAR(3)
);
```

Currency	
PK	currency_id
	name
	abbreviation

INSERT

```sql
INSERT INTO Currency (name, abbreviation) VALUES ("United States dollar", "USD");
```

‘Currency’ is a simple table, see test case in test.sql

- The currency table represents all currencies available in the application.
- Name represents the name of the currency while country represents the country it is used in.
- Abbreviation is used for display purposes.
- Currency is not a table that will see frequent changes and is rather used as a reference or lookup table.
- This table is very simple and does not require complicated testing, a simple select all test can be found in the test.sql file.

```
mysql> SELECT COUNT(*) FROM Language;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.01 sec)
```

COUNT

TABLE - LANGUAGE

CREATE

```
195   CREATE TABLE Language (
196       language_id INT AUTO_INCREMENT PRIMARY KEY,
197       name VARCHAR(32) NOT NULL,
198       country VARCHAR(32)
199   );
```

Language	
PK	language_id
	name
	country

INSERT

```
19    INSERT INTO Language (name, country) VALUES ("English", "United States");
```

'Language' is a simple table, see test case in test.sql

- The language table represents all languages available in the application.
- Name represents the name of the language while country represents the country it is used in.
- The reason for this is that Airbnb differentiates between, for example, American and British English.
- Language is not a table that will see frequent changes and is rather used as a reference or look up table.
- Like the 'Currency', this table is also very simple, a test for content should suffice for this table, which can be found in the test.sql file.

TABLE - CHAT

```
mysql> SELECT COUNT(*) FROM Chat;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

- A chat is a collection of messages, in the next slide we will inspect the 'message' table.
- These messages are linked to a chat by sharing the same chat id.
- Other than the 'created' and 'last_modified' timestamps, the chats table also saves both chat participants.
- The test case for this table works in combination with the message table (next slide). The first test case checks the general content of the chat table.

INSERT

```sql
/* Chat
- the chat table is hard to make sense of without the frontend, the chat table holds the ids of the two users chatting,
the owner being the initiator of the chat
- the id's are referenced by the messages to string together the whole chat
- important is that the user id's have to be valid and they cannot be identical, as a user can't chat with themselves
- the partner/owner naming is just for context and does not have to be regarded when requesting a chat
(otherwise duplicates would be needed, which makes no sense)
*/
INSERT INTO Chat (chat_partner_id, owner_user_id) VALUES (1, 2);
```

CREATE

```sql
CREATE TABLE Chat (
    chat_id INT AUTO_INCREMENT PRIMARY KEY,
    chat_partner_id INT, /*FK*/
    owner_user_id INT, /*FK*/
    created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,
    last_modified TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
);
```

```sql
/* Chat constraints */
ALTER TABLE Chat
ADD CONSTRAINT fk_chat_partner
FOREIGN KEY (chat_partner_id)
REFERENCES User(user_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE Chat
ADD CONSTRAINT fk_chat_owner
FOREIGN KEY (owner_user_id)
REFERENCES User(user_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

Test Case

```sql
/* Chat & Message data
- two examples, the first one will display general details of the chat, the second text will
return all messages of a given chat
*/
CREATE VIEW iu_chat_details_view AS
SELECT
    C.*,
    UO.legal_name AS owning_user_name,
    UP.legal_name AS partner_guest_name,
    COUNT(M.message_id) AS message_count
FROM Chat C
JOIN User UO ON C.owner_user_id = UO.user_id
JOIN User UP ON C.chat_partner_id = UP.user_id
LEFT JOIN Message M ON M.owning_chat_id = C.chat_id
GROUP BY C.chat_id, UO.legal_name, UP.legal_name;

-- usage example of view
SELECT * FROM iu_chat_details_view WHERE chat_id = 1;

CREATE VIEW iu_chat_messages_view AS
SELECT
    M.message_id,
    M.text,
    M.image_id,
    C.chat_id AS owning_chat_id_ref
FROM Message M
JOIN Chat C ON C.chat_id = M.owning_chat_id;

-- usage example of view
SELECT * FROM iu_chat_messages_view WHERE owning_chat_id_ref = 1;
```

Chat	
PK	chat_id
FK	chat_partner_id
FK	owner_user_id
	created
	last_modified

```
mysql> SELECT * FROM iu_chat_details_view WHERE chat_id = 1;
+---------+-----------------+---------------+---------------------+---------------------+-----------------+--------------------+---------------+
| chat_id | chat_partner_id | owner_user_id | created             | last_modified       | owning_user_name | partner_guest_name | message_count |
+---------+-----------------+---------------+---------------------+---------------------+-----------------+--------------------+---------------+
|       1 |               1 |             2 | 2024-01-08 10:03:57 | 2024-01-08 10:03:57 | John Doe        | Max Musterman      |             1 |
+---------+-----------------+---------------+---------------------+---------------------+-----------------+--------------------+---------------+
1 row in set (0.00 sec)
```

TABLE - MESSAGE

```
mysql> SELECT COUNT(*) FROM Message;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

- The message is linked to the chat via the chat id, represented here as ‘owning_chat_id’. The ‘author_user_id’ attribute holds the author; Both id’s can be used to reconstruct a chat.
- As Airbnb enables users to share images in chats, a message may contain an image instead of text. This necessitates the optional ‘image_id’ attribute.
- The created timestamp is essentially the ‘sent’ timestamp of the message.
- The second test case in the screenshot tests the relationship of ‘Chat’ and ‘Message’ tables by returning all data entries of messages for a given Chat.

INSERT

```
/* Message
- the messages hold the individual text of a message and their owning user, they reference the owning chat,
- their timestamp is used to recreate the chat when requried
*/
INSERT INTO Message (text, author_user_id, owning_chat_id) VALUES ("Content for message 1", 1, 1);
```

```
/* examples with images - the same user_id must be used for the image and the chat message */
INSERT INTO Image (uploaded_by_user_id, image_url)
VALUES (1, "https://airbnb.com/images/chat_message_image1.jpg");
SET @message_image_id = LAST_INSERT_ID();
INSERT INTO Message (image_id, author_user_id, owning_chat_id) VALUES (@message_image_id, 9, 12);
```

CREATE

```
CREATE TABLE Message (
    message_id INT AUTO_INCREMENT PRIMARY KEY,
    text TEXT,
    image_id INT, /*FK*/
    author_user_id INT, /*FK*/
    owning_chat_id INT, /*FK*/
    created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP
);
```

```
/* Message constraints */
ALTER TABLE Message
ADD CONSTRAINT fk_message_owningchat
FOREIGN KEY (owning_chat_id)
REFERENCES Chat(chat_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

Test Case

```
/* Chat & Message data
- two examples, the first one will display general details of the chat, the second text will
return all messages of a given chat
*/
CREATE VIEW iu_chat_details_view AS
SELECT
    C.*,
    UO.legal_name AS owning_user_name,
    UP.legal_name AS partner_guest_name,
    COUNT(M.message_id) AS message_count
FROM Chat C
JOIN User UO ON C.owner_user_id = UO.user_id
JOIN User UP ON C.chat_partner_id = UP.user_id
LEFT JOIN Message M ON M.owning_chat_id = C.chat_id
GROUP BY C.chat_id, UO.legal_name, UP.legal_name;

-- usage example of view
SELECT * FROM iu_chat_details_view WHERE chat_id = 1;

CREATE VIEW iu_chat_messages_view AS
SELECT
    M.message_id,
    M.text,
    M.image_id,
    C.chat_id AS owning_chat_id_ref
FROM Message M
JOIN Chat C ON C.chat_id = M.owning_chat_id;

-- usage example of view
SELECT * FROM iu_chat_messages_view WHERE owning_chat_id_ref = 1;
```

Message	
PK	message_id
	text
	created
FK	image_id
FK	*author_user_id*
FK	*owning_chat_id*

```
mysql> SELECT * FROM iu_chat_messages_view WHERE owning_chat_id_ref = 1;
+------------+-----------------------+----------+--------------------+
| message_id | text                  | image_id | owning_chat_id_ref |
+------------+-----------------------+----------+--------------------+
|          1 | Content for message 1 |     NULL |                  1 |
+------------+-----------------------+----------+--------------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT COUNT(*) FROM EmergencyContact;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.01 sec)
```

COUNT

TABLE - EMERGENCYCONTACT

- The emergency contact is different to a user as it is only a collection of information relevant to the contact without any of the functionality of an actual account in the application.
- All the information regarding the contact should be self-explanatory.
- The 'owning_user_id' refers to the user that "owns" the entry.
- This table is covered in the Guest user test cases, another simple select all statement is provided in the test.sql file to check for completeness of content.

CREATE

```sql
CREATE TABLE EmergencyContact (
    emergencycontact_id INT AUTO_INCREMENT PRIMARY KEY,
    name VARCHAR(255) NOT NULL,
    relationship VARCHAR(255),
    prefered_language_id INT DEFAULT 1, /*FK*/
    email VARCHAR(255),
    country_code VARCHAR (32),
    phone_number VARCHAR(15) NOT NULL,
    owning_user_id INT NOT NULL /*FK*/

/* EmergencyContact constraints */
ALTER TABLE EmergencyContact
ADD CONSTRAINT fk_econtact_language
FOREIGN KEY (prefered_language_id)
REFERENCES Language(language_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE EmergencyContact
ADD CONSTRAINT fk_econtact_user
FOREIGN KEY (owning_user_id)
REFERENCES User(user_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

EmergencyContact	
PK	emergencycontact_id
	name
	relationship
FK	prefered_language_id
	email
	country_code
	phone_number
FK	owning_user_id

INSERT

```sql
-- Insert into EmergencyContact table
INSERT INTO EmergencyContact (name, relationship, prefered_language_id, email, country_code, phone_number, owning_user_id)
VALUES ("Anna Mustermann", "Family", 4, "anna@example.com", "+49", "123456789", @user_id);
-- Retrieve the auto-generated emergencycontact_id
SET @emergencycontact_id = LAST_INSERT_ID();
```

'Language' is a simple table that gets added to during the guest transaction.

TABLE - WISHLIST

COUNT

```
mysql> SELECT COUNT(*) FROM Wishlist;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

- Wishlists in the Airbnb application are a collection of property listings.
- As this is a M:N relation it needs to be normalized. We achieve this by using this 'wishlist' and a 'wishlist_propertylisting' table (see next slide).
- A user can have multiple Wishlists, hence the need for a name.
- The 'wishlist_id' is used in the next table to normalize the M:N relation.
- The table works in close relation to the 'wishlist_propertylisting' table (next slide). This first test case checks for general data of the wishlist table and other related tables in conjunction. The second test case checks the relation of a wishlist and its propertylistings.

CREATE

```sql
CREATE TABLE Wishlist (
    wishlist_id INT AUTO_INCREMENT PRIMARY KEY,
    name VARCHAR(255) NOT NULL,
    private BOOLEAN NOT NULL DEFAULT TRUE,
    owning_user_id INT NOT NULL /*FK*/
);
```

```sql
/* Wishlist constraints */
ALTER TABLE Wishlist
ADD CONSTRAINT fk_wishlist_guest
FOREIGN KEY (owning_user_id)
REFERENCES Guest(guest_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

INSERT

```sql
/* Wishlist
- the wishlist is the relation that stores the data relevant to the wishlists
- the wishlist is referenced by the wishlist_propertylisting relation to link the properties in the list with the list itself
- similar to the chat/messages, it is hard to visualize the wishlist tables without the frontend
*/
INSERT INTO Wishlist (name, private, owning_user_id) VALUES ("Wishlist 1", TRUE, 1);
```

Test Case

```sql
/* Wishlist data
- test case that shows the wishlist, user and property listing data to proves the proper implementation of links between them. Goal is to see the relationship of a user owning a wishlist, which in turn 'owns' (multiple) propertylistings.
*/
CREATE VIEW iu_wishlist_details_view AS
SELECT
    W.*,
    U.legal_name AS owning_user_name,
    PL.name AS property_listing_namne
FROM
    Wishlist W
JOIN User U ON W.owning_user_id = U.user_id
JOIN Wishlist_PropertyListing WPL ON W.wishlist_id = WPL.wishlist_id
JOIN PropertyListing PL ON WPL.propertylisting_id = PL.propertylisting_id;

-- usage example of view
SELECT * FROM iu_wishlist_details_view WHERE wishlist_id = 1;

-- this view gets all data regarding the property listings that are in a given wishlist
CREATE VIEW iu_wishlist_propertylistings_view AS
SELECT
    W.wishlist_id,
    PL.*
FROM Wishlist W
JOIN Wishlist_PropertyListing WPL ON W.wishlist_id = WPL.wishlist_id
JOIN PropertyListing PL ON WPL.propertylisting_id = PL.propertylisting_id;

-- usage example of view
SELECT * FROM iu_wishlist_propertylistings_view WHERE wishlist_id = 1;
```

Wishlist	
PK	wishlist_id
	name
	private
FK	*owning_user_id*

```
mysql> SELECT * FROM iu_wishlist_details_view WHERE wishlist_id = 1;
+-------------+------------+---------+---------------+-----------------+--------------------------+
| wishlist_id | name       | private | owning_user_id | owning_user_name | property_listing_namne   |
+-------------+------------+---------+---------------+-----------------+--------------------------+
|           1 | wishlist 1 |       1 |             1 | Max Musterman   | Cozy Studio Apartment    |
|           1 | wishlist 1 |       1 |             1 | Max Musterman   | Cozy Studio Apartment    |
|           1 | wishlist 1 |       1 |             1 | Max Musterman   | Spacious Loft in the City |
|           1 | wishlist 1 |       1 |             1 | Max Musterman   | Luxurious Beachfront Villa |
|           1 | wishlist 1 |       1 |             1 | Max Musterman   | Mountain Retreat Cabin   |
+-------------+------------+---------+---------------+-----------------+--------------------------+
5 rows in set (0.00 sec)
```

```
mysql> SELECT COUNT(*) FROM Wishlist_Propertylisting;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.01 sec)
```

COUNT

TABLE – WISHLIST_PROPERTYLISTING

- This table, as mentioned, is used to normalize the wishlist – propertylisting relation.
- The table matches Propertylistings to Wishlists using the two foreign key ids.
- The propertylisting table will be introduced in the following slides.
- As explained in the previous slide, this table stands in close relation to the wishlist table. The second test case demonstrates the relationship of a wishlist with the propertylisting table via the link of this table very well.

CREATE

```sql
CREATE TABLE Wishlist_PropertyListing (
    wishlist_propertylisting_id INT AUTO_INCREMENT PRIMARY KEY,
    propertylisting_id INT, /*FK*/
    wishlist_id INT /*FK*/
);
```

```sql
/* Wishlist_PropertyListing constraints */
ALTER TABLE Wishlist_PropertyListing
ADD CONSTRAINT fk_wishlist_property
FOREIGN KEY (propertylisting_id)
REFERENCES PropertyListing(propertylisting_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE Wishlist_PropertyListing
ADD CONSTRAINT fk_wishlist_wishlist
FOREIGN KEY (wishlist_id)
REFERENCES Wishlist(wishlist_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

INSERT

```sql
/* Wishlist_propertylisting
- this is a relation table that links the wishlists and the properties together
- the wishlist_id references the previous Wishlist relation
*/
INSERT INTO Wishlist_PropertyListing (propertylisting_id, wishlist_id) VALUES (1, 1);
```

Test Case

```sql
/* Wishlist data
- test case that shows the wishlist, user and property listing data to proves the proper
implementation of links between them. Goal is to see the relationship of a user owning
a wishlist, which in turn 'owns' (multiple) propertylistings.
*/
CREATE VIEW iu_wishlist_details_view AS
SELECT
    W.*,
    U.legal_name AS owning_user_name,
    PL.name AS property_listing_namne
FROM
    Wishlist W
JOIN User U ON W.owning_user_id = U.user_id
JOIN Wishlist_PropertyListing WPL ON W.wishlist_id = WPL.wishlist_id
JOIN PropertyListing PL ON WPL.propertylisting_id = PL.propertylisting_id;

-- usage example of view
SELECT * FROM iu_wishlist_details_view WHERE wishlist_id = 1;

-- this view gets all data regarding the property listings that are in a given wishlist
CREATE VIEW iu_wishlist_propertylistings_view AS
SELECT
    W.wishlist_id,
    PL.*
FROM Wishlist W
JOIN Wishlist_PropertyListing WPL ON W.wishlist_id = WPL.wishlist_id
JOIN PropertyListing PL ON WPL.propertylisting_id = PL.propertylisting_id;

-- usage example of view
SELECT * FROM iu_wishlist_propertylistings_view WHERE wishlist_id = 1;
```

Wishlist_PropertyListing	
PK	wishlist_propertylisting_id
FK	*propertylisting_id*
FK	*wishlist_id*

```
mysql> SELECT * FROM iu_wishlist_propertylistings_view WHERE wishlist_id = 1;
+-------------+--------------------+---------------+---------------------------+------------+------------------+---------------+----------------+-------------------------+-----------------+-------------+---------------+----------------+----------------+-------------------------+
| wishlist_id | propertylisting_id | owning_host_id | name                      | address_id | property_type_id | bedroom_count | bathroom_count | available_booking_slots | price_per_night | currency_id | check_in_time | check_out_time | average_rating | total_nr_of_ratings |
+-------------+--------------------+---------------+---------------------------+------------+------------------+---------------+----------------+-------------------------+-----------------+-------------+---------------+----------------+----------------+-------------------------+
|           1 |                  1 |          NULL | Cozy Studio Apartment     |         61 |                1 |             1 |              1 |                       2 |           50.00 |           1 | 15:00:00      | 11:00:00       |            0.0 |                       0 |
|           1 |                  2 |          NULL | Cozy Studio Apartment     |         62 |                1 |             1 |              1 |                       2 |           50.00 |           1 | 15:00:00      | 11:00:00       |            0.0 |                       0 |
|           1 |                  3 |          NULL | Spacious Loft in the City |         63 |                2 |             2 |              1 |                       4 |          120.00 |           1 | 16:00:00      | 10:00:00       |            0.0 |                       0 |
|           1 |                  4 |          NULL | Luxurious Beachfront Villa|         64 |                3 |             4 |              3 |                       6 |          300.00 |           1 | 14:00:00      | 12:00:00       |            0.0 |                       0 |
|           1 |                  5 |          NULL | Mountain Retreat Cabin    |         65 |                4 |             2 |              1 |                       3 |           80.00 |           1 | 12:00:00      | 10:00:00       |            0.0 |                       0 |
+-------------+--------------------+---------------+---------------------------+------------+------------------+---------------+----------------+-------------------------+-----------------+-------------+---------------+----------------+----------------+-------------------------+
5 rows in set (0.00 sec)
```

TABLE - PROPERTYLISTING

```
mysql> SELECT COUNT(*) FROM Propertylisting;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.01 sec)
```

COUNT

- The ‘PropertyListing’ table marks the second important ‘block’ of data mentioned in the introduction.
- This table holds all relevant information for the listings and has multiple M:N relations that are not shown in the table itself.
- These relations rely on the ‘propertylisting_id’ and are introduced in the following slides.
- Although many of the relations of this table have already been tested, this table is of great importance to the overall system. It is therefore reasonable to create a test case that generally tests all relationships of this table. Said test case can be seen here, it focuses on returning relevant data from all tables that have a relationship with the propertylisting table. (Either via property or host id)

CREATE

```sql
CREATE TABLE PropertyListing (
    propertylisting_id INT AUTO_INCREMENT PRIMARY KEY,
    owning_host_id INT NOT NULL, /*FK*/
    name VARCHAR(255) NOT NULL,
    address_id INT UNIQUE NOT NULL, /*FK*/
    property_type_id INT, /*FK*/
    bedroom_count INT,
    bathroom_count INT,
    available_booking_slots INT,
    price_per_night DECIMAL(10,2),
    currency_id INT NOT NULL DEFAULT 1, /*FK*/
    check_in_time TIME DEFAULT '14:00',
    check_out_time TIME DEFAULT '10:00',
    average_rating DECIMAL(2,1) DEFAULT 0, /* should get updated by the applciation when a new review is published, is initially 0 */
    total_nr_of_ratings INT DEFAULT 0, /* should get updated/incremented by the applciation when a new review is published, is initially 0 */

    FOREIGN KEY (owning_host_id) REFERENCES Host(host_id)
);
```

```sql
/* PropertyListing constraints */
ALTER TABLE PropertyListing
ADD CONSTRAINT fk_listing_address
FOREIGN KEY (address_id)
REFERENCES Address(address_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE PropertyListing
ADD CONSTRAINT fk_listing_currency
FOREIGN KEY (currency_id)
REFERENCES Currency(currency_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

INSERT

```sql
/* PropertyListing
- the propertylisting is referenced by the previously created tables for the relevant categoy, amenities, and houserules
- the structure of the inserts is fairly simple, we first insert the address data and then use the insert id for the propertylisting
- for the other attributes we simlpy enter semi-random dummy data for testing/demonstration purposes
*/
-- PropertyListing 1
INSERT INTO Address (country, state, city, street, house_nr, zip_code, address_type)
VALUES ("United States", "New York", "Brooklyn", "Elm Street", "1234", "11201", "property");
SET @property_address_id = LAST_INSERT_ID();
INSERT INTO PropertyListing (owning_host_id, name, address_id, property_type_id, bedroom_count, bathroom_count, available_booking_slots, price_per_night, currency_id, check_in_time, check_out_time)
VALUES (1, "Cozy Studio Apartment", @property_address_id, 1, 1, 1, 2, 50.00, 1, "15:00:00", "11:00:00");
```

Test Case

```sql
/* relevant property listing data
- this first view shows the data attributes that somewhat directly relate to the propertylisting while
the the following view will serve as an example for one of the tables that is linked via another table.
In that case we will use the amenitites table to demonstrate the proper relationship between a
propertylisting and amenities, categories and houserules.
- includes property_type relation test
*/
CREATE VIEW iu_propertylisting_view AS
SELECT
    PL.propertylisting_id,
    PL.name AS propertylisting_name,
    PT.name AS property_type,
    PL.price_per_night,
    C.name AS currency,
    A.country,
    A.state,
    A.city,
    A.street,
    A.house_nr,
    A.zip_code,
    H.host_id AS host_id,
    HU.legal_name AS host_name
FROM
    PropertyListing PL
JOIN Address A ON PL.address_id = A.address_id
JOIN Host H ON PL.owning_host_id = H.host_id
JOIN User HU ON H.user_id = HU.user_id
JOIN Currency C ON PL.currency_id = C.currency_id
JOIN PropertyType PT ON PL.property_type_id = PT.propertytype_id;

-- usage example of view
SELECT * FROM iu_propertylisting_view WHERE propertylisting_id = 1;
SELECT * FROM iu_propertylisting_view WHERE host_id = 1;
```

PropertyListing	
PK	propertylisting_id
FK	owning_host_id
	name
FK	address_id
FK	property_type_id
	bedroom_count
	bathroom_count
	available_booking_slots
	price_per_night
	cleaning_fee
FK	currency_id
	check_in_time
	check_out_time
	average_rating
	total_nr_of_ratings

```
mysql> SELECT * FROM iu_propertylisting_view WHERE host_id = 1;
+---------------------+---------------------+---------------+----------------+-----------------------+---------------+------------+-------------+-------------+----------+----------+---------+-----------------+
| propertylisting_id  | propertylisting_name| property_type | price_per_night| currency              | country       | state      | city        | street      | house_nr | zip_code | host_id | host_name       |
+---------------------+---------------------+---------------+----------------+-----------------------+---------------+------------+-------------+-------------+----------+----------+---------+-----------------+
|                   1 | Cozy Studio Apartment | Entire place  |          50.00 | United States dollar  | United States | New York   | Brooklyn    | Elm Street  |     1234 |    11201 |       1 | William Turner  |
|                   2 | Tranquil Retreat Cottage | Entire place |          50.00 | United States dollar  | United States | California | San Francisco | Oak Avenue | 5678 |    94110 |       1 | William Turner  |
|                   3 | Spacious Loft in the City | Private room |         120.00 | United States dollar  | United States | California | Los Angeles | Maple Drive |      910 |    90046 |       1 | William Turner  |
|                   4 | Luxurious Beachfront Villa | Hotel room  |         300.00 | United States dollar  | United States | Illinois   | Chicago     | Pine Lane   |      123 |    60611 |       1 | William Turner  |
+---------------------+---------------------+---------------+----------------+-----------------------+---------------+------------+-------------+-------------+----------+----------+---------+-----------------+
4 rows in set (0.00 sec)
```

```
mysql> SELECT COUNT(*) FROM Propertyreview;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

TABLE - PROPERTYREVIEW

- Similar to a User Review this table holds the reviews given by guests to properties.
- It holds multiple ratings/scores which are displayed on the listing page. These are represented as integers with values from 0 to 5. (Star rating). The application should make sure that the input is an integer within the given range before sending it to the DBMS.
- Users can also add comments to the review.
- The test case simple checks the relationship between propertylistings and reviews, as well as the review content.

CREATE

```sql
CREATE TABLE PropertyReview (
    propertyreview_id INT AUTO_INCREMENT PRIMARY KEY,
    property_id INT NOT NULL, /*FK*/
    author_guest_id INT NOT NULL, /*FK*/
    cleanliness_score INT,
    accuracy_score INT,
    check_in_score INT,
    communication_score INT,
    location_score INT,
    value_score INT,
    comment VARCHAR(2000),
    created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP
);
```

```sql
/* PropertyReview constraints */
ALTER TABLE PropertyReview
ADD CONSTRAINT fk_review_property
FOREIGN KEY (property_id)
REFERENCES PropertyListing(propertylisting_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE PropertyReview
ADD CONSTRAINT fk_review_author
FOREIGN KEY (author_guest_id)
REFERENCES Guest(guest_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

Test Case

```sql
/* PropertyReviews are very similar to the UserReviews above, i will therefore not go into much detail
about the structure of the query / test case
- the reason i constrained the query is that it would otherwise be very bloated with less readability
*/
CREATE VIEW iu_propertyreviews_view AS
SELECT
    PL.propertylisting_id, -- left in to show that PL.id and PR. id are equal -> functioning relation
    PL.name,
    PR.*
FROM PropertyListing PL
JOIN PropertyReview PR ON PL.propertylisting_id = PR.property_id;

-- usage example of view
SELECT * FROM iu_propertyreviews_view WHERE propertylisting_id = 1;
```

PropertyReview	
PK	propertyreview_id
FK	property_id
FK	author_guest_id
	cleanliness_score
	accuracy_score
	check_in_score
	communication_score
	location_score
	value_score
	comment
	created

INSERT

```sql
/* Property Review
- the propertyreview table is very simple, in that it only contains two foreign keys, which are easy to explain
- the property_id is the property the review is about, while the author_guest_id is the guest who published the review
- the other attributes are simple and obvious
*/
-- PropertyReview 1
INSERT INTO PropertyReview (property_id, author_guest_id, cleanliness_score, accuracy_score, check_in_score, communication_score, location_score, value_score, comment)
VALUES (1, 1, 4, 4, 5, 4, 5, 4, "We had a wonderful stay at this place!");
```

```
mysql> SELECT * FROM iu_propertyreviews_view WHERE propertylisting_id = 1;
+--------------------+--------------------+--------------------+-------------+----------------+-------------------+----------------+----------------+---------------------+----------------+-------------+-----------------------------+---------------------+
| propertylisting_id | name               | propertyreview_id  | property_id | author_guest_id | cleanliness_score | accuracy_score | check_in_score | communication_score | location_score | value_score | comment                     | created             |
+--------------------+--------------------+--------------------+-------------+----------------+-------------------+----------------+----------------+---------------------+----------------+-------------+-----------------------------+---------------------+
|                  1 | Cozy Studio Apartment |                  1 |           1 |              1 |                 4 |              4 |              5 |                   4 |              5 |           4 | We had a wonderful stay at this place! | 2024-01-18 20:59:43 |
+--------------------+--------------------+--------------------+-------------+----------------+-------------------+----------------+----------------+---------------------+----------------+-------------+-----------------------------+---------------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT COUNT(*) FROM Property_Amenity;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

TABLE – PROPERTY_X

- Each table is used to normalize a relation between the PropertyListing and their respective table. I see these tables as one equivalence class.
- The naming convention of these tables is meant to represent the link between 'PropertyListing' and 'Amenity', 'Category' or 'HouseRule' table.
- The individual tables they are related to will be introduced in the following slide.
- These table are used to link other tables and hence do not necessarily need an id attribute.
  (I am considering removing these ids for the finalization phase and would appreciate feedback regarding this)
- The test case checks the link of the propertylisting to the respective table via the link of these tables by returning data of each data entry.

*X = Category/Amenity/HouseRule

Property_Category	
PK	property_category_id
FK	property_id
FK	category_id

Property_Amenity	
PK	property_amenity_id
FK	property_id
FK	amenity_id

Property_HouseRule	
PK	property_houserule_id
FK	property_id
FK	houserule_id

```sql
CREATE TABLE Property_Amenity (
    property_amenity_id INT AUTO_INCREMENT PRIMARY KEY,
    property_id INT, /*FK*/
    amenity_id INT /*FK*/
);
```

CREATE

```sql
/* Property_Amenity constraints */
ALTER TABLE Property_Amenity
ADD CONSTRAINT fk_amenity_property
FOREIGN KEY (property_id)
REFERENCES PropertyListing(propertylisting_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE Property_Amenity
ADD CONSTRAINT fk_amenity_amenity
FOREIGN KEY (amenity_id)
REFERENCES Amenity(amenity_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

INSERT

```sql
/* Property_Amenity
- this relation links the properties with their respective amentities
- each propertylisting will essentially have multiple entries with its id in this table,
each pointing at a the different amenities selected in the propertylisting
*/
INSERT INTO Property_Amenity (property_id, amenity_id) VALUES (1,1);
```

```sql
/* this test case shows the selected amenities for a certain propertylisting
- this same structure will work for categories and houserules as well, which will not be included as
they function identically to this view (with different names, etc.)
- i have essentially decided to view amenities, categories and houserules as an equivalence class
and chose Amenity as the representative. this can reduce testing workload/effort
(this can/could be reasoned as trying to reduce testing costs for example)
*/
CREATE VIEW iu_propertylisting_amentities_view AS
SELECT
    PL.propertylisting_id,
    PL.name AS property_name,
    A.name AS amenity_name
FROM PropertyListing PL
JOIN Property_Amenity PA ON PL.propertylisting_id = PA.property_id
JOIN Amenity A ON PA.amenity_id = A.amenity_id;

-- usage example of view
SELECT * FROM iu_propertylisting_amentities_view WHERE propertylisting_id = 1;
```

Test Case

```
mysql> SELECT * FROM iu_propertylisting_amentities_view WHERE propertylisting_id = 1;
+--------------------+---------------------+--------------+
| propertylisting_id | property_name       | amenity_name |
+--------------------+---------------------+--------------+
|                  1 | Cozy Studio Apartment | Kitchen      |
|                  1 | Cozy Studio Apartment | Smoke alarm  |
|                  1 | Cozy Studio Apartment | Refrigerator |
|                  1 | Cozy Studio Apartment | Dishwasher   |
|                  1 | Cozy Studio Apartment | Lockbox      |
+--------------------+---------------------+--------------+
5 rows in set (0.00 sec)
```

```
mysql> SELECT COUNT(*) FROM Amenity;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.01 sec)
```

COUNT

TABLE – AMENITY/CATEGORY/HOUSERULE

- These are the tables that are in a M:N relationship with the 'PropertyListing' table.
- Like the tables in the last slide, I also consider these tables one equivalence class.
- These table hold unexpectedly little information because they are only represented by their name and an icon in the application.
- Relevant for test cases are the relationships of these tables; these are already tested via other test cases, resulting in these simple queries, which check for content.

Category	
PK	category_id
	name
	icon_url
	created
	last_modified

Amenity	
PK	amenity_id
	name
	icon_url
	created
	last_modified

HouseRule	
PK	houserule_id
	name
	icon_url
	created
	last_modified

CREATE

```
125  CREATE TABLE Amenity (
126      amenity_id INT AUTO_INCREMENT PRIMARY KEY,
127      name VARCHAR(255),
128      icon_url VARCHAR(1024),
129      created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,
130      last_modified TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
131  );
```

INSERT

```
1890  /* Amenity
1891  - this relation is essentially a list of all the amenities that are available
1892  - this table will not be changed often, and if it does then it will likely be an admin
1893  - i selected some example amenities that actually exist in the airbnb application to serve as dummy data
1894  */
1895  INSERT INTO Amenity (name, icon_url) VALUE ("Kitchen", "https://airbnb.com/images/amenity_icon1.ico");
```

```
305  /* Amenity data */
306  SELECT * FROM Amenity;
307
308  /* Category data */
309  SELECT * FROM Category;
310
311  /* HouseRule data  */
312  SELECT * FROM HouseRule;
```

Simple tables, which are tested in test case on previous slide.

```
mysql> SELECT COUNT(*) FROM Propertytype;
+----------+
| COUNT(*) |
+----------+
|        4 |
+----------+
1 row in set (0.00 sec)
```

COUNT

*explained in the comment of the insert statement (2nd bullet point)

TABLE - PROPERTYTYPE

CREATE

```sql
CREATE TABLE PropertyType (
    propertytype_id INT AUTO_INCREMENT PRIMARY KEY,
    name VARCHAR(255),
    icon_url VARCHAR(1024),
    created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,
    last_modified TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
);
```

PropertyType	
PK	propertytype_id
	name
	icon_url
	created
	last_modified

INSERT

```sql
/* PropertyType
- refer to the property_amenity relation above for an explanation
- this is the only table i cannot insert 20 data entries with a good conciense as there are not enough propertytypes that exist in the application.
i hope it is acceptable to not make add duplicates or unsensible entries
*/
INSERT INTO PropertyType (name, icon_url) VALUES ("Entire place", "https://airbnb.com/images/propertytype_icon1.ico");
```

‘PropertyType’ is tested via the ‘PropertyListing’ table test case.

- Different to the previous three tables, the ‘PrototypeType’ is not in a M:N relation with the PropertyListing table.
- In the Airbnb application, each property is listed based on its type.
- These types are not frequently changed, and if they are, then they are changed by an admin.
- The relevant relationship of this table is already tested in the propertylisting test case, the content itself is once again tested via a simple select all statement at the end of the test.sql file.

TABLE - BOOKING

```
mysql> SELECT COUNT(*) FROM Booking;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

- Once a guest books a property, an entry in the 'Booking' table is made.
- Most of the information listed is obvious and inferred by the attribute name.
- The time frame is stated by the booking start and end dates.
- The optional 'cancelled' Boolean and the relevant 'refund_amount' is only used in case the booking is cancelled.
- The test case displays that the relationships work as intended, and the related data is properly drawn into one coherent data entry.

CREATE

```sql
CREATE TABLE Booking (
    booking_id INT AUTO_INCREMENT PRIMARY KEY,
    total_price DECIMAL(10,2) NOT NULL,
    currency_id INT DEFAULT 1, /*FK*/
    booking_start_date TIMESTAMP NOT NULL,
    booking_end_date TIMESTAMP NOT NULL,
    confirmation_code VARCHAR(16) NOT NULL,
    cancelled BOOLEAN NOT NULL,
    cancellation_date DATE,
    refund_amount DECIMAL(10,2),
    propertylisting_id INT NOT NULL, /*FK*/
    host_id INT NOT NULL, /*FK*/
    guest_id INT NOT NULL, /*FK*/
    created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP
);
```

```sql
/* Booking constraints */
ALTER TABLE Booking
ADD CONSTRAINT fk_booking_currency
FOREIGN KEY (currency_id)
REFERENCES Currency(currency_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE Booking
ADD CONSTRAINT fk_booking_propertylisting
FOREIGN KEY (propertylisting_id)
REFERENCES PropertyListing(propertylisting_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE Booking
ADD CONSTRAINT fk_booking_host
FOREIGN KEY (host_id)
REFERENCES Host(host_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE Booking
ADD CONSTRAINT fk_booking_guest
FOREIGN KEY (guest_id)
REFERENCES Guest(guest_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

Test Case

```sql
/* Booking data
- this test case serves the purpose of testing the relationships relevant to a booking table entry
*/
CREATE VIEW iu_booking_view AS
SELECT
    B.booking_id AS booking_id,
    B.propertylisting_id,
    PL.name AS propertylisting_name,
    H.host_id AS host_id,
    HU.legal_name AS host_legal_name,
    G.guest_id AS guest_id,
    GU.legal_name AS guest_legal_name
FROM Booking B
JOIN PropertyListing PL ON B.propertylisting_id = PL.propertylisting_id
JOIN Host H ON B.host_id = H.host_id
JOIN User HU ON HU.user_id = H.user_id
JOIN Guest G ON B.guest_id = G.guest_id
JOIN User GU ON GU.user_id = G.user_id;

-- usage examples of view (either look up booking via the transaction, or propertylisting)
SELECT * FROM iu_booking_view WHERE booking_id = 1;
SELECT * FROM iu_booking_view WHERE propertylisting_id = 1;
```

Booking	
PK	booking_id
	total_price
FK	currency_id
	booking_start_date
	booking_end_date
	confirmation_code
	cancelled
	cancellation_date
	refund_amount
FK	triphistory_id
FK	propertylisting_id
FK	host_id
FK	guest_id
	created

```
mysql> SELECT * FROM iu_booking_view WHERE propertylisting_id = 1;
+------------+--------------------+---------------------+---------+-----------------+----------+-----------------+
| booking_id | propertylisting_id | propertylisting_name | host_id | host_legal_name | guest_id | guest_legal_name |
+------------+--------------------+---------------------+---------+-----------------+----------+-----------------+
|          1 |                  1 | Cozy Studio Apartment |       2 | John Doe        |        3 | Dave Adams      |
+------------+--------------------+---------------------+---------+-----------------+----------+-----------------+
1 row in set (0.00 sec)
```

INSERT

```sql
/* Booking
- the booking relation holds data related to the booking of a property by a guest
- the cancellation data is obviously optional and can be NULL until updated if a cancellation occurs
*/
-- Booking 1
INSERT INTO Booking (total_price, currency_id, booking_start_date, booking_end_date, confirmation_code, cancelled, cancellation_date, refund_amount, propertylisting_id, host_id, guest_id)
VALUES (250.00, 1, '2024-03-15 12:00:00', '2024-03-20 10:00:00', 'ABCD1234', FALSE, NULL, NULL, 1, 2, 3);
```

```
mysql> SELECT COUNT(*) FROM BankInformation;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

TABLE - BANKINFORMATION

CREATE

```sql
CREATE TABLE BankInformation (
    bankinformation_id INT AUTO_INCREMENT PRIMARY KEY NOT NULL,
    owning_host_id INT NOT NULL, /*FK*/
    name VARCHAR(128) NOT NULL,
    account_nr VARCHAR(32) NOT NULL,
    code VARCHAR(64) NOT NULL,
    address_id INT NOT NULL /*FK*/
);
```

```sql
/* BankInformation constraints */
ALTER TABLE BankInformation
ADD CONSTRAINT fk_bankinfo_host
FOREIGN KEY (owning_host_id)
REFERENCES Host(host_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE BankInformation
ADD CONSTRAINT fk_bankinfo_address
FOREIGN KEY (address_id)
REFERENCES Address(address_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

BankInformation	
PK	bankinformation_id
FK	*owning_host_id*
	name
	account_nr
	code
FK	*address_id*

Tested via multiple other test cases, insert statement happens in the ‘Host’ transaction.

- As mentioned in the problem statement, Bank Information is only relevant for hosts.
- The ‘BankInformation’ table references the bank address as well its owning host user via the respective foreign keys.
- The rest of the information given in this table is example data relevant to Banks.
- This tables relationships are tested via other test cases (such as Host), the content itself is tested once again via a select all query at the end of the test.sql file.

```
mysql> SELECT COUNT(*) FROM CreditCardInformation;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

TABLE - CREDITCARDINFORMATION

CREATE

```sql
CREATE TABLE CreditCardInformation (
    creditcardinformation_id INT AUTO_INCREMENT PRIMARY KEY,
    owning_guest_id INT NOT NULL, /*FK*/
    bank VARCHAR(128) NOT NULL,
    card_number VARCHAR(64) NOT NULL,
    cvc_code VARCHAR(3) NOT NULL,
    expiration_date DATE NOT NULL
);
```

CreditCardInformation	
PK	creditcardinformation_id
FK	*owning_guest_id*
	bank
	card_number
	cvc_code
	expiration_date

```sql
/* CreditCardInformation constraints */
ALTER TABLE CreditCardInformation
ADD CONSTRAINT fk_ccinformation_guest
FOREIGN KEY (owning_guest_id)
REFERENCES Guest(guest_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

Tested via multiple other test cases, insert statement happens in the ‘Guest’ transaction.

- As stated in the problem statement, Credit Card Information is only relevant for guests.
- The ‘CreditCardInformation’ table references its owning host user via the foreign key.
- The rest of the information given in this table is example data relevant to credit cards.
- Counterpart to the previous table, it is likewise tested in the relevant user table, in this case ‘Guest’.
- Both tables are also tested in the test cases of the ‘Transaction’ table in the following slide.

TABLE - TRANSACTION

```
mysql> SELECT COUNT(*) FROM Transaction;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

- The transaction holds relevant payment information for each booking.
- The table references ‘BankInformation’ and ‘CreditCardInformation’, as well as the booking it was made for.
- The test case can be used to check if the relationships of the transaction table and the respective payment information and ‘booking_id’ are plausible.

CREATE

```
CREATE TABLE Transaction (
    transaction_id INT AUTO_INCREMENT PRIMARY KEY,
    booking_id INT NOT NULL, /*FK*/
    bankinformation_id INT, /*FK*/
    creditcardinformation_id INT, /*FK*/
    created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,
    last_modified TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
);
```

```
/* Transaction constraints */
ALTER TABLE Transaction
ADD CONSTRAINT fk_transaction_booking
FOREIGN KEY (booking_id)
REFERENCES Booking(booking_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE Transaction
ADD CONSTRAINT fk_transaction_bankinformation
FOREIGN KEY (bankinformation_id)
REFERENCES BankInformation(bankinformation_id)
ON DELETE CASCADE ON UPDATE CASCADE;

ALTER TABLE Transaction
ADD CONSTRAINT fk_transaction_creditcard
FOREIGN KEY (creditcardinformation_id)
REFERENCES CreditCardInformation(creditcardinformation_id)
ON DELETE CASCADE ON UPDATE CASCADE;
```

INSERT

```
/* Transaction
- this table again does not make a whole lot of sense without the application actually pulling in the relevant data from their respective tables
- the table is intended to be the base lookup table for purchase transaction data
*/
-- Transaction 1
INSERT INTO Transaction (booking_id, bankinformation_id, creditcardinformation_id)
VALUES (1, 2, 3);
```

Test Case

```
/* Transaction, CreditCard, Bankinformation data
- Test case that shows the relation between transactions with payment informations, such as
credit cards or banks and the corresponding booking
- (this test case will be seen as sufficient for testing the proper implementaiton of the tables that are
a part of it)
*/
CREATE VIEW iu_transaction_view AS
SELECT
    T.*,
    B.booking_id AS Booking_id_ref,
    CCI.creditcardinformation_id AS creditcard_id,
    CCI.card_number AS creditcard_number,
    BI.bankinformation_id AS bankinfo_id,
    BI.account_nr AS bank_account_number
FROM Transaction T
JOIN Booking B ON T.booking_id = B.booking_id
JOIN CreditCardInformation CCI ON T.creditcardinformation_id = CCI.creditcardinformation_id
JOIN BankInformation BI ON T.bankinformation_id = BI.bankinformation_id;

-- usage examples of view (either look up data via the transaction, or booking)
SELECT * FROM iu_transaction_view WHERE transaction_id = 1;
SELECT * FROM iu_transaction_view WHERE booking_id = 1;
```

Transaction	
PK	transaction_id
FK	*booking_id*
FK	*bankinformation_id*
FK	*creditcardinformation_id*
	created
	last_modified

```
mysql> SELECT * FROM iu_transaction_view WHERE transaction_id = 1;
+----------------+------------+-------------------+-------------------------+---------------------+---------------------+----------------+---------------+---------------------+-------------+---------------------+
| transaction_id | booking_id | bankinformation_id | creditcardinformation_id | created             | last_modified       | Booking_id_ref | creditcard_id | creditcard_number   | bankinfo_id | bank_account_number |
+----------------+------------+-------------------+-------------------------+---------------------+---------------------+----------------+---------------+---------------------+-------------+---------------------+
|              1 |          1 |                 2 |                       3 | 2024-01-08 10:03:59 | 2024-01-08 10:03:59 |              1 |             3 | 0195402326072019    |           2 | 9876543210          |
+----------------+------------+-------------------+-------------------------+---------------------+---------------------+----------------+---------------+---------------------+-------------+---------------------+
1 row in set (0.00 sec)
```

```
mysql> SELECT COUNT(*) FROM Giftcard;
+----------+
| COUNT(*) |
+----------+
|       20 |
+----------+
1 row in set (0.00 sec)
```

COUNT

TABLE - GIFTCARD

CREATE

```sql
CREATE TABLE GiftCard (
    giftcard_code VARCHAR(16) PRIMARY KEY,
    amount DECIMAL(10,2) NOT NULL,
    currency_id INT NOT NULL DEFAULT 1, /*FK*/
    valid_until_date TIMESTAMP NOT NULL,
    created TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP
);
```

GiftCard	
PK	giftcard_code
FK	amount
	currency_id
	valid_until_date
	created

INSERT

```sql
INSERT INTO GiftCard (giftcard_code, amount, currency_id, valid_until_date)
VALUES ("TYTYZSNBMAQRTJOY", 15.00, 1, TIMESTAMP("2024-08-31", "00:00:00"));
```

‘GiftCard’ is a simple table, see content test in test.sql

- The ‘GiftCard’ table contains information relevant to gift cards.
- The ‘amount’ attribute in combination with the ‘currency_id’ attribute are used to store the value of the gift card.
- The GiftCard table is quite simple and not as important as other tables to the functionality of the system and therefore does not warrant a complicated test case, content is checked again at the end of the test.sql file.

THANKS FOR READING

I am looking forward to your feedback!