Database

step-by-step creation of a simple databases

Specification of the problem

In our database, we want to manage information about **recipes** and its **ingredients**.

An example would be tea, which contains, for example, hot water, a dried mixture of tea leaves and optionally sugar.

Ingredients

We want to record the **name** of the ingredients. To simplify our task, we will not register anything else with them. To clearly distinguish the ingredients from each other, we choose a unique identifier in the form of a unique number.

- **id**
  - unique value for each record
  - a positive integer
  - required value
- **name**
  - text
  - required value

Recipe

We will also simplify the recipe itself. We will only record the name, the date of entering the recipe into the database and again a unique identifier.

- **id**
  - unique value for each record
  - a positive integer
  - required value
- **name**
  - text
  - required value
- **dttm**
  - Date and time: YYYY-MM-DD HH:MM:SS
  - required value

Table with relationships

recipe

id	name	dttm
1	tea	2023-09-10 14:00:00
2	pancake	2023-09-10 15:20:00
3	chicken schnitzel	2023-10-01 16:00:00
4	cappuccino	2023-10-15 08:00:00

We can visualize the data in tables.

ingredient

id	name
1	water
2	tea leaves
3	salt
4	sugar
5	flour
6	pork
7	egg
8	milk
9	chicken breast

Relationships between records

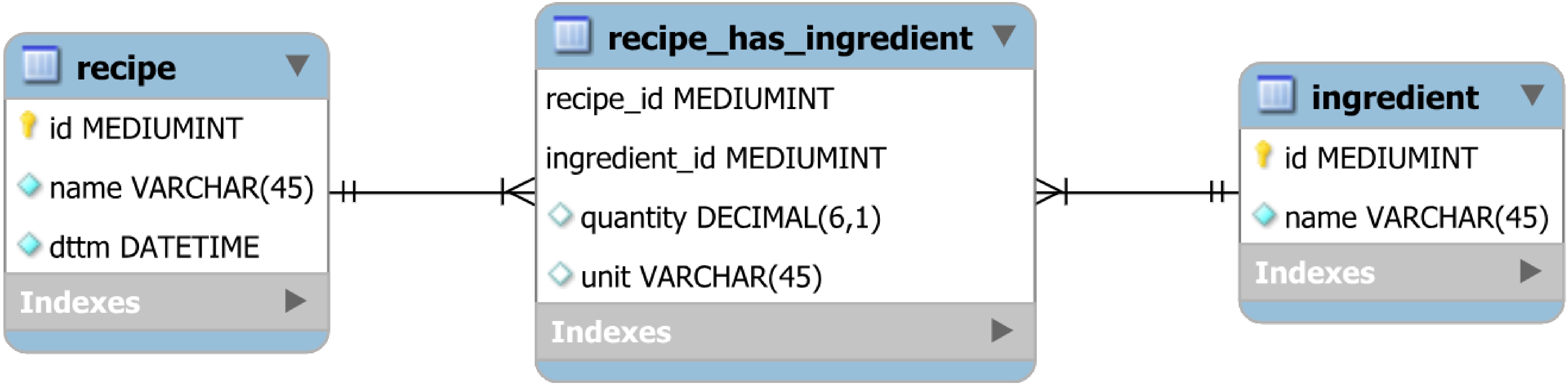
We record recipes and ingredients, but we do not link them together. It is not yet possible to determine what ingredients the tea is made from.

So, we must think about the **relationship** itself and what we expect from it.

Relationship properties:

- Recipe must have at least one ingredient. There may be more.
- An ingredient can be in more than one recipe. For example, milk can be in a pancake recipe as well as a milkshake.
- From the relationship of the ingredient to the recipe, we should also know the quantity.

E-R diagram (MySQL Workbench)



recipe

id MEDIUMINT

name VARCHAR(45)

dttm DATETIME

Indexes

recipe_has_ingredient

recipe_id MEDIUMINT

ingredient_id MEDIUMINT

quantity DECIMAL(6,1)

unit VARCHAR(45)

Indexes

ingredient

id MEDIUMINT

name VARCHAR(45)

Indexes

Table again

recipe

id	name	dttm
1	tea	2023-09-10 14:00:00
2	pancake	2023-09-10 15:20:00
3	chicken schnitzel	2023-10-01 16:00:00
4	cappuccino	2023-10-15 08:00:00

recipe_has_ingredient

recipe_id	ingredient_id	quantity	unit
1	1	250	ml
1	2	3	g
1	4	4	g

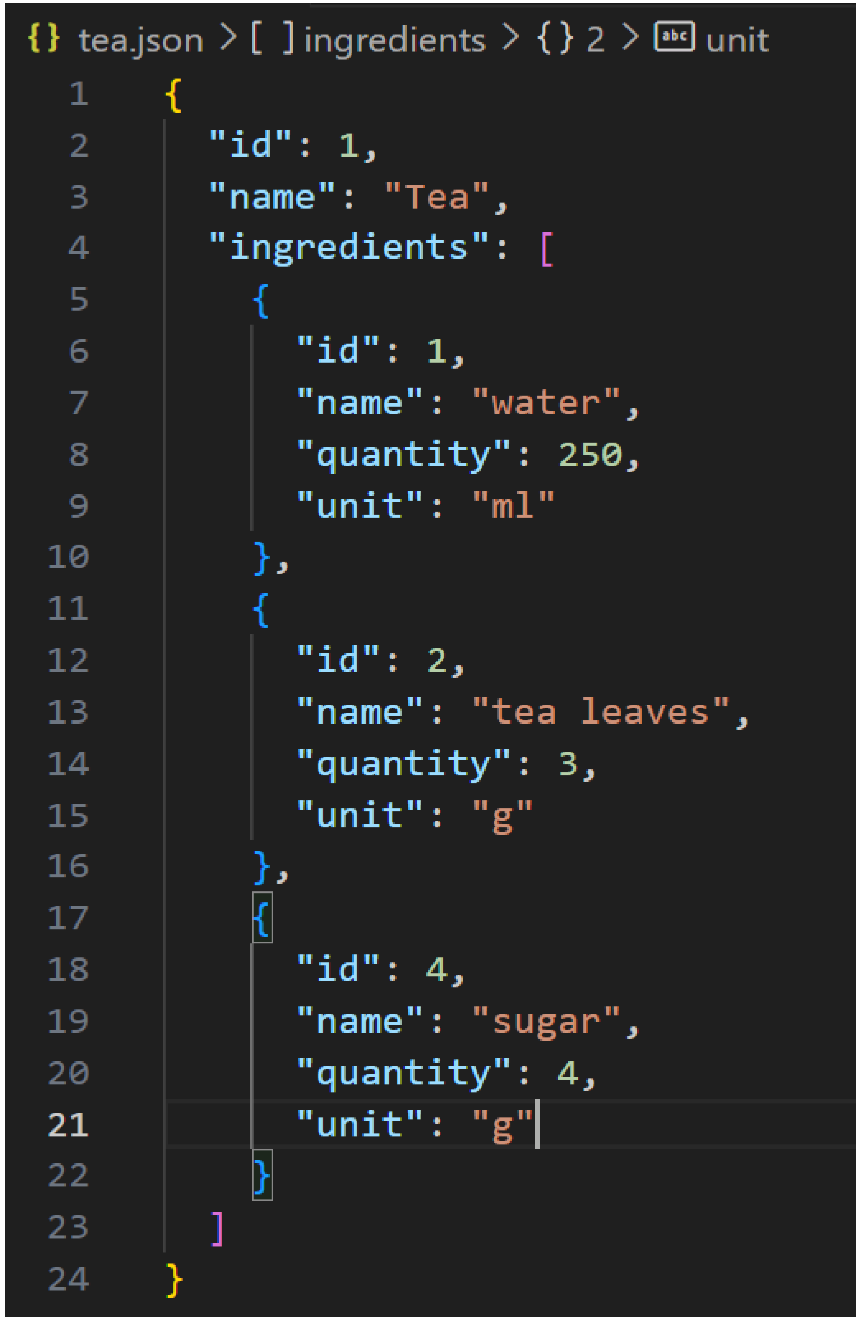
ingredient

id	name
1	water
2	tea leaves
3	salt
4	sugar
5	flour
6	pork
7	egg
8	milk
9	chicken breast

File formats

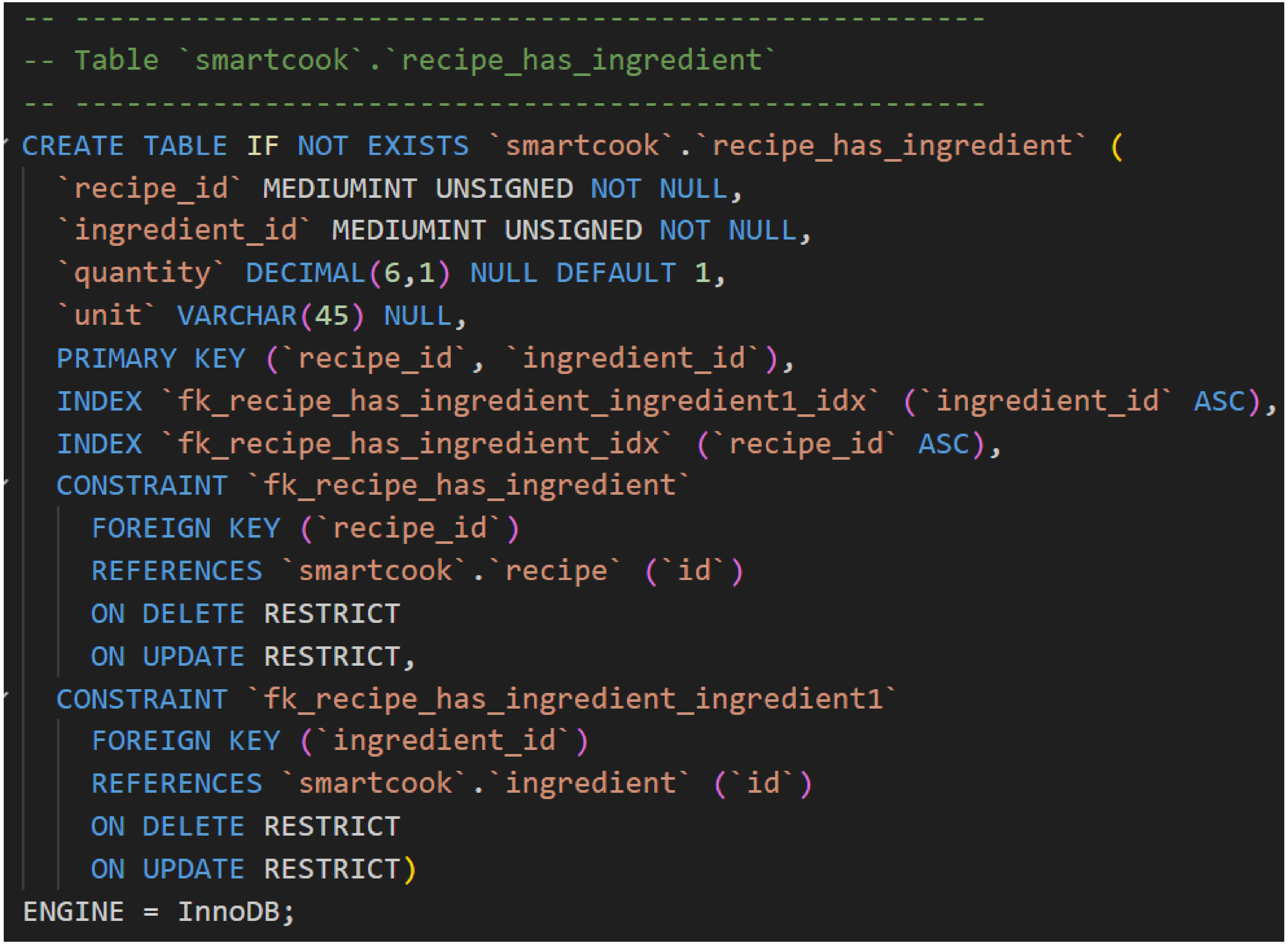
Databases also use special data file formats for data transfer:

- JSON
- XML
- CSV



```json
{
  "id": 1,
  "name": "Tea",
  "ingredients": [
    {
      "id": 1,
      "name": "water",
      "quantity": 250,
      "unit": "ml"
    },
    {
      "id": 2,
      "name": "tea leaves",
      "quantity": 3,
      "unit": "g"
    },
    {
      "id": 4,
      "name": "sugar",
      "quantity": 4,
      "unit": "g"
    }
  ]
}
```

SQL



```sql
-- -----------------------------------------------------
-- Table `smartcook`.`recipe_has_ingredient`
-- -----------------------------------------------------
CREATE TABLE IF NOT EXISTS `smartcook`.`recipe_has_ingredient` (
  `recipe_id` MEDIUMINT UNSIGNED NOT NULL,
  `ingredient_id` MEDIUMINT UNSIGNED NOT NULL,
  `quantity` DECIMAL(6,1) NULL DEFAULT 1,
  `unit` VARCHAR(45) NULL,
  PRIMARY KEY (`recipe_id`, `ingredient_id`),
  INDEX `fk_recipe_has_ingredient_ingredient1_idx` (`ingredient_id` ASC),
  INDEX `fk_recipe_has_ingredient_idx` (`recipe_id` ASC),
  CONSTRAINT `fk_recipe_has_ingredient`
    FOREIGN KEY (`recipe_id`)
    REFERENCES `smartcook`.`recipe` (`id`)
    ON DELETE RESTRICT
    ON UPDATE RESTRICT,
  CONSTRAINT `fk_recipe_has_ingredient_ingredient1`
    FOREIGN KEY (`ingredient_id`)
    REFERENCES `smartcook`.`ingredient` (`id`)
    ON DELETE RESTRICT
    ON UPDATE RESTRICT)
ENGINE = InnoDB;
```

SQL

```
INSERT INTO ingredient VALUES (NULL, ‘sugar')

INSERT INTO ingredient(name) VALUES ('salt'), ('milk'), ('water')

UPDATE ingredient SET name=‘butter‘ WHERE id=4

DELETE FROM ingredient WHERE id=3
```