SKILLPILLS

Skill Pill: Database Manipulation

Session 2 - SQL requests

OIST

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- Let's suppose we have a database, how can we get the information out?

- We use Structured Query Language (SQL)

- While SQL is standard, there are many implementations and variants (MySQL, Oracle-SQL, PostgreSQL, Microsoft SQL Server…)
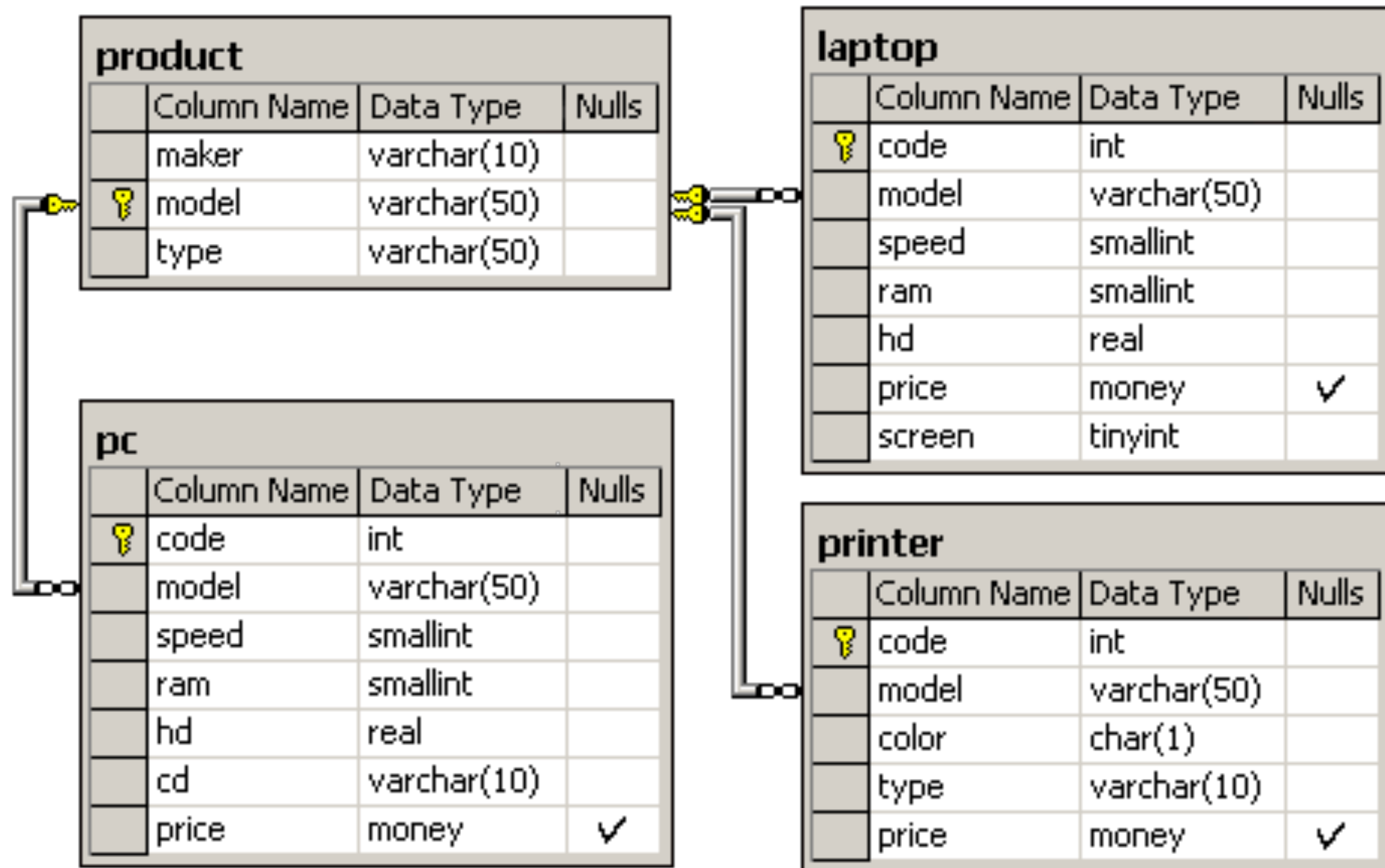
Let's jump right to it!

- Open up a terminal

- Access the (temporary) Skill Pill MySQL server:

  ★ `ssh your_OIST_username@skillpills`

  ★ `mysql -u userX -p -h localhost`

- Select the pre-existing database:

  ★ `USE userX;`

- We're in!

The computer database

- Check what tables exist in the DB

  ★ `SHOW TABLES;`

- Get details on any table:

  ★ `DESCRIBE table_of_interest;`

- Display all the data in the PC table:
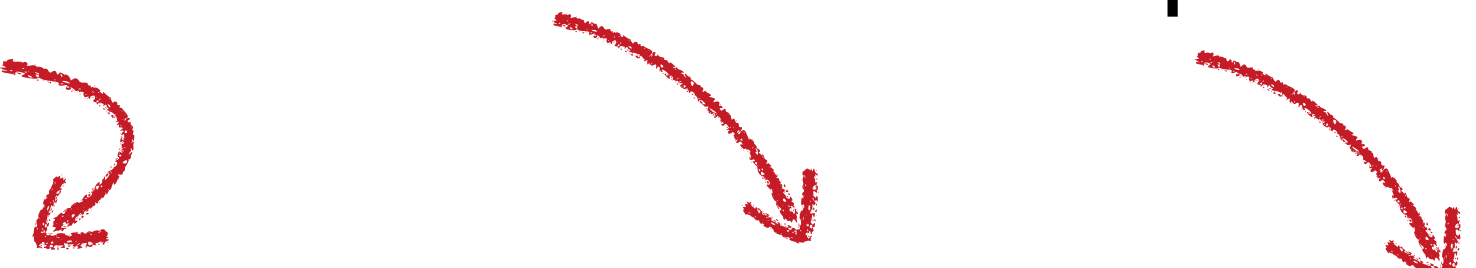
  ★ `SELECT * FROM PC;`

The computer database

product

	Column Name	Data Type	Nulls
	maker	varchar(10)	
🔑	model	varchar(50)	
	type	varchar(50)	

pc

	Column Name	Data Type	Nulls
🔑	code	int	
	model	varchar(50)	
	speed	smallint	
	ram	smallint	
	hd	real	
	cd	varchar(10)	
	price	money	✓

laptop

	Column Name	Data Type	Nulls
🔑	code	int	
	model	varchar(50)	
	speed	smallint	
	ram	smallint	
	hd	real	
	price	money	✓
	screen	tinyint	

printer

	Column Name	Data Type	Nulls
🔑	code	int	
	model	varchar(50)	
	color	char(1)	
	type	varchar(10)	
	price	money	✓

http://www.sql-ex.ru

Comparaison predicates

column names

table name

comparaison

```
SELECT model, speed FROM PC WHERE HD=10;
```

Exercices

1. Find the model number, speed and hard drive capacity for all the PCs with prices below $500.
2. Find all records from the Printer table about color printers.
3. List all printer makers.

DISTINCT and comparisons

To avoid duplicate answers:

```
SELECT DISTINCT maker FROM Product
WHERE type='printer';
```

To enter more criteria:

field = value1   field IN (value1, value2)
field <> value1   field NOT IN (value1, value2)
field LIKE 'value _ %'   field BETWEEN value1 AND value2
field IS NULL   condition1 AND condition2
field IS NOT NULL   condition1 OR condition2

Exercices

1. Find the model number, speed and hard drive capacity of PCs cheaper than $600 having a 12x or a 24x CD drive
2. Find all the information there is on PCs with a CD drive speed multiple of 10x.

To order the answers (ASC is default):

```
SELECT * FROM PC
ORDER BY price, speed DESC;
```

You can combine the answers

Alias

```
SELECT
model + SQRT(speed) as crazy_number
FROM PC;
```

Exercice

1. For each element in the PC table, calculate $B = speed \times HD^2$ and order the answers by ascending values of B.

Multiple tables

Goal: Print all PC models along with their maker.

PC

model	price
1	200
2	300

Solution 1: using multiple tables

Product

mod	maker
2	A
3	B

`SELECT * FROM PC, Product;`

model	price	mod	maker
1	200	2	A
1	200	3	B
2	300	2	A
2	300	3	B

`SELECT * FROM PC, Product`
`WHERE PC.model=Product.mod;`

model	price	mod	maker
2	300	2	A

Goal: Print all PC models along with their maker.

PC

model	price
1	200
2	300

Solution 2: using JOIN

Product

mod	maker
2	A
3	B

```
SELECT * FROM PC JOIN Product p
      ON PC.model=p.mod;
```

model	price	mod	maker
2	300	2	A

```
SELECT * FROM PC LEFT JOIN Product p
      ON PC.model=p.mod;
```

model	price	mod	maker
1	200	NULL	NULL
2	300	2	A

```
SELECT * FROM PC RIGHT JOIN Product p
      ON PC.model=p.mod;
```

model	price	mod	maker
2	300	2	A
NULL	NULL	3	B

JOIN

```
SELECT * FROM PC
[LEFT, RIGHT] JOIN Product p
    ON PC.model=p.model;
```

Exercices

1. Print all PC models along with their maker.
2. For each maker, find the speed of laptops with a hard drive capacity of 10 Gb or higher. Result set: maker, speed.
3. Find the makers of PCs with a processor speed of 450 MHz or more.

Aggregation

```
SELECT COUNT(*), MAX(hd), MIN(hd) FROM PC;
```

You can aggregate globally, like above, or by sub-groups, like below

```
SELECT cd, COUNT(*), MAX(hd), MIN(hd)
        FROM PC GROUP BY cd;
```

or even finer

```
SELECT cd, ram, COUNT(*), MAX(hd), MIN(hd)
        FROM PC GROUP BY cd, ram;
```

Exercices

1. Find out the average speed of the laptops priced over $1000.
2. Find out the average speed of the PCs produced by each maker. Result set: maker, speed.

You can impose conditions on the sub-groups

```
SELECT cd, COUNT(*), MAX(hd), MIN(hd)
FROM PC GROUP BY cd HAVING COUNT(*)=2;
```

Exercices

1. Get the makers who produce only one product type and more than one model. Result set: maker, type.
2. Get hard drive capacities that are identical for two or more PCs. Result set: hd.

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```
SELECT speed FROM PC
        UNION
SELECT speed FROM Laptop;
```

Exercice

1. Find out the models and prices for all the products (of any type) produced by maker B.

Subqueries

```
       SELECT model, speed FROM PC
WHERE speed NOT IN (SELECT speed FROM Laptop);


         SELECT model, speed,
       (SELECT COUNT(*) FROM PC p2
   WHERE p2.speed=p1.speed ) speed_count
              FROM PC p1;
```

Exercice

1. Find the printer models having the highest price. Result set: model, price.
2. Get the laptop models that have a speed smaller than the speed of any PC. Result set: type, model, speed.