Database Management System Homework 1 ----- NotAP

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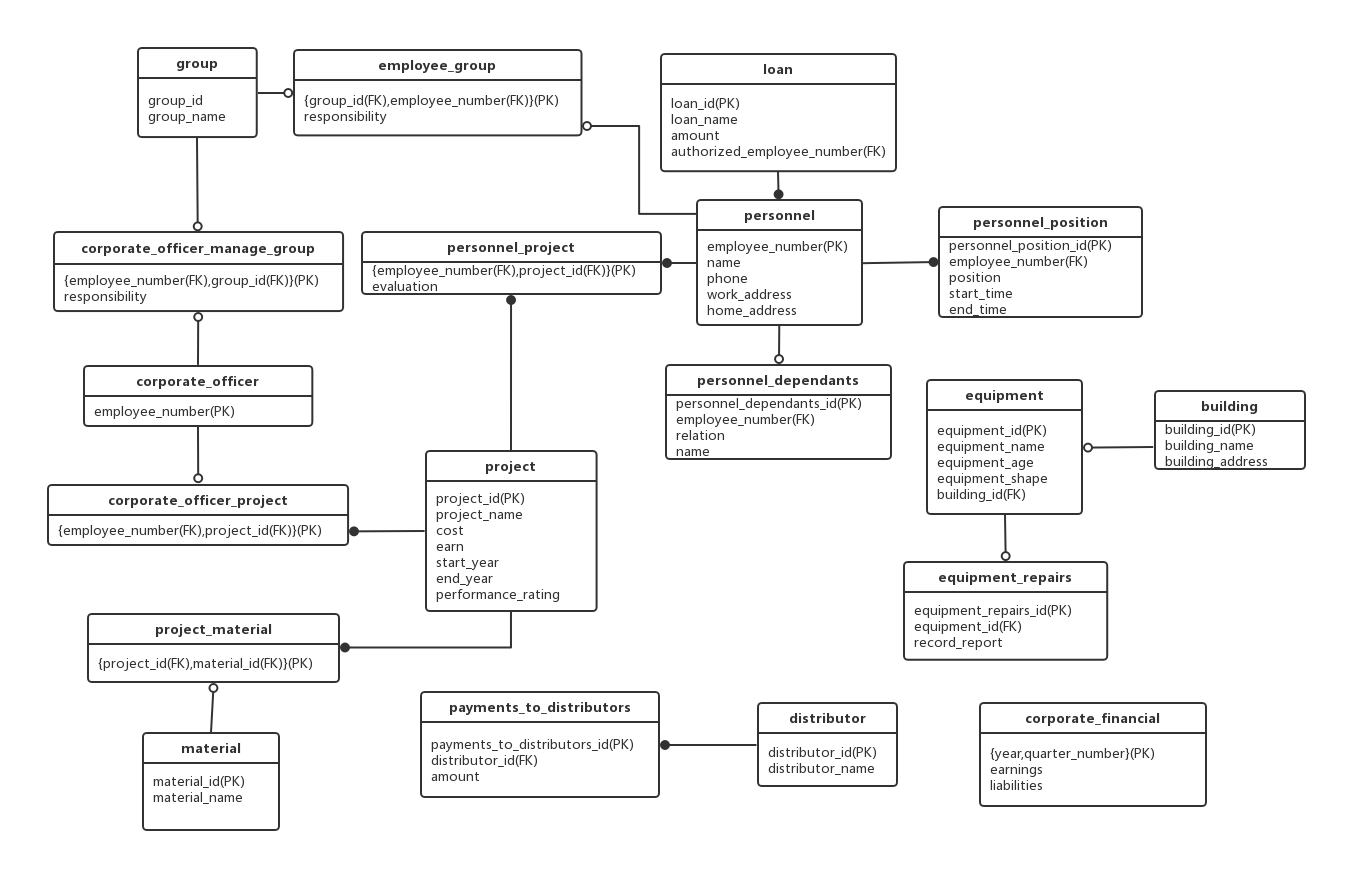
Xianzhao Liao

**outline**

To make the management easier, we design a database named NotAP, which can be used for the company. This database aims to carry out efficient information management. Based on this goal, we create 19 tables to store the information. In order to avoid anomalies and simplify the organization, all of the tables are in 3NF.

The design of these tables is based on the relationship among entities. There are mainly five entities: personnel, facilities, projects, financial and organization structure. After analyzing the attributes and relationship of these entities, we design the database as following figure. To test the function of the database, we add some tuples to each table.

**ER Diagram**



**Tables and explanations**

**Create schema:**

DROP DATABASE IF EXISTS NotAP;

CREATE DATABASE NotAP;

USE NotAP;

**(1)personnel table**

|  |
| --- |
|  |

CREATE TABLE `personnel` (

`employee\_number` int(11) NOT NULL,

`name` varchar(45) NOT NULL,

`phone` varchar(20) NOT NULL,

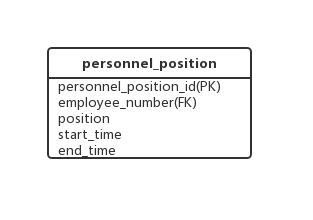
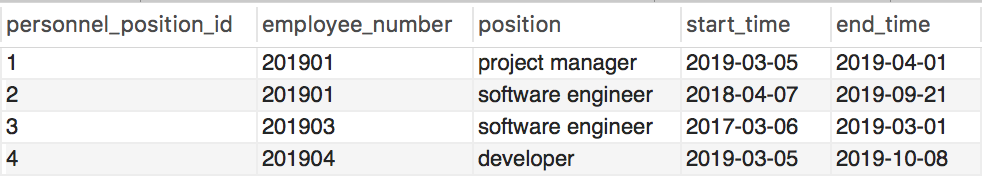
`work\_address` varchar(45) DEFAULT 'null',

`home\_address` varchar(45) DEFAULT 'null',

PRIMARY KEY (`employee\_number`)

)

**(2)personnel\_position table**

CREATE TABLE `personnel\_position` (

`personnel\_position\_id` int(11) NOT NULL AUTO\_INCREMENT,

`employee\_number` int(11) NOT NULL,

`position` varchar(45) NOT NULL,

`start\_time` date DEFAULT NULL,

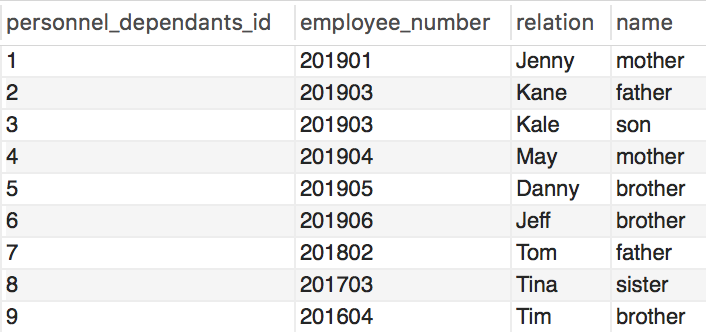
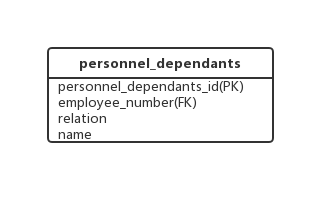
`end\_time` date DEFAULT NULL,

PRIMARY KEY (`personnel\_position\_id`),

KEY `personnel\_position\_ibfk\_1\_idx` (`employee\_number`),

CONSTRAINT `personnel\_position\_ibfk\_1` FOREIGN KEY (`employee\_number`) REFERENCES `personnel` (`employee\_number`) ON DELETE CASCADE ON UPDATE RESTRICT)

**(3)personnel\_dependants table**



CREATE TABLE `personnel\_dependants` (

`personnel\_dependants\_id` int(11) NOT NULL AUTO\_INCREMENT,

`employee\_number` int(11) NOT NULL,

`relation` varchar(45) NOT NULL,

`name` varchar(45) NOT NULL,

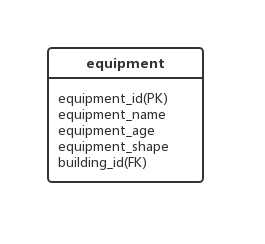
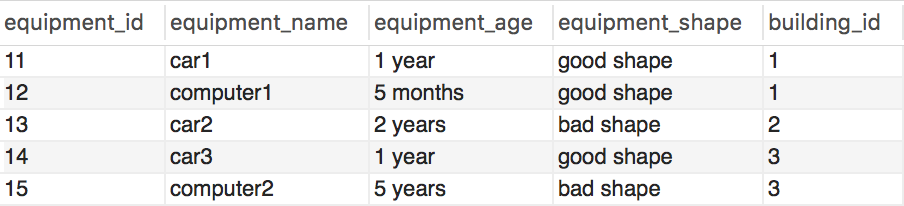
PRIMARY KEY (`personnel\_dependants\_id`),

KEY `personnel\_dependants\_ibfk\_1\_idx` (`employee\_number`),

CONSTRAINT `personnel\_dependants\_ibfk\_1` FOREIGN KEY (`employee\_number`) REFERENCES `personnel` (`employee\_number`) ON DELETE CASCADE ON UPDATE RESTRICT

)

**(4)equipment table**

CREATE TABLE `equipment` (

`equipment\_id` int(11) NOT NULL,

`equipment\_name` varchar(45) NOT NULL,

`equipment\_age` varchar(45) NOT NULL,

`equipment\_shape` varchar(45) NOT NULL,

`building\_id` int(11) DEFAULT NULL,

PRIMARY KEY (`equipment\_id`),

KEY `equipment\_ibfk\_1\_idx` (`building\_id`),

CONSTRAINT `equipment\_ibfk\_1` FOREIGN KEY (`building\_id`) REFERENCES `building` (`building\_id`) ON DELETE SET NULL

)

**Explanation：**

1 NF

all domains contains scalar values

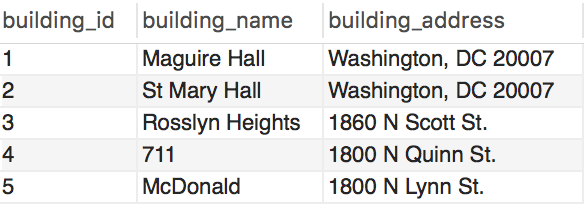
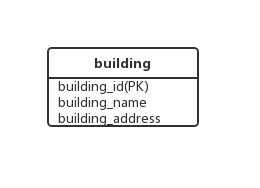
2NF

Non-key attributes are fully dependent on equipment\_id

3NF

Non-key attributes are non-transitively dependent on equipment\_id

**(5)building table**



CREATE TABLE `building` (

`building\_id` int(11) NOT NULL,

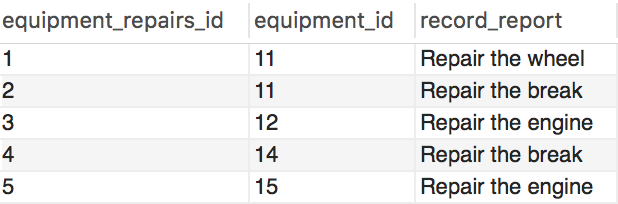
`building\_name` varchar(45) NOT NULL,

`building\_address` varchar(45) NOT NULL,

PRIMARY KEY (`building\_id`)

)

**(6)equipment\_repairs table**



CREATE TABLE `equipment\_repairs` (

`equipment\_repairs\_id` int(11) NOT NULL,

`equipment\_id` int(11) NOT NULL,

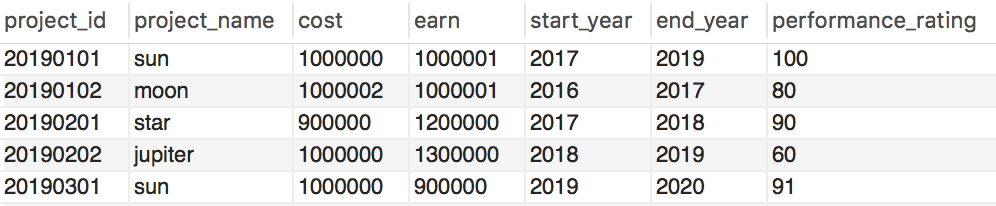
`record\_report` varchar(100) DEFAULT NULL,

PRIMARY KEY (`equipment\_repairs\_id`),

KEY `equipment\_repairs\_ibfk\_1\_idx` (`equipment\_id`),

CONSTRAINT `equipment\_repairs\_ibfk\_1` FOREIGN KEY (`equipment\_id`) REFERENCES `equipment` (`equipment\_id`) ON UPDATE RESTRICT ON DELETE NO ACTION)

**(7)project table**



CREATE TABLE `project` (

`project\_id` int(11) NOT NULL,

`project\_name` varchar(45) NOT NULL,

`cost` int(20) DEFAULT NULL,

`earn` int(20) DEFAULT NULL,

`start\_year` year(4) DEFAULT NULL,

`end\_year` year(4) DEFAULT NULL,

`performance\_rating` int(3) DEFAULT NULL,

PRIMARY KEY (`project\_id`)

)

**Explanation：**

1 NF

all domains contains scalar values

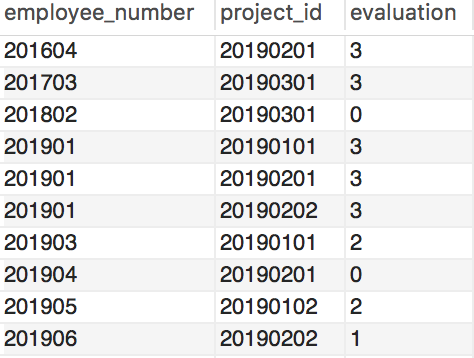
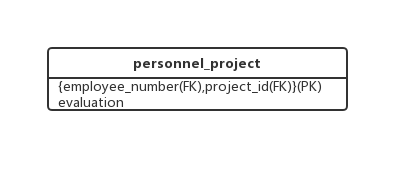
2NF

Non-key attributes are fully dependent on equipment\_id

3NF

Non-key attributes are non-transitively dependent on equipment\_id

**(8)personnel\_project table**



CREATE TABLE `personnel\_project` (

`employee\_number` int(11) NOT NULL,

`project\_id` int(11) NOT NULL,

`evaluation` int(1) NOT NULL COMMENT '0:poor1:fair2:good3:great',

PRIMARY KEY (`employee\_number`,`project\_id`),

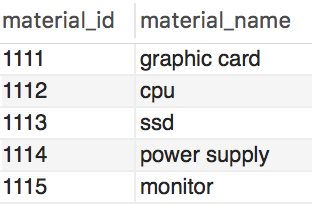
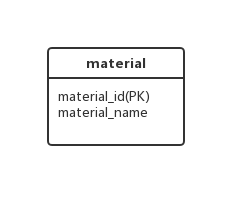
KEY `personnel\_project\_ibfk\_2\_idx` (`project\_id`),

CONSTRAINT `personnel\_project\_ibfk\_1` FOREIGN KEY (`employee\_number`) REFERENCES `personnel` (`employee\_number`) ON DELETE CASCADE ON UPDATE RESTRICT,

CONSTRAINT `personnel\_project\_ibfk\_2` FOREIGN KEY (`project\_id`) REFERENCES `project` (`project\_id`) ON DELETE CASCADE ON UPDATE RESTRICT

)

**(9)material table**



CREATE TABLE `material` (

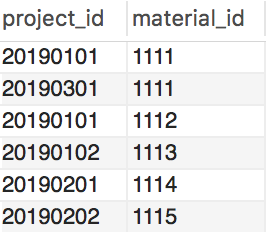
`material\_id` int(11) NOT NULL,

`material\_name` varchar(45) NOT NULL,

PRIMARY KEY (`material\_id`)

)

**(10)project\_material table**



CREATE TABLE `project\_material` (

`project\_id` int(11) NOT NULL,

`material\_id` int(11) NOT NULL,

PRIMARY KEY (`project\_id`,`material\_id`),

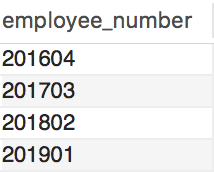
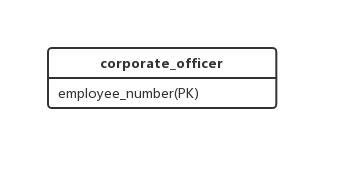
KEY `project\_material\_ibfk\_2\_idx` (`material\_id`),

CONSTRAINT `project\_material\_ibfk\_1` FOREIGN KEY (`project\_id`) REFERENCES `project` (`project\_id`) ON UPDATE RESTRICT,

CONSTRAINT `project\_material\_ibfk\_2` FOREIGN KEY (`material\_id`) REFERENCES `material` (`material\_id`) ON UPDATE RESTRICT

)

**(11)corporate officer table**



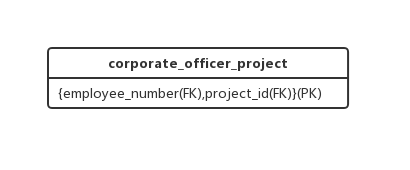
CREATE TABLE `corporate\_officer` (

`employee\_number` int(11) NOT NULL,

PRIMARY KEY (`employee\_number`)

)

**(12)corporate\_officer\_project table**



CREATE TABLE `corporate\_officer\_project` (

`employee\_number` int(11) NOT NULL,

`project\_id` int(11) NOT NULL,

PRIMARY KEY (`employee\_number`,`project\_id`),

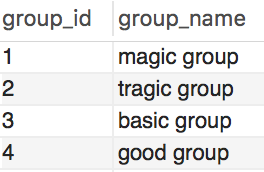
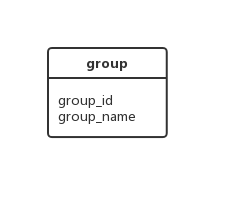
KEY `corporate\_officer\_project\_ibfk\_1\_idx` (`project\_id`),

CONSTRAINT `corporate\_officer\_project\_ibfk\_1` FOREIGN KEY (`employee\_number`) REFERENCES `corporate\_officer` (`employee\_number`) ON UPDATE RESTRICT,

CONSTRAINT `corporate\_officer\_project\_ibfk\_2` FOREIGN KEY (`project\_id`) REFERENCES `project` (`project\_id`) ON UPDATE RESTRICT

)

**(13)group table**



CREATE TABLE `group` (

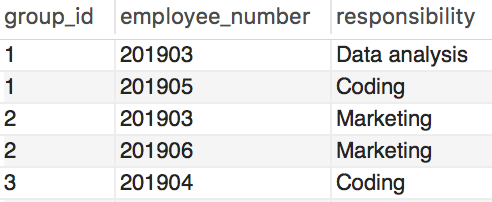
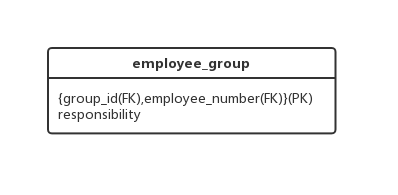
`group\_id` int(11) NOT NULL,

`group\_name` varchar(45) NOT NULL,

PRIMARY KEY (`group\_id`)

)

**(14)employee\_group table**



CREATE TABLE `employee\_group` (

`group\_id` int(11) NOT NULL,

`employee\_number` int(11) NOT NULL,

`responsibility` varchar(45) DEFAULT NULL,

PRIMARY KEY (`group\_id`,`employee\_number`),

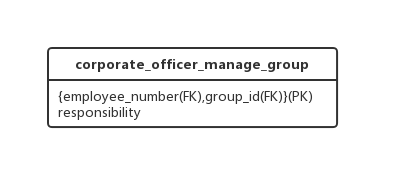
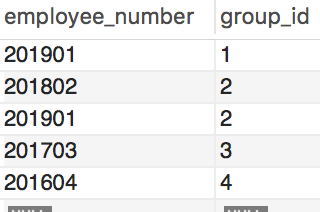
KEY `employee\_group\_ibfk\_1\_idx` (`employee\_number`),

CONSTRAINT `employee\_group\_ibfk\_1` FOREIGN KEY (`employee\_number`) REFERENCES `personnel` (`employee\_number`) ON DELETE CASCADE ON UPDATE RESTRICT,

CONSTRAINT `employee\_group\_ibfk\_2` FOREIGN KEY (`group\_id`) REFERENCES `group` (`group\_id`) ON DELETE CASCADE ON UPDATE RESTRICT

)

**(15)corporate\_officer\_manage\_group table**

CREATE TABLE `corporate\_officer\_manage\_group` (

`employee\_number` int(11) NOT NULL,

`group\_id` int(11) NOT NULL,

`responsibility` varchar(45) NOT NULL,

PRIMARY KEY (`employee\_number`,`group\_id`),

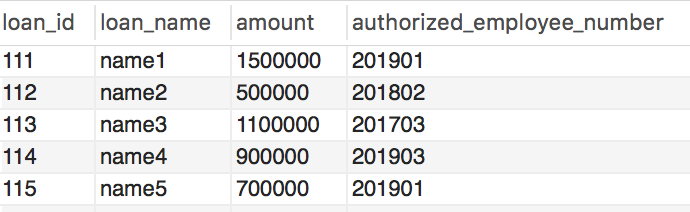
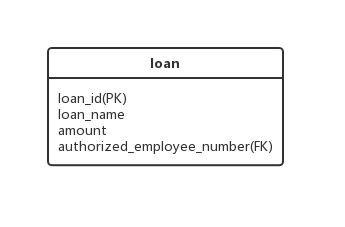
KEY `corporate\_officer\_manage\_group\_ibfk\_2\_idx` (`group\_id`),

CONSTRAINT `corporate\_officer\_manage\_group\_ibfk\_1` FOREIGN KEY (`employee\_number`) REFERENCES `corporate\_officer` (`employee\_number`) ON DELETE CASCADE ON UPDATE RESTRICT,

CONSTRAINT `corporate\_officer\_manage\_group\_ibfk\_2` FOREIGN KEY (`group\_id`) REFERENCES `group` (`group\_id`) ON DELETE CASCADE ON UPDATE RESTRICT

)

**(16)loan table**



CREATE TABLE `loan` (

`loan\_id` int(11) NOT NULL,

`loan\_name` varchar(45) DEFAULT NULL,

`amount` int(20) DEFAULT NULL,

`authorized\_employee\_number` int(11) DEFAULT NULL,

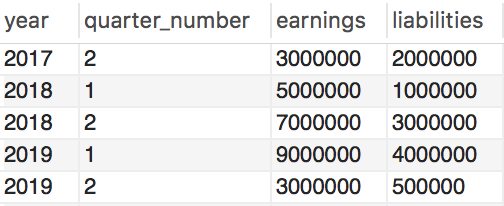
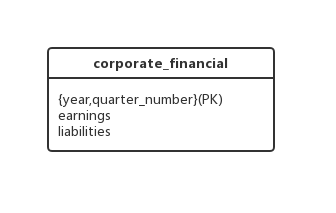
PRIMARY KEY (`loan\_id`),

KEY `loan\_ibfk\_1\_idx` (`authorized\_employee\_number`),

CONSTRAINT `loan\_ibfk\_1` FOREIGN KEY (`authorized\_employee\_number`) REFERENCES `personnel` (`employee\_number`)

)

**(17)corporate\_financial**



CREATE TABLE `corporate\_financial` (

`year` year(4) NOT NULL,

`quarter\_number` int(1) NOT NULL,

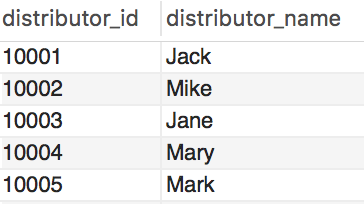
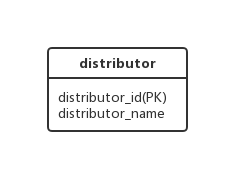
`earnings` int(11) NOT NULL,

`liabilities` int(11) NOT NULL,

PRIMARY KEY (`year`,`quarter\_number`)

)

**(18)distributor table**



CREATE TABLE `distributor` (

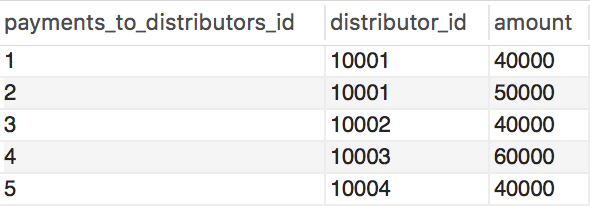
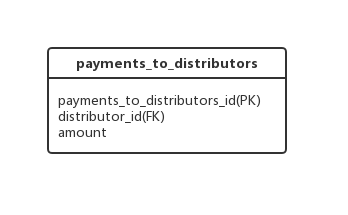
`distributor\_id` int(11) NOT NULL,

`distributor\_name` varchar(45) NOT NULL,

PRIMARY KEY (`distributor\_id`)

)

**(19)payments\_to\_distributors table**



CREATE TABLE `payments\_to\_distributors` (

`payments\_to\_distributors\_id` int(11) NOT NULL,

`distributor\_id` int(11) NOT NULL,

`amount` int(20) NOT NULL,

PRIMARY KEY (`payments\_to\_distributors\_id`),

KEY `payments\_to\_distributors\_ibfk\_1\_idx` (`distributor\_id`),

CONSTRAINT `payments\_to\_distributors\_ibfk\_1` FOREIGN KEY (`distributor\_id`) REFERENCES `distributor` (`distributor\_id`) ON DELETE RESTRICT ON UPDATE RESTRICT

)

**Queries**

* use NotAP;

SELECT DISTINCT a.employee\_number, a.name

FROM personnel a, personnel\_project b, project c

WHERE c.performance\_rating >= 90

AND b.project\_id = c.project\_id

AND a.employee\_number = b.employee\_number;

**Explanation: We use distinct to avoid duplicates.**



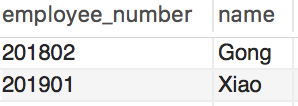
* use NotAP;

SELECT b.employee\_number, b.name

FROM corporate\_officer a, personnel b

WHERE b.home\_address = 'Chevy Chase, Maryland'

AND a.employee\_number = b.employee\_number;

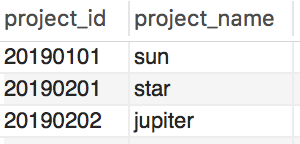


* use NotAP;

SELECT project.project\_id, project.project\_name

FROM project

WHERE project.earn - project.cost > 0;



* use NotAP;

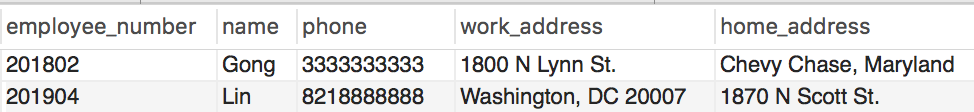
SELECT DISTINCT a.\*

FROM personnel a, personnel\_project b

WHERE b.evaluation = 0

AND a.employee\_number=b.employee\_number;

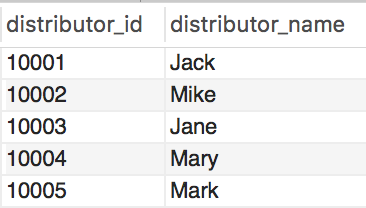
**Explanation: We use distinct to avoid duplicates.**



* use NotAP;

SELECT distributor.\*

FROM distributor;



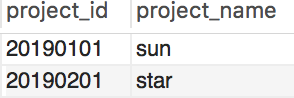
* use NotAP;

SELECT a.project\_id, a.project\_name

FROM project a, corporate\_officer\_project b

WHERE b.employee\_number = '201901'

AND a.project\_id = b.project\_id;



* use NotAP;

SELECT b.\*, a.work\_address

FROM personnel a, loan b

WHERE b.amount > 1000000

AND b.authorized\_employee\_number = a.employee\_number;



* use NotAP;

SELECT a.employee\_number, a.name

FROM personnel a, personnel\_project b, project c

WHERE c.start\_year <= 2018

AND c.end\_year >= 2018

AND c.project\_id = b.project\_id

AND b.employee\_number = a.employee\_number

GROUP BY b.employee\_number

HAVING count(b.employee\_number) > 2;

