Fachbereich 07 Informatik/Mathematik


# Praktikum Datenbanksysteme II
Wintersemester 2018/19

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## Übung 2

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# Aufgaben

## *Aufgabe 1*

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## *Aufgabe 2*

Die zwei Möglichkeiten, die wir in Betracht ziehen:

1. Allmögliche Objekt-Typen definieren und gegenseitig referenzieren. Bspw. könnte die Adresse ein Typ sein, die sich aus der Straße und der Hausnummer (und ggf. PLZ und Ort) zusammensetzt. Auch könnte ein Kontotyp mit Konto-Nr., Kontostand, Art und ID der Zweigstelle ein eigenes Attribut sein. (Es ist keine Zuordnungstabelle erforderlich, da es sich bei Zweigstelle ↔ Konto um eine 1:n-Beziehung handelt.)
2. Beispielsweiße könnten wir den Konto-Typ nicht als eigene Tabelle speichern sondern als innere Tabelle beim Zweigstellen-Typs speichern, dadurch entfällt die Referenz auf diese Tabelle.

## *Aufgabe 3*

Wir würden folgendes Schema aufstellen: (Legende: 1. Möglichkeit, **2. Möglichkeit**, beide)

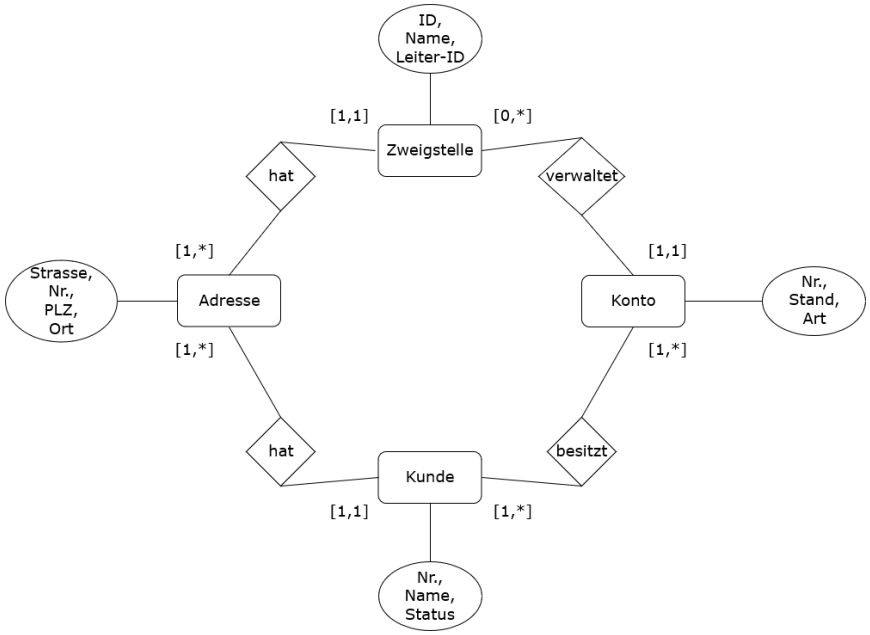
5 Typen wie folgt:

- Adress-Typ mit Straße und Hausnummer (und ggf. PLZ und Ort)
- **Kontolisten-Typ als Tabelle vom Typ Integer (Kontonummern)**
- Kunden-Typ mit Kunden-Nr., -Name, Adress-Typ, Status **und Kontolisten-Typ**
- Kontoinhaber-Typ als Tabelle vom Kunden-Typ
- **Zweigstellenkonten-Typ als Tabelle von Konto-Typen**
- Zweigstellen-Typ mit Zweigstellenname, Adress-Typ, Leiter-Id **und Zweigkonten**
- Konto-Typ mit Konto-Nr., Kontostand, Art, Kontoinhaber-Typ und Zweigstellen-Typ

Dazu noch folgende Tabellen:

- Kunden-Tabelle mit Kunden-Typ
- Zweigstellen-Adresse mit Zweigstellen-Typ
- Konto-Tabelle mit Konto-Typ **(entfällt bei der 2. Möglichkeit)**

Eine Skizzierung des Zusammenspiels der Typen und Tabellen:



SQL-Statements zum Erzeugen der Typen und Tabellen **(1. Möglichkeit)**:

```
CREATE TYPE AddressType AS Object(street VARCHAR(31), houseNr
VARCHAR(7), zip INT(5), place VARCHAR(31));
/
CREATE TYPE CustomerType AS Object(customerNr INT, customerName
VARCHAR(63), addr AddressType, status VARCHAR(15));
/
CREATE TYPE AccountOwnerType AS TABLE OF REF CustomerType;
/
CREATE TYPE BranchOfficeType AS Object(branchOfficeName VARCHAR(63),
addr AddressType, leaderId INT);
/
CREATE TYPE AccountType AS Object(accountNr INT,
balance DOUBLE PRECISION, kind VARCHAR(1),
owners AccountOwnerType, branchOffice REF BranchOfficeType);
/
CREATE TABLE Customer OF CustomerType;
CREATE TABLE BranchOffice OF BranchOfficeType;
CREATE TABLE AccountTable OF AccountType NESTED TABLE owners STORE
AS lorem_ipsum;
```

SQL-Statements zum Einfügen von Beispieldatensätzen in die Datenbank **(1. Möglichkeit)**:

```
INSERT INTO Customer VALUES(CustomerType(2345, 'H. Fach',
AddressType('Münchenerstr.', '33', 60329, ' Frankfurt am Main'),
'Geschäftskunde'));

INSERT INTO Customer VALUES(CustomerType(7654, 'B. Meier',
AddressType('Eschenweg', '12', 85354, 'Freising'), 'Privatkunde'));

INSERT INTO Customer VALUES(CustomerType(8764, 'J. Wiesner',
AddressType('Schellingstr.', '42', 80799, 'München'),
'Geschäftskunde'));


INSERT INTO BranchOffice VALUES(BranchOfficeType('Bachdorf',
AddressType('Hochstr.', '1', 81669, 'München'), 1768));

INSERT INTO BranchOffice VALUES(BranchOfficeType('Riedering',
AddressType('Simseestr.', '3', 81549, 'München'), 9823));


INSERT INTO AccountTable VALUES(AccountType(120768, 234.56, 'S',
AccountOwnerType((SELECT REF(c) FROM Customer c WHERE c.customerNr =
2345)), (SELECT REF(b) FROM BranchOffice b WHERE b.branchOfficeName =
'Bachdorf')));

INSERT INTO AccountTable VALUES(AccountType(678453, -456.78, 'G',
AccountOwnerType((SELECT REF(c) FROM Customer c WHERE c.customerNr =
8764)), (SELECT REF(b) FROM BranchOffice b WHERE b.branchOfficeName =
'Bachdorf')));

INSERT INTO AccountTable VALUES(AccountType(348973, 12567.56, 'G',
AccountOwnerType((SELECT REF(c) FROM Customer c WHERE c.customerNr =
2345), (SELECT REF(c) FROM Customer c WHERE c.customerNr = 8764)),
(SELECT REF(b) FROM BranchOffice b WHERE b.branchOfficeName =
'Bachdorf')));

INSERT INTO AccountTable VALUES(AccountType(987654, 789.65, 'G',
AccountOwnerType((SELECT REF(c) FROM Customer c WHERE c.customerNr =
7654)), (SELECT REF(b) FROM BranchOffice b WHERE b.branchOfficeName =
'Riedering')));

INSERT INTO AccountTable VALUES(AccountType(745363, -23.67, 'S',
AccountOwnerType((SELECT REF(c) FROM Customer c WHERE c.customerNr =
8764)), (SELECT REF(b) FROM BranchOffice b WHERE b.branchOfficeName =
'Riedering')));
```

SQL-Statements zum Erzeugen der Typen und Tabellen **(2. Möglichkeit)**:

```
CREATE TYPE AddressType AS Object(street VARCHAR(31), houseNr
VARCHAR(7), zip INT(5), place VARCHAR(31));
/
CREATE TYPE AccountsT AS TABLE OF INT;
/
CREATE TYPE CustomerType AS Object(customerNr INT, customerName
VARCHAR(63), addr AddressType, status VARCHAR(15), accNr AccountsT);
/
CREATE TYPE AccountType AS Object(accountNr INT,
balance DOUBLE PRECISION, kind VARCHAR(1));
/
CREATE TYPE BranchAccountsType AS TABLE OF AccountType;
/
CREATE TYPE BranchOfficeType AS Object(branchOfficeName VARCHAR(63),
addr AddressType, leaderId INT, accounts BranchAccountsType);
/

CREATE TABLE Customer OF CustomerType
NESTED TABLE accNr STORE AS accNr_useless;

CREATE TABLE BranchOffice OF BranchOfficeType
NESTED TABLE accounts STORE AS accounts_useless;
```

SQL-Statements zum Einfügen von Beispieldatensätzen in die Datenbank **(2. Möglichkeit)**:

```
INSERT INTO Customer
VALUES(CustomerType(2345, 'H. Fach',
AddressType('Münchenerstr.', '33', 60329, 'Frankfurt am Main'),
'Geschäftskunde', AccountsT(120768, 348973)));

INSERT INTO Customer
VALUES(CustomerType(7654, 'B. Meier',
AddressType('Eschenweg', '12', 85354, 'Freising'), 'Privatkunde',
AccountsT(987654)));

INSERT INTO Customer
VALUES(CustomerType(8764, 'J. Wiesner',
AddressType('Schellingstr.', '42', 80799, 'München'), 'Geschäftskunde',
AccountsT(745363, 678453, 348973)));

INSERT INTO BranchOffice
VALUES(BranchOfficeType('Bachdorf', AddressType('Hochstr.', '1', 81669,
'München'), 1768, BranchAccountsType()));

INSERT INTO TABLE(SELECT accounts FROM BranchOffice WHERE
branchOfficeName='Bachdorf')
VALUES(AccountType(120768, 234.56, 'S'));

INSERT INTO TABLE(SELECT accounts FROM BranchOffice WHERE
branchOfficeName='Bachdorf')
VALUES(AccountType(678453, -456.78, 'G'));

INSERT INTO TABLE(SELECT accounts FROM BranchOffice WHERE
branchOfficeName='Bachdorf')
VALUES(AccountType(348973, 12567.56, 'G'));

INSERT INTO BranchOffice
VALUES(BranchOfficeType('Riedering', AddressType('Simseestr.', '3',
81549, 'München'), 9823, BranchAccountsType()));

INSERT INTO TABLE(SELECT accounts FROM BranchOffice WHERE
branchOfficeName='Riedering')
VALUES(AccountType(987654, 789.65, 'G'));

INSERT INTO TABLE(SELECT accounts FROM BranchOffice WHERE
branchOfficeName='Riedering')
VALUES(AccountType(745363, -23.67, 'S'));
```

### *Aufgabe 4*

Bei der 1. Möglichkeit:

```
a) SELECT a.accountNr, a.balance, a.kind,
   CONCAT(CONCAT(DEREF(a.branchOffice).addr.street, ' '),
   DEREF(a.branchOffice).addr.houseNr) AS addr FROM AccountTable a;

b) SELECT a.accountNr, DEREF(o.COLUMN_VALUE).customerName AS
   customerName, CONCAT(CONCAT(DEREF(o.COLUMN_VALUE).addr.street, '
   '), DEREF(o.COLUMN_VALUE).addr.houseNr) as addr FROM AccountTable
   a, TABLE(a.owners) o;
```

Bei der 2. Möglichkeit:

```
a) SELECT a.accountNr, a.balance, a.kind,
   CONCAT(CONCAT(b.addr.street, ' '), b.addr.houseNr) AS addr
   FROM BranchOffice b, TABLE(b.accounts) a;

b) SELECT a.COLUMN_VALUE,
   CONCAT(CONCAT(c.addr.street, ' '),c.addr.houseNr) AS addr
   FROM Customer c, TABLE(c.accNr) a;
```

## Screendumps

Hier Screendumps unserer Tabellen und den Ergebnissen aus Aufgabe 4.

**1. Möglichkeit:**

Screendump von Aufgabe 4a) (Kontonummer, -stand, -art und Adresse der Zweigstelle):

| | ACCOUNTNR | BALANCE | KIND | ADDR |
|---|---|---|---|---|
| 1 | 120768 | 234,56 | S | Hochstr. 1 |
| 2 | 678453 | -456,78 | G | Hochstr. 1 |
| 3 | 348973 | 12567,56 | G | Hochstr. 1 |
| 4 | 987654 | 789,65 | G | Simseestr. 3 |
| 5 | 745363 | -23,67 | S | Simseestr. 3 |

Screendump von Aufgabe 4b) (Paare von Kontonummern, Namen und Adressen der Inhaber):

| | ACCOUNTNR | CUSTOMERNAME | ADDR |
|---|---|---|---|
| 1 | 120768 | H. Fach | Münchenerstr. 33 |
| 2 | 678453 | J. Wiesner | Schellingstr. 42 |
| 3 | 348973 | H. Fach | Münchenerstr. 33 |
| 4 | 348973 | J. Wiesner | Schellingstr. 42 |
| 5 | 987654 | B. Meier | Eschenweg 12 |
| 6 | 745363 | J. Wiesner | Schellingstr. 42 |

Zweigstellen-Tabelle:

| | BRANCHOFFICENAME | ADDR | LEADERID |
|---|---|---|---|
| 1 | Bachdorf | [DBST42.ADDRESSTYPE] | 1768 |
| 2 | Riedering | [DBST42.ADDRESSTYPE] | 9823 |

Kunden-Tabelle:

| | CUSTOMERNR | CUSTOMERNAME | ADDR | STATUS |
|---|---|---|---|---|
| 1 | 2345 | H. Fach | [DBST42.ADDRESSTYPE] | Geschäftskunde |
| 2 | 7654 | B. Meier | [DBST42.ADDRESSTYPE] | Privatkunde |
| 3 | 8764 | J. Wiesner | [DBST42.ADDRESSTYPE] | Geschäftskunde |

Konten-Tabelle:

| | ACCOUNTNR | BALANCE | KIND | OWNERS | BRANCHOFFICE |
|---|---|---|---|---|---|
| 1 | 120768 | 234,56 | S | DBST42.ACCOUNTOWNERTYPE([DBST42.CUSTOMERTYPE]) | [DBST42.BRANCHOFFICETYPE] |
| 2 | 678453 | -456,78 | G | DBST42.ACCOUNTOWNERTYPE([DBST42.CUSTOMERTYPE]) | [DBST42.BRANCHOFFICETYPE] |
| 3 | 348973 | 12567,56 | G | DBST42.ACCOUNTOWNERTYPE([DBST42.CUSTOMERTYPE],[DBST42.CUSTOMERTYPE]) | [DBST42.BRANCHOFFICETYPE] |
| 4 | 987654 | 789,65 | G | DBST42.ACCOUNTOWNERTYPE([DBST42.CUSTOMERTYPE]) | [DBST42.BRANCHOFFICETYPE] |
| 5 | 745363 | -23,67 | S | DBST42.ACCOUNTOWNERTYPE([DBST42.CUSTOMERTYPE]) | [DBST42.BRANCHOFFICETYPE] |

## 2. Möglichkeit:

Screendump von Aufgabe 4a)

| | ACCOUNTNR | BALANCE | KIND | ADDR |
|---|---|---|---|---|
| 1 | 120768 | 234,56 | S | Hochstr. 1 |
| 2 | 678453 | -456,78 | G | Hochstr. 1 |
| 3 | 348973 | 12567,56 | G | Hochstr. 1 |
| 4 | 987654 | 789,65 | G | Simseestr. 3 |
| 5 | 745363 | -23,67 | S | Simseestr. 3 |

Screendump von Aufgabe 4b)

| | COLUMN_VALUE | ADDR |
|---|---|---|
| 1 | 120768 | Münchenerstr. 33 |
| 2 | 348973 | Münchenerstr. 33 |
| 3 | 987654 | Eschenweg 12 |
| 4 | 745363 | Schellingstr. 42 |
| 5 | 678453 | Schellingstr. 42 |
| 6 | 348973 | Schellingstr. 42 |

Zweigstellen-Tabelle:

| | BRANCHOFFICENAME | ADDR | LEADERID | ACCOUNTS |
|---|---|---|---|---|
| 1 | Bachdorf | [DBST42.ADDRESSTYPE] | 1768 | DBST42.BRANCHACCOUNTSTYPE([DBST42.ACCOUNTTYPE],[DBST42.ACCOUNTTYPE],[DBST42.ACCOUNTTYPE]) |
| 2 | Riedering | [DBST42.ADDRESSTYPE] | 9823 | DBST42.BRANCHACCOUNTSTYPE([DBST42.ACCOUNTTYPE],[DBST42.ACCOUNTTYPE]) |

Kunden-Tabelle:

| | CUSTOMERNR | CUSTOMERNAME | ADDR | STATUS | ACCNR |
|---|---|---|---|---|---|
| 1 | 2345 | H. Fach | [DBST42.ADDRESSTYPE] | Geschäftskunde | DBST42.ACCOUNTST(120768,348973) |
| 2 | 7654 | B. Meier | [DBST42.ADDRESSTYPE] | Privatkunde | DBST42.ACCOUNTST(987654) |
| 3 | 8764 | J. Wiesner | [DBST42.ADDRESSTYPE] | Geschäftskunde | DBST42.ACCOUNTST(745363,678453,348973) |

### *Aufgabe 5 (Fallstudie)*

Zuerst haben wir für die Fallstudie die Aufgabenstellung analysiert und angefangen, Typen zu definieren um die Tabellen vollständig korrekt zu speichern.
Hierfür haben wir 30 Typen (Normale und List-Typen) angelegt, die wie folgt aussehen:

```
CREATE TYPE CampusT AS OBJECT (campus_location VARCHAR(15),
campus_addr VARCHAR(127), campus_phone VARCHAR(15), campus_fax
VARCHAR(15), campus_head VARCHAR(31));
/
CREATE TYPE ProfessorT AS OBJECT (prof_id INTEGER, prof_name
VARCHAR(31), prof_contact VARCHAR(31), prof_research
VARCHAR(63), prof_year INTEGER);
/
CREATE TYPE ProfessorListT AS TABLE OF REF ProfessorT;
/
CREATE TYPE DepartmentT AS OBJECT (dept_id VARCHAR(3),
dept_name VARCHAR(31), dept_head VARCHAR(31), dept_prof
ProfessorListT);
/
CREATE TYPE DepartmentListT AS TABLE OF DepartmentT;
/
CREATE TYPE SchoolT AS OBJECT (school_id VARCHAR(3),
school_name VARCHAR(31), school_head VARCHAR (31), school_prof
ProfessorListT);
/
CREATE TYPE SchoolListT AS TABLE OF SchoolT;
/
CREATE TYPE RCUnitT AS TABLE OF VARCHAR(127);
/
CREATE TYPE ResearchCentreT AS OBJECT (rc_id VARCHAR(3),
rc_name VARCHAR(127), rc_head VARCHAR(31), rc_unit RCUnitT);
/
CREATE TYPE ResearchCentreListT AS TABLE OF ResearchCentreT;
/
-- TODO aggregation clustering technique
CREATE TYPE FacultyT AS OBJECT (fac_id INTEGER, fac_name
VARCHAR(31), fac_dean VARCHAR(15), dept DepartmentListT,
school SchoolListT, rc ResearchCentreListT);
/
CREATE TYPE BuildingT AS OBJECT (bld_id VARCHAR(4), bld_name
VARCHAR(31), bld_location VARCHAR(2), bld_level INTEGER,
campus REF CampusT, fac REF FacultyT, MEMBER PROCEDURE
show_bld_details));
/
CREATE TYPE PersonT AS OBJECT (person_id VARCHAR(8),
person_surname VARCHAR(15), person_forename VARCHAR(15),
person_title VARCHAR(7), person_addr VARCHAR(127),
person_phone VARCHAR(15), person_postcode VARCHAR(5), campus
REF CampusT) NOT FINAL;
/
```

```
CREATE TYPE OfficeT AS OBJECT (office_No VARCHAR(7), bld REF
BuildingT, office_phone VARCHAR(15));
/
CREATE TYPE ClassroomT AS OBJECT (class_no VARCHAR(4), bld REF
BuildingT, class_capacity INTEGER);
/
CREATE TYPE LabEquipmentT AS TABLE OF VARCHAR(15);
/
CREATE TYPE LabT AS OBJECT (lab_no VARCHAR(5), bld REF
BuildingT, lab_capacity INTEGER, lab_equipment LabEquipmentT);
/
CREATE TYPE DegreeT AS OBJECT (deg_id VARCHAR(4), deg_name
VARCHAR(31), deg_length INTEGER, deg_prereq VARCHAR(31), fac
REF FacultyT);
/
CREATE TYPE ComputerskillsT AS TABLE OF VARCHAR(15);
/
CREATE TYPE OfficeskillsT AS TABLE OF VARCHAR(31);
/
CREATE TYPE TechnicianskillsT AS TABLE OF VARCHAR(15);
/
CREATE TYPE StaffT UNDER PersonT (office_No VARCHAR(7),
staff_type VARCHAR(15)) NOT FINAL;
/
CREATE TYPE StudentT UNDER PersonT (student_year INTEGER,
MEMBER PROCEDURE insert_student, MEMBER PROCEDURE
delete_student);
/
CREATE TYPE AdminT UNDER StaffT (admin_title VARCHAR(31),
admin_computerskills ComputerskillsT, admin_officeskills
OfficeskillsT);
/
CREATE TYPE TechnicianT UNDER StaffT (tech_title VARCHAR(31),
tech_skills TechnicianskillsT);
/
CREATE TYPE TutorT UNDER StaffT (tutor_hours INTEGER,
tutor_rate DOUBLE PRECISION);
/
CREATE TYPE LecturerT UNDER StaffT (lect_area VARCHAR(31),
lect_type VARCHAR(15)) NOT FINAL;
/
CREATE TYPE SeniorLecturerT UNDER LecturerT (senlect_phd
INTEGER, senlect_master INTEGER, senlect_honours INTEGER);
/
CREATE TYPE AssociateLecturerT UNDER LecturerT
(asslect_honours INTEGER, asslect_year INTEGER);
/
CREATE TYPE SubjectT AS OBJECT (subject_id VARCHAR(8),
subject_name VARCHAR(31), subject_credit INTEGER,
subject_prereq VARCHAR(8), person REF PersonT);
/
```

Dazu haben wir noch folgende 13 Tabellen angelegt, um konkrete Exemplare zu speichern:

```
CREATE TABLE Campus OF CampusT;

CREATE TABLE Professor OF ProfessorT;

CREATE TABLE Faculty OF FacultyT
     NESTED TABLE dept STORE AS department_nm (NESTED TABLE
dept_prof STORE AS dept_prof_nm)
     NESTED TABLE school STORE AS school_nm(NESTED TABLE
school_prof STORE AS school_prof_nm)
     NESTED TABLE rc STORE AS rc_nm (NESTED TABLE rc_unit STORE
AS rc_unit_nm);

CREATE TABLE Building OF BuildingT;

CREATE TABLE Office OF OfficeT;

CREATE TABLE Classroom OF ClassroomT;

CREATE TABLE Lab OF LabT
     NESTED TABLE lab_equipment STORE AS lab_equip_nm;

CREATE TABLE DegreeTbl OF DegreeT;

CREATE TABLE Staff OF StaffT;

CREATE TABLE Student OF StudentT;

CREATE TABLE Subject OF SubjectT;

CREATE TABLE Enrolls_in (student REF StudentT, deg REF
DegreeT);

CREATE TABLE Takes (student REF StudentT, subject REF
SubjectT, mark INTEGER);
```

Dazu haben wir noch die im Diagramm eingezeichneten Funktionen wie folgt implementiert:

```
CREATE OR REPLACE FUNCTION show_bld_details(in_bld_id IN
VARCHAR2)
   RETURN VARCHAR2
   IS building_details VARCHAR2(255);

BEGIN

SELECT 'ID: '|| building.bld_id ||', Name: '|| building.bld_name
||', Location: '|| building.bld_location ||', Level: '||
building.bld_level ||', Campus: '||
DEREF(building.campus).campus_location ||', Faculty:
'||DEREF(building.fac).fac_name
  INTO building_details
  FROM Building building
  WHERE building.bld_id = in_bld_id;

  RETURN(building_details);

END show_bld_details;
-- SELECT show_bld_details('BB1') AS "Building Info" FROM DUAL;

-- below is not working correctly, declaration would be needed
CREATE OR REPLACE FUNCTION insert_student(in_person_id IN
VARCHAR2, in_year IN NUMBER)
   RETURN VARCHAR2
   IS success_state VARCHAR2(5);  -- boolean type not supported

BEGIN

INSERT INTO Student (
  SELECT pers.*, in_year FROM Person pers
  WHERE pers.person_id = in_person_id
);
success_state := 'TRUE';
RETURN(success_state);

END insert_student;


CREATE OR REPLACE FUNCTION delete_student(in_person_id IN
VARCHAR2)
   RETURN VARCHAR2
   IS success_state VARCHAR2(5);  -- boolean type not supported

BEGIN

DELETE FROM Student student WHERE student.person_id =
in_person_id;
success_state := 'TRUE';
RETURN(success_state);

END delete_student;
```

Schlussendlich haben wir mittels folgenden Insert-Statements Daten in die Tabellen angelegt:

```
INSERT INTO Campus
VALUES (CampusT('Albury/Wodonga', 'Parkers Road Wodonga VIC
3690',
          '61260583700', '620260583777', 'John Hill'));
INSERT INTO Campus
VALUES (CampusT('City', '215 Franklin St. Melb VIC 3000',
          '61392855100', '610392855111', 'Michael A.
O''Leary'));
INSERT INTO Campus
VALUES (CampusT('Mildura', 'Benetook Ave. Mildura VIC 3502',
          '61350223757', '61350223646', 'Ron Broadhead'));
INSERT INTO Campus
VALUES (CampusT('Bundoora', '221b Baker St. London NW1',
          '6195135755', '6137196482', 'Sherlock Holmes'));

INSERT INTO Faculty
VALUES (FacultyT(1, 'Health Science', 'S. Duckett',
          DepartmentListT(), SchoolListT(),
ResearchCentreListT()));
INSERT INTO Faculty
VALUES (FacultyT(2, 'Humanity '||'&'||' Social Sc.', 'J. A.
Salmond',
          DepartmentListT(), SchoolListT(),
ResearchCentreListT()));
INSERT INTO Faculty
VALUES (FacultyT(3, 'Law '||'&'||' Management', 'G. C.
O''Brien',
          DepartmentListT(), SchoolListT(),
ResearchCentreListT()));
INSERT INTO Faculty
VALUES (FacultyT(4, 'Science, Tech. '||'&'||' Eng.', 'D.
Finlay',
          DepartmentListT(), SchoolListT(),
ResearchCentreListT()));
INSERT INTO Faculty
VALUES (FacultyT(5, 'Regional Department', 'L. Kilmartin',
          DepartmentListT(), SchoolListT(),
ResearchCentreListT()));

INSERT INTO Professor VALUES (ProfessorT(42, 'Nick
Hoogenraad', 'hoogenraad@cu.edu', 'Advanced Software
Engineering', 2007));
INSERT INTO Professor VALUES (ProfessorT(88, 'Robin Anders',
'robin.anders@cu.edu', 'Computer Architecture', 2017));
INSERT INTO Professor VALUES (ProfessorT(101, 'Claude
Bernard', 'cbernard@cu.edu', 'Networking', 2016));
INSERT INTO Professor VALUES (ProfessorT(420, 'Bruce Stone',
'b.stone@cu.edu', 'Software Development', 2015));
INSERT INTO Professor VALUES (ProfessorT(555, 'Chris Handley',
'handley@cu.edu', 'Compiler', 2009));
```

```
INSERT INTO Professor VALUES (ProfessorT(782, 'Sheena Reilly',
'sheenareilly@cu.edu', 'Discrete Mathematics', 2005));
INSERT INTO Professor VALUES (ProfessorT(1001, 'Alison Perry',
'Alison.Perry@cu.edu', 'Physics', 2012));
INSERT INTO Professor VALUES (ProfessorT(1337, 'Jan Branson',
'branson@cu.edu', 'Software Architecture', 2018));

INSERT INTO TABLE (SELECT dept FROM Faculty WHERE fac_id=4)
VALUES(DepartmentT('4-1', 'Agricultural Sciences', 'Mark
Sandeman',
          ProfessorListT()));
INSERT INTO TABLE (SELECT dept FROM Faculty WHERE fac_id=4)
VALUES(DepartmentT('4-2', 'Biochemistry', 'Nick Hoogenraad',
          ProfessorListT()));

INSERT INTO TABLE (SELECT school FROM Faculty WHERE fac_id=1)
VALUES(SchoolT('1-1', 'Human Biosciences', 'Chris Handley',
          ProfessorListT((SELECT REF(p) FROM Professor p WHERE
p.prof_id=555))));
INSERT INTO TABLE (SELECT school FROM Faculty WHERE fac_id=1)
VALUES(SchoolT('1-2', 'Human Comm. Sciences', 'Elizabeth
Lavender',
          ProfessorListT()));

INSERT INTO TABLE (SELECT rc FROM Faculty WHERE fac_id=1)
VALUES(ResearchCentreT('1-1', 'Australian Research Centre in
Sex, Health '||'&'||' Society', 'Martin Pitts', RCUnitT()));
INSERT INTO TABLE (SELECT rc FROM Faculty WHERE fac_id=1)
VALUES(ResearchCentreT('1-2', 'Australian Institute for
Primary Care', 'Hal Swerissen', RCUnitT()));

INSERT INTO TABLE(SELECT dept_prof FROM TABLE(SELECT dept FROM
Faculty WHERE fac_id=4) dep WHERE dep.dept_id = '4-2') (SELECT
REF(p) FROM Professor p WHERE p.prof_id=42 OR p.prof_id=88 OR
p.prof_id=101 OR p.prof_id=420);

INSERT INTO TABLE(SELECT school_prof FROM TABLE(SELECT school
FROM Faculty WHERE fac_id=1) scho WHERE scho.school_id = '1-
2') (SELECT REF(p) FROM Professor p WHERE p.prof_id=782 OR
p.prof_id=1001 OR p.prof_id=1337);

INSERT INTO TABLE (SELECT rc_unit FROM TABLE (SELECT rc FROM
Faculty WHERE fac_id=1) r WHERE r.rc_id='1-1')
VALUES('SSAY Projects');
INSERT INTO TABLE (SELECT rc_unit FROM TABLE (SELECT rc FROM
Faculty WHERE fac_id=1) r WHERE r.rc_id='1-1')
VALUES('HIV Futures');
INSERT INTO TABLE (SELECT rc_unit FROM TABLE (SELECT rc FROM
Faculty WHERE fac_id=1) r WHERE r.rc_id='1-1')
VALUES('Australian Study of Health and Relationships');
```

```
INSERT INTO TABLE (SELECT rc_unit FROM TABLE (SELECT rc FROM
Faculty WHERE fac_id=1) r WHERE r.rc_id='1-2')
VALUES('Centre for Dev. and Innovation in Health');
INSERT INTO TABLE (SELECT rc_unit FROM TABLE (SELECT rc FROM
Faculty WHERE fac_id=1) r WHERE r.rc_id='1-2')
VALUES('Centre for Quality in Health '||'&'||' Community
Svc.');
INSERT INTO TABLE (SELECT rc_unit FROM TABLE (SELECT rc FROM
Faculty WHERE fac_id=1) r WHERE r.rc_id='1-2')
VALUES('Lincoln Gerontology Centre');

INSERT INTO Building
VALUES (BuildingT('BB1', 'Beth Gleeson', 'D5', 4,
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Bundoora'),
          (SELECT REF(f) FROM Faculty f WHERE f.fac_id=4)));
INSERT INTO Building
VALUES (BuildingT('BB2', 'Martin Building', 'F5', 4,
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Bundoora'),
          (SELECT REF(f) FROM Faculty f WHERE f.fac_id=3)));
INSERT INTO Building
VALUES (BuildingT('BB3', 'Thomas Cherry', 'D4', 4,
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Bundoora'),
          (SELECT REF(f) FROM Faculty f WHERE f.fac_id=1)));
INSERT INTO Building
VALUES (BuildingT('BB4', 'Physical Science 1', 'D5', 3,
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Bundoora'),
          (SELECT REF(f) FROM Faculty f WHERE f.fac_id=4)));

INSERT INTO Office
VALUES (OfficeT('BG207',
          (SELECT REF(b) FROM Building b WHERE
b.bld_id='BB4'),
          '94791118'));
INSERT INTO Office
VALUES (OfficeT('BG208',
          (SELECT REF(b) FROM Building b WHERE
b.bld_id='BB4'),
          '94792393'));

INSERT INTO Classroom
VALUES (ClassroomT('TCLT',
          (SELECT REF(b) FROM Building b WHERE
b.bld_id='BB3'),
          50));
INSERT INTO Classroom
VALUES (ClassroomT('TC01',
          (SELECT REF(b) FROM Building b WHERE
b.bld_id='BB3'),
          30));
```

```
INSERT INTO Lab
VALUES (LabT('BG113',
          (SELECT REF(b) FROM Building b WHERE
b.bld_id='BB1'),
          25, LabEquipmentT('25 PC', '1 Printer')));
INSERT INTO Lab
VALUES (LabT('BG114',
          (SELECT REF(b) FROM Building b WHERE
b.bld_id='BB1'),
          20, LabEquipmentT('21 PC')));

INSERT INTO DegreeTbl
VALUES (DegreeT('D100', 'Bachelor of Comp. Sci', 3, 'Year 12
or equivalent',
          (SELECT REF(f) FROM Faculty f WHERE f.fac_id=4)));
INSERT INTO DegreeTbl
VALUES (DegreeT('D101', 'Master of Comp. Sci', 2, 'Bachelor of
Comp. Sci',
          (SELECT REF(f) FROM Faculty f WHERE f.fac_id=4)));

INSERT INTO Student VALUES ('01234234', 'Grant', 'Felix',
'Mr', '2 Boadle Rd Bundoora VIC', '0398548753', '3083',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Bundoora'), 2000);

INSERT INTO Student VALUES ('01958652', 'Doe', 'John', 'Mr',
'64 Austin St Holow VIC', '0321343123', '1337',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='City'), 2000);
-- additional Student needed for Enrolls_in / Takes Entry
without existing ID
INSERT INTO Student VALUES ('10012568', 'Shields', 'Duncan',
'Mr', '13 Flame St Seaside VIC', '0195837592', '3037',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='City'), 1995);

INSERT INTO Staff VALUES (TutorT('01234234', 'Grant', 'Felix',
'Mr', '2 Boadle Rd Bundoora VIC', '0398548753', '3083',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Bundoora'), 'BG265', 'Tutor', 10, 20.00));

INSERT INTO Staff VALUES (AssociateLecturerT('10008895',
'Xin', 'Harry', 'Mr', '6 Kelley St Kew VIC', '0398875542',
'3088',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Bundoora'),  'BG212', 'Lecturer', 'Software
Engineering', 'Associate', 2, 1999));
```

```
INSERT INTO Staff VALUES (AdminT('10002935', 'Jones',
'Felicity', 'Ms', '14 Rennie St Thornbury VIC', '0398722001',
'3071',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Bundoora'), 'BG210', 'Admin', 'Office
Manager', ComputerskillsT(), OfficeskillsT()));

INSERT INTO Staff VALUES (TutorT('01958652', 'Doe', 'John',
'Mr', '64 Austin St Holow VIC', '0321343123', '1337',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='City'), 'BG265', 'Tutor', 30, 35.00));

INSERT INTO Staff VALUES (AdminT('10008957', 'Jane',
'Patrick', 'Mr', '23 Rainbow Rd Allumy VIC', '0236263636',
'3033',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='City'), 'BG221', 'Admin', 'Receptionist',
ComputerskillsT(), OfficeskillsT()));

INSERT INTO Staff VALUES (TechnicianT('10005825', 'Gibbs',
'Lewroy', 'Mr', '127 Moltres Way Jotho VIC', '0285624733',
'3042',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Mildura'), 'BG231', 'Technician', 'Network
Officer', TechnicianskillsT()));

INSERT INTO Staff VALUES (TechnicianT('10015826', 'Beckett',
'Kate', 'Ms', '42 Donestry St Jibisy VIC', '0263957394',
'3087',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Mildura'), 'BG232', 'Technician',
'Photocopy Technician', TechnicianskillsT()));

INSERT INTO Staff VALUES (SeniorLecturerT('10000255',
'Morgan', 'Henry', 'Mr', '2 London Ave Karrigan VIC',
'0395182649', '3062',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='City'), 'BG225', 'Lecturer', 'Business
Information', 'Senior', 2, 5, 7));

INSERT INTO Staff VALUES (SeniorLecturerT('10000258', 'Flow',
'Max', 'Mr', '26 Hollow Tips St Precidense VIC', '0492849184',
'3012',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Mildura'), 'BG226', 'Lecturer', 'Business
Administration', 'Senior', NULL, 1, 5));

INSERT INTO Staff VALUES (AssociateLecturerT('10006935',
'Gunn', 'Montgomery', 'Mr', '65 Arrow Ave Catery VIC',
'0492847294', '3085',
          (SELECT REF(c) FROM Campus c WHERE
c.campus_location='Mildura'), 'BG225', 'Lecturer', 'Software
Development', 'Associate', NULL, 2001));
```

```
INSERT INTO TABLE (SELECT TREAT(VALUE(s) AS
AdminT).admin_officeskills FROM Staff s WHERE s.person_id =
'10002935') VALUES('Managerial');
INSERT INTO TABLE (SELECT TREAT(VALUE(s) AS
AdminT).admin_computerskills FROM Staff s WHERE s.person_id =
'10008957') VALUES('MS Office');
INSERT INTO TABLE (SELECT TREAT(VALUE(s) AS
AdminT).admin_officeskills FROM Staff s WHERE s.person_id =
'10008957') VALUES('Customer Service');
INSERT INTO TABLE (SELECT TREAT(VALUE(s) AS
AdminT).admin_officeskills FROM Staff s WHERE s.person_id =
'10008957') VALUES('Phone');

INSERT INTO TABLE (SELECT TREAT(VALUE(t) AS
TechnicianT).tech_skills FROM Staff t WHERE t.person_id =
'10005825')
VALUES('UNIX');
INSERT INTO TABLE (SELECT TREAT(VALUE(t) AS
TechnicianT).tech_skills FROM Staff t WHERE t.person_id =
'10005825')
VALUES('NT');
INSERT INTO TABLE (SELECT TREAT(VALUE(t) AS
TechnicianT).tech_skills FROM Staff t WHERE t.person_id =
'10015826')
VALUES('Electrician');

INSERT INTO Subject
VALUES (SubjectT('CSE21NET', 'Networking', 10, 'CSE11IS',
          (SELECT REF(s) FROM Staff s WHERE
s.person_id='10008895')));
INSERT INTO Subject
VALUES (SubjectT('CSE42ADB', 'Advanced Database', 15,
'CSE21DB',
          (SELECT REF(s) FROM Staff s WHERE
s.person_id='10006935')));

INSERT INTO Enrolls_in VALUES ((SELECT REF(s) FROM Student s
WHERE s.person_id='01234234'), (SELECT REF(d) FROM DegreeTbl d
WHERE d.deg_id='D101'));
INSERT INTO Enrolls_in VALUES ((SELECT REF(s) FROM Student s
WHERE s.person_id='10012568'), (SELECT REF(d) FROM DegreeTbl d
WHERE d.deg_id='D101'));

INSERT INTO Takes VALUES ((SELECT REF(st) FROM Student st
WHERE st.person_id='01234234'), (SELECT REF(su) FROM Subject
su WHERE su.subject_id='CSE42ADB'), 70);
INSERT INTO Takes VALUES ((SELECT REF(st) FROM Student st
WHERE st.person_id='10012568'), (SELECT REF(su) FROM Subject
su WHERE su.subject_id='CSE42ADB'), 80);
```

Bitte verzeihen Sie das fehlende Syntax-Highlighting, wir machen dies immer von Hand.

## Screendumps der Tabellen

Campus-Table:

| | CAMPUS_LOCATION | CAMPUS_ADDR | CAMPUS_PHONE | CAMPUS_FAX | CAMPUS_HEAD |
|---|---|---|---|---|---|
| 1 | Albury/Wodonga | Parkers Road Wodonga VIC 3690 | 61260583700 | 620260583777 | John Hill |
| 2 | City | 215 Franklin St. Melb VIC 3000 | 61392855100 | 610392855111 | Michael A. O'Leary |
| 3 | Mildura | Benetook Ave. Mildura VIC 3502 | 61350223757 | 61350223646 | Ron Broadhead |
| 4 | Bundoora | 221b Baker St. London NW1 | 6195135755 | 6137196482 | Sherlock Holmes |

Professor-Table:

| | PROF_ID | PROF_NAME | PROF_CONTACT | PROF_RESEARCH | PROF_YEAR |
|---|---|---|---|---|---|
| 1 | 42 | Nick Hoogenraad | hoogenraad@cu.edu | Advanced Software Engineering | 2007 |
| 2 | 88 | Robin Anders | robin.anders@cu.edu | Computer Architecture | 2017 |
| 3 | 101 | Claude Bernard | cbernard@cu.edu | Networking | 2016 |
| 4 | 420 | Bruce Stone | b.stone@cu.edu | Software Development | 2015 |
| 5 | 555 | Chris Handley | handley@cu.edu | Compiler | 2009 |
| 6 | 782 | Sheena Reilly | sheenareilly@cu.edu | Discrete Mathematics | 2005 |
| 7 | 1001 | Alison Perry | Alison.Perry@cu.edu | Physics | 2012 |
| 8 | 1337 | Jan Branson | branson@cu.edu | Software Architecture | 2018 |

Faculty-Table:

| | FAC_ID | FAC_NAME | FAC_DEAN | DEPT |
|---|---|---|---|---|
| 1 | 1 | Health Science | S. Duckett | DBST42.DEPARTMENTLISTT() |
| 2 | 2 | Humanity & Social Sc. | J. A. Salmond | DBST42.DEPARTMENTLISTT() |
| 3 | 3 | Law & Management | G. C. O'Brien | DBST42.DEPARTMENTLISTT() |
| 4 | 4 | Science, Tech. & Eng. | D. Finlay | DBST42.DEPARTMENTLISTT([DBST42.DEPARTMENTT],[DBST42.DEPARTMENTT]) |
| 5 | 5 | Regional Department | L. Kilmartin | DBST42.DEPARTMENTLISTT() |

| SCHOOL | RC |
|---|---|
| DBST42.SCHOOLLISTT([DBST42.SCHOOLT],[DBST42.SCHOOLT]) | DBST42.RESEARCHCENTRELISTT([DBST42.RESEARCHCENTRET],[DBST42.RESEARCHCENTRET]) |
| DBST42.SCHOOLLISTT() | DBST42.RESEARCHCENTRELISTT() |
| DBST42.SCHOOLLISTT() | DBST42.RESEARCHCENTRELISTT() |
| DBST42.SCHOOLLISTT() | DBST42.RESEARCHCENTRELISTT() |
| DBST42.SCHOOLLISTT() | DBST42.RESEARCHCENTRELISTT() |

Building-Table:

| | BLD_ID | BLD_NAME | BLD_LOCATION | BLD_LEVEL | CAMPUS | FAC |
|---|---|---|---|---|---|---|
| 1 | BB1 | Beth Gleeson | D5 | 4 | [DBST42.CAMPUST] | [DBST42.FACULTYT] |
| 2 | BB2 | Martin Building | F5 | 4 | [DBST42.CAMPUST] | [DBST42.FACULTYT] |
| 3 | BB3 | Thomas Cherry | D4 | 4 | [DBST42.CAMPUST] | [DBST42.FACULTYT] |
| 4 | BB4 | Physical Science 1 | D5 | 3 | [DBST42.CAMPUST] | [DBST42.FACULTYT] |

Office-Table:

| | OFFICE_NO | BLD | OFFICE_PHONE |
|---|---|---|---|
| 1 | BG207 | [DBST42.BUILDINGT] | 94791118 |
| 2 | BG208 | [DBST42.BUILDINGT] | 94792393 |

Classroom-Table:

| | CLASS_NO | BLD | CLASS_CAPACITY |
|---|---|---|---|
| 1 | TCLT | [DBST42.BUILDINGT] | 50 |
| 2 | TC01 | [DBST42.BUILDINGT] | 30 |

Lab-Table:

| | LAB_NO | BLD | LAB_CAPACITY | LAB_EQUIPMENT |
|---|---|---|---|---|
| 1 | BG113 | [DBST42.BUILDINGT] | 25 | DBST42.LABEQUIPMENTT('25 PC','1 Printer') |
| 2 | BG114 | [DBST42.BUILDINGT] | 20 | DBST42.LABEQUIPMENTT('21 PC') |

Degree-Table:

| | DEG_ID | DEG_NAME | DEG_LENGTH | DEG_PREREQ | FAC |
|---|---|---|---|---|---|
| 1 | D100 | Bachelor of Comp. Sci | 3 | Year 12 or equivalent | [DBST42.FACULTYT] |
| 2 | D101 | Master of Comp. Sci | 2 | Bachelor of Comp. Sci | [DBST42.FACULTYT] |

Student-Table:

| | PERSON_ID | PERSON_SURNAME | PERSON_FORENAME | PERSON_TITLE | PERSON_ADDR | PERSON_PHONE | PERSON_POSTCODE | CAMPUS | STUDENT_YEAR |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 01234234 | Grant | Felix | Mr | 2 Boadle Rd Bundoora VIC | 0398548753 | 3083 | [DBST42.CAMPUST] | 2000 |
| 2 | 01958652 | Doe | John | Mr | 64 Austin St Holow VIC | 0321343123 | 1337 | [DBST42.CAMPUST] | 2000 |
| 3 | 10012568 | Shields | Duncan | Mr | 13 Flame St Seaside VIC | 0195837592 | 3037 | [DBST42.CAMPUST] | 1995 |

Staff-Table:

| | PERSON_ID | PERSON_SURNAME | PERSON_FORENAME | PERSON_TITLE | PERSON_ADDR | PERSON_PHONE | PERSON_POSTCODE | CAMPUS | OFFICE_NO | STAFF_TYPE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 01234234 | Grant | Felix | Mr | 2 Boadle Rd Bundoora VIC | 0398548753 | 3083 | [DBST42.CAMPUST] | BG265 | Tutor |
| 2 | 10008895 | Xin | Harry | Mr | 6 Kelley St Kew VIC | 0398875542 | 3088 | [DBST42.CAMPUST] | BG212 | Lecturer |
| 3 | 10002935 | Jones | Felicity | Ms | 14 Rennie St Thornbury VIC | 0398722001 | 3071 | [DBST42.CAMPUST] | BG210 | Admin |
| 4 | 01958652 | Doe | John | Mr | 64 Austin St Holow VIC | 0321343123 | 1337 | [DBST42.CAMPUST] | BG265 | Tutor |
| 5 | 10008957 | Jane | Patrick | Mr | 23 Rainbow Rd Allumy VIC | 0236263636 | 3033 | [DBST42.CAMPUST] | BG221 | Admin |
| 6 | 10005825 | Gibbs | Lewroy | Mr | 127 Moltres Way Jotho VIC | 0285624733 | 3042 | [DBST42.CAMPUST] | BG231 | Technician |
| 7 | 10015826 | Beckett | Kate | Ms | 42 Donestry St Jibisy VIC | 0263957394 | 3087 | [DBST42.CAMPUST] | BG232 | Technician |
| 8 | 10000255 | Morgan | Henry | Mr | 2 London Ave Karrigan VIC | 0395182649 | 3062 | [DBST42.CAMPUST] | BG225 | Lecturer |
| 9 | 10000258 | Flow | Max | Mr | 26 Hollow Tips St Precidense VIC | 0492849184 | 3012 | [DBST42.CAMPUST] | BG226 | Lecturer |
| 10 | 10006935 | Gunn | Montgomery | Mr | 65 Arrow Ave Catery VIC | 0492847294 | 3085 | [DBST42.CAMPUST] | BG225 | Lecturer |

Subject-Table:

| | SUBJECT_ID | SUBJECT_NAME | SUBJECT_CREDIT | SUBJECT_PREREQ | PERSON |
|---|---|---|---|---|---|
| 1 | CSE21NET | Networking | 10 | CSE11IS | [DBST42.ASSOCIATELECTURERT] |
| 2 | CSE42ADB | Advanced Database | 15 | CSE21DB | [DBST42.ASSOCIATELECTURERT] |

Enrolls-In-Table:

| | STUDENT | DEG |
|---|---|---|
| 1 | [DBST42.STUDENTT] | [DBST42.DEGREET] |
| 2 | [DBST42.STUDENTT] | [DBST42.DEGREET] |

Takes-Table:

| | STUDENT | SUBJECT | MARK |
|---|---|---|---|
| 1 | [DBST42.STUDENTT] | [DBST42.SUBJECTT] | 70 |
| 2 | [DBST42.STUDENTT] | [DBST42.SUBJECTT] | 80 |

Um bspw. alle Tutors mit deren Attributen zu erhalten, können wir folgendes Script benutzen:

```
SELECT t.*, TREAT(VALUE(t) AS TutorT).tutor_hours tutor_hours,
TREAT(VALUE(t) AS TutorT).tutor_rate tutor_rate FROM Staff t
WHERE TREAT(VALUE(t) AS TutorT) IS NOT NULL;
```

Das Ergebnis sieht dann wie folgt aus:

| | PERSON_ID | PERSON_SURNAME | PERSON_FORENAME | PERSON_TITLE | PERSON_ADDR | PERSON_PHONE |
|---|---|---|---|---|---|---|
| 1 | 01234234 | Grant | Felix | Mr | 2 Boadle Rd Bundoora VIC | 0398548753 |
| 2 | 01958652 | Doe | John | Mr | 64 Austin St Holow VIC | 0321343123 |

| PERSON_PHONE | PERSON_POSTCODE | CAMPUS | OFFICE_NO | STAFF_TYPE | TUTOR_HOURS | TUTOR_RATE |
|---|---|---|---|---|---|---|
| 0398548753 | 3083 | [DBST42.CAMPUST] | BG265 | Tutor | 10 | 20 |
| 0321343123 | 1337 | [DBST42.CAMPUST] | BG265 | Tutor | 30 | 35 |

## Anmerkungen

Uns ist bei der Planung von Typen und Tabellen aufgefallen, dass einige Tabellenattribute unnötig waren, da man über Joins an dieses Attribut gelangen könnte. So hatte bspw. der Staff-Type in der Fallstudien-Beschreibung noch ein Attribut für das Gebäude (Building), dieses haben wir nicht übernommen, da man mit dem Office_Nr-Attribut über einen Join zur Office-Tabelle zu dem Gebäude gelangen kann. So haben wir unnötige Redundanzen / Speicherplatz-Verschwendung vermieden.

Auf der anderen Seite haben wir in vielen Tabellen wie bspw. Building, Office, Classroom, Lab uvm. mit Referenzen statt einfachen IDs benutzt, dies hat zwei Vorteile:

- Wir können ohne Join sofort auf die Daten zugreifen (Dereferenzierung)
- Wir können sicherstellen das in bspw. der Takes-Tabelle nur gültige Studenten sind

Ich hoffe, dass diese Änderungen in Ihrem Sinn sind und unsere Gedankengänge für Sie sinnvoll bzw. nachvollziehbar erscheinen.

Falls Sie sich die SQL-Statements genauer ansehen oder zum selbst Testen kopieren möchten, finden Sie diese und alle anderen Dateien / Informationen auf GitHub.com/AnyaW/DBS2.