

CPSC 304 Project Cover Page

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Group Number: 40

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

Project Description

This is a listing viewing application that allows users to view rental or sale listings of properties, as well as the property's associated information, such as who the homeowner is, which real estate agent is managing the listing, which contractor companies maintain the property, and so on. We are taking privacy and information confidentiality out of consideration and letting the user see as much information as possible.

Ways to Implement Relationships

IMPORTANT NOTE: We can't model total participation constraints on the "one" side of one-to-many relationships or any side of many-to-many constraints. These will be dealt with with assertions.

HiresREA: separate relation table

HiresContractor: separate relation table

Pays: separate relation table

EmployedBy: foreign key in RealEstateAgent

Maintains: separate relation table

TaxedBy: foreign key in Property

ManagesProperty: foreign key in Property

Owns: foreign key in Property

Lists: foreign key in Listing

ManagesListing: separate relation table

Built: foreign key in Property

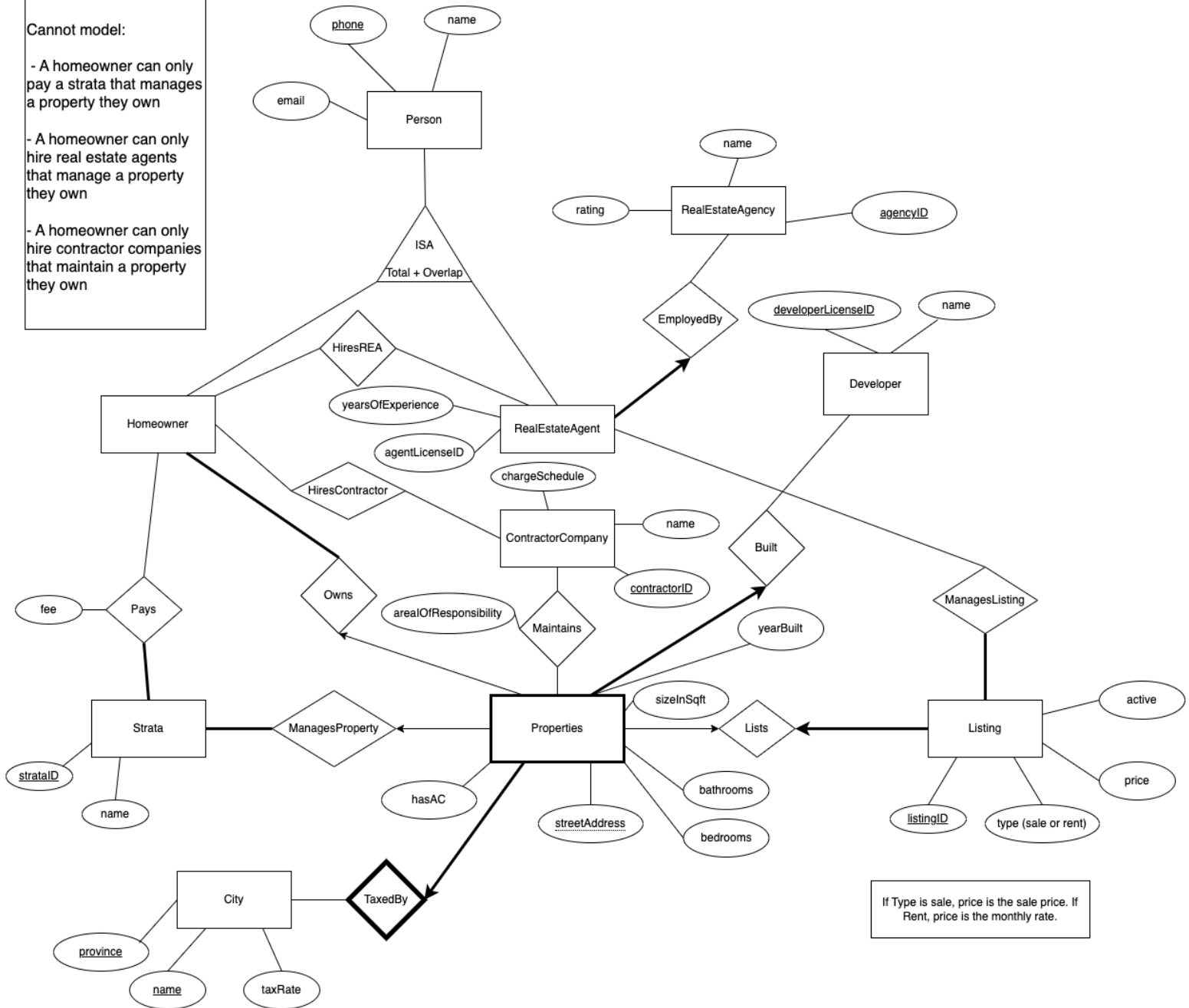
ER Diagram

Cannot model:

- A homeowner can only pay a strata that manages a property they own

- A homeowner can only hire real estate agents that manage a property they own

- A homeowner can only hire contractor companies that maintain a property they own



Schema

Note: we will not be adding a Homeowner table because a Homeowner doesn't have any extra attributes. Having a Homeowner(phone) with phone referencing Person is a bit redundant. We assume that any person who owns a property is a homeowner. In the ER diagram, however, we will keep Homeowner as an entity for clarity of our structure.

**** For candidate keys that are primary keys, we will not be explicitly specifying them**

Person(phone: String, name:String, email: String)
Primary Key: Phone#

RealEstateAgent(**phone**: int, agentLicenseId: int, yearsOfExp: int, **agencyID**: int)
Primary Key: agentLicenseId
Candidate Key: phone, agentLicenseId
Foreign Key: phone# references Person, agencyID references RealEstateAgency
Not null: agencyID
Unique: agentLicenseID

RealEstateAgency(agencyID: int, name: String, rating: double)
Primary Key: agencyID

Developer(developerLicenseID: int , name: String)
Primary Key: developerLicenseID

ContractorCompany(contractorID: int, name: String, chargeSchedule: String)
Primary Key: contractorID

Strata(strataID: int, name: String)
Primary Key: strataID

City(province: String, name: String, taxRate: double)
PrimaryKey: province, name

Property(streetAddress: String, province: String, cityName:String, **developerLicenseID**: int, **strataID**: int, **phone**: int, bedrooms: int, bathrooms: int, sizeInSqft: int, hasAC: boolean)
PrimaryKey: streetAddress, province, cityName
Foreign Key:
province, cityName references City(province, name)
strataID references Strata
phone references Person
developerLicenseID references Developer
Not NULL: developerLicenseID, cityName, province

Listing(listingID: int, streetAddress: String, province: String, cityName:String, type: String, price: int, active: boolean)
Primary Key: listingID, streetAddress, province, cityName
Foreign Key: (streetAddress, cityName, province) references Property
Unique: (streetAddress, cityName, province)
Not Null: (streetAddress, cityName, province)

HiresREA(homeownerPhone: int, realEstateAgentPhone: int)
Primary Key: agentLicenseID, phone
FK: homeownerPhone references Person(phone), realEstateAgentPhone references RealEstateAgent(phone)

HiresContractor(homeownerPhone: int, contractorID: int)
Primary Key: contractorID, phone
Foreign Key: homeownerPhone references Person(phone), contractorID references ContractorCompany

Pays(homeownerPhone: int, strataID: int, fee: int)
Primary Key: homeownerPhone, strataID
Foreign Key: homeownerPhone references Person(phone), strataID references Strata

Maintains(contractorID: int, streetAddress: String, province: String, cityName: String, areaOfResponsibility: String)
Primary Key: contractorID, streetAddress, province, cityName
Foreign Key: streetAddress, province, cityName references Property(streetAddress, province, cityName). contractorID references ContractorCompany

ManagesListing(realEstateAgentPhone: String, listingID: int)

Primary Key: listingID, agentLicenseID

Foreign Key: realEstateAgentPhone references RealEstateAgent. listingID references Listing

Note: We could not represent the following total participations:

- 1) Strata's total participation in StrataManagesProperties
- 2) Strata's total participation in HomeownersPaysStrata
- 3) Homeowner's total participation in HomeownerOwnsProperty
- 4) Listing's total participation in REA manages Listing

Functional Dependencies (trivial FDs not listed):

Person(phone, name, email)

phone \rightarrow name, email

RealEstateAgent(phone, agentLicenseID, yearsOfExperience, agencyID)

phone \rightarrow agencyID, yearsOfExperience, agentLicenseID

agentLicenseID \rightarrow phone, agencyID, yearsOfExperience

RealEstateAgency(agencyID, name, rating)

agencyID \rightarrow name, rating

Developer(developerLicenseID, name)

developerLicenseID \rightarrow name

ContractorCompany(contractorID, name, chargeSchedule)

contractorID \rightarrow name, chargeSchedule

Strata(strataID, name)

strataID \rightarrow name

City(province, name, taxRate)

province, name \rightarrow taxRate

Property(streetAddress, province, cityName, developerLicenseID, strataID, phone, bedrooms, bathrooms, sizeInSqft, hasAc)

streetAddress, province, cityName \rightarrow developerLicenseID, strataID, phone, bedrooms, bathrooms, sizeInSqft, hasAc

Listing(listingID, streetAddress, province, cityName, type, price, active)

listingID \rightarrow streetAddress, province, cityName, type, price, active

streetAddress, province, cityName \rightarrow listingID, type, price, active

HiresREA(homeownerPhone, realEstateAgentPhone)

// None

HiresContractor(homeownerPhone, contractorID)

// None

Pays(homeownerPhone, strataID, fee)

homeownerPhone, strataID \rightarrow fee

Maintains(contractorID, streetAddress, province, cityName, areaOfResponsibility)
contractorID, streetAddress, province, cityName → areaOfResponsibility
streetAddress, province, cityName, areaOfResponsibility → contractorID
// Let's say an area of responsibility is only handled by one contractor in the same property

ManagesListing(realEstateAgentPhone, listingID)
// None

**** All tables are already in 3NF or BCNF**

SQL DDL Statements

```
CREATE TABLE Person (  
  phone CHAR(20) PRIMARY KEY,  
  name CHAR(255),  
  email CHAR(255)  
);
```

```
CREATE TABLE RealEstateAgent (  
  phone INTEGER PRIMARY KEY,  
  agentLicenseId INTEGER UNIQUE,  
  yearsOfExp INTEGER,  
  agencyID INTEGER NOT NULL,  
  FOREIGN KEY (phone) REFERENCES Person(phone),  
  FOREIGN KEY (agencyID) REFERENCES RealEstateAgency(agencyID)  
);
```

```
CREATE TABLE RealEstateAgency (  
  agencyID INTEGER PRIMARY KEY,  
  name CHAR(255),  
  rating DOUBLE PRECISION  
);
```

```
CREATE TABLE Developer (  
  developerLicenseID INTEGER PRIMARY KEY,  
  name CHAR(255)  
);
```

```
CREATE TABLE ContractorCompany (  
  contractorID INTEGER PRIMARY KEY,  
  name CHAR(255),  
  chargeSchedule CHAR(255)  
);
```

```
CREATE TABLE Strata (  
  strataID INTEGER PRIMARY KEY,  
  name VARCHAR(255)  
);
```

```
CREATE TABLE City (  
  province CHAR(255),  
  name CHAR(255),
```

```
    taxRate DOUBLE PRECISION,  
    PRIMARY KEY (province, name)  
);
```

```
CREATE TABLE Property (  
    streetAddress CHAR(255),  
    province CHAR(255),  
    cityName CHAR(255),  
    developerLicenseID INTEGER NOT NULL,  
    strataID INTEGER,  
    phone CHAR(20),  
    bedrooms INTEGER,  
    bathrooms INTEGER,  
    sizeInSqft INTEGER,  
    hasAC BOOLEAN,  
    PRIMARY KEY (streetAddress, province, cityName),  
    FOREIGN KEY (province, cityName) REFERENCES City(province, name),  
    FOREIGN KEY (strataID) REFERENCES Strata(strataID),  
    FOREIGN KEY (phone) REFERENCES Person(phone),  
    FOREIGN KEY (developerLicenseID) REFERENCES Developer(developerLicenseID)  
);
```

```
CREATE TABLE Listing (  
    listingID INT,  
    streetAddress CHAR(255),  
    province CHAR(255),  
    cityName CHAR(255),  
    type CHAR(255),  
    price INTEGER,  
    active BOOLEAN,  
    PRIMARY KEY (listingID, streetAddress, province, cityName),  
    FOREIGN KEY (streetAddress, cityName, province) REFERENCES Property(streetAddress,  
cityName, province),  
    UNIQUE (streetAddress, cityName, province)  
);
```

```
CREATE TABLE HiresREA (  
    homeownerPhone CHAR(20),  
    realEstateAgentPhone INTEGER,  
    PRIMARY KEY (homeownerPhone, realEstateAgentPhone),  
    FOREIGN KEY (homeownerPhone) REFERENCES Person(phone),  
    FOREIGN KEY (realEstateAgentPhone) REFERENCES RealEstateAgent(phone)  
);
```

```
CREATE TABLE HiresContractor (  
    homeownerPhone CHAR(20),  
    contractorID INTEGER,  
    PRIMARY KEY (homeownerPhone, contractorID),  
    FOREIGN KEY (homeownerPhone) REFERENCES Person(phone),  
    FOREIGN KEY (contractorID) REFERENCES ContractorCompany(contractorID)  
);
```

```
CREATE TABLE Pays (  
    homeownerPhone CHAR(20),  
    strataID INTEGER,  
    fee INTEGER,  
    PRIMARY KEY (homeownerPhone, strataID),  
    FOREIGN KEY (homeownerPhone) REFERENCES Person(phone),  
    FOREIGN KEY (strataID) REFERENCES Strata(strataID)  
);
```

```
CREATE TABLE Maintains (  
    contractorID INTEGER,  
    streetAddress CHAR(255),  
    province CHAR(255),  
    cityName CHAR(255),  
    areaOfResponsibility CHAR(255),  
    PRIMARY KEY (contractorID, streetAddress, province, cityName),  
    FOREIGN KEY (streetAddress, cityName, province) REFERENCES Property(streetAddress,  
cityName, province),  
    FOREIGN KEY (contractorID) REFERENCES ContractorCompany(contractorID)  
);
```

```
CREATE TABLE ManagesListing (  
    realEstateAgentPhone VARCHAR(20),  
    listingID INT,  
    PRIMARY KEY (listingID, realEstateAgentPhone),  
    FOREIGN KEY (realEstateAgentPhone) REFERENCES RealEstateAgent(phone),  
    FOREIGN KEY (listingID) REFERENCES Listing(listingID)  
);
```

Initialize Data

INSERT INTO Person (phone, name, email)

VALUES

('123 456 7890', 'John Doe', 'john.doe@email.com'),
('234 567 8901', 'Jane Smith', 'jane.smith@email.com'),
('345 678 9012', 'Bob Johnson', 'bob.johnson@email.com'),
('456 789 0123', 'Alice Brown', 'alice.brown@email.com'),
('164 551 5313', 'Alice Brown', 'alice23@name.com');

INSERT INTO RealEstateAgency (agencyID, name, rating)

VALUES

(01000001, 'ABC Realty', 4.5),
(01000002, 'XYZ Realty', 4.2),
(01000003, 'PQR Realty', 4.0),
(01000004, 'Best Realtor', 4.2),
(01000005, 'Dream Inc, 3.5);

INSERT INTO RealEstateAgent (phone, agentLicenseId, yearsOfExp, agencyID)

VALUES

('123 456 7890', 9876, 5, 01000001),
('234 567 8901', 6543, 3, 01000002),
('345 678 9012', 7890, 7, 01000003),
('456 789 0123', 7290, 0, 01000002),
('164 551 5313', 7890, 12, 01000005);

INSERT INTO Developer (developerLicenseID, name)

VALUES

(02000001, 'ABC Developers'),
(02000002, 'XYZ Builders'),
(02000003, 'UBC Builders') ,
(02000004, 'Thunder Developers'),
(02000005, 'Blue Inc');

```
INSERT INTO ContractorCompany (contractorID, name, chargeSchedule)
VALUES
  (03000001, 'FixIt Inc.', 'Hourly'),
  (03000002, 'FixAll Construction', 'Fixed Price'),
  (03000003, 'Fix Roofing Inc ', 'Hourly'),
  (03000004, 'New Maintainance Company', 'Hourly'),
  (03000005, 'FixAll Construction', 'Fixed Price');
```

```
INSERT INTO Strata (strataID, name)
VALUES
  (04000001, 'Sunny Heights Condos'),
  (04000002, 'Pineview Estates')
  (04000003, 'Thunderbird Condos'),
  (04000004, ' KWTQ Estates')
  (04000005, 'Marine Condos');
```

```
INSERT INTO City (province, name, taxRate)
VALUES
  ('Alberta', 'Calgary', 0.11),
  ('Quebec', 'Montreal', 0.14),
  ('Manitoba', 'Winnipeg', 0.10),
  ('BC', 'Vancouver', 0.08),
  ('ON', 'Toronto', 0.10);
```

```
INSERT INTO Property (streetAddress, province, cityName, developerLicenseID, strataID,
phone, bedrooms, bathrooms, sizeInSqft, hasAC)
VALUES
  ('123 Main St', 'BC', 'Vancouver', 02000001, 04000001, '123 456 7890', 2, 2, 1200, true),
  ('456 Elm St', 'ON', 'Toronto', 02000002, 04000001, '234 567 8901', 3, 2, 1500, false);
  ('2525 West Mall', 'ON', 'Toronto', 02000001, 04000005, '345 678 9012', 3, 2, 1500, false);
  ('6331 Thunderbird Cres', 'AB', 'Calgary', 02000001, 04000004, '456 789 0123', 3, 2, 1500,
true);
  ('202 Birch St', 'MB', 'Winnipeg', 02000003, 04000002, '456 789 0123', 3, 2, 1500, true);
```

```
INSERT INTO Listing (listingID, streetAddress, province, cityName, type, price, active)
VALUES
  (05000001, '123 Main St', 'BC', 'Vancouver', 'sale', 500000, true),
  (05000002, '456 Elm St', 'ON', 'Toronto', 'sale', 700000, true);
  (05000003, '2525 West Mall', 'ON', 'Toronto', 'rent', 500000, true),
```

```
(05000004, '6331 Thunderbird Cres', 'AB', 'Calgary', 'sale', 100000, true);  
(05000005, '202 Birch St", 'MB', 'Winnipeg', 'rent', 250000, true);
```

```
INSERT INTO HiresREA (homeownerPhone, realEstateAgentPhone)  
VALUES  
( '123 456 7890', '123 456 7890'),  
( '456 789 0123', '3456789012'),  
( '345 678 9012', '1234567890'),  
( '234 567 8901', '456 789 0123'),  
( '123 456 7890', '164 551 5313');
```

```
INSERT INTO HiresContractorCompany (homeownerPhone, contractorID)  
VALUES  
( '123 456 7890', 03000001),  
( '234 567 8901', 03000002),  
( '345 678 9012', 03000003),  
( '456 789 0123', 03000004),  
( '164 551 5313', 03000005);
```

```
INSERT INTO Pays (homeownerPhone, strataID, fee)  
VALUES  
( '123 456 7890', 04000001),  
( '234 567 8901', 04000002),  
( '345 678 9012', 04000003),  
( '456 789 0123', 04000004),  
( '164 551 5313', 04000005);
```

```
INSERT INTO Maintains (contractorID, streetAddress, province, cityName,  
areaOfResponsibility)  
VALUES  
(03000001, '123 Main St', 'BC', 'Vancouver', 'Landscaping'),  
(03000002, '456 Elm St', 'ON', 'Toronto', 'Plumbing'),  
(03000003, '2525 West Mall', 'ON', 'Toronto', 'Electrical'),  
(03000004, '6331 Thunderbird Cres', 'AB', 'Calgary', 'HVAC'),  
(03000005, '202 Birch St', 'Manitoba', 'Winnipeg', 'Roofing');
```

```
INSERT INTO ManagesListing (realEstateAgentPhone, listingID)
VALUES
('123 456 7890', 05000001),
('234 567 8901', 05000002),
('345 678 9012', 05000003),
('456 789 0123', 05000004),
('164 551 5313', 05000005);
```