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A MUNICIPAL DATABASE DESIGN FOR POLOPOLIS

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*sorted by alphabetical order

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I - Introduction

With great pleasure, Al Aafiya team presents our report, "A Database Design for Polopolis Municipality." This project allowed us to flex our creative muscles, apply our knowledge on database creation and understand the art of ER diagram design.

Our report provides a summary of our work during the first phase of the project. We were tasked with designing a database for a municipality. Our team took the initiative of designing one for Polopolis, capital of PetLand. All things considered, we strongly believe this experience has been highly educational and beneficial for our careers.

As we set out to create the Polopolis database, we recognize how crucial it is that our database system truly captures the unventured dynamics of a pet-ruled society. The first part of this report covers the key concepts of the municipality we want to depict. Phase I focuses on the entity types and relationships that must be specified in order to build an efficient database. It is impossible to have a functional database without these items and connections. Phase II aims to map the ER model into a relational database. Phase III involves designing, querying, and executing complex SQL transactions on an Oracle database. Finally, Phase IV covers the normalization of the relations we have previously created.

We are thrilled to have contributed towards Polopolis' development and excited to grow beyond the course with the skillset we have gained during this project.

II - Copyright Notice

III - System Description and Constraints

Polopolis is a diverse and lively city found in the heart of PetLand. As the capital, it houses several pet types with different behaviors, habitats, goals, and lives. Polopolis is a strongly desired destination for pets from all over the world due to the abundance of jobs, high quality facilities, safe neighborhoods, and no rabies outbreaks! All the perks of this city would not be possible if it weren't for the city's municipality. Like human municipalities, pet municipalities act as the local government body of a city or town.

The municipality is run by Mayor Polo. His vision encapsulates creating a prospering community where pets of all kinds thrive, live in harmony, and feel at home. He aims to accomplish this by providing accessible healthcare, well-kept parks, and neighborhoods tailored to the pets' needs. To efficiently implement their goals, the municipality recruited Al Aafiya to build and maintain a database for the city.

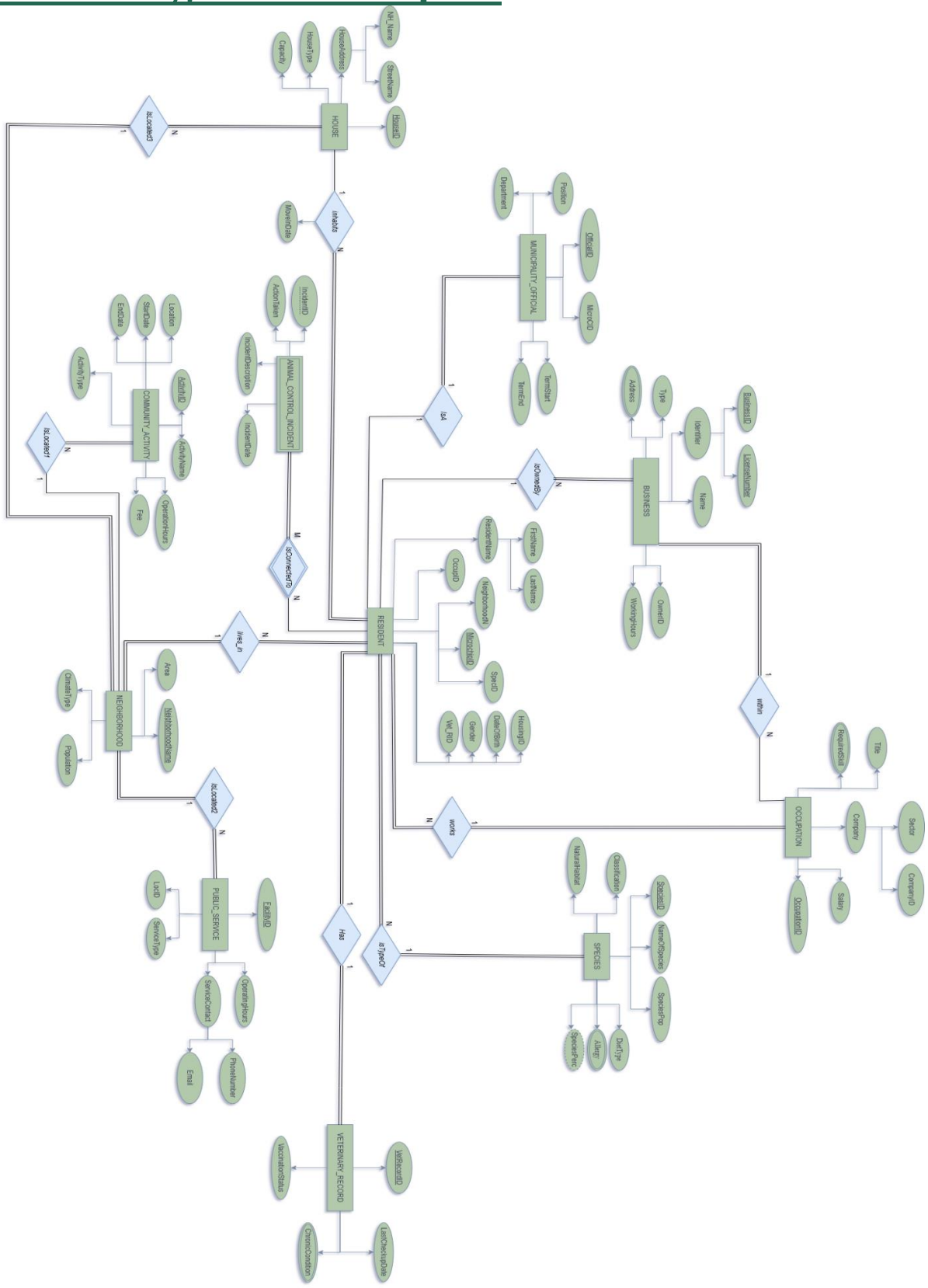
The municipality is composed of unique neighborhood districts customized to satisfy the needs of the residents. For instance, the neighborhood contains information on the climate type maintained within the area to accommodate warm-blooded and cold-blooded pets. The pet residents are tracked via their microchips and belong to a specific species.

The municipality utilizes the resident's and species' information to help provide housing in the appropriate neighborhoods. Additionally, the municipality provides public services for each neighborhood such as utility services and fire stations. The municipality also keeps track of veterinary records for each pet to maintain vaccinations and avoid deadly outbreaks such as rabies (Johns, 2021). Community activities such as plays and festivals are also commonly hosted along with facilities like public parks throughout the year.

The municipality is managed by municipality officials in specific departments and positions. The database also tracks the businesses within the city along with their corresponding operating license. Pets work specific jobs in either the public or private sector, and their occupation describes their role, salary, and business or sector they work in.

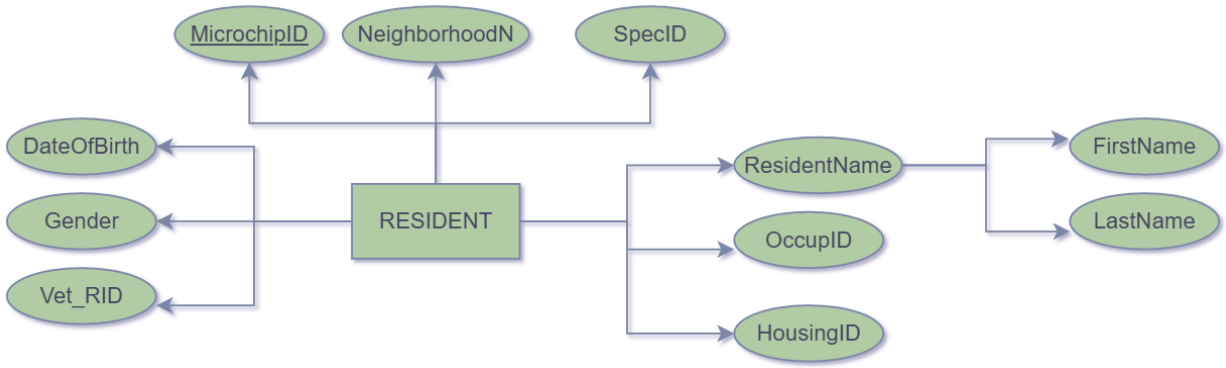
*See attached PNG for clearer picture

IV - ER diagram for Polopolis



V – Entity Types

RESIDENT



This entity type represents a pet living within the municipality of Polopolis. Each resident is identified by a unique primary key which is MicrochipID. This entity type helps to keep track of the resident's information and relationships within the city by storing a variety of personal and relational attributes.

- **DATEOfBirth**: The DATE of birth of the resident, likely formatted as DD-MM-YYYY.
- **Gender**: Indicates the resident's gender (e.g., male, female, or other).

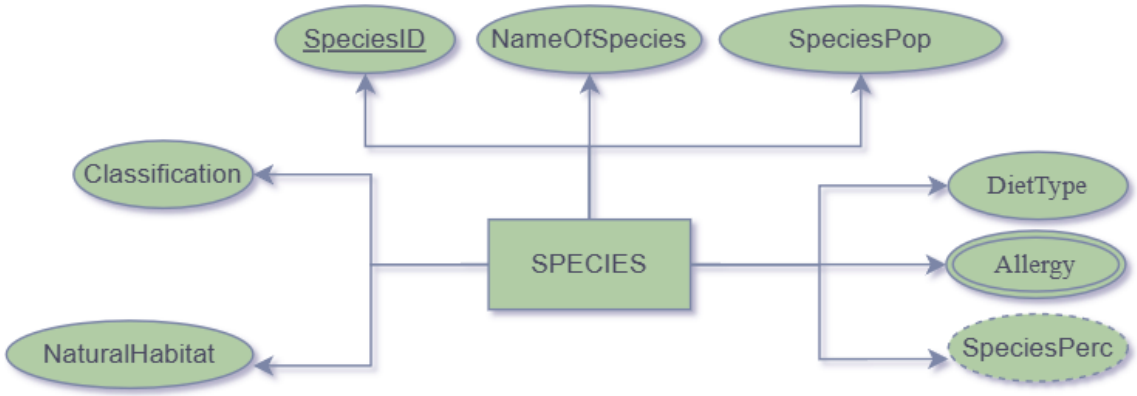
We have five foreign keys in this entity type which are:

- **SpecID**: specifies the type of species the resident belongs to (e.g., dog, cat, bird).
- **HousingID**: indicates the house occupied by the resident.
- **NeighborhoodN**: represents the neighborhood name in which the resident lives in.
- **OccupID**: specifies the resident's job or role within the pet society, for unemployment it would have a specific value such as 0.
- **Vet_RID**: is an ID for a health record that holds the health-related data for the resident.

One composite attribute exists which is:

- **ResidentName**: The resident's full name has two subparts, first name and last name.
    - **FirstName**: Stores the resident's first name.
    - **LastName**: Stores the resident's last name.

SPECIES



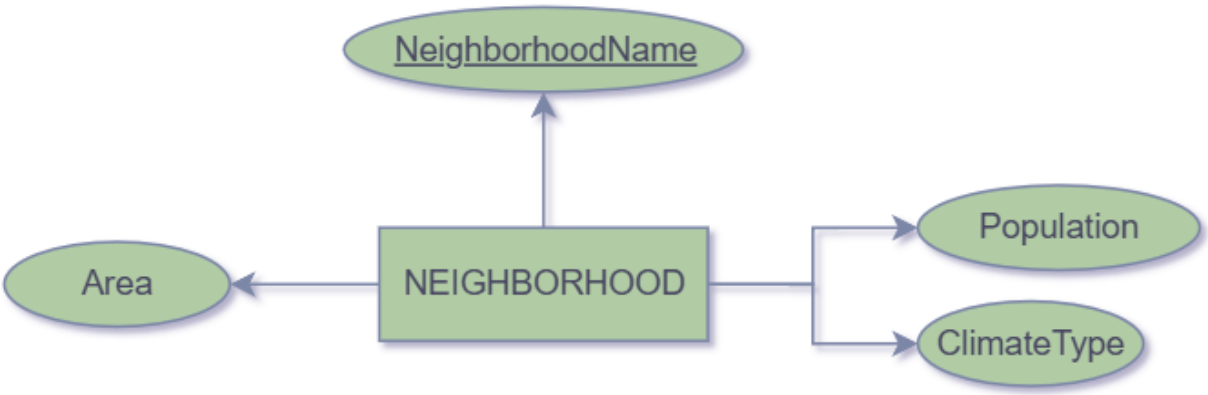
The SPECIES entity type represents different types of species within Polopolis providing detailed information about each one. This entity type includes general characteristics, statistical data, and demographic information for each species. Each species is uniquely identified by a primary key SpeciesID, assigned incrementally from 1 up to the total number of species in the city.

- **NameOfSpecies**: the name of the species (e.g., Dog, Cat, Parrot).
- **Classification**: specifies the classification of the species (e.g., Mammal, Reptile, Bird), helping to categorize them into broader groups.
- **NaturalHabitat**: describes the natural habitat of the species, such as forest, desert, or urban areas.
- **SpeciesPop**: the total population of the species within the Polopolis, providing a count of residents that belong to this species.
- **SpeciesPerc**: percentage of a certain species out of the whole population of Polopolis, we can get this percentage by **SpeciesPop/TotalPop**
- **DietType**: Specifies the dietary preference of the species (e.g., Herbivore, Carnivore, Omnivore). Example entries include carnivore for a cat resident or herbivore for a bird resident.

One multivalued attribute exists which is:

- **Allergy**: Specifies the allergies of the species (e.g., lactose intolerance, gluten allergy, chocolate allergy)

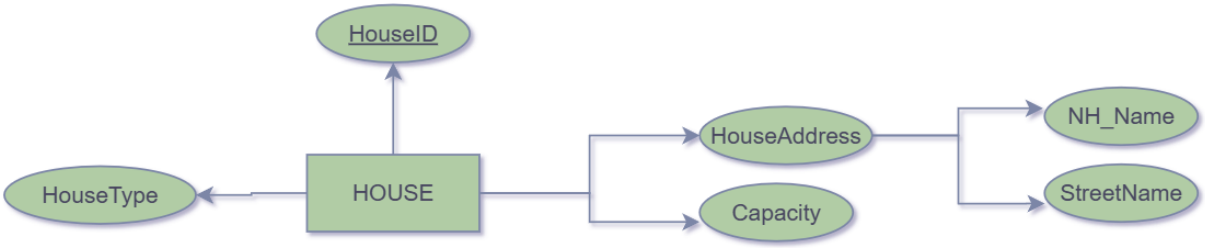
NEIGHBORHOOD



The NEIGHBORHOOD entity type represents different neighborhoods within Polopolis, it provides details about each area's environment, demographics, and unique characteristics. Its primary key is identified by NeighborhoodName.

- **Area**: the size of the neighborhood, usually measured in square kilometers.
- **ClimateType**: describes the main climate of the neighborhood (e.g., Tropical, Temperate, Desert), and helps us identify suitable living conditions for different types of species.
- **Population**: total number of residents living in the neighborhood.

HOUSE



Every pet needs a house to live in, so we made a House entity type, which represents different types of housing structures available for pets within Polopolis. Each house is identified by a primary key, HouseID, and includes details about the house type, address, capacity, and residents living within it. This entity type is very important as it allows the municipality to manage pet housing, providing specific details about each house and its connection to its pets.

Attributes

- **HouseID** (Primary Key): A unique identifier for each housing unit, ensuring each entry is distinct and easily referenced within the database.
- **HouseType**: Specifies the type of housing available. This classification helps match housing units to the specific needs of different pet species.
- **Capacity**: Indicates the maximum number of pets the housing unit can accommoDATE.

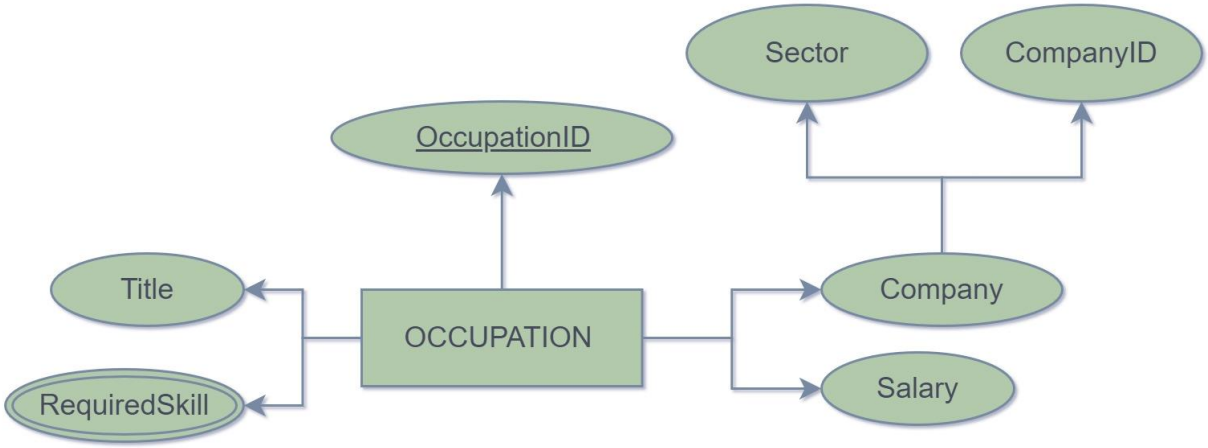
HOUSE includes one composite key:

- **HouseAddress**: Stores the physical address of the housing unit, allowing for precise location identification within Polopolis, which becomes particularly important if there is any mischief going on.
    - **NH_Name (**foreign key): Refers to the name of the neighborhood where the house is located, linking to the Neighborhood entity type. This supports the "isLocated" relationship, which makes it easier to identify which neighborhood a house is in.
    - **StreetName**: Specifies the street where the housing unit is located, providing additional detail to the address.

HOUSE includes one foreign key:

- **NH_Name** mentioned above.

OCCUPATION



This entity type tracks various roles and responsibilities that pets hold within Polopolis, allowing us to understand how each pet contributes to the community. Each occupation is uniquely identified by OccupationID, the primary key.

The simple attributes include:

- **Title**: The title of the pet's role (e.g., Service Animal, Guard Dog, Therapy Pet), indicating their specialized duties.
- **Salary**: Represents potential earnings or resources provided in exchange for the pet's services, like treats or toys.

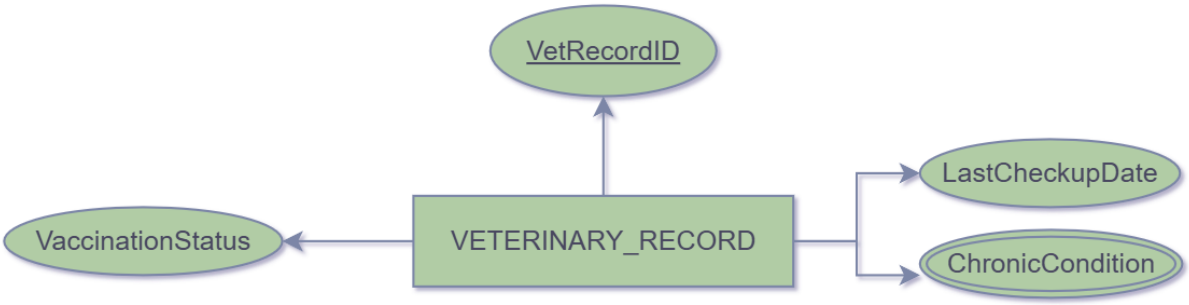
We have one multivalued attribute:

- **RequiredSkill**: Lists specific skills pets need for each occupation, such as obedience, agility, or social behavior.

We have one composite attribute which is:

- **Company**:
    - **Sector:** indicates whether they work in a public sector - municipality, public sector-other, private business, non-profit, etc.
    - **CompanyID:** The business where the pet works, serving as a foreign key to the BusinessID in the Business entity type could be N/A if the pet's occupation is not associated with a business.

VETERINARY_RECORD



It's integral that every pet has their own VETERINARY_RECORD to keep track of their vaccination status, diet, and diseases. The municipality ensures pets are up to DATE on their vaccines for the well-being of the city! The primary key is VetRecordID, which is this numerical key will indicate the unique ID number of each vet record.

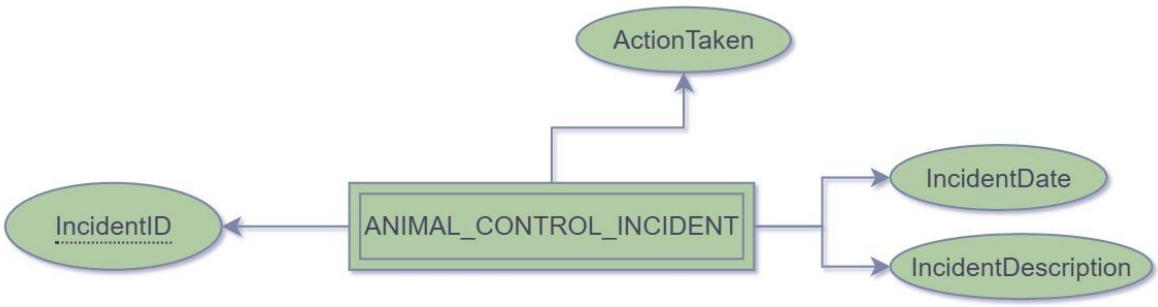
Attributes include:

- **VaccinationStatus:** Keeps track if they are up to DATE with their yearly vaccinations
- **LastCheckupDATE:** Lets the municipality know the last DATE of their checkup and if they are due for a new vet visit, the DATE is in the format DD-MM-YY.

A multivalued variable exists, which is:

- **ChronicCondition:** If the pet suffers from any chronic condition it will be stated here

ANIMAL_CONTROL_INCIDENT

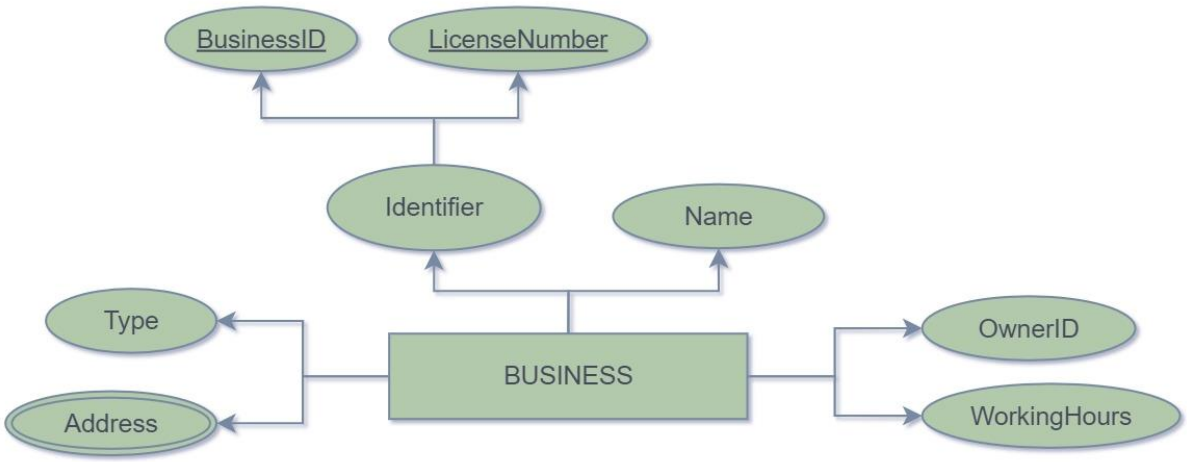


This entity type holds information regarding the aggressive or unlawful behavior of residents in Polopolis. Data such as the incident DATE and punishment are contained here. Since this is a weak entity type, ANIMAL_CONTROL_INCIDENT's key is a combination of a partial key IncidentID, which indicates the category of the offense committed, and the foreign key MicrochipID which indicates who committed it.

The rest of the attributes of ANIMAL_CONTROL_INCIDENT are the following simple attributes:

- **IncidentDATE**: The DATE of the committed offense.
- **IncidentDescription**: The description of the offense.
- **ActionTaken**: The punishment given to the offender/s.

BUSINESS



This entity type represents the various businesses operating within Polopolis, from pet grooming salons to toy stores. Each business is uniquely identified by a primary composite key, an identifier which is composed of BusinessID that allows for organized management of commercial entity types and their operational details, and LicenseNumber which is a unique identifier for the business's license, ensuring compliance with municipal regulations.

- **Name**: The official name of the business, such as "Pawsome Groomers" or "Pet Paradise."
- **Type**: Indicates the business type, such as Restaurant, Grooming Salon, or Toy Store, providing a quick identification of services offered.
- **WorkingHours**: Specifies the hours during which the business is operational, aiding residents and visitors in planning visits.

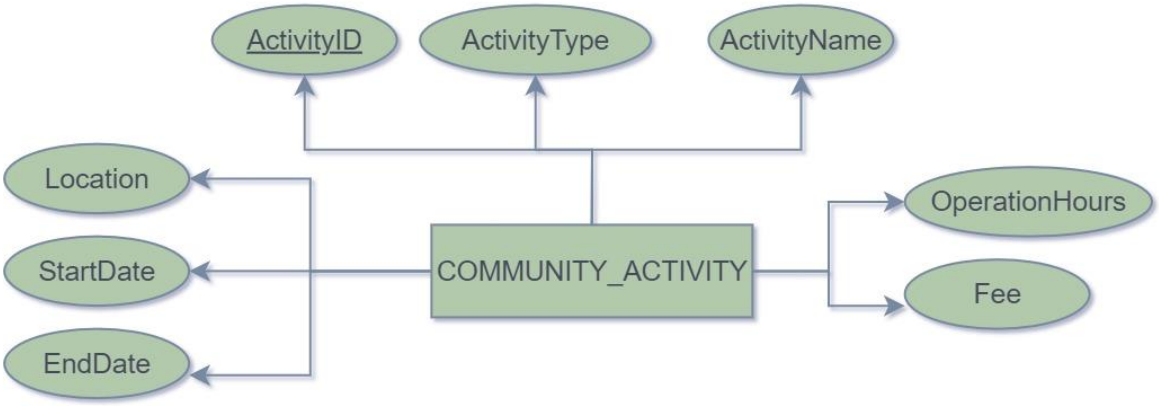
One multivalued attribute which is:

- **Address**: neighborhood name where the business operates. A business can have more than one address that why it's multivalued.

One foreign key which is:

- **OwnerID**: A foreign key linking the business to the owner, who is a resident of Polopolis.

COMMUNITY_ACTIVITY



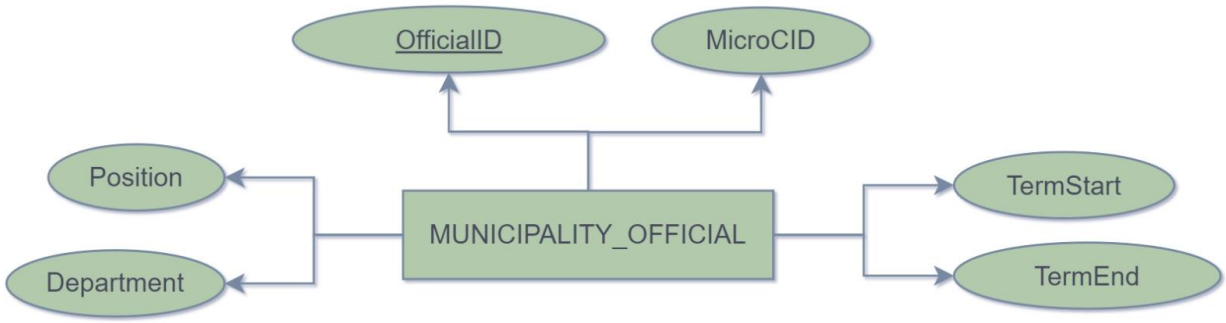
The residents of Polopolis love to get involved with their community and create events to keep their city fun and interesting. Activities are uniquely identified using the
ActivityID primary key. Other attributes include:

- **ActivityType**: contains the type of the activity
- **ActivityName**: contains the name of the activity
- **StartDATE**: contains the start DATE of the activity
- **EndDATE**: contains the end DATE of the activity
- **OperatingHours**: contains the operating hours of the activity
- **Fee**: contains the admission fee, if any

One foreign key which is:

- **Location**: specifies the location of the activity by referencing the neighborhood name.

MUNICIPALITY_OFFICIAL



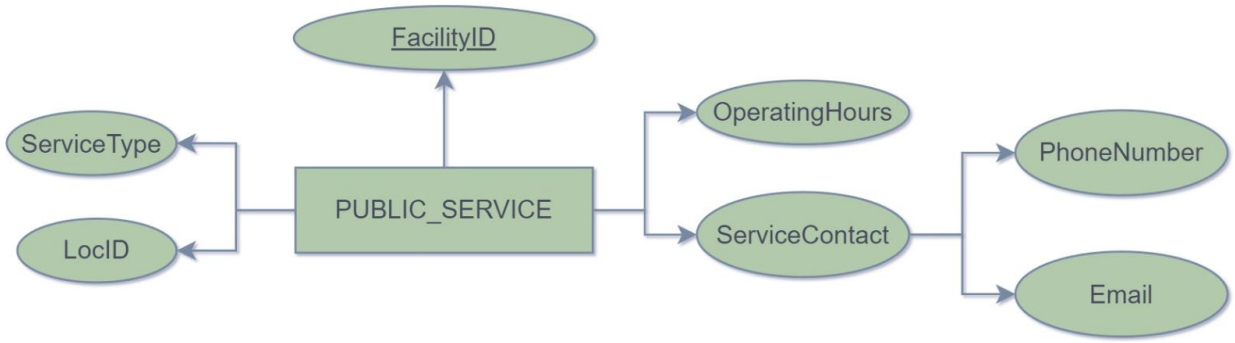
The municipality needs to keep track of its pet employees, how long they'll be in term (if applicable), what departments they belong to and their position within each department. The primary key is OfficialID which is a numerical key that will indicate the unique ID number of each official in the municipality
The attributes include:

- **Department:** the department that each official belongs to within the municipality
- **Position:** The position of each official in their respective department
- **TermStart:** The start DATE of their employment
- **TermEnd:** If applicable, the DATE of the end of their employment

One foreign key exists which is:

- **MicroCID**: references the MicrochipID number of each pet

PUBLIC_SERVICE



We all like services right? Well, Polopolis is no different, Public services represent essential services available in this city, to try and establish a clean, safe, and sustainable environment for these cute pets. Public services are usually identified using FacilityID - a primary key. This entity type ensures proper tracking of various services provided across the neighborhoods, their operating hours, and types of services.

Attributes:

- **ServiceType:** Specifies the type of public service offered, with examples like Sewage and Plumbing, Electricity, Water Supply, etc.
- **OperatingHours:** represents the hours during which each facility operates, which allows pet residents to know when they are capable of accessing services.

One foreign key which is:

- **LocID**: Links to the NeighborhoodName in which the facility is located, supporting a relationship to the Neighborhood entity type.

One composite attribute:

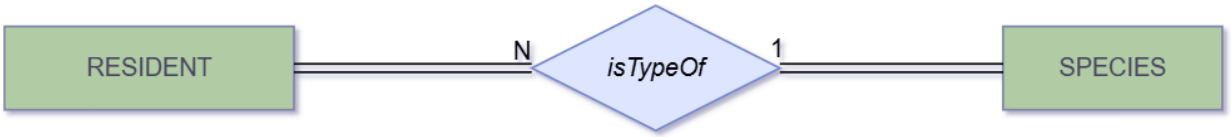
- **ServiceContact**: Represents contact information with two subparts, PhoneNumber and Email.
    - **PhoneNumber**: Stores the primary contact number of the facility.
    - **Email**: Stores the email address associated with the facility, which allows residents to communicate with service providers easily.

VI – Relationships

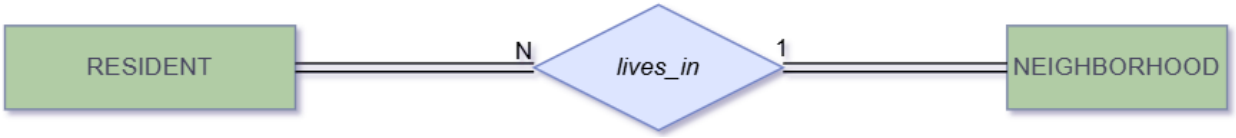
The pets in Polopolis should know where activities are held in order to participate and join the fun. Thus, Every COMMUNITY_ACTIVITY *isLocated1* in a NEIGHBORHOOD. Participation of the COMMUNITY_ACTIVITY is total since every activity should be located in some NEIGHBORHOOD. However, the participation of NEIGHBORHOOD is partial since not every NEIGHBORHOOD will host a COMMUNITY_ACTIVITY. The relationship is N:1 since multiple COMMUNITY_ACTIVITYs can be located in a NEIGHBORHOOD, but an event cannot occur in multiple NEIGHBORHOODs simultaneously.

Every Neighborhood will be provided with electricity, water, and fire fighters. So every PUBLIC_SERVICE *isLocated2* in a NEIGHBORHOOD. The participation of both entity types is total, meaning that each PUBLIC_SERVICE must be in a NEIGHBORHOOD, and every NEIGHBORHOOD should have PUBLIC_SERVICE provided. This is an N:1 relationship because multiple Public Services can be located within a single NEIGHBORHOOD, but each PUBLIC_SERVICE is uniquely tied to only one NEIGHBORHOOD.

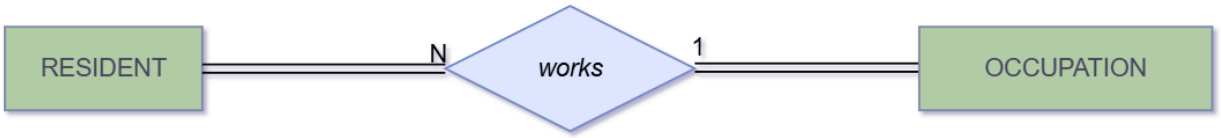
Residential areas span the multiple neighborhoods within Polopolis. So, each HOUSE *isLocated3* in NEIGHBORHOOD. Both entity types exhibit total participation since the city can't have a HOUSE that isn't situated in a NEIGHBORHOOD, and neighborhoods will all have residential buildings. This relationship is N:1 because multiple Houses can be located in a singular Neighborhood, but each House can only be tied to one Neighborhood.



The pets will all be attributed to a specific species. Thus, the *isTypeOf* relationship links RESIDENT with SPECIES. The participation of both entity types is total since all RESIDENTS belong to a SPECIES and all SPECIES will be linked to at least one RESIDENT. The relation is N:1, as each RESIDENT can only belong to one SPECIES, and a SPECIES may correspond to more than one pet.

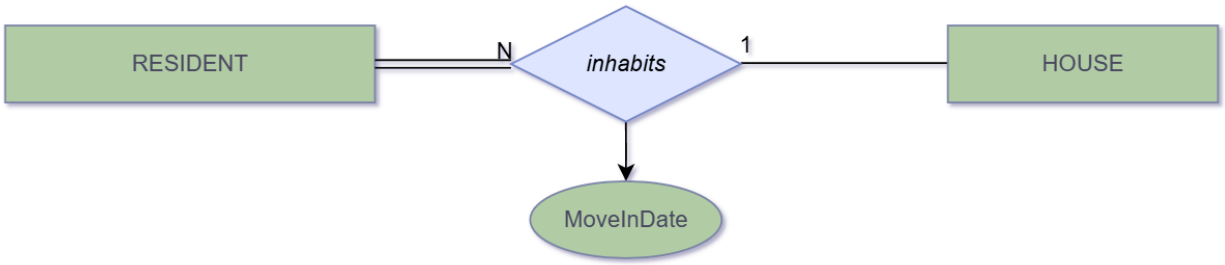


Each pet will reside within a specific area in the city. *lives_in* describes the relationship between the RESIDENT and NEIGHBORHOOD entity types. The participation of the entity types is total since every RESIDENT will live in a NEIGHBORHOOD and every NEIGHBORHOOD will contain at least one RESIDENT. This relationship is N:1 because multiple Residents can be located in a singular Neighborhood, but a pet may not reside in two neighborhoods at once.



A pet may reach working age and get a job. This defines the works relationship between the RESIDENT and the OCCUPATION entity types. Both RESIDENT and OCCUPATION have full participation since all residents will have an OCCUPATION entity describing their employment or unemployment, and OCCUPATION is in total participation since every job must be done by a resident. This is an N:1 relationship where multiple RESIDENTs can hold only one OCCUPATION, and each OCCUPATION can be done by more than one RESIDENT.

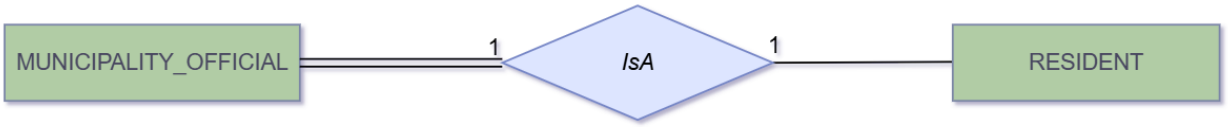
To ensure vaccinations are being taken regularly, Every RESIDENT is assigned a unique VETERINARY_RECORD through the *Has* relationship. The participation is total, meaning every RESIDENT must have a VETERINARY_RECORD, and each record must be linked to a specific pet. The relation is 1:1, as each RESIDENT can have only one record, and each vet record is associated with only one pet.



A HOUSE could be inhabited by at least one RESIDENT. Otherwise, the house would be available for future pets. This defines the *inhabits* relationship between the HOUSE and RESIDENT entity types. The participation of residents is total, meaning that all residents will inhabit a house. While a HOUSE has partial participation since not all of them will be occupied. This relationship is N:1, where every HOUSE has at least one RESIDENT, and each RESIDENT can only inhabit a single HOUSE. The attribute "MoveInDATE" is specific to the *inhabits* relationship which basically represents the DATE when a RESIDENT moves into a HOUSE, recorded in the format dd/mm/yyyy.

Whenever a RESIDENT commits an offense in Polopolis, their crimes should be recorded in the ANIMAL_CONTROL_INCIDENT relation. Thus, the relationship *isConnectedTo* must be created between ANIMAL_CONTROL_INCIDENT and RESIDENT. The participation of ANIMAL_CONTROL_INCIDENT is total since every entity in the relation must be connected to a criminal RESIDENT. However, the participation of the RESIDENT is partial, since it is not necessary that every RESIDENT commits a crime. The relationship is M:N since multiple ANIMAL_CONTROL_INCIDENTs can be connected to a RESIDENT, and an ANIMAL_CONTROL_INCIDENT can be attributed to multiple RESIDNETs (e.g. a gang of cats harassing an innocent mouse couple).

Some OCCUPATIONs in Polopolis are associated with a specific BUSINESS. This forms the *within* relationship between the OCCUPATION and BUSINESS entity types. The participation of BUSINESS is total since every BUSINESS must have at least one job, and the participation of OCCUPATION is partial since not all OCCUPATIONs will be attributed to a business. This is an N:1 relationship, as a single BUSINESS can have multiple OCCUPATIONS, but each OCCUPATION is associated with only one BUSINESS entity.



The municipality needs to employ pets residing in the city. Thus, the *IsA* relation must be created between MUNICIPALITY_OFFICIALS and RESIDENT. Participation of the MUNICIPALITY_OFFICIALS entity is total since every official should be a pet RESIDENT. On the other hand, the participation of RESIDENT is partial since not all pets are municipality officials. The relation is 1:1 because a pet resident can only hold one position in the municipality, and each position is done by one pet residing in the city.

Every BUSINESS in Polopolis is owned by a pet. *isOwnedBy* describes the relationship between the BUSINESS and RESIDENT entity types. The BUSINESS entities participates totally in this relationship, meaning that each BUSINESS must have an owner. However, RESIDENT partially participates in the relationship since a pet may own a business. This is a N:1 relationship, as each BUSINESS is associated with only one pet, but a single RESIDENT can own multiple businesses.

VII - ER to Relational Mapping Algorithm

Now that our ER schema design is complete, illustrated as a system of entity types, attributes, and relationships, we need to transform it into a relational database design. Mapping the ER model to a relational database design is a seven-step process, each of which is specified and described in the following pages.

Step 1: Mapping of Regular Entity Types

In the first step, each regular entity type must be mapped into a relation. Every regular entity type will have its own relation, including all of its simple attributes and one primary key, which is underlined. The main entity types for the Polopolis Municipality Database Design are: RESIDENT, SPECIES, NEIGHBORHOOD, HOUSE, OCCUPATION, VETERINARY_RECORD, BUSINESS, COMMUNITY_ACTIVITY, MUNICIPALITY_OFFICIAL, and PUBLIC_SERVICE .

RESIDENT

MicrochipID	DATEOfBirth	Gender	FirstName	LastName

The RESIDENT entity type includes both simple and composite attributes. The composite attribute ResidentName consists of FirstName and LastName which are included in the RESIDENT relation as simple attributes. The other simple attributes are DATEOfBirth, Gender, and lastly MicrochipID, which is underlined since it is the **primary key** of this relation.

SPECIES

SpeciesID	NameOfSpecies	Classification	NaturalHabitat	SpeciesPop
DietType				

The SPECIES entity type includes both simple, multivalued, and derived attributes, but in this step, we will only include the six simple attributes in the SPECIES relation. The six attributes are: NameOfSpecies, Classification, NaturalHabitat, SpeciesPop, DietType, and lastly SpeciesID, which is underlined since it is the **primary key** of this relation.

NEIGHBORHOOD

NeighborhoodName	Area	ClimateType	Population

The NEIGHBORHOOD entity type includes four simple attributes which are also included in the NEIGHBORHOOD relation. The four attributes are Area, ClimateType, Population, and NeighborhoodName which is the **primary key** of this relation.

HOUSE

HouseID	HouseType	Capacity	StreetName

The HOUSE entity type includes simple and composite attributes. The composite attribute is composed of StreetName (simple attribute) and NH_Name(added in later steps). In this current relation, only the attributes StreetName, HouseType, Capacity, and the underlined **primary key** HouseID are included.

OCCUPATION

OccupationID	Salary	Title	Sector

The OCCUPATION entity type includes simple attributes, the composite attribute company which includes sector (simple attribute) and companyID (added in later steps), and multivalued attributes. In this current relation, only the **primary key** OccupationID, underlined above, and the three simple attributes Title, Salary, and Sector are included.

VETERINARY_RECORD

VetRecordID	VaccinationStatus	LastCheckUpDATE

The VETERINARY_RECORD entity type includes both simple and multivalued attributes, and in this step we only included the three simple attributes in the VETERINARY_RECORD relation. The three included are VaccinationStatus, LastCheckUpDATE, and VetRecordID which is underlined since it is the **primary key** of this relation.

BUSINESS

BusinessID	LicenseNumber	Name	Type	WorkingHours

The BUSINESS entity type includes both simple and multivalued attributes, and in this step we only include the simple attributes in the BUSINESS relation. The attributes included are Type, WorkingHours, Name. Also, in the entity type we defined a composite key identifier composed of BusinessID and LicenseNumber, so both these attributes will be underlined in the relation since they will form the **primary key**.

COMMUNITY_ACTIVITY

ActivityID	ActivityType	ActivityName	StartDATE	EndDATE
OperatingHours	Fee			

The COMMUNITY_ACTIVITY entity type is composed of seven simple attributes, all of which are included in the COMMUNITY_ACTIVITY relation. The seven attributes are ActivityType, ActivityName, StartDATE, EndDATE, OperatingHours, Fee, and the **primary key** ActivityID.

MUNICIPALITY_OFFICIAL

OfficialID	Department	Position	TermStart	TermEnd

The MUNICIPLAITY_OFFICIAL relation is composed of five different simple attributes which include OfficialID as the **primary key**. The other four are Department, Position, Termstart, and TermEnd.

PUBLIC_SERVICE

FacilityID	ServiceType	OperatingHours	PhoneNumber	Email

The PUBLIC_SERVICE entity type includes both simple and composite attributes. The composite attribute ServiceContact consists of PhoneNumber and Email which are included in the PUBLIC_SERVICE relation as simple attributes. The other simple attributes are ServiceType, OperatingHours, and FacilityID which is underlined as it is the **primary key** of this relation.

Step 2: Mapping of Weak Entity Types

In this step, we map the weak entity type into a relation. Similar to Step 1, only simple attributes are included in this relation. Additionally, the weak entity relation includes a foreign key that references the primary key of the associated owner relation. The primary key for this relation is a combination of the added foreign key and the partial key of the weak entity type. Our database includes only one weak entity type which is ANIMAL_CONTROL_INCIDENT.

ANIMAL_CONTROL_INCIDENT

MicrochipID	IncidentID	IncidentDATE	IncidentDescription	ActionsTaken

The weak entity type ANIMAL_CONTROL_INCIDENT consists of four simple attributes, three of which are IncidentDATE, IncidentDescription, and ActionsTaken. MicrochipID is the **primary key** of the owner entity type RESIDENT. MicrochipID along with the **partial key** IncidentID, the fourth simple attribute, are combined to represent the **primary key** of this relation.

Step 3: Mapping of Binary 1:1 Relation Types

In this step, we are going to map the binary one-to-one relationships. In order to accomplish our goal we can follow one of three approaches. We are going to follow the foreign key approach because it is the most useful in our case. The binary one-to-one relationships that need to be mapped are: *Has*, and *IsA*

RESIDENT(*Has*)

MicrochipID	DATEOfBirth	Gender	FirstName	LastName
Vet_RID				

Every RESIDENT has a VETERINARY_RECORD. In this case, both entity types have full participation in the previously defined relationship, so we chose to include the foreign key in the RESIDENT relation. We add the **foreign key** Vet_RID in the Resident relation which references the primary key, VetRecordID, in the VETERINARY_RECORD relation.

MUNICIPALITY_OFFICIAL(*IsA*)

OfficialID	MicroCID	Department	Position	TermStart
TermEnd				

Every Municipality_official should be a resident in Polopolis, and the *IsA* relationship links the Municipality_Official and Resident entity types. Since MUNICIPALITY_OFFICIAL has full participation, we chose to include the MicroCID **foreign key** within its relation to refer to the MicroChipID primary key in the RESIDENT relation.

Step 4: Mapping of Binary 1:N Relation Types

This step will include mapping the binary one-to-many relationships. The foreign key is added to the relation of the corresponding entity type at the “many” side of the previously defined relationship. Any simple attributes of the one-to-many relationship must be included as well. The following one-to-many relationships need to be mapped: *isLocated1, isLocated2,* and *isLocated3, isTypeOf, lives_in, inhabits, works, within, and isOwnedBy.*

COMMUNITY_ACTIVITY(*isLocated1*)

ActivityID	ActivityType	ActivityName	StartDATE	EndDATE
OperatingHours	Fee	Location		

Many COMMUNITY_ACTIVITY events may be located in the same NEIGHBORHOOD. In this case, the COMMUNITY_ACTIVITY entity type is on the "many" side. Thus, we add to the COMMUNITY_ACTIVITY relation the **foreign key** Location, which references the primary key, NeighborhoodName, in the NEIGHBORHOOD relation.

PUBLIC_SERVICE(*isLocated2*)

FacilityID	ServiceType	OperatingHours	PhoneNumber	Email
LocID				

Many PUBLIC_SERVICE events may be located in the same NEIGHBORHOOD. In this case, the PUBLIC_SERVICE entity type is on the "many" side. Thus, we add to the PUBLIC_SERVICE relation the **foreign key** LocID, which references the primary key, NeighborhoodName, in the NEIGHBORHOOD relation.

HOUSE(*isLocated3)*

HouseID	HouseType	Capacity	NH_Name	StreetName

Many HOUSEs may be located in the same NEIGHBORHOOD. In this case, the HOUSE entity type is on the "many" side. Thus, we add to the HOUSE relation the **foreign key** NH_Name, which references the primary key, NeighborhoodName, in the NEIGHBORHOOD relation.

RESIDENT (*isTypeOf, lives_in, inhabits, works)*

MicrochipID	DATEOfBirth	Gender	FirstName	LastName
Vet_RID	NeighborhoodN	SpecID	HousingID	Housing_MoveInDATE
OccupID				

Many RESIDENTs may live in the same NEIGHBORHOOD. In this case, the RESIDENT entity type is on the "many" side. Thus, we add to the RESIDENT relation the **foreign key** NeighborhoodN which references the primary key, NeighborhoodName, in the NEIGHBORHOOD relation.

Many RESIDENTs are of the same SPECIES type, that's why the RESIDENT entity type is on the "many" side. So, we add to the RESIDENT relation the **foreign key** SpecID which references the primary key, SpeciesID, in the SPECIES relation.

Each HOUSE may be inhabited by multiple RESIDENTs. HOUSE is on the "one" side, while RESIDENT is on the "many" side. So, we add HousingID as a **foreign key** in the RESIDENT relation, referencing the primary key HouseID in the HOUSE relation. Additionally, we also include the simple attribute MoveInDATE of the *inhabits* relationship type in the RESIDENT relation and rename it to Housing_MoveInDATE.

Each RESIDENT may work in multiple OCCUPATIONs. OCCUPATION is on the "one" side, while RESIDENT is on the "many" side. So, we add OccupID as a **foreign key** in the RESIDENT relation. OccupID references the primary key, OccupationID, in the OCCUPATION relation.

OCCUPATION(w*ithin*)

OccupationID	Salary	Title	Sector	CompanyID

Some OCCUPATIONs in Polopolis are situated within a specific BUSINESS. BUSINESS is on the “one” side while OCCUPATION is on the “many” side. So, we add companyID as a **foreign key** in the OCCUPATION relation, which references the primary key, businessID, in the BUSINESS relation.

BUSINESS (*isOwnedBy*)

BusinessID	LicenseNumber	Name	Type	WorkingHours
OwnerID				

Each resident may own more than one business. RESIDENT is on the "one" side, while BUSINESS is on the "many" side. Thus, we add OwnerID as a **foreign key** in the BUSINESS relation which references the primary key MicrochipID in the RESIDENT relation.

Step 5: Mapping of Binary M:N Relation Types

In this step, we map each binary many-to-many relationship by creating a new relation for each one. This new relation will contain foreign keys that reference the primary keys of the participating entities. Together, these foreign keys will serve as the primary key for the new relation. We will also add any other relevant simple attributes related to the many-to-many relationship. For this report, the many-to-many relationship that requires mapping is *is_connected_to*.

IS_CONNECTED_TO

MicrochipID	IncidentID

A RESIDENT can be connected to many incidents, and one incident can be connected to many residents. The *is_connected_to* relationship links the RESIDENT and the ANIMAL_CONTROL_INCIDENT entity types. So, we created a new relation called IS_CONNECTED_TO that includes the primary keys of the RESIDENT and ANIMAL_CONTROL_INCIDENT entity types. The combination of both added keys represents the **primary key** of the “IS_CONNECTED_TO” relation and they are consequently underlined.

Step 6: Mapping of Multivalued Attributes

In this step, for each multivalued attribute we did not include previously, we will create a new relation. The new relation will contain the related attribute and primary key(s) of the entity type to which it belongs. The combination of the primary key(s) and attribute will represent the primary key of the newly created relation. We have four multivalued attributes: SPECIES_ALLERGY, OCCUPATION_REQUIRED_SKILL, VR_CHRONIC_CONDITION, and BUSINESS_ADDRESS.

SPECIES_ALLERGY

SpeciesID	Allergy

The Allergy multivalued attribute belongs to the SPECIES entity type. So, we created a new relation called “SPECIES_ALLERGY”. The **primary key** of this relation is the SpeciesID which is the same as the SPECIES relation. It is also composed of the Allergy attribute which represents the allergies belonging to certain species.

OCCUPATION_REQUIRED_SKILL

OccupationID	RequiredSkill

The RequiredSkill multivalued attribute belongs to the OCCUPATION entity type. So, we created a new relation called “OCCUPATION_REQUIRED_SKILL”. The **primary key** of this relation is the OccupationID which is the same as the OCCUPATION relation. It is also composed of the RequiredSkill attribute which represents the skills needed in each occupation.

VR_CHRONIC_CONDITION

VetRecordID	ChronicCondition

The ChronicCondition multivalued attribute belongs to the VETERINARY_RECORD entity type. So, we created a new relation called “VR_CHRONIC_CONDITION”. The **primary key** of this relation is the VetRecordID which is the same as the VETERINARY_RECORD relation. It is also composed of the ChronicCondition attribute which represents the chronic conditions recorded in each veterinary record.

BUSINESS_ADDRESS

BusinessID	LicenseNumber	Address

The Address multivalued attribute belongs to the BUSINESS entity type. So, we created a new relation called “BUSINESS_ADDRESS”. The **primary key** of this relation is the BusinessID and LicenseNumber which are the primary keys of the BUSINESS relation. It is also composed of the attribute Address which represents the locations of each business.

Step 7: Mapping of N-ary Relationship Types

This step focuses on mapping N-ary relationship types. This involves creating a new relation that includes the primary keys of each participating entity as well as any simple attributes associated with the relationship type. However, since our design does not include any N-ary relationship types, this step does not apply to our report.

Final Displays

RESIDENT

MicrochipID	DATEOfBirth	Gender	FirstName	LastName
Vet_RID	NeighborhoodN	SpecID	HousingID	Housing_MoveInDATE
OccupID				

SPECIES

SpeciesID	NameOfSpecies	Classification	NaturalHabitat	SpeciesPop
DietType				

NEIGHBORHOOD

NeighborhoodName	Area	ClimateType	Population

HOUSE

HouseID	HouseType	Capacity	NH_Name	StreetName

OCCUPATION

OccupationID	Salary	Title	Sector	CompanyID

VETERINARY_RECORD

VetRecordID	VaccinationStatus	LastCheckUpDATE

BUSINESS

BusinessID	LicenseNumber	Name	Type	WorkingHours
OwnerID				

COMMUNITY_ACTIVITY

ActivityID	ActivityType	ActivityName	StartDATE	EndDATE
OperatingHours	Fee	Location		

MUNICIPALITY_OFFICIAL

OfficialID	MicroCID	Department	Position	TermStart
TermEnd				

PUBLIC_SERVICE

FacilityID	ServiceType	OperatingHours	PhoneNumber	Email
LocID				

ANIMAL_CONTROL_INCIDENT

MicrochipID	IncidentID	IncidentDATE	IncidentDescription	ActionsTaken

IS_CONNECTED_TO

MicrochipID	IncidentID

SPECIES_ALLERGY

SpeciesID	Allergy

OCCUPATION_REQUIRED_SKILL

OccupationID	RequiredSkill

VR_CHRONIC_CONDITION

VetRecordID	ChronicCondition

BUSINESS_ADDRESS

BusinessID	LicenseNumber	Address

VIII - Table Creation in SQL

After completing the ER diagram for Polopolis and translating it into a relational database design, the next step is to create the actual tables on the Oracle Database Server. We'll begin by setting up all the tables, followed by populating them with data. Finally, we will run queries to demonstrate the database's significance in a municipality context.

RESIDENT

```
CREATE TABLE RESIDENT (
    MICROCHIPID          CHAR(15) PRIMARY KEY,
    DATEOFBIRTH          DATE NOT NULL,
    GENDER         VARCHAR(10) NOT NULL CHECK (GENDER IN ('MALE', 'FEMALE',
'OTHER')),
    FIRSTNAME            VARCHAR(50) NOT NULL,
    LASTNAME             VARCHAR(50) NOT NULL,
    SPECID         CHAR(9) NOT NULL,
    NEIGHBORHOODN  VARCHAR(30) NOT NULL,
    HOUSINGID            CHAR(9) NOT NULL,
    VET_RID              CHAR(9) NOT NULL,
    HOUSING_MOVEINDATE DATE NOT NULL,
    OCCUPID               CHAR(9)
);
```

SPECIES

```
CREATE TABLE SPECIES (
    SpeciesID      CHAR(9) PRIMARY KEY,
    NameOfSpecies  VARCHAR(50) NOT NULL,
    Classification  VARCHAR(20) NOT NULL CHECK (
Classification IN ('Mammal', 'Bird', 'Reptile', 'Fish', 'Amphibian', 'Invertebrate')),
    NaturalHabitat  VARCHAR(50),
    SpeciesPop     INT DEFAULT 0 CHECK (SpeciesPop >= 0),
    DietType             VARCHAR(20) NOT NULL CHECK (DietType IN ('Herbivore',
'Carnivore', 'Omnivore'))
);
```

NEIGHBORHOOD

```
CREATE TABLE NEIGHBORHOOD (
    NeighborhoodName VARCHAR(30) PRIMARY KEY,
    Area                 DECIMAL(5, 2) NOT NULL,
    ClimateType    VARCHAR(30) NOT NULL CHECK (ClimateType IN ('Humid', 'Dry',
'Cold', 'Temperate', 'Tropical')),
    Population      INT DEFAULT 0 CHECK (Population >= 0)
);
```

HOUSE

```
CREATE TABLE HOUSE (
    HouseID             CHAR(9) PRIMARY KEY,
    HouseType           VARCHAR(50) NOT NULL,
    Capacity            INT DEFAULT 1 CHECK (Capacity > 0),
    StreetName          VARCHAR(50),
    NH_Name             VARCHAR(30) NOT NULL,
    FOREIGN KEY (NH_Name) REFERENCES NEIGHBORHOOD(NeighborhoodName)
);
```

OCCUPATION

```
CREATE TABLE OCCUPATION (
    OccupationID   CHAR(9) PRIMARY KEY,
    Title               VARCHAR(50) NOT NULL,
    Salary         DECIMAL(10, 2) DEFAULT 0 CHECK (Salary >= 0),
    Sector         VARCHAR(30) CHECK (Sector IN ('Public', 'Private', 'Non-
Profit')),
    CompanyID           CHAR(9)
);
```

VETERINARY_RECORD

```
CREATE TABLE VETERINARY_RECORD (
    VetRecordID          CHAR(9) PRIMARY KEY,
VaccinationStatus  VARCHAR(20) NOT NULL CHECK
(VaccinationStatus IN ('Vaccinated', 'Not Vaccinated')),
     LastCheckUpDate            DATE NOT NULL
);
```

BUSINESS

```
CREATE TABLE BUSINESS (
    BusinessID     CHAR(9) NOT NULL UNIQUE,
    LicenseNumber  CHAR(9) NOT NULL,
    Name                VARCHAR(50) NOT NULL, Type VARCHAR(30),
    WorkingHours   CHAR(19) NOT NULL,
    OwnerID             CHAR(15),
    PRIMARY KEY (BusinessID, LicenseNumber),
    FOREIGN KEY (OwnerID) REFERENCES RESIDENT(MicrochipID)
);
```

COMMUNITY_ACTIVITY

```
CREATE TABLE COMMUNITY_ACTIVITY (
    ACTIVITYID      CHAR(9) PRIMARY KEY,
    ACTIVITYTYPE    VARCHAR(50),
   ActivityName   VARCHAR(50),
    STARTDATE             DATE,
    ENDDATE         DATE,
   OperatingHours     CHAR(19),

    FEE DECIMAL(5, 2) DEFAULT 0 CHECK (FEE >= 0),
LOCATION VARCHAR(30) NOT NULL,
    FOREIGN KEY (LOCATION) REFERENCES NEIGHBORHOOD(NEIGHBORHOODNAME)
);
```

MUNICIPALITY_OFFICIAL

```
CREATE TABLE MUNICIPALITY_OFFICIAL (
    OFFICIALID      CHAR(9) PRIMARY KEY,
    MICROCID              CHAR(15) NOT NULL,
    DEPARTMENT      VARCHAR(50), POSITION VARCHAR(50),
    TERMSTART       DATE NOT NULL,
    TERMEND         DATE,
    FOREIGN KEY (MICROCID) REFERENCES RESIDENT(MICROCHIPID)
);
```

PUBLIC_SERVICE

```
CREATE TABLE PUBLIC_SERVICE (
    FACILITYID     CHAR(9) PRIMARY KEY,
    SERVICETYPE    VARCHAR(50) NOT NULL,
    OPERATINGHOURS CHAR(19) NOT NULL,
    PHONENUMBER    VARCHAR(15),
    EMAIL          VARCHAR(50),
    LOCID          VARCHAR(30) NOT NULL,
    FOREIGN KEY (LOCID) REFERENCES NEIGHBORHOOD(NEIGHBORHOODNAME)
);
```

ANIMAL_CONTROL_INCIDENT

```
CREATE TABLE ANIMAL_CONTROL_INCIDENT (
     MICROCHIPID   CHAR(15) NOT NULL,
     INCIDENTID    CHAR(9) NOT NULL,
    INCIDENTDATE   DATE NOT NULL,
    INCIDENTDESCRIPTION VARCHAR(255) NOT NULL
    CHECK(LENGTH(INCIDENTDESCRIPTION) > 0),
    ACTIONSTAKEN   VARCHAR(255),
    PRIMARY KEY (MICROCHIPID,INCIDENTID),
    FOREIGN KEY (MICROCHIPID) REFERENCES RESIDENT(MICROCHIPID)
);
```

IS_CONNECTED_TO

```
CREATE TABLE IS_CONNECTED_TO (
    MICROCHIPID    CHAR(15) NOT NULL,
    INCIDENTID     CHAR(9) NOT NULL,
    PRIMARY KEY (MICROCHIPID, INCIDENTID),
    FOREIGN KEY (MICROCHIPID) REFERENCES RESIDENT(MICROCHIPID),
    FOREIGN KEY (MICROCHIPID, INCIDENTID) REFERENCES
ANIMAL_CONTROL_INCIDENT(MICROCHIPID, INCIDENTID)
);
```

SPECIES_ALLERGY

```
CREATE TABLE SPECIES_ALLERGY (
    SPECIESID            CHAR(9) NOT NULL,
    ALLERGY        VARCHAR(100) NOT NULL,
    PRIMARY KEY (SPECIESID, ALLERGY),
    FOREIGN KEY (SPECIESID) REFERENCES SPECIES(SPECIESID)
);
```

OCCUPATION_REQUIRED_SKILL

```
CREATE TABLE OCCUPATION_REQUIRED_SKILL (
    OCCUPATIONID   CHAR(9) NOT NULL,
    REQUIREDSKILL  VARCHAR(100) NOT NULL,
    PRIMARY KEY (OCCUPATIONID, REQUIREDSKILL),
    FOREIGN KEY (OCCUPATIONID) REFERENCES OCCUPATION(OCCUPATIONID));
```

VR_CHRONIC_CONDITION

```
CREATE TABLE VR_CHRONIC_CONDITION (
    VetRecordID      CHAR(9) NOT NULL,
    ChronicCondition  VARCHAR(100) NOT NULL,
    PRIMARY KEY (VetRecordID, ChronicCondition),
FOREIGN KEY (VetRecordID) REFERENCES VETERINARY_RECORD(VetRecordID)
);
```

BUSINESS_ADDRESS

```
CREATE TABLE BUSINESS_ADDRESS (
    BusinessID     CHAR(9) NOT NULL,
    LicenseNumber  CHAR(9) NOT NULL,
    Address VARCHAR(100) NOT NULL,
    PRIMARY KEY (BusinessID, LicenseNumber, Address),
    FOREIGN KEY (BusinessID, LicenseNumber)REFERENCES
    BUSINESS(BusinessID, LicenseNumber)
);
```

ADD FOREIGN KEYS USING ALTER TABLE:

Certain referential integrity constraints cannot be added during the initial table creation because the referenced primary key has not yet been established. Therefore, we need to use the ALTER command to add these constraints afterward.

```
ALTER TABLE RESIDENT ADD FOREIGN KEY (SpecID) REFERENCES SPECIES(SpeciesID);

ALTER TABLE RESIDENT ADD FOREIGN KEY (NeighborhoodN) REFERENCES
NEIGHBORHOOD(NeighborhoodName);

ALTER TABLE RESIDENT ADD FOREIGN KEY (HousingID) REFERENCES HOUSE(HouseID);

ALTER TABLE RESIDENT ADD FOREIGN KEY (OccupID) REFERENCES
OCCUPATION(OccupationID);

ALTER TABLE RESIDENT ADD FOREIGN KEY (Vet_RID) REFERENCES
VETERINARY_RECORD(VetRecordID);

ALTER TABLE OCCUPATION ADD FOREIGN KEY (CompanyID) REFERENCES
BUSINESS(BusinessID);
```

IX - Tables Descriptions

After creating all the tables on the Oracle database server, we can view the description of each table to make sure everything is fine and no mistakes were made during the creation of the table. In our database, we have the following tables created on the Oracle database server:

List of all of our tables

```
SQL> SELECT DISTINCT OBJECT_NAME
FROM USER_OBJECTS
WHERE OBJECT_TYPE='TABLE';
OBJECT_NAME
--------------------------------------------------------------------------------
ANIMAL_CONTROL_INCIDENT
BUSINESS
BUSINESS_ADDRESS
COMMUNITY_ACTIVITY
HOUSE
IS_CONNECTED_TO
MUNICIPALITY_OFFICIAL
NEIGHBORHOOD
OCCUPATION
OCCUPATION_REQUIRED_SKILL
PUBLIC_SERVICE
RESIDENT
SPECIES
SPECIES_ALLERGY
VETERINARY_RECORD
VR_CHRONIC_CONDITION
```

RESIDENT

```
SQL> DESC RESIDENT;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 MICROCHIPID                               NOT NULL CHAR(15)
 DATEOFBIRTH                               NOT NULL DATE
 GENDER                                    NOT NULL VARCHAR2(10)
 FIRSTNAME                                 NOT NULL VARCHAR2(50)
 LASTNAME                                  NOT NULL VARCHAR2(50)
 SPECID                                    NOT NULL CHAR(9)
 NEIGHBORHOODN                             NOT NULL VARCHAR2(30)
 HOUSINGID                                 NOT NULL CHAR(9)
 VET_RID                                   NOT NULL CHAR(9)
 HOUSING_MOVEINDATE                        NOT NULL DATE
 OCCUPID                                            CHAR(9)
```

SPECIES

```
SQL> DESC SPECIES;
```

Name	Null?	Type
SPECIESID	NOT NULL	CHAR(9)
NAMEOFSPECIES	NOT NULL	VARCHAR2(50)
CLASSIFICATION	NOT NULL	VARCHAR2(20)
NATURALHABITAT		VARCHAR2(50)
SPECIESPOP		NUMBER
DIETTYPE		VARCHAR2(20)

NEIGHBORHOOD

```
SQL > DESC NEIGHBORHOOD;
```

Name	Null?	Type
NEIGHBORHOODNAME	NOT NULL	VARCHAR2(30)
AREA	NOT NULL	NUMBER(5,2)
CLIMATETYPE	NOT NULL	VARCHAR2(30)
POPULATION		NUMBER

HOUSE

```
SQL > DESC HOUSE;
```

Name	Null?	Type
HOUSEID	NOT NULL	CHAR(9)
HOUSETYPE	NOT NULL	VARCHAR2(50)
CAPACITY		NUMBER
STREETNAME		VARCHAR2(50)
NH_NAME	NOT NULL	VARCHAR2(30)

OCCUPATION

```
SQL > DESC OCCUPATION;
 Name                                      Null?        Type
 ----------------------------------------- ---------- ------------------------------
 OCCUPATIONID                              NOT NULL     CHAR(9)
 TITLE                                     NOT NULL     VARCHAR2(50)
 SALARY                                                 NUMBER(10,2)
 SECTOR                                                 VARCHAR2(30)
 COMPANYID                                              CHAR(9)
```

VETERINARY_RECORD

```
SQL > DESC VETERINARY_RECORD;
 Name                                      Null?        Type
 ----------------------------------------- ---------- ------------------------------
 VETRECORDID                               NOT NULL          CHAR(9)
 VACCINATIONSTATUS                         NOT NULL          VARCHAR2(20)
 LASTCHECKUPDATE                           NOT NULL          DATE
```

BUSINESS

```
SQL > DESC BUSINESS;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 BUSINESSID                                NOT NULL CHAR(9)
 LICENSENUMBER                             NOT NULL CHAR(9)
 NAME                                      NOT NULL VARCHAR2(50)
 TYPE                                               VARCHAR2(30)
 WORKINGHOURS                              NOT NULL CHAR(19)
 OWNERID                                            CHAR(15)
```

COMMUNITY_ACTIVITY

```
SQL > DESC COMMUNITY_ACTIVITY;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 ACTIVITYID                                         CHAR(9)
 ACTIVITYTYPE                                       VARCHAR2(50)
 ACTIVITYNAME                                       VARCHAR2(50)
 STARTDATE                                          DATE
 ENDDATE                                            DATE
 OPERATINGHOURS                                     CHAR(19)
 FEE                                                NUMBER(5,2)
 LOCATION                                  NOT NULL VARCHAR2(30)
```

MUNICIPALITY_OFFICIAL

```
SQL > DESC MUNICIPALITY_OFFICIAL;
 Name                                      Null?        Type
 ----------------------------------------- ---------- ------------------------------
 OFFICIALID                                NOT NULL     CHAR(9)
 MICROID                                   NOT NULL     CHAR(15)
 DEPARTMENT                                             VARCHAR2(50)
 POSITION                                               VARCHAR2(50)
 TERMSTART                                 NOT NULL     DATE
 TERMEND                                                DATE
```

PUBLIC_SERVICE

```
SQL > DESC PUBLIC_SERVICE;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 FACILITYID                                NOT NULL CHAR(9)
 SERVICETYPE                               NOT NULL VARCHAR2(50)
 OPERATINGHOURS                            NOT NULL CHAR(19)
 PHONENUMBER                                        VARCHAR2(15)
 EMAIL                                              VARCHAR2(50)
 LOCID                                              VARCHAR2(30)
```

ANIMAL_CONTROL_INCIDENT

```
SQL > DESC ANIMAL_CONTROL_INCIDENT;
 Name                                      Null?        Type
 ----------------------------------------- ---------- ------------------------------
 MICROCHIPID                               NOT NULL     CHAR(15)
 INCIDENTID                                NOT NULL     CHAR(9)
 INCIDENTDATE                              NOT NULL     DATE
 INCIDENTDESCRIPTION                       NOT NULL     VARCHAR2(255)
 ACTIONSTAKEN                                           VARCHAR2(255)
```

IS_CONNECTED_TO

```
SQL > DESC IS_CONNECTED_TO;
 Name                                      Null?        Type
 ----------------------------------------- ---------- ------------------------------
 MICROCHIPID                               NOT NULL     CHAR(15)
 INCIDENTID                                NOT NULL     CHAR(9)
```

SPECIES_ALLERGY

```
SQL > DESC SPECIES_ALLERGY;
 Name                                      Null?        Type
 ----------------------------------------- ---------- ------------------------------
 SPECIESID                                 NOT NULL     CHAR(9)
 ALLERGY                                   NOT NULL     VARCHAR2(100)
```

OCCUPATION_REQUIRED_SKILL

```
SQL > DESC OCCUPATION_REQUIRED_SKILL;
 Name                                      Null?        Type
 ----------------------------------------- ---------- ------------------------------
 OCCUPATIONID                              NOT NULL     CHAR(9)
 REQUIREDSKILL                             NOT NULL     VARCHAR2(100)
```

VR_CHRONIC_CONDITION

```
SQL > DESC VR_CHRONIC_CONDITION;
 Name                                      Null?        Type
 ----------------------------------------- ---------- ------------------------------
 VETRECORDID                               NOT NULL     CHAR(9)
 CHRONICCONDITION                          NOT NULL     VARCHAR2(100)
```

BUSINESS_ADDRESS

```
SQL > DESC BUSINESS_ADDRESS;
 Name                                      Null?        Type
 ----------------------------------------- ---------- ------------------------------
 BUSINESSID                                NOT NULL     CHAR(9)
 LICENSENUMBER                             NOT NULL     CHAR(9)
 ADDRESS                                   NOT NULL     VARCHAR2(100)
```

X - Inserting data

RESIDENT

```
INSERT INTO RESIDENT VALUES ('985141000123456', DATE'2019-03-10',
'Male', 'Polo', 'Lweis', '000000001', 'Dahr El Wahesh', 'H00000001',
'V00000001', DATE'2019-10-10', NULL);
INSERT INTO RESIDENT VALUES ('985141000234567', DATE'2022-09-25',
'Male', 'Farfoor', 'Doudee', '000000004', 'Sin El Feel', 'H00000004',
'V00000004', DATE'2022-09-25', NULL);
INSERT INTO RESIDENT VALUES ('985141000345678', DATE'2017-05-20',
'Male', 'Ralph', 'Abu Fouad', '000000002',  'Nahr El Kalb',
'H00000002', 'V00000005', DATE'2020-01-11', NULL);
INSERT INTO RESIDENT VALUES ('985141000456789', DATE'2020-12-15',
'Male', 'Bob', 'Marley', '000000009', 'Nahr El Kalb', 'H00000009',
'V00000003', DATE'2021-03-24', NULL);
INSERT INTO RESIDENT VALUES ('985141000567890', DATE'2021-04-15',
'Male', 'Hamtaro', 'Hamham', '000000007', 'Beit Dib', 'H00000007',
'V00000006', DATE'2022-07-17', NULL);
INSERT INTO RESIDENT VALUES ('985141000678901', DATE'2018-03-22',
'Male', 'Bunbun', 'Hopper', '000000005', 'Rabbiton', 'H00000005',
'V00000007', DATE'2019-02-28', NULL);
INSERT INTO RESIDENT VALUES ('985141000789012', DATE'2015-07-14',
'Male', 'Neigh', 'Galloper', '000000006', 'Ain Al Ghazal',
'H00000006', 'V00000009', DATE'2017-12-16', NULL);
INSERT INTO RESIDENT VALUES ('985141000890123', DATE'2021-11-11',
'Female', 'Polly', 'Pepper', '000000008', 'Featherfield', 'H00000008',
'V00000008', DATE'2022-05-22', NULL);
INSERT INTO RESIDENT VALUES ('985141000901234', DATE'2022-03-15',
'Male', 'Goldy', 'Drowns', '000000009', 'Goldstream', 'H00000009',
'V00000010', DATE'2022-03-15', NULL);
INSERT INTO RESIDENT VALUES ('985141001012345', DATE'2016-02-10',
'Female', 'Shelly', 'Slider', '000000010', 'Laqlouq', 'H00000010',
'V00000002', DATE'2020-04-24', NULL);
```

```
INSERT INTO RESIDENT VALUES ('985141001123456', DATE'2020-01-01',
'Female', 'Luna', 'Sky', '000000003', 'Featherfield', 'H00000003',
'V00000011', DATE'2020-02-01', NULL);
INSERT INTO RESIDENT VALUES ('985141001234567', DATE'2018-06-12',
'Male', 'Rex', 'Hunter', '000000002', 'Dahr El Wahesh', 'H00000002',
'V00000012', DATE'2020-08-12', NULL);
INSERT INTO RESIDENT VALUES ('985141001345678', DATE'2022-03-05',
'Male', 'Chucky', 'Junior', '000000004', 'Sin El Feel', 'H00000004',
'V00000013', DATE'2023-01-01', NULL);
INSERT INTO RESIDENT VALUES ('985141001456789', DATE'2019-04-23',
'Female', 'Sandy', 'Acorn', '000000005', 'Rabbiton', 'H00000005',
'V00000014', DATE'2020-05-01', NULL);
INSERT INTO RESIDENT VALUES ('985141001567890', DATE'2020-10-15',
'Male', 'Bolt', 'Gallop', '000000006', 'Ain Al Ghazal', 'H00000006',
'V00000015', DATE'2021-10-20', NULL);
INSERT INTO RESIDENT VALUES ('985141001678901', DATE'2021-09-01',
'Female', 'Heather', 'Crane', '000000008', 'Laqlouq', 'H00000008',
'V00000016', DATE'2022-01-01', NULL);
INSERT INTO RESIDENT VALUES ('985141001789012', DATE'2019-11-11',
'Male', 'Bubba', 'Shine', '000000009', 'Goldstream', 'H00000009',
'V00000017', DATE'2020-03-01', NULL);
INSERT INTO RESIDENT VALUES ('985141001890123', DATE'2015-07-01',
'Female', 'Yoshi', 'Racer', '000000010', 'Ain Al Samak', 'H00000010',
'V00000018', DATE'2021-04-15', NULL);
INSERT INTO RESIDENT VALUES ('985141001901234', DATE'2021-06-22',
'Male', 'Jojo', 'Slither', '000000011', 'Rabbiton', 'H00000011',
'V00000019', DATE'2022-06-15', NULL);
INSERT INTO RESIDENT VALUES ('985141002012345', DATE'2017-03-11',
'Female', 'Sammy', 'Salamanca', '000000012', 'Beit Dib', 'H00000012',
'V00000020', DATE'2018-05-20', NULL);
```

OCCUPATION

```
INSERT INTO OCCUPATION VALUES ('O000000001', 'Mayor', 500000.00,
'Public', NULL);
INSERT INTO OCCUPATION VALUES ('O000000002', 'Deputy Mayor', 500000.00,
'Public', NULL);
INSERT INTO OCCUPATION VALUES ('O000000003', 'Guard Dog', 12000.00,
'Private', NULL);
INSERT INTO OCCUPATION VALUES ('O000000004', 'Marine Guide', 15000.00,
'Private', NULL);
INSERT INTO OCCUPATION VALUES ('O000000005', 'Wheel Runner', 8000.00,
'Private', NULL);
INSERT INTO OCCUPATION VALUES ('O000000006', 'Carrot Farmer', 9500.00,
'Private', NULL);
INSERT INTO OCCUPATION VALUES ('O000000007', 'Stable Keeper', 11000.00,
'Private', NULL);
INSERT INTO OCCUPATION VALUES ('O000000008', 'Songbird Performer',
9000.00, 'Private', NULL);
INSERT INTO OCCUPATION VALUES ('O000000009', 'Stream Cleaner', 8500.00,
'Private', NULL);
INSERT INTO OCCUPATION VALUES ('O000000010', 'Coastal Guard', 10000.00,
'Private', NULL);
INSERT INTO OCCUPATION VALUES ('O000000011', 'Municipality Worker',
10000.00, 'Public', NULL);
```

BUSINESS

```
INSERT INTO BUSINESS VALUES ('B00000001', 'L00000001', 'Paw Market',
'Retail', '09:00-18:00', NULL);
INSERT INTO BUSINESS VALUES ('B00000002', 'L00000002', 'Squeak Cheese
Co.', 'Food', '08:00-17:00', NULL);
INSERT INTO BUSINESS VALUES ('B00000003', 'L00000003', 'Furry
Protectors', 'Security', '24/7', NULL);
INSERT INTO BUSINESS VALUES ('B00000004', 'L00000004', 'Marine
Adventures', 'Tourism', '10:00-18:00', NULL);
INSERT INTO BUSINESS VALUES ('B00000005', 'L00000005', 'Wheels & Co.',
'Manufacturing', '09:00-17:00', NULL);
INSERT INTO BUSINESS VALUES ('B00000006', 'L00000006', 'Rabbit
Greens', 'Agriculture', '07:00-15:00', NULL);
INSERT INTO BUSINESS VALUES ('B00000007', 'L00000007', 'Stable
Solutions', 'Livestock', '06:00-14:00', NULL);
INSERT INTO BUSINESS VALUES ('B00000008', 'L00000008', 'Performances',
'Entertainment', '11:00-19:00', NULL);
INSERT INTO BUSINESS VALUES ('B00000009', 'L00000009', 'Sparkling
Tails', 'Services', '09:00-17:00', NULL);
INSERT INTO BUSINESS VALUES ('B00000010', 'L00000010', 'Ninja
Turtles', 'Security', '24/7', NULL);
INSERT INTO BUSINESS VALUES ('B00000011', 'L00000011', 'Flight
Academy', 'Education', '07:00-14:00', NULL);
```

The issue we encountered stemmed from the circular dependencies between the RESIDENT, OCCUPATION, and BUSINESS tables due to foreign key relationships. Specifically, the RESIDENT table references OCCUPATION through the OccupID field, and the BUSINESS table references RESIDENT through the OwnerID field. Additionally, the OCCUPATION table references the BUSINESS table through the CompanyID. This created a situation where data in one table could not be inserted without first inserting data in the others.

To solve this problem, we adopted a two-step approach. First, we inserted dummy data into all three tables, leaving the foreign key fields (OwnerID, CompanyID, OccupID) as NULL. This allowed us to bypass the circular dependencies and successfully insert the necessary records. After the initial insertions, we used UPDATE statements to fill in the NULL values, ensuring that each foreign key correctly referenced its corresponding record in the other tables. This solution allowed us to maintain referential integrity while circumventing the circular dependency.

```
UPDATE BUSINESS SET OwnerID = '985141000123456' WHERE BusinessID =
'B00000001';
UPDATE BUSINESS SET OwnerID = '985141000234567' WHERE BusinessID =
'B00000002';
UPDATE BUSINESS SET OwnerID = '985141000345678' WHERE BusinessID =
'B00000003';
UPDATE BUSINESS SET OwnerID = '985141000456789' WHERE BusinessID =
'B00000004';
UPDATE BUSINESS SET OwnerID = '985141000567890' WHERE BusinessID =
'B00000005';
UPDATE BUSINESS SET OwnerID = '985141000678901' WHERE BusinessID =
'B00000006';
UPDATE BUSINESS SET OwnerID = '985141000789012' WHERE BusinessID =
'B00000007';
UPDATE BUSINESS SET OwnerID = '985141000890123' WHERE BusinessID =
'B00000008';
UPDATE BUSINESS SET OwnerID = '985141000901234' WHERE BusinessID =
'B00000009';
UPDATE BUSINESS SET OwnerID = '985141001012345' WHERE BusinessID =
'B00000010';
```

```
UPDATE BUSINESS SET OwnerID = '985141001123456' WHERE BusinessID =
'B00000011';
UPDATE OCCUPATION SET CompanyID = 'B00000001' WHERE OccupationID =
'O00000001';
UPDATE OCCUPATION SET CompanyID = 'B00000002' WHERE OccupationID =
'O00000002';
UPDATE OCCUPATION SET CompanyID = 'B00000003' WHERE OccupationID =
'O00000003';
UPDATE OCCUPATION SET CompanyID = 'B00000004' WHERE OccupationID =
'O00000004';
UPDATE OCCUPATION SET CompanyID = 'B00000005' WHERE OccupationID =
'O00000005';
UPDATE OCCUPATION SET CompanyID = 'B00000006' WHERE OccupationID =
'O00000006';
UPDATE OCCUPATION SET CompanyID = 'B00000007' WHERE OccupationID =
'O00000007';
UPDATE OCCUPATION SET CompanyID = 'B00000008' WHERE OccupationID =
'O00000008';
UPDATE OCCUPATION SET CompanyID = 'B00000009' WHERE OccupationID =
'O00000009';
UPDATE OCCUPATION SET CompanyID = 'B00000010' WHERE OccupationID =
'O00000010';
UPDATE OCCUPATION SET CompanyID = 'B00000011' WHERE OccupationID =
'O00000011';
UPDATE RESIDENT SET OccupID = 'O00000001' WHERE MicrochipID =
'985141000123456';

UPDATE RESIDENT SET OccupID = 'O00000002' WHERE MicrochipID =
'985141000234567';
UPDATE RESIDENT SET OccupID = 'O00000003' WHERE MicrochipID =
'985141001234567';
UPDATE RESIDENT SET OccupID = 'O00000004' WHERE MicrochipID =
'985141001345678';
UPDATE RESIDENT SET OccupID = 'O00000005' WHERE MicrochipID =
'985141001456789';
```

```
UPDATE RESIDENT SET OccupID = 'O00000006' WHERE MicrochipID =
'985141001567890';
UPDATE RESIDENT SET OccupID = 'O00000007' WHERE MicrochipID =
'985141001678901';
UPDATE RESIDENT SET OccupID = 'O00000008' WHERE MicrochipID =
'985141001789012';
UPDATE RESIDENT SET OccupID = 'O00000009' WHERE MicrochipID =
'985141001890123';
UPDATE RESIDENT SET OccupID = 'O00000010' WHERE MicrochipID =
'985141001901234';
UPDATE RESIDENT SET OccupID = 'O00000011' WHERE MicrochipID IN
('985141000345678', '985141000456789', '985141000567890',
'985141000678901', '985141000789012', '985141000890123',
'985141000901234', '985141001012345', '985141001123456',
'985141002012345');
```

SPECIES

```
INSERT INTO SPECIES VALUES ('000000001', 'Cat', 'Mammal', 'Urban',
600, 'Carnivore');
INSERT INTO SPECIES VALUES ('000000002', 'Dog', 'Mammal', 'Urban',
500, 'Carnivore');
INSERT INTO SPECIES VALUES ('000000003', 'Canary', 'Bird', 'Forest',
300, 'Herbivore');
INSERT INTO SPECIES VALUES ('000000004', 'Mouse', 'Mammal', 'Forest',
100, 'Herbivore');
INSERT INTO SPECIES VALUES ('000000005', 'Rabbit', 'Mammal', 'Meadow',
200, 'Herbivore');
INSERT INTO SPECIES VALUES ('000000006', 'Horse', 'Mammal', 'Plain',
50, 'Herbivore');
INSERT INTO SPECIES VALUES ('000000007', 'Hamster', 'Mammal', 'Plain',
120, 'Herbivore');
INSERT INTO SPECIES VALUES ('000000008', 'Parrot', 'Bird', 'Forest',
80, 'Omnivore');
INSERT INTO SPECIES VALUES ('000000009', 'Goldfish', 'Fish', 'Water',
200, 'Herbivore');
INSERT INTO SPECIES VALUES ('000000010', 'Turtle', 'Reptile', 'Water',
50, 'Herbivore');
INSERT INTO SPECIES VALUES ('000000011', 'Snake', 'Reptile', 'Desert',
20, 'Carnivore');
INSERT INTO SPECIES VALUES ('000000012', 'Salamander', 'Amphibian',
'Meadow', 30, 'Carnivore');
```

NEIGHBORHOOD

```
INSERT INTO NEIGHBORHOOD VALUES ('Nahr El Kalb', 20.3, 'Temperate',
600);
INSERT INTO NEIGHBORHOOD VALUES ('Dahr El Wahesh', 15.5, 'Temperate',
500);
INSERT INTO NEIGHBORHOOD VALUES ('Ain Al Samak', 12.7, 'Humid', 300);
INSERT INTO NEIGHBORHOOD VALUES ('Sin El Feel', 8.9, 'Dry', 100);
INSERT INTO NEIGHBORHOOD VALUES ('Rabbiton', 10.0, 'Humid', 200);
INSERT INTO NEIGHBORHOOD VALUES ('Beit Dib', 18.4, 'Tropical', 50);
INSERT INTO NEIGHBORHOOD VALUES ('Laqlouq', 9.5, 'Humid', 120);
INSERT INTO NEIGHBORHOOD VALUES ('Featherfield', 11.6, 'Tropical',
80);
INSERT INTO NEIGHBORHOOD VALUES ('Goldstream', 14.2, 'Dry', 200);
INSERT INTO NEIGHBORHOOD VALUES ('Ain Al Ghazal', 7.8, 'Cold', 50);
```

HOUSE

```
INSERT INTO HOUSE VALUES ('H00000001', 'Condo', 3, 'Whisker Way',
'Dahr El Wahesh');
INSERT INTO HOUSE VALUES ('H00000002', 'Doghouse', 2, 'Bone Street',
'Nahr El Kalb');
INSERT INTO HOUSE VALUES ('H00000003', 'Birdnest', 1, 'Wing Avenue',
'Featherfield');
INSERT INTO HOUSE VALUES ('H00000004', 'Mouse Hole', 2, 'Cheese Lane',
'Sin El Feel');
INSERT INTO HOUSE VALUES ('H00000005', 'Rabbit Burrow', 4, 'Carrot
Lane', 'Rabbiton');
INSERT INTO HOUSE VALUES ('H00000006', 'Stable', 5, 'Gallop Road',
'Ain Al Ghazal');
INSERT INTO HOUSE VALUES ('H00000007', 'Hamster Cage', 1, 'Wheel
Street', 'Beit Dib');
INSERT INTO HOUSE VALUES ('H00000008', 'Parrot Perch', 1, 'Squawk
Avenue', 'Featherfield');
INSERT INTO HOUSE VALUES ('H00000009', 'Fish Tank', 10, 'Stream Way',
'Goldstream');
INSERT INTO HOUSE VALUES ('H00000010', 'Turtle Shell', 1, 'Pond
Drive', 'Laqlouq');
INSERT INTO HOUSE VALUES ('H00000011', 'Snake Hole', 1, 'Scorching
Strip', 'Rabbiton');
INSERT INTO HOUSE VALUES ('H00000012', 'Pondside Stone', 4, 'Mossy
Rock', 'Beit Dib');
```

VETERINARY_RECORD

```
INSERT INTO VETERINARY_RECORD VALUES ('V00000001', 'Vaccinated',
DATE'2024-02-10');
INSERT INTO VETERINARY_RECORD VALUES ('V00000002', 'Vaccinated',
DATE'2024-01-15');
INSERT INTO VETERINARY_RECORD VALUES ('V00000003', 'Vaccinated',
DATE'2027-05-20');
INSERT INTO VETERINARY_RECORD VALUES ('V00000004', 'Vaccinated',
DATE'2023-09-30');
INSERT INTO VETERINARY_RECORD VALUES ('V00000005', 'Vaccinated',
DATE'2023-12-01');
INSERT INTO VETERINARY_RECORD VALUES ('V00000006', 'Not Vaccinated',
DATE'2022-03-18');
INSERT INTO VETERINARY_RECORD VALUES ('V00000007', 'Not Vaccinated',
DATE'2022-01-01');
INSERT INTO VETERINARY_RECORD VALUES ('V00000008', 'Not Vaccinated',
DATE'2020-07-25');
INSERT INTO VETERINARY_RECORD VALUES ('V00000009', 'Not Vaccinated',
DATE'2022-11-10');
INSERT INTO VETERINARY_RECORD VALUES ('V00000010', 'Vaccinated',
DATE'2024-02-20');
INSERT INTO VETERINARY_RECORD VALUES ('V00000011', 'Vaccinated',
DATE'2023-12-10');
INSERT INTO VETERINARY_RECORD VALUES ('V00000012', 'Not Vaccinated',
DATE'2022-06-15');
INSERT INTO VETERINARY_RECORD VALUES ('V00000013', 'Vaccinated',
DATE'2024-01-20');
INSERT INTO VETERINARY_RECORD VALUES ('V00000014', 'Not Vaccinated',
DATE'2023-11-05');
INSERT INTO VETERINARY_RECORD VALUES ('V00000015', 'Vaccinated',
DATE'2024-02-01');
INSERT INTO VETERINARY_RECORD VALUES ('V00000016', 'Not Vaccinated',
DATE'2022-09-12');
```

```
INSERT INTO VETERINARY_RECORD VALUES ('V00000017', 'VACCINATED',
DATE'2023-08-10');
INSERT INTO VETERINARY_RECORD VALUES ('V00000018', 'NOT VACCINATED',
DATE'2023-10-01');
INSERT INTO VETERINARY_RECORD VALUES ('V00000019', 'VACCINATED',
DATE'2024-03-01');
INSERT INTO VETERINARY_RECORD VALUES ('V00000020', 'NOT VACCINATED',
DATE'2023-07-01');
```

COMMUNITY_ACTIVITY

```
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000001', 'Event', 'Feline Festival', DATE'2024-03-01', DATE'2024-03-05', NULL, 10.00, 'Dahr El Wahesh');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000002', 'Event', 'Cheese Tasting', DATE'2024-04-01', DATE'2024-04-02', NULL, 5.00, 'Sin El Feel');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000003', 'Event', 'Dog Show', DATE'2024-05-10', DATE'2024-05-12', NULL, 15.00, 'Nahr El Kalb');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000004', 'Event', 'Marine Day', DATE'2024-06-15', DATE'2024-06-20', NULL, 20.00, 'Goldstream');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000005', 'Event', 'Hamster Racing', DATE'2024-07-01', DATE'2024-07-03', NULL, 8.00, 'Beit Dib');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000006', 'Event', 'Carrot Festival', DATE'2024-08-01', DATE'2024-08-05', NULL, 7.00, 'Rabbiton');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000007', 'Event', 'Stable Fair', DATE'2024-09-15', DATE'2024-09-20', NULL, 12.00, 'Ain Al Ghazal');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000008', 'Event', 'Parrot Parade', DATE'2024-10-01', DATE'2024-10-03', NULL, 10.00, 'Featherfield');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000009', 'Event', 'Pond Cleaning Day', DATE'2024-11-05', DATE'2024-11-07', NULL, 0.00, 'Goldstream');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000010', 'Event', 'Turtle Protection Seminar', DATE'2024-12-01', DATE'2024-12-02', NULL, 5.00, 'Laqlouq');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000011', 'Facility', 'Polo Park', DATE'2022-05-22', NULL, '06:00-18:30', 12.50, 'Nahr El Kalb');
INSERT INTO COMMUNITY_ACTIVITY VALUES ('A00000012', 'Facility', 'Sports Center', DATE'2021-05-09', NULL, '06:00-21:30', 5.50, 'Dahr El Wahesh');
```

MUNICIPALITY_OFFICIAL

```
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000001',
'985141000123456', 'Administration', 'Mayor', DATE'2020-01-01', NULL);
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000002',
'985141000234567', 'Administration', 'Deputy Mayor', DATE'2021-06-15',
NULL);
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000003',
'985141000345678', 'Public Safety', 'Chief of Security', DATE'2019-03-01',
NULL);
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000004',
'985141000456789', 'Marine Operations', 'Aquatic Coordinator', DATE'2022-
05-10', NULL);
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000005',
'985141000567890', 'Community Development', 'Event Organizer',
DATE'2021-04-01', DATE'2023-12-31');
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000006',
'985141000678901', 'Agriculture', 'Head Gardener', DATE'2022-03-15',
NULL);
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000007',
'985141000789012', 'Transportation', 'Stable Manager', DATE'2023-01-10',
NULL);
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000008',
'985141000890123', 'Entertainment', 'Parade Leader', DATE'2020-11-15',
NULL);
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000009',
'985141000901234', 'Environmental Services', 'Pond Supervisor', DATE'2022-
08-01', NULL);
INSERT INTO MUNICIPALITY_OFFICIAL VALUES ('M00000010',
'985141001012345', 'Public Health', 'Health Kennel Manager', DATE'2021-07-
25', NULL);
```

PUBLIC_SERVICE

```
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000001', 'Water Supply', '06:00-22:00', '123-456-7890', 'water@nahrkelb.org', 'Nahr El Kalb');
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000002', 'Electricity', '24/7', '234-567-8901', 'power@dahrelwahesh.org', 'Dahr El Wahesh');
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000003', 'Waste Management', '07:00-19:00', '345-678-9012', 'waste@ainsamak.org', 'Ain El Samak');
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000004', 'Marine Rescue', '24/7', '456-789-0123', 'rescue@sinelfeel.org', 'Sin El Feel');
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000005', 'Recycling Center', '08:00-16:00', '567-890-1234', 'recycle@rabbiton.org', 'Rabbiton');
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000006', 'Community Garden', '06:00-18:00', '678-901-2345', 'garden@beitdib.org', 'Beit Dib');
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000007', 'Livestock Health', '07:00-15:00', '789-012-3456', 'health@laqlouq.org', 'Laqlouq');
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000008', 'Entertainment Park', '10:00-22:00', '890-123-4567', 'park@featherfield.org', 'Featherfield');
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000009', 'Pond Maintenance', '06:00-20:00', '901-234-5678', 'maintenance@goldstream.org', 'Goldstream');
INSERT INTO PUBLIC_SERVICE VALUES ('PS0000010', 'Coastal Protection', '24/7', '012-345-6789', 'protection@ainalghazal.org', 'Ain Al Ghazal');
```

ANIMAL_CONTROL_INCIDENT

```
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141000234567',
'I00000001', DATE'2023-01-15', 'Stealing cheese from another resident in
Rabbiton', 'Community service for 1 month');
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141000345678',
'I00000002', DATE'2022-05-10', 'Aggressive barking in Nahr El Kalb',
'Mandatory training');
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141000456789',
'I00000003', DATE'2024-02-20', 'Swimming in a restricted area near Sin El
Feel', 'Fine of $100');
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141000567890',
'I00000004', DATE'2023-07-01', 'Chewing public wires in Ain El Samak', 'Fine
of $50 and training');
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141000678901',
'I00000005', DATE'2022-11-30', 'Eating garden crops without permission in
Beit Dib', 'Replanting crops as community service');
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141000789012',
'I00000006', DATE'2024-01-25', 'Blocking traffic in Laqlouq', 'Warning
issued');
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141000890123',
'I00000007', DATE'2023-06-15', 'Loud squawking at night in Featherfield',
'Soundproofing training');
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141000901234',
'I00000008', DATE'2023-09-10', 'Leaving algae uncleaned in Goldstream pond',
'Clean algae as community service');
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141001012345',
'I00000009', DATE'2022-04-20', 'Blocking coastal access in Ain Al Ghazal',
'Fine of $200');
INSERT INTO ANIMAL_CONTROL_INCIDENT VALUES ('985141000123456',
'I00000010', DATE'2023-12-01', 'Unauthorized meeting organization in Dahr El
Wahesh', 'Written apology');
```

IS_CONNECTED_TO

```
INSERT INTO IS_CONNECTED_TO VALUES ('985141000234567',' I00000001');
INSERT INTO IS_CONNECTED_TO VALUES ('985141000345678',' I00000002');
INSERT INTO IS_CONNECTED_TO VALUES ('985141000456789', 'I00000003');
INSERT INTO IS_CONNECTED_TO VALUES ('985141000567890', 'I00000004');
INSERT INTO IS_CONNECTED_TO VALUES ('985141000678901’, 'I00000005');
INSERT INTO IS_CONNECTED_TO VALUES ('985141000789012', 'I00000006');
INSERT INTO IS_CONNECTED_TO VALUES ('985141000890123', 'I00000007');
INSERT INTO IS_CONNECTED_TO VALUES ('985141000901234’, 'I00000008');
INSERT INTO IS_CONNECTED_TO VALUES ('985141001012345', 'I00000009');
INSERT INTO IS_CONNECTED_TO VALUES ('985141000123456', 'I00000010');
INSERT INTO IS_CONNECTED_TO VALUES ('985141000567890', 'I00000010');
```

SPECIES_ALLERGY

```
INSERT INTO SPECIES_ALLERGY VALUES ('000000001', 'Lactose');
INSERT INTO SPECIES_ALLERGY VALUES ('000000001', 'Chocolate');
INSERT INTO SPECIES_ALLERGY VALUES ('000000002', 'Chocolate');
INSERT INTO SPECIES_ALLERGY VALUES ('000000002', 'Grapes');
INSERT INTO SPECIES_ALLERGY VALUES ('000000003', 'Pollen');
INSERT INTO SPECIES_ALLERGY VALUES ('000000004', 'Peanuts');
INSERT INTO SPECIES_ALLERGY VALUES ('000000005', 'Carrots');
INSERT INTO SPECIES_ALLERGY VALUES ('000000006', 'Dust');
INSERT INTO SPECIES_ALLERGY VALUES ('000000008', 'Avocado');
INSERT INTO SPECIES_ALLERGY VALUES ('000000009', 'Water Chemicals');
```

OCCUPATION_REQUIRED_SKILL

```
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000001',
'LEADERSHIP');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000001', 'CORRUPT');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000011',
'ORGANIZATION');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000003', 'SECURITY
TRAINING');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000004', 'MARINE
NAVIGATION');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000005', 'PHYSICAL
FITNESS');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000006', 'AGRICULTURE
EXPERTISE');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000007', 'ANIMAL
CARE');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000008', 'PERFORMANCE
SKILLS');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000009', 'CLEANING
TECHNIQUES');
INSERT INTO OCCUPATION_REQUIRED_SKILL VALUES ('O000000010', 'COASTAL
MANAGEMENT');
```

VR_CHRONIC_CONDITION

```
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000001','OBESITY');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000002', 'DIABETES');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000003', 'ASTHMA');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000004', 'HEART DISEASE');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000005','ARTHRITIS');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000006', 'SKIN ALLERGIES');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000007', 'KIDNEY DISEASE');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000008', 'EPILEPSY');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000009', 'THYROID
DISORDER');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000009', 'OBESITY');
INSERT INTO VR_CHRONIC_CONDITION VALUES ('V00000010', 'DENTAL DISEASE');
```

BUSINESS_ADDRESS

```
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000001', 'L00000001', '123 Whisker Way, Dahr El Wahesh');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000002', 'L00000002', '45 Cheese Lane, Sin El Feel');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000003', 'L00000003', '78 Bone Street, Nahr El Kalb');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000004', 'L00000004', '89 Ocean Drive, Ain El Samak');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000005', 'L00000005', '56 Wheel Road, Beit Dib');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000006', 'L00000006', '12 Carrot Lane, Rabbiton');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000007', 'L00000007', '34 Gallop Road, Ain Al Ghazal');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000008', 'L00000008', '67 Squawk Avenue, Featherfield');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000009', 'L00000009', '90 Stream Way, Goldstream');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000010', 'L00000010', '11 Shell Street, Laqlouq');
INSERT INTO BUSINESS_ADDRESS VALUES ('B00000006', 'L00000006', '90 Stream Way, Goldstream');
```

XI - Final Tables State

RESIDENT

STARTS ON NEXT PAGE

MICROCHIPID	DATEOFBIRTH	GENDER	FIRSTNAME	LASTNAME	SPECID	NEIGHBORHOODN	HOUSINGID	VET_RID	HOUSING_MOVEINDATE	OCCUPID
985141000123456	3/10/2019	Male	Polo	Lweis	00000001	Dahr El Wahesh	H00000001	V000001	10/10/2019	O000001
985141000234567	9/25/2022	Male	Farfoor	Doudee	00000004	Sin El Feel	H00000004	V000004	9/25/2022	O000002
985141000345678	5/20/2017	Male	Ralph	Abu Fouad	00000002	Nahr El Kalb	H00000002	V000005	1/11/2020	O000011
985141000456789	12/15/2020	Male	Bob	Marley	00000009	Nahr El Kalb	H00000009	V000003	3/24/2021	O000011
985141000567890	4/15/2021	Male	Hamtaro	Hamham	00000007	Beit Dib	H00000007	V000006	7/17/2022	O000011
985141000678901	3/22/2018	Male	Bunbun	Hopper	00000005	Rabbiton	H00000005	V000007	2/28/2019	O000011
985141000789012	7/14/2015	Male	Neigh	Galloper	00000006	Ain Al Ghazal	H00000006	V000009	12/16/2017	O000011
985141000890123	11/11/2021	Female	Polly	Pepper	00000008	Featherfield	H00000008	V000008	5/22/2022	O000011
985141000901234	3/15/2022	Male	Goldy	Drowns	00000009	Goldstream	H00000009	V000010	3/15/2022	O000011
985141001012345	2/10/2016	Female	Shelly	Slider	000000010	Laqlouq	H00000010	V000002	4/24/2020	O000011

985141001123456	1/1/2020	Female	Luna	Sky	00000003	Featherfield	H000 00003	V00 000011	2/1/2020	O00 000011
985141001234567	6/12/2018	Male	Rex	Hunter	00000002	Dahr El Wahesh	H000 00002	V00 000012	8/12/2020	O00 000003
985141001345678	3/5/2022	Male	Chucky	Junior	00000004	Sin El Feel	H000 00004	V00 000013	1/1/2023	O00 000004
985141001456789	4/23/2019	Female	Sandy	Acorn	00000005	Rabbiton	H000 00005	V00 000014	5/1/2020	O00 000005
985141001567890	10/15/2020	Male	Bolt	Gallop	00000006	Ain Al Ghazal	H000 00006	V00 000015	10/20/2021	O00 000006
985141001678901	9/1/2021	Female	Heather	Crane	00000008	Laqlouq	H000 00008	V00 000016	1/1/2022	O00 000007
985141001789012	11/11/2019	Male	Bubba	Shine	00000009	Goldstream	H000 00009	V00 000017	3/1/2020	O00 000008
985141001901234	6/22/2021	Male	Jojo	Slither	00000011	Rabbiton	H000 00011	V00 000019	6/15/2022	O00 000010
985141002012345	3/11/2017	Female	Sammy	Salamanca	00000012	Beit Dib	H000 00012	V00 000020	5/20/2018	O00 000011
985141001890123	7/1/2015	Female	Yoshi	Racer	00000010	Ain El Samak	H000 00010	V00 000018	4/15/2021	O00 000009

SPECIES

SPECIESID	NAMEOFSPECIES	CLASSIFICATION	NATURALHABITAT	SPECIESPOP	DIETTYPE
000000001	Cat	Mammal	Urban	600	Carnivore
000000002	Dog	Mammal	Urban	500	Carnivore
000000003	Canary	Bird	Forest	300	Herbivore
000000004	Mouse	Mammal	Forest	100	Herbivore
000000005	Rabbit	Mammal	Meadow	200	Herbivore
000000006	Horse	Mammal	Plain	50	Herbivore
000000007	Hamster	Mammal	Plain	120	Herbivore
000000008	Parrot	Bird	Forest	80	Omnivore
000000009	Goldfish	Fish	Water	200	Herbivore
000000010	Turtle	Reptile	Water	50	Herbivore
000000011	Snake	Reptile	Desert	20	Carnivore
000000012	Salamander	Amphibian	Meadow	30	Carnivore

NEIGHBORHOOD

NEIGHBORHOODNAME	AREA	CLIMATETYPE	POPULATION
Nahr El Kalb	20.3	Temperate	600
Dahr El Wahesh	15.5	Temperate	500
Ain El Samak	12.7	Humid	300
Sin El Feel	8.9	Dry	100
Rabbiton	10	Humid	200
Beit Dib	18.4	Tropical	50
Laqlouq	9.5	Humid	120
Featherfield	11.6	Tropical	80
Goldstream	14.2	Dry	200
Ain Al Ghazal	7.8	Cold	50

HOUSE

HOUSEID	HOUSETYPE	CAPACITY	STREETNAME	NH_NAME
H00000001	Condo	3	Whisker Way	Dahr El Wahesh
H00000002	Doghouse	2	Bone Street	Nahr El Kalb
H00000003	Birdnest	1	Wing Avenue	Featherfield
H00000004	Mouse Hole	2	Cheese Lane	Sin El Feel
H00000005	Rabbit Burrow	4	Carrot Lane	Rabbiton
H00000006	Stable	5	Gallop Road	Ain Al Ghazal
H00000007	Hamster Cage	1	Wheel Street	Beit Dib
H00000008	Parrot Perch	1	Squawk Avenue	Featherfield
H00000009	Fish Tank	10	Stream Way	Goldstream
H00000010	Turtle Shell	1	Pond Drive	Laqlouq
H00000011	Snake Hole	1	Scorching Strip	Rabbiton
H00000012	Pondside Stone	4	Mossy Rock	Beit Dib

OCCUPATION

OCCUPATIONID	TITLE	SALARY	SECTOR	COMPANYID
O00000001	Mayor	500000	Public	B00000001
O00000002	Deputy Mayor	500000	Public	B00000002
O00000003	Guard Dog	12000	Private	B00000003
O00000004	Marine Guide	15000	Private	B00000004
O00000005	Wheel Runner	8000	Private	B00000005
O00000006	Carrot Farmer	9500	Private	B00000006
O00000007	Stable Keeper	11000	Private	B00000007
O00000008	Songbird Performer	9000	Private	B00000008
O00000009	Stream Cleaner	8500	Private	B00000009
O00000010	Coastal Guard	10000	Private	B00000010
O00000011	Municipality Worker	10000	Public	B00000011

VETERINARY_RECORD

VETRECORDID	VACCINATIONSTATUS	LASTCHECKUPDATE
V00000001	Vaccinated	2/10/2024
V00000002	Vaccinated	1/15/2024
V00000003	Vaccinated	5/20/2027
V00000004	Vaccinated	9/30/2023
V00000005	Vaccinated	12/1/2023
V00000006	Not Vaccinated	3/18/2022
V00000007	Not Vaccinated	1/1/2022
V00000008	Not Vaccinated	7/25/2020
V00000009	Not Vaccinated	11/10/2022
V00000010	Vaccinated	2/20/2024
V00000011	Vaccinated	12/10/2023
V00000012	Not Vaccinated	6/15/2022
V00000013	Vaccinated	1/20/2024
V00000014	Not Vaccinated	11/5/2023
V00000015	Vaccinated	2/1/2024
V00000016	Not Vaccinated	9/12/2022
V00000017	Vaccinated	8/10/2023
V00000018	Not Vaccinated	10/1/2023
V00000019	Vaccinated	3/1/2024
V00000020	Not Vaccinated	7/1/2023

BUSINESS

BUSINESSID	LICENSENUMBER	NAME	TYPE	WORKINGHOURS	OWNERID
B00000001	L00000001	Paw Market	Retail	09:00-18:00	985141000123456
B00000002	L00000002	Squeak Cheese Co.	Food	08:00-17:00	985141000234567
B00000003	L00000003	Furry Protectors	Security	24/7	985141000345678
B00000004	L00000004	Marine Adventures	Tourism	10:00-18:00	985141000456789
B00000005	L00000005	Wheels & Co.	Manufacturing	09:00-17:00	985141000567890
B00000006	L00000006	Rabbit Greens	Agriculture	07:00-15:00	985141000678901
B00000007	L00000007	Stable Solutions	Livestock	06:00-14:00	985141000789012
B00000008	L00000008	Performances	Entertainment	11:00-19:00	985141000890123
B00000009	L00000009	Sparkling Tails	Services	09:00-17:00	985141000901234
B00000010	L00000010	Ninja Turtles	Security	24/7	985141001012345
B00000011	L00000011	Flight Academy	Education	07:00-14:00	985141001123456

COMMUNITY_ACTIVITY

ACTIVITYID	ACTIVITY TYPE	ACTIVITYNAME	STARTDATE	ENDDATE	OPERATINGHOURS	FEE	LOCATION
A00000001	Event	Feline Festival	3/1/2024	3/5/2024	-	10	Dahr El Wahesh
A00000002	Event	Cheese Tasting	4/1/2024	4/2/2024	-	5	Sin El Feel
A00000003	Event	Dog Show	5/10/2024	5/12/2024	-	15	Nahr El Kalb
A00000004	Event	Marine Day	6/15/2024	6/20/2024	-	20	Goldstream
A00000005	Event	Hamster Racing	7/1/2024	7/3/2024	-	8	Beit Dib
A00000006	Event	Carrot Festival	8/1/2024	8/5/2024	-	7	Rabbiton
A00000007	Event	Stable Fair	9/15/2024	9/20/2024	-	12	Ain Al Ghazal
A00000008	Event	Parrot Parade	10/1/2024	10/3/2024	-	10	Featherfield
A00000009	Event	Pond Cleaning Day	11/5/2024	11/7/2024	-	0	Goldstream
A00000010	Event	Turtle Protection Seminar	12/1/2024	12/2/2024	-	5	Laqlouq
A00000011	Facility	Polo Park	05/22/2022	-	06:00-18:30	12.5	Nahr El Kalb
A00000012	Facility	Sports Center	05/09/2021	-	06:00-21:30	5.5	Dahr El Wahesh

MUNICIPALITY_OFFICIAL

OFFICIALID	MICROCID	DEPARTMENT	POSITION	TERMSTART	TERMEND
M00000002	985141000234567	Administration	Deputy Mayor	06/15/2021	
M00000003	985141000345678	Public Safety	Chief of Security	03/01/2019	-
M00000004	985141000456789	Marine Operations	Aquatic Coordinator	05/10/2022	-
M00000006	985141000678901	Agriculture	Head Gardener	03/15/2022	-
M00000007	985141000789012	Transportation	Stable Manager	01/10/2023	-
M00000008	985141000890123	Entertainment	Parade Leader	11/15/2020	-
M00000009	985141000901234	Environmental Services	Pond Supervisor	08/01/2022	-
M00000010	985141001012345	Public Health	Health Kennel Manager	07/25/2021	-
M00000001	985141000123456	Administration	Mayor	01/01/2020	-
M00000005	985141000567890	Community Development	Event Organizer	04/01/2021	12/31/2023

PUBLIC_SERVICE

FACILITY ID	SERVICETYPE	OPERATINGHOURS	PHONENUMBER	EMAIL	LOCID
PS0000001	Water Supply	06:00-22:00	123-456-7890	water@nahrkelb.org	Nahr El Kalb
PS0000002	Electricity	24/7	234-567-8901	power@dahrelwahesh.org	Dahr El Wahesh
PS0000003	Waste Management	07:00-19:00	345-678-9012	waste@ainsamak.org	Ain El Samak
PS0000004	Marine Rescue	24/7	456-789-0123	rescue@sinelfeel.org	Sin El Feel
PS0000005	Recycling Center	08:00-16:00	567-890-1234	recycle@rabbiton.org	Rabbiton
PS0000006	Community Garden	06:00-18:00	678-901-2345	garden@beitdib.org	Beit Dib
PS0000007	Livestock Health	07:00-15:00	789-012-3456	health@laqlouq.org	Laqlouq
PS0000008	Entertainment Park	10:00-22:00	890-123-4567	park@featherfield.org	Featherfield
PS0000009	Pond Maintenance	06:00-20:00	901-234-5678	maintenance@goldstream.org	Goldstream
PS0000010	Coastal Protection	24/7	012-345-6789	protection@ainalghazal.org	Ain Al Ghazal

ANIMAL_CONTROL_INCIDENT

MICROCHIPID	INCIDENTID	INCIDENTDATE	INCIDENTDESCRIPTION	ACTIONSTAKEN
985141000234567	I00000001	01/15/2023	Stealing cheese from another resident in Rabbiton	Community service for 1 month
985141000345678	I00000002	05/10/2022	Aggressive barking in Nahr El Kalb	Mandatory training
985141000456789	I00000003	02/20/2024	Swimming in a restricted area near Sin El Feel	Fine of $100
985141000567890	I00000004	07/01/2023	Chewing public wires in Ain El Samak	Fine of $50 and training
985141000678901	I00000005	11/30/2022	Eating garden crops without permission in Beit Dib	Replanting crops as community service
985141000789012	I00000006	01/25/2024	Blocking traffic in Laqlouq	Warning issued
985141000890123	I00000007	06/15/2023	Loud squawking at night in Featherfield	Soundproofing training
985141000901234	I00000008	09/10/2023	Leaving algae uncleaned in Goldstream pond	Clean algae as community service
985141001012345	I00000009	04/20/2022	Blocking coastal access in Ain Al Ghazal	Fine of $200
985141000123456	I00000010	12/01/2023	Unauthorized meeting organization in Dahr El Wahesh	Written apology

IS_CONNECTED_TO

MICROCHIPID	INCIDENTID
985141000123456	I00000010
985141000567890	I00000010
985141000234567	I00000001
985141000345678	I00000002
985141000456789	I00000003
985141000567890	I00000004
985141000678901	I00000005
985141000789012	I00000006
985141000890123	I00000007
985141000901234	I00000008
985141001012345	I00000009

SPECIES_ALLERGY

SPECIESID	ALLERGY
000000001	Chocolate
000000001	Dairy
000000002	Chocolate
000000002	Grapes
000000003	Pollen
000000004	Peanuts
000000005	Carrots
000000006	Dust
000000008	Avocado
000000009	Algae

OCCUPATION_REQUIRED_SKILL

OCCUPATIONID	REQUIREDSKILL
O00000001	Corrupt
O00000001	Leadership
O00000003	Security Training
O00000004	Marine Navigation
O00000005	Physical Fitness
O00000006	Agriculture Expertise
O00000007	Animal Care
O00000008	Performance Skills
O00000009	Cleaning Techniques
O00000010	Coastal Management
O00000011	Organization

VR_CHRONIC_CONDITION

VETRECORDID	CHRONICCONDITION
V00000001	Obesity
V00000002	Diabetes
V00000003	Asthma
V00000004	Heart Disease
V00000005	Arthritis
V00000006	Skin Allergies
V00000007	Kidney Disease
V00000008	Epilepsy
V00000009	Obesity
V00000009	Thyroid Disorder
V00000010	Dental Disease

BUSINESS_ADDRESS

BUSINESSID	LICENSENUMBER	ADDRESS
B00000001	L00000001	123 Whisker Way, Dahr El Wahesh
B00000002	L00000002	45 Cheese Lane, Sin El Feel
B00000003	L00000003	78 Bone Street, Nahr El Kalb
B00000004	L00000004	89 Ocean Drive, Ain El Samak
B00000005	L00000005	56 Wheel Road, Beit Dib
B00000006	L00000006	12 Carrot Lane, Rabbiton
B00000006	L00000006	90 Stream Way, Goldstream
B00000007	L00000007	34 Gallop Road, Ain Al Ghazal
B00000008	L00000008	67 Squawk Avenue, Featherfield
B00000009	L00000009	90 Stream Way, Goldstream
B00000010	L00000010	11 Shell Street, Laqlouq

XII - Transactions

Problem 1

Aquatic Life

In the lively and vibrant **Pet City** peculiar trend caught the attention of the city council. Reports veterinarians indicated that the aquatic animal population in the city was slowly increasing. This caught the interest of the **Municipality of Pet City**, which was curious to know exactly how many aquatic animals now resided in their city.

Aquatic Species in Pet City

Aquatic species were those whose natural habitat was classified as "Water." Scanning the data, we identified two aquatic species:

1. **Goldfish**: A shimmering delight of the water, with a population of **200**.
2. **Turtle**: The quiet guardians of the ponds, with a smaller population of **50**.

Query:

```
SELECT
    (SUM(SPECIESPOP) * 100.0 / (SELECT SUM(SPECIESPOP) FROM SPECIES))
FROM SPECIES
WHERE NATURALHABITAT = 'Water';
```

OUTPUT:

AQUATICPERCENTAGE
11.11111111111111111111111111111111111111

Adding the numbers, we concluded that aquatic animals in Pet City now contribute to 11.11% of the population.

The Municipality's Reaction

The news quickly spread, and the Mayor convened a meeting to discuss the findings. While the current number wasn't alarming, the steady rise in aquatic animals hinted at changes in Pet City's urban ecology. It might have been due to:

- Cleaner water systems implemented in the city's parks.
- Increased public interest in adopting aquatic pets.
- Expanding aquatic habitats in the city's neighborhoods.

Problem 2

As the sun lingered longer in the sky and laughter filled the air, the Featherfield Entertainment Park became the heartbeat of summer. Families flocked to its gates for thrilling rides, scenic picnics, and evening concerts. However, the park's usual schedule of 10:00 AM to 10:00 PM just wasn't enough to keep up with the summer festivities.

The Entertainment Department part of the municipality proposed extending the hours, allowing visitors to start their day earlier and enjoy the cool summer nights under the twinkling lights. The change was approved, and the Entertainment Park now welcomes guests from 8:00 AM to midnight.

Query:

```
UPDATE PUBLIC_SERVICE
SET OperatingHours = '08:00-00:00'
WHERE FacilityID = 'PS0000008';
```

Output:

```
1 row(s) updated.
Select Servicetype, OperatingHours
FROM PUBLIC_SERVICE
WHERE FacilityID = 'PS0000008';
```

SERVICETYPE	OPERATINGHOURS

Entertainment Park	08:00-00:00

Problem 3

Mayor Polo's corruption

PetLand has been investigating municipal fraud and corruption, and Mayor Polo fears his illegal activities will be revealed. He has been funnelling the municipality's budget into his own and the deputy mayor's accounts! Mayor Polo reaches out to Al Aafiya for assistance, making it clear that refusal could jeopardize Al Aafiya's business. Polo requests an adjustment to his and the deputy mayor's publicly visible salary to make it appear more modest, attempting to keep his real income hidden from municipal employees.

This query creates a view of salaries that effectively masks the extremely high salaries of the mayor and deputy mayor from the municipality workers in all departments:

Query:

```
CREATE VIEW worker_view AS
SELECT FirstName, LastName, Title,
       CASE
           WHEN title = 'Mayor' THEN 50000.00
           WHEN title = 'Deputy Mayor' THEN 40000.00
           ELSE Salary
       END AS Salary,
       Sector
FROM OCCUPATION, RESIDENT
WHERE occupID = OccupationID;
```

Output:

```
View created.
```

SELECT VIEW_NAME FROM USER_VIEWS;

VIEW_NAME
WORKER_VIEW

SELECT * FROM WORKER_VIEW;

FIRSTNAME	LASTNAME	TITLE	SALARY	SECTOR
Polo	Lweis	Mayor	50000	Public
Farfoor	Doudee	Deputy Mayor	40000	Public
Ralph	Abu Fouad	Municipality Worker	10000	Public
Bob	Marley	Municipality Worker	10000	Public
Hamtaro	Hamham	Municipality Worker	10000	Public
Bunbun	Hopper	Municipality Worker	10000	Public
Neigh	Galloper	Municipality Worker	10000	Public
Polly	Pepper	Municipality Worker	10000	Public
Goldy	Drowns	Municipality Worker	10000	Public
Shelly	Slider	Municipality Worker	10000	Public
More than 10 rows available. Increase rows selector to view more rows.				

Problem 4

Housing Overcapacity in Polopolis

The Polopolis Municipality is investigating housing overcapacity issues in various neighborhoods. Due to the increasing number of pet residents, some housing units are nearing or exceeding their capacity. The city has strict regulations that no house should house more pets than its specified capacity.

We need to Identify the houses that are currently over capacity. List the neighborhood name they belong to. Count the number of residents in those houses. Highlight if the housing unit has exceeded its capacity.

The investigation is part of a larger review of the city's residential planning. If any house exceeds its capacity, immediate action is required, such as reassigning pets to other units or expanding the housing unit.

Query:

```
SELECT     HouseID, HouseType, MaxCapacity,
    (SELECT COUNT(*) FROM RESIDENT  WHERE HousingID = HouseID) AS
ResidentCount,
    CASE
        WHEN (SELECT COUNT(*) FROM RESIDENT WHERE HousingID = HouseID)
> Capacity THEN 'Over Capacity'
        ELSE 'Within Capacity'
    END AS CapacityStatus
FROM   HOUSE
WHERE   (SELECT COUNT(*) FROM RESIDENT  WHERE HousingID = HouseID) >
Capacity
ORDER BY   HouseID;
```

Output:

HOUSEID	HOUSETYPE	CAPACITY	RESIDENTCOUNT	CAPACITYSTATUS
H00000008	Parrot Perch	1	2	Over Capacity
H00000010	Turtle Shell	1	2	Over Capacity

Problem 5

Mayor Polo's kidnap

On November 5, 2024, Mayor Polo was kidnapped in the bustling city of Polopolis while attending a community event at the Goldstream Neighborhood. In the chaos that followed, witnesses reported seeing Mayor Polo being taken into a nearby business. The Public Safety Department needs the following information to aid in the search:

1. A list of all **community activities** held in Goldstream on that date.
2. The **businesses located in Goldstream**, along with their working hours and owners, to identify potential hideouts.

Query 1:

Retrieve community activities on the kidnapping date in Goldstream

```
SELECT ActivityName, Date, Location
FROM CommunityActivity
WHERE Location = 'Goldstream' AND Date = DATE '2024-11-05';
```

Output 1:

ACTIVITYNAME	STARTDATE	ENDDATE	LOCATION
Pond Cleaning Day	*11/05/2024*	*11/07/2024*	*Goldstream*

Query 2:

Retrieve businesses in Goldstream, their working hours, and owners.

```
SELECT Name, Type, WorkingHours, FirstName, LastName, Address
FROM Business B,Resident, Business_address BA
WHERE OwnerID =MicrochipID AND BA.BusinessID=B.BusinessID AND Address
LIKE '%Goldstream%';
```

Output 2:

NAME	TYPE	WORKINGHOURS	FIRSTNAME	LASTNAME	ADDRESS
Rabbit Greens	Agriculture	07:00-15:00	Bunbun	Hopper	90 Stream Way, Goldstream
Sparkling Tails	Services	09:00-17:00	Goldy	Drowns	90 Stream Way, Goldstream

Conclusion

The department found that due to the water-based nature of the activity, the most likely hideout was Sparkling Tails owned by Goldy Drowns.

Problem 6

Rabbit Murder

It was a bright morning in Rabbiton, and Sandy Acron, a loving rabbit and soon-to-be mother of twins, was tending her carrot garden with joy. Unbeknownst to her, danger was watching. Jojo Slither, a snake infamous for his cunning and cruelty, had slithered into Rabbiton and was waiting for the perfect moment to strike.

As Sandy hummed and worked in her garden, Jojo emerged silently from the shadows. In a flash, he attacked. Sandy fought valiantly, kicking and dodging, but she was no match for the ruthless predator. The garden fell silent, and Sandys dreams of raising a family were tragically cut short.

Later that afternoon, Bunbun Hopper returned to find the garden in ruins and Sandy gone. Following the drag marks through the dirt, he discovered her lifeless body near the woods. Overcome with grief, Bunbun alerted the authorities.

Animal Control quickly investigated and found clear evidence—slither tracks and signs of a struggle—leading them to Jojo Slither, who was still lurking nearby. With the evidence stacked against him, Jojo was sentenced to life imprisonment in the Polopolis Wildlife Penitentiary, ensuring Rabbiton's safety.

Though justice was served, the loss of Sandy left a scar on Rabbiton, reminding everyone of the fragility of peace in their quiet neighborhood.

Query:

```
INSERT INTO ANIMAL_CONTROL_INCIDENT (MicrochipID, IncidentID,
IncidentDate, IncidentDescription, ActionsTaken) VALUES
    ((SELECT MicrochipID
      FROM RESIDENT
      WHERE FirstName = 'Jojo' AND LastName = 'Slither' AND SpecID =
'000000011' AND NeighborhoodN = 'Rabbiton'), 'I00000011', DATE '2024-
11-01',  'Jojo Slither attacked and killed Sandy Acron, a rabbit
expecting twins.',  'Life Imprisonment'     );
```

Output:

INCIDENTID	MICROCHIPID	INCIDENTDATE	INCIDENTDESCRIPTION	ACTIONSTAKEN
I00000001	985141000234567	01/15/2023	Stealing cheese from another resident in Rabbiton	Community service for 1 month
I00000002	985141000345678	05/10/2022	Aggressive barking in Nahr El Kalb	Mandatory training
I00000003	985141000456789	02/20/2024	Swimming in a restricted area near Sin El Feel	Fine of $100
I00000004	985141000567890	07/01/2023	Chewing public wires in Ain El Samak	Fine of $50 and training
I00000005	985141000678901	11/30/2022	Eating garden crops without permission in Beit Dib	Replanting crops as community service
I00000006	985141000789012	01/25/2024	Blocking traffic in Laqlouq	Warning issued
I00000007	985141000890123	06/15/2023	Loud squawking at night in Featherfield	Soundproofing training
I00000008	985141000901234	09/10/2023	Leaving algae uncleaned in Goldstream pond	Clean algae as community service
I00000009	985141001012345	04/20/2022	Blocking coastal access in Ain Al Ghazal	Fine of $200
I00000010	985141000123456	12/01/2023	Unauthorized meeting organization in Dahr El Wahesh	Written apology

I00000011	985141001901234	11/01/2024	Jojo Slither attacked and killed Hoppity Hopper, a rabbit expecting twins.	Life Imprisonment

Problem 7

Rabies Outbreak

The Ministry of Health in PetLand has alerted Polopolis about a rabies outbreak. In response, the health department of Polopolis wants to ensure residents are up-to-date on their vaccines. The department skimmed the records and found outdated and fishy check up dates along with unvaccinated residents! Mayor Polo requested Al Aafiya to review the vaccination records of residents and provide a query that identifies unvaccinated residents, pinpoints outdated vaccinations, and validates date insertion.

We will do so by:

1. Identifying residents who have not been vaccinated or have outdated vaccines. In PetLand, the rabies vaccine needs to be taken every year, otherwise it is outdated.
2. Identifying vaccination records with dates in the future which may indicate possible data entry errors and identifying the corresponding residents.

3. Enforcing a constraint on the "LastCheckupDate" to prevent future dates.

Query 1:

```
SELECT MicrochipID, VaccinationStatus,
    CASE
        WHEN LastCheckUpDate > SYSDATE THEN 'Invalid Date'
    END AS VaccinationValidity,
    LastCheckUpDate
FROM VETERINARY_RECORD, RESIDENT
WHERE Vet_RID = VetRecordID AND (LastCheckUpDate < SYSDATE - 365 OR
VaccinationStatus = 'Not Vaccinated' OR LastCheckUpDate > SYSDATE);
```

Output 1:

MICROCHIPID	VACCINATIONSTATUS	VACCINATIONVALIDITY	LASTCHECKUPDATE
985141000234567	Vaccinated	-	09/30/2023
985141000456789	Vaccinated	Invalid Date	05/20/2027
985141000567890	Not Vaccinated	-	03/18/2022
985141000678901	Not Vaccinated	-	01/01/2022
985141000789012	Not Vaccinated	-	11/10/2022
985141000890123	Not Vaccinated	-	07/25/2020
985141001234567	Not Vaccinated	-	06/15/2022
985141001456789	Not Vaccinated	-	11/05/2023
985141001678901	Not Vaccinated	-	09/12/2022
985141001789012	Vaccinated	-	08/10/2023
985141002012345	Not Vaccinated	-	07/01/2023
985141001890123	Not Vaccinated	-	10/01/2023

Query 2:

```
CREATE TRIGGER trg_check_last_checkup_date
BEFORE INSERT OR UPDATE ON Veterinary_Record
FOR EACH ROW
BEGIN
  IF :NEW.LastCheckUpDate > SYSDATE THEN
    RAISE_APPLICATION_ERROR(-20001, 'LastCheckUpDate cannot be in the future.');
  END IF;
END;
```

Output 2:

```
Trigger created.
```

Problem 8

Health Manager Shelly, while conducting routine park inspections, notices unusual behaviors in some animals—sluggishness, agitation, and distress. Suspecting allergies or chronic illnesses, she runs this query to identify animals with documented conditions.

With the resulting list, Shelly collaborates with the municipal public health team to provide these animals with proper resources, ensuring their health and happiness in the community.

Query:

```
SELECT r.FirstName, r.LastName, s.NameOfSpecies, sa.Allergy,
vcc.ChronicCondition
FROM RESIDENT r, SPECIES s, SPECIES_ALLERGY sa, VR_CHRONIC_CONDITION
vcc
WHERE r.SpecID = s.SpeciesID AND s.SpeciesID = sa.SpeciesID AND
r.Vet_RID = vcc.VetRecordID AND (sa.Allergy IS NOT NULL OR
vcc.ChronicCondition IS NOT NULL);
```

Output:

FIRSTNAME	LASTNAME	NAMEOFSPECIES	ALLERGY	CHRONICCONDITION
Polo	Lweis	Cat	Chocolate	Obesity
Polo	Lweis	Cat	Dairy	Obesity
Farfoor	Doudee	Mouse	Peanuts	Heart Disease
Ralph	Abu Fouad	Dog	Chocolate	Arthritis
Ralph	Abu Fouad	Dog	Grapes	Arthritis
Bob	Marley	Goldfish	Algae	Asthma
Bunbun	Hopper	Rabbit	Carrots	Kidney Disease
Neigh	Galloper	Horse	Dust	Obesity
Neigh	Galloper	Horse	Dust	Thyroid Disorder
Polly	Pepper	Parrot	Avocado	Epilepsy
Goldy	Drowns	Goldfish	Algae	Dental Disease

Problem 9

The Polopolis Succession Crisis

The Polopolis Municipality faced a dilemma. When officials, the backbone of the city's operations, had reached the end of their working terms, the challenge was to find successors with the right skills to continue their work.

The Municipality requested the identification of:

1. Officials whose terms had expired.
2. The skills required for their replacements.

Query:

```
SELECT RequiredSkill, FirstName, Title, TermEnd
FROM OCCUPATION_REQUIRED_SKILL ors, OCCUPATION o, RESIDENT,
MUNICIPALITY_OFFICIAL
WHERE Sector = 'Public' AND ors.OccupationID = o.OccupationID AND
OccupId = o.OccupationID AND microCID = MicrochipID AND TermEnd <=
SYSDATE;
```

Output:

REQUIREDSKILL	FIRSTNAME	TITLE	TERMEND
Organization	Hamtaro	Municipality Worker	12/31/2023

Problem 10

PBI Report: Corruption and Salary Manipulation at Aafiya Co.

The Polar Bureau of Investigation (PBI) launched an inquiry into **Aafiya Co.** after a tip suggested the Deputy Mayor was earning a salary equal to the Mayor's, despite public records showing otherwise. The PBI uncovered evidence of deliberate salary manipulation and corruption.

Initial Findings: Discrepancy in Public Salary Records

Query:

```
SELECT Title,Salary
FROM OCCUPATION
WHERE Title = 'Deputy Mayor' or Title='Mayor';
```

The PBI spied at a workers device and found the following values for their respective salaries:

- **Mayor's Salary**: $50,000 (expected).
- **Deputy Mayor's Salary**: $40,000

This contradicted insider information, raising suspicions of data tampering.

Undercover Operation: Agent Ice's Discovery

To confirm our suspicions, **Agent Ice**, a highly trained polar bear, was sent undercover to Aafiya Co. infiltrated Aafiya Co.'s backend systems, uncovering the true salary data:

- **Mayor's Salary**: Actual figures matched at $500,000.
- **Deputy Mayor's Salary**: Public figure altered to $40,000, but actual salary matched the Mayor's at $500,000

Output:

TITLE	SALARY
Mayor	500000
Deputy Mayor	500000

The Revelation

The altered records concealed the Deputy Mayor's true salary, aligning with broader evidence of missing funds. This manipulation appeared deliberate, likely to mask unethical salary distributions and misappropriation of resources.

Grounds for Legal Action

The PBI will pursue legal action against Aafiya Co. on the grounds of:

1. **Corruption**: Misuse of funds and improper salary distributions.
2. **Data Tampering**: Manipulation of records to mislead investigators.

Conclusion

Agent Ice's investigation uncovered a scheme to falsify salary records and obscure financial misconduct. The PBI has sufficient evidence to hold Al-Aafiya accountable for corruption and restore transparency.

XIII – Normalization

After creating all of the relations (and avoiding legal trouble due to Mayor Polo), we should improve upon them by normalizing according to several normal forms. Here we are going to normalize our database up to the fourth normal form which is the BoyceCodd Normal Form. We will start with the first followed by the second and so on until the BCNF normal form. The guidelines for each normal form that will be followed is according to the class and book material.

RESIDENT

MicrochipID	DATEOfBirth	Gender	FirstName	LastName
Vet_RID	NeighborhoodN	SpecID	HousingID	Housing_MoveInDATE
OccupID				

A. The **RESIDENT** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **RESIDENT** relation schema satisfies all conditions of the 2NF because every nonprime attribute is fully functionally dependent on the primary key **"MicrochipID"**.

C. The **RESIDENT** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"MicrochipID"**.

D. The **RESIDENT** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X→A where X is not a super key or A is a prime attribute and X is not a super key.

SPECIES

SpeciesID	NameOfSpecies	Classification	NaturalHabitat	SpeciesPop
DietType				

A. The **SPECIES** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **SPECIES** relation schema satisfies all conditions of the 2NF because every nonprime attribute is fully functionally dependent on the primary key **"MicrochipID"**.

C. The **SPECIES** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"MicrochipID"**.

D. The **SPECIES** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X→A where X is not a super key or A is a prime attribute and X is not a super key.

NEIGHBORHOOD

NeighborhoodName	Area	ClimateType	Population

A. The **NEIGHBORHOOD** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **NEIGHBORHOOD** relation schema satisfies all conditions of the 2NF because every non-prime attribute is fully functionally dependent on the primary key **"NeighborhoodName"**.

C. The **NEIGHBORHOOD** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"NeighborhoodName"**.

D. The **NEIGHBORHOOD** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X→A where X is not a super key or A is a prime attribute and X is not a super key.

HOUSE

HouseID	HouseType	Capacity	NH_Name	StreetName

A. The **HOUSE** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **HOUSE** relation schema satisfies all conditions of the 2NF because every non prime attribute is fully functionally dependent on the primary key **"HouseID"**.

C. The **HOUSE** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"HouseID"**.

D. The **HOUSE** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X→A where X is not a super key or A is a prime attribute and X is not a super key.

OCCUPATION

OccupationID	Salary	Title	Sector	CompanyID

A. The **OCCUPATION** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **OCCUPATION** relation schema satisfies all conditions of the 2NF because every non prime attribute is fully functionally dependent on the primary key **"OccupationID"**.

C. The **OCCUPATION** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"OccupationID"**.

D. The **OCCUPATION** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X→A where X is not a super key or A is a prime attribute and X is not a super key.

VETERINARY_RECORD

VetRecordID	VaccinationStatus	LastCheckUpDATE

A. The **VETERINARY_RECORD** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **VETERINARY_RECORD** relation schema satisfies all conditions of the 2NF because every non prime attribute is fully functionally dependent on the primary key **"VetRecordID"**

C. The **VETERINARY_RECORD** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"VetRecordID"**.

D. The **VETERINARY_RECORD** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X→A where X is not a super key or A is a prime attribute and X is not a super key.

BUSINESS

BusinessID	LicenseNumber	Name	Type	WorkingHours
OwnerID				

A. The **BUSINESS** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **BUSINESS** relation schema satisfies all conditions of the 2NF because every nonprime attribute is fully functionally dependent on the primary key **"BusinessID and LicenseNumber"**.

C. The **BUSINESS** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"BusinessID and LicenseNumber"**.

D. The **BUSINESS** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X → A where X is not a super key, or A is a prime attribute and X is not a super key.

COMMUNITY_ACTIVITY

ActivityID	ActivityType	ActivityName	StartDATE	EndDATE
OperatingHours	Fee	Location		

A. The **COMMUNITY_ACTIVITY** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **COMMUNITY_ACTIVITY** relation schema satisfies all conditions of the 2NF because every nonprime attribute is fully functionally dependent on the primary key **"ActivityID"**.

C. The **COMMUNITY_ACTIVITY** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"ActivityID"**.

D. The **COMMUNITY_ACTIVITY** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X→A where X is not a super key or A is a prime attribute and X is not a super key.

MUNICIPALITY_OFFICIAL

OfficialID	MicroCID	Department	Position	TermStart
TermEnd				

A. The **MUNICIPALITY_OFFICIAL** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **MUNICIPALITY_OFFICIAL** relation schema satisfies all conditions of the 2NF because every nonprime attribute is fully functionally dependent on the primary key **"OfficialID"**.

C. The **MUNICIPALITY_OFFICIAL** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"OfficialID"**.

D. The **MUNICIPALITY_OFFICIAL** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X → A where X is not a super key, or A is a prime attribute and X is not a super key.

PUBLIC_SERVICE

FacilityID	ServiceType	OperatingHours	PhoneNumber	Email
LocID				

A. The **PUBLIC_SERVICE** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **PUBLIC_SERVICE** relation schema satisfies all conditions of the 2NF because every nonprime attribute is fully functionally dependent on the primary key **"FacilityID"**.

C. The **PUBLIC_SERVICE** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"FacilityID"**.

D. The **PUBLIC_SERVICE** relation schema satisfies all conditions of the BCNF because there exists no functional dependency X→A where X is not a super key or A is a prime attribute and X is not a super key.

ANIMAL_CONTROL_INCIDENT

MicrochipID	IncidentID	IncidentDATE	IncidentDescription	ActionsTaken

A. The **ANIMAL_CONTROL_INCIDENT** relation schema satisfies all conditions of the 1NF because it neither has multivalued attributes nor composite attributes. All attributes are single and atomic.

B. The **ANIMAL_CONTROL_INCIDENT** relation schema does **NOT** satisfy all conditions of the 2NF because every nonprime attribute is fully functionally dependent **ONLY** on the primary key **"IncidentID"**, and not on **"MicrochipID"**. Thus, further decomposition is needed:

ANIMAL_INCIDENT

MicrochipID	IncidentID

INCIDENT_DETAIL

IncidentID	IncidentDATE	IncidentDescription	ActionsTaken

C. The **ANIMAL_INCIDENT** relation schema satisfies all conditions of the 3NF because it satisfies 2NF and has no non-prime attributes. The **INCIDENT_DETAIL** relation schema satisfies all conditions of the 3NF because it satisfies the 2NF and there are no non-prime attributes that are transitively dependent on the primary key **"IncidentID"**.

D. The **ANIMAL_INCIDENT** relation schema satisfies all conditions of BCNF because it contains no non-prime attributes. The **ANIMAL_DETAIL** relation schema satisfies all conditions of the BCNF because there exists no functional dependency $X \rightarrow A$ where X is not a super key, or A is a prime attribute and X is not a super key.

Relation Schemas without non-prime attributes:

Since the following relation schemas have no non-prime attributes, they satisfy all normal form conditions up to BCNF

IS_CONNECTED_TO

MicrochipID	IncidentID

SPECIES_ALLERGY

SpeciesID	Allergy

OCCUPATION_REQUIRED_SKILL

OccupationID	RequiredSkill

VR_CHRONIC_CONDITION

VetRecordID	ChronicCondition

BUSINESS_ADDRESS

BusinessID	LicenseNumber	Address

XIV - Conclusion

A modern municipality like Polopolis which houses many diverse citizens, services, neighborhoods, and enterprises demands a well-structured database to efficiently manage its data. An organized database is the foundation for the functional handling of said data, just as a municipality must meet the many demands of its residents by preserving public areas, offering necessary services, and guaranteeing the welfare of its community.

Residents of Polopolis have their own neighborhood traits, veterinary records, and social contributions such as the potential to work in a variety of positions as municipal officials or service animals. Every pet is a unique entity with unique relationships that need to be properly monitored in order to prevent mistakes that could hinder community operations or result in the neglect of vital services.

Moreover, to maintain a desirable standard of living for its citizens, the municipality must also make sure that all of its elements from public services to vet visits are accessible and well-coordinated. For interactions between the municipality, its authorities, and its citizens to go smoothly, it is essential that different entity types like jobs and vet records be integrated into a single database system.

Therefore, as we work on the Polopolis municipality database, we are committed to building a thorough and well-structured system that takes into account the everyday activities and services needed to maintain the municipality's prosperity. In the end, this methodical approach will improve Polopolis' quality of life and guarantee that all pets' needs are successfully satisfied.

XV – References

Johns, S. (2021, September 1). Dog vaccination essential for preventing rabies spread to humans and animals. *Imperial College London*. https://www.imperial.ac.uk/news/228654/dog-vaccination-essential-preventing-rabies-spread/

XVI - Phase IV Report Checklist

- Font Type: Times New Roman.
- Team of five: Yes.
- Plain English: Yes.
- Group named: Yes
- Group leader: Yes.
- Real life database application: Yes.
- Challenging and interesting database application: Yes.
- Font Size: 11.
- 1.5 Spaced: Yes.
- Typed: Yes.
- At least 10 essential pages: Yes.
- At least 10 entity types: Yes.
- At least 1 multivalued attribute: Yes.
- At least 1 composite attribute: Yes.
- At least 1 attribute on a relationship: Yes.
- At least 1 weak entity type: Yes.
- ER Model built: Yes.
- Translated the ER-diagram into relational schemas: Yes.
- Added SQL Codes and Queries: Yes.
- Normalize the database up to the BCNF Normal Form: Yes.
- Deadline respected: Yes.