

# ERD Packet

# *Table of Contents*

<i>Steps to Creating an Entity Relationship Diagram.....</i>	<i>3</i>
<i>Exercise #1 - Ticktown .....</i>	<i>4</i>
<i>Exercise #2 – Lee’s Video Store.....</i>	<i>5</i>
<i>Exercise #3 – Ashe &amp; Macomb .....</i>	<i>6</i>
<i>Exercise #4 – MSTC .....</i>	<i>7</i>
<i>Exercise #5 – Vet .....</i>	<i>8</i>
<i>Customer Form.....</i>	<i>9</i>
<i>Visit Form .....</i>	<i>10</i>
<i>Fees .....</i>	<i>11</i>
<i>Pretest.....</i>	<i>12</i>

## Steps to Creating an Entity Relationship Diagram

- ❶ Study your problem to identify entities (**entity discovery**) for which the company wishes to store data.
  - A true entity has multiple instances
  - Entities should be named with nouns
- ❷ Construct the **context ERD** to include entities and relationships, but no attributes.
  - The context data model contains the fundamental entities or independent entities
  - Relationships should be named with verb phrases from parent-to-child
- ❸ Choose a unique identifying attribute for the entity. If one cannot be found, look to see if a combination of 2 or more attributes will uniquely identify the entity - this is called a **concatenated key**. List the key or concatenated key first in the table, underscoring the key attribute(s) or placing a (PK) by each key.
  - The value of the key should not change over the lifetime of each entity instance
  - The value of the key cannot be null and must be unique
  - If you cannot define a key for an entity, it may be that the entity doesn't exist
- ❹ For N:M (many to many) cardinality relationships, create a new table. This is called an **associative entity** because it is created from the association between two entities. The key to the new entity is the combination of the keys from its source entities. This combination of keys is called a **concatenated key**. Each of the attributes in the new table which compose the concatenated key in the new table are also called **foreign keys** because they are keys to another table. Steps 3 and 4 will produce the **key-based ERD**.
- ❺ List the remaining non-key attributes in the tables.
- ❻ For 1:1 cardinality relationships, merge all attributes into one table. The name of the table can be either one of the original entity names or a combination of the two names.
- ❼ For 1:N cardinality relationships, take the key for the 1 side and post it as an attribute in the many side. This new attribute in the many side becomes a **foreign key** and is indicated by typing the attribute in *italics* or place an (FK) by each foreign key.
- ❽ List any additional attributes that describe new associative entities or are required to make the key in the new table unique in the associative entity table. You should now have a **fully attributed ERD**.

## Exercise #1 - Ticktown

---

Ticktown is famous for the fact that each person in town owns at least one dog. The number of practicing vets that treat dogs in Ticktown is astronomical compared to any other place on earth. As a matter of fact, Ticktown's nickname is "Dog Heaven".

Each vet has a name, address, and phone number as well as a license number. Each vet's license number is different from any other vet's license number. Each Ticktown vet has a workload which indicates the number of dogs the vet has treated in a year.

Each person is identified by a name and lives in a house with a unique address. More than one person can live in the same house. Each dog is owned by one person. However, each person can own more than one dog.

People in Ticktown never get their dogs mixed up because each dog is distinguishable from every other dog by its dog tag number. Each dog has a name. Each dog is treated by only one vet.

Create an ERD.

## Exercise #2 – Lee’s Video Store

---

Lee is interested in movies and wants to keep information on movies, stars, and directors in a database. The example contains the following requirements:

1. For each director, list his or her number, name, the year he or she was born, and, if he or she is deceased, the year of death.
2. For each movie, list its number, title, the year the movie was made, its type, the number and name of its director, the critics’ rating, the MPAA rating, the number of awards the movie was nominated for, the number it won and the names of all the stars that appeared in it.
3. For each movie star, list his or her number, name, birthplace, the year he or she was born, and, if he or she is deceased, the year of death.

For this project, we will add the following requirements to the above list:

### Requirement 1:

Each video tape purchased by Lee’s store is assigned a unique number. For each tape, Lee wants to store the number; the date the tape was purchased; the number, name, and address of the supplier from which the tape was purchased; and the number and title of the movie that is on the tape. Although Lee will usually only have one tape for any given movie, he will often purchase several tapes of the movies that he feels are especially popular. If Lee purchases more than 1 tape, he will purchase them all from the same supplier.

### Requirement 2:

For each customer, store the customer’s number, name, street address, city, state and zip. In addition, we must be able to determine precisely which tapes the customer has rented along with the date and time at which they were rented as well as the date and time that they are due to be returned.

Create an ERD

## Exercise #3 – Ashe & Macomb

---

It was about time for the small accounting firm of Ashe & Macomb to computerize their record keeping procedures. Business had grown by "leaps and bounds" first half of the new year and the two partners couldn't keep up with all the new business because of the outdated record keeping procedures they used.

As one example of how outdated things were at A & M, they produced ledger reports by hand for their customers! Now that business had accelerated, the number of mistakes they were finding was increasing. They had to do something.

One of the ledger reports for a new (and very large) customer, Denton Packaging, is illustrated. The information for each row and column had to be input by hand the old way to create the report. Each transaction had to hand sorted into the correct row. It was a nightmare!

A ledger report consists of data about various types of financial transactions, in the case of Denton Packaging, for each department within each of its divisions.

A ledger account is important to ledger report because it helps to uniquely identify each financial transaction. Each ledger account is different from all others because each ledger account has a unique code number. Each ledger account also has a description and is a debit or credit.

Each transaction comes from a department of Denton Packaging and consists of a date, ledger account, amount and comment. Each transaction can be uniquely identified by knowing its ledger account, date and department.

Each division can be identified by a division number and has a name. Each department can be identified by knowing its department number and its division. Each department also has a name.

### Ashe & Macomb Ledger Report for Denton Packaging

Date	Amt	Comment	Code	Description	D C	No	Name	Div No	Name
01/17/02	150	Office Party	2001	Petty Cash	D	170	Accounting	100	Comsumer Products
01/18/02	1500	Electronic Parts	1020	Invoices Pymt Rcv	C	150	Inv Mgmt	200	Commercial Products
01/18/02	2900	CDs and Tapes	1015	Credit Card Sales	C	130	Marketing	100	Consumer Products
01/21/02	5000	Payroll	2053	Payroll Expense	D	170	Accounting	100	Consumer Products
01/24/02	75	Office Meeting	2001	Petty Cash	D	130	Marketing	100	Consumer Products

## Exercise #4 – MSTC

---

MSTC needs to store information about Departments, Faculty, Students and Courses. The example contains the following requirements.

1. For a department, store the department number and name.
2. For a faculty member, store the number and name.
3. For a student, store the number and name.
4. For a course, store the code and title.
5. For each student, store the grade earned in each of the courses he or she has taken.
6. For each faculty member and each course taught by the faculty member, store the number of times he or she has taught the course. A course can be taught by more than one faculty member.
7. Each department may contain any number of faculty members, but each faculty member is assigned to exactly one department.
8. Each faculty member may advise any number of students, but each student is advised by, at most, one faculty member.
9. The system must be able to efficiently retrieve a department, faculty member, student, or course based on the department number, the faculty number, the student number or the course code respectively. A grade does not need to be retrieved directly; neither does the number of times a faculty member has taught a course.
10. A faculty member cannot be added to the database unless the department to which the faculty member is assigned is known and already stored in the database. Once a faculty member is stored, the department to which the faculty member is assigned cannot be changed.
11. A student need not have an advisor to be stored. Further, once a student is stored, it must still be possible to change the student's advisor.

## Exercise #5 – Vet

---

Dr. Good is a Veterinarian who currently keeps all of his office records in a paper filing system. He would like it computerized because:

- record keeping is tedious and cumbersome
- records are not backed up and could all be lost in an event of a physical disaster (fire, flood, etc.)
- information is not readily available. It can take days to compile a report, for example, about how many dogs were treated for Lymes Disease this year.
- Calculating customer bills is difficult

The records are kept in the following system at this time. Find a way to reorganize it into a relational database.

Draw up the ERD to show your plan.

---

The doctor keeps a list of medications that are available in a spreadsheet. It looks like this:

<u>Medication Name</u>	<u>Dose/5 Pounds</u>	<u>Price/Dose</u>
Acetimophenabil	20 mL	1.1
Echerschnial	12.5 grams	0.25
Ehisyvia	1 tsp	0.59
Empernalia	1/4 ounce	0.67
Hemperstau	1/2 tsp	2.25
Rakor	1/2 ounce	0.12
Raxora	1.6 ounces	0.15

---

The doctor posts in this office lobby a list of the types of animals that he sees. It includes: dogs, cats, mini-pigs, and ferrets. He may expand his practice in the future to include other types of animals.

---

# Customer Form

He has new customers fill out the following form:

## NEW CUSTOMER FORM

Today's Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_

Street: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_ ZIP: \_\_\_\_\_

Phone: \_\_\_\_\_

Please provide the following information for each animal that you plan to bring into our clinic. If you own more than one animal, please ask the receptionist for an additional form. Do not complete the top part again, simply staple the pages together.

Pet Name: \_\_\_\_\_

Type of Animal: Dog      Cat      Ferret      Pig

Breed: \_\_\_\_\_ (ex: Cocker Spaniel)

Date of Birth: \_\_\_\_\_

Sex: M      F

Color(s): \_\_\_\_\_

Neutered/Spayed? Yes    No

Weight: \_\_\_\_\_

Current Vaccinations: \_\_\_\_\_

Other Comments: \_\_\_\_\_



## Fees

The doctor has a chart of how much different types of visits cost to help in calculating the fees to be charged:

Routine Vaccination .....	\$5.00
Physical .....	\$15.00
Ailment .....	\$30.00
Surgery	
Clean Teeth .....	\$25.00
Minor .....	\$75.00
Major .....	\$175.00
Specialty .....	varies

## Pretest

---

### Problem #1

The local Clinic wants to keep track of patients and the doctors they are assigned to.

A household is identified by a number. For each household, there is a single head of household (last name), a balance due, address and a single insurance company identified by a code. The Clinic also wants to keep track of the name of the insurance company and address.

In a household, there are several patients, each identified by a patient number, which is only unique within the household. (In other words, a patient number could be used in another household).

For each of these patients, we store the patient's name together with the number and name of the primary doctor within the practice that cares for this patient. The Clinic also wants to keep track of the doctors phone number

Create a Context ERD, Key-based ERD and a Fully Attributed ERD.