Lab: Unit 07 – Conceptual Data Modeling

# Overview

In this lab we will explore how to capture entity-relationship data requirements and crow’ foot Entity-Relationship diagrams.

## Learning Objectives

Upon completion of the lab, you should be able to:

* Clearly identify the benefits of conceptual data modeling.
* Draw Crow’s foot ERD’s from E-R data requirements using a CASE tool.
* Check E-R models for weak and associative entities.
* Capture data requirements as entities, attributes, and relationships.

## What you will need

To complete this lab, you will need the Draw.io Tool by <https://www.diagrams.net/> You can draw your diagrams online or download the app to your computer. Follow the link to draw in the browser or download.

# Walkthrough

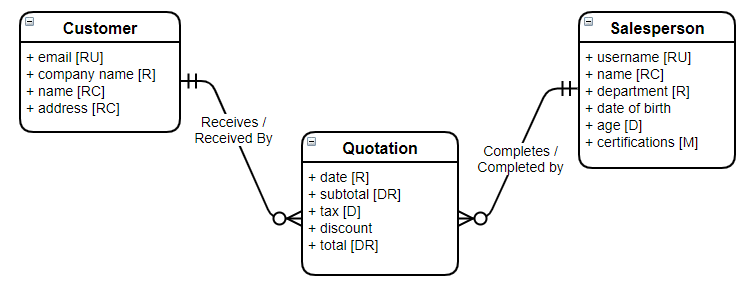
## Step 1: Learn to Use Draw.io

Watch this video to get started drawing conceptual model diagrams with the **draw.io** tool. The video will take you through the basics of setting up entities, relationships, and attributes.

<https://youtu.be/7lGFx-qYmhU>

Also, here is more general tutorial for how to use Draw.io here: <https://www.youtube.com/watch?v=Z0D96ZikMkc>

## Step 2: Re-Create an ERD

After you have completed the tutorial, try to draw this diagram by re-creating it exactly.  


When you are done, save the diagram file as **sales-quotation**

## Step 3: Drawing an ERD from E-R requirements.

Now that you are comfortable drawing a diagram, try to draw a Crow’s foot, ERD from the following E-R requirements. You must turn the requirements into the correct diagram.

1. Entities: **Foo, Bar, Baz, Qux**
2. Attributes:
   1. **Foo:** flip (required), flop (unique)
   2. **Bar:** beep (required and unique), bloop (multi-valued)
   3. **Baz:** zoop (composite, required), zip, zap (unique)
   4. **Qux:** quick (required, unique), quack, quote
3. Relationships:
   1. A **Foo** gobbles 1 or more **Bar**. A **Bar** is gobbled by 0 or More **Foo**.
   2. A **Foo** quaffs 1 and only 1 **Qux**, but a **Qux** can be quaffed by 1 or more **Foo**.
   3. A **Bar** guzzles 0 or more **Baz**, a **Baz** is guzzled by 0 or more **Bar**. Furthermore, when a Bar or Baz is guzzled there are attributes: guzzle-amount (required) and guzzle-date (required)

When you are done save the diagram as **foo-bar-baz**

## Step 4: Identifying E-R Data Requirements, then draw an ERD.

Normally we are not given such specific requirements, we are usually just given information about the system we are designing, and then it’s up to us to:

1. Identify the E-R Requirements
2. Draw the ERD

In this final step, practice capturing the E-R requirements and then draw the ERD.

**Information Provided**:  
Spotify is an online music streaming service. Spotify has over 10 Million songs containing information such as title, artist, which of many genres the music belongs to, and length of song. Users sign up for the service providing their name, email and option list of music genres they prefer. Users can build playlists of songs. These playlists are built from individual song titles and Spotify keeps track of when the playlist was created. In addition, any song listened to is archived to a history table so that the company can do analytics on the songs users are listening to and credit artists.

Identify the E-R Requirements:

1. Entities: object data
2. Attributes: atomic values for each entity, include properties such as required, unique, etc.
3. Relationships: business rules among the entities, including cardinality in both directions

Use a copy of the **Empty-ER-Data-Requirements** spreadsheet, provided with this lab, to enter your data requirements.

After you identify the requirements, draw the diagram, save the diagram as **Spotify**

# Questions

Answer these questions using the problem set submission template. You will need to provide a screen shot for each answer. Please follow the guidelines for submitting a screenshot.

1. Provide a screenshot of your completed E-R Diagram (ERD) from Walkthrough Part 3.
2. Provide a screenshot of your E-R data requirements from Walkthrough Part 4.
3. Provide a screenshot of the E-R Diagram (ERD) Walkthrough Part 4.
4. Draft an ERD from the following requirements. Try not to let your interpretation of the facts get into the way until **after you’ve drawn the diagram**. Once you have a diagram together, feel free to criticize and comment.
   1. Entities: customer, order, products, order line item
   2. Attributes:
      1. Customer: customer email – unique, required, customer name – composite, required, customer address – composite, required.
      2. Order: order number – unique, required, order date – required, order subtotal – required, order tax – required, order total – derived
      3. Products: product inventory number – required, unique, product name – required, product description, product price – required.
      4. Order Line Item: item product inventory number – required, item product price – required, item quantity – required, item extended price – derived.
   3. Relationships:
      1. A customer places 0 or more orders. An order is placed by 1 and only 1 customer.
      2. An order contains 1 or more line items. A line item belongs to 1 and only 1 order.
      3. A line item contains 1 and only 1 product, a product appears on 0 or more line items
   4. Other facts:
      1. You cannot have a line item without a product and an order.
5. In this next example, I give you a list of data requirements, but they are not organized into entities, relationships, and attributes. You may have to make some assumptions to complete E-R Model.
   1. A car is made by only one manufacturer, but a manufacturer makes a lot of cars.
   2. A car has a make, model, vehicle identification number (vin), msrp, and color.
   3. A manufacturer has a name (which is unique and not always the same as the make).
   4. A manufacturer has several plants where the cars are made. A plant is owned by just one manufacturer.
   5. A car is produced at just one single plant. And a plan produces several cars.
   6. A Plant has a name and address.
   7. Only cars of a certain make are produced at certain plants. For example, plant “A” might produce makes “X”, “Y”, and “Z”, while plant “B” might produce makes “W” and “Z” only.

Use a copy of the **Empty-ER-Data-Requirements** spreadsheet, provided with this lab, to enter your data requirements. Provide a screenshot of your data requirements.

1. Draw an ER Diagram based on the data requirements you identified in the previous question.
2. In this last example, read the following paragraphs, identify the data requirements. Once more use a copy of the **Empty-ER-Data-Requirements** spreadsheet, provided with this lab, to enter your data requirements.

The XYZ consulting firm handles project management for its customers.

**Custome**rs have a name, address, phone, and one or more contacts (people who work for the company). Customers interact with XYZ through projects.

For any **project** there should be the name of the project the estimated cost, estimated hours, and an agreed-to billable hourly rate. There should also be an optional description for the project. There should be one customer contact assigned to the project.

Each project is broken down into **task**s. Tasks have a name, estimated time to completion, actual time to completion, and assigned employee to the task. One **employee** is assigned to the project as the project manager. Tasks also contain a list of required skills to complete the tasks. An example of those skills might be database, systems admin, project management, web design, or programming to name a few.

XYZ employees have a name, email, set of skills (like the ones in tasks), and billable hourly rate. The estimated and actual billable amounts are derived from the employee’s hourly rate and the task’s estimated and actual time to completion these values should be stored with the task. Employees can work on more than one task and can be assigned to different tasks at the same time.

1. Draw an ERD based on the data requirements you identified in the previous question.