Data Admin Concepts & Database Management

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Lab 01 – The Relational Data Model

Overview

This lab is the first of ten labs in which we will build a database using the systematic approach covered in the asynchronous material. Each successive lab will build upon the one before and can be a useful guide for building your own database projects in a systematic way.

In this lab, we will review data collected prior to database design and identify ways the relational data model will improve the efficiency of data capture and retrieval. We will also begin to create a diagram called an Entity-Relationship Diagram (ERD) to explain how our data are organized. We will expand upon this diagram in later labs.

Read this lab document once through before beginning.

Learning Objectives

In this lab you will

- Demonstrate understanding of the relational database model
- Identify ways the relational database model improves upon file-based data storage systems

- Demonstrate basic model creation using diagramming tools

Lab Goals

This lab consists of two sections. The first section presents a "spreadsheet" view of representative data for the database system we will create (see the table of data at the end). You will be asked to identify problem spots and recommend improvements that the relational data model can afford. In the second section, you will connect to and use an online software tool to create a basic diagram. At this point, you won't be asked to identify entities or relationships on your own. This will be a tutorial walk-through of the tool. You will apply what you've learned in future labs.

What You Will Need to Begin

- This document
- An active Internet connection
- Visit draw.io (https://www.draw.io/) and ensure you can create a blank diagram. Ideally, connect draw.io to your Google Account, OneDrive, or local disk. If you are new to using online software tools, the recommendation is to connect draw.io to your Google Drive. If you do not have a drive, visit drive.google.com (https://drive.google.com) to create one for free before beginning the second part of this lab.
- A blank Word (or similar) document into which you can place your answers. Please include your name, the current date, and the lab number on this document. Please also number your responses, indicating which part and question of the lab to which the answer pertains. Word docx format is preferred. If using another word processing application, please convert the document to pdf before submitting your work to ensure your instructor can open the file.

Part 1 – VidCast Database

Setup

Throughout the course, we will be designing and implementing a database for a fictional online video streaming platform. We will explore the design details more fully in later labs, but the basic business case is provided here.

VidCast is a platform for general purpose video streaming, akin to live podcasting with video and similar in format to popular game-streaming service, Twitch (https://twitch.tv). Users will be able to stream their audio and video content on the platform on-demand and will be able to watch the streams of other users as well (either live or recorded). Users can opt to follow other users and receive in-application notifications of the activity of users they've followed. Each user will be categorized according to the number of followers they have. Users above a certain threshold of followers are invited to monetize their streams by allowing the service to periodically overlay advertising content in exchange for a share of the revenue. There will be different tiers of user status to be determined later.

In addition to the live streams, users can optionally record their streamed content and save it to the video-on-demand (VOD) section of the service. The length of time a stream recording is available in VOD is determined by which tier of follower count they are in. The specifics of this will be determined later.

VidCast will use a robust user-created tagging system to effectively categorize not only the user accounts, but also each stream (saved or live). These tags can be applied on the flay or after a stream recording has been made available in the VOD.
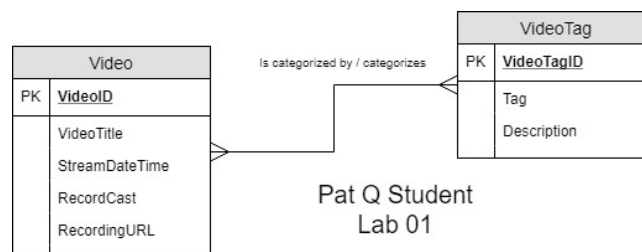
To-do

Initial brainstorming on the data we'll need to capture has created the "spreadsheet" below (See Table 1 – VidCast Datasheet at the end of this document). It is up to us to review this and find ways to improve it. On your answer sheet, identify at least 4 challenges to fitting this data into the relational data model. There may be more, so feel free to elaborate, but find at least 4. An example is "Not every row in the sheet has a user name"

Part 2 – Diagramming with Draw.IO

Setup

This course extensively uses online diagramming tools for designing database constructs including entities, relationships, and attributes. This part is a walkthrough of creating a basic entity-relationship diagram (ERD) using draw.io. Before starting, ensure you can connect to https://draw.io either through the preceding link or through your Google Drive account.
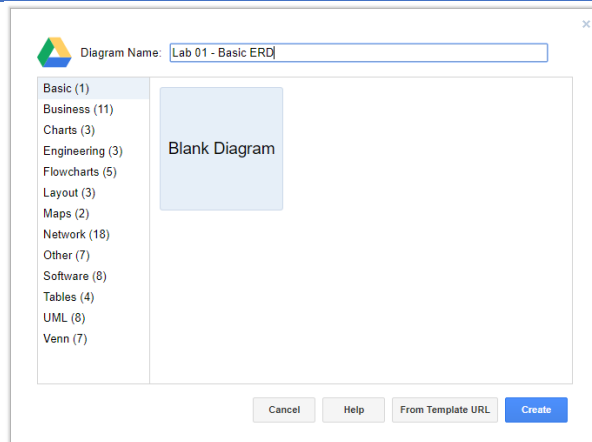
We are going to create the following diagram in draw.io.

To-do

Follow these steps to create a basic ERD. At the end, you will import your diagram into the answer sheet you started in Part 1.
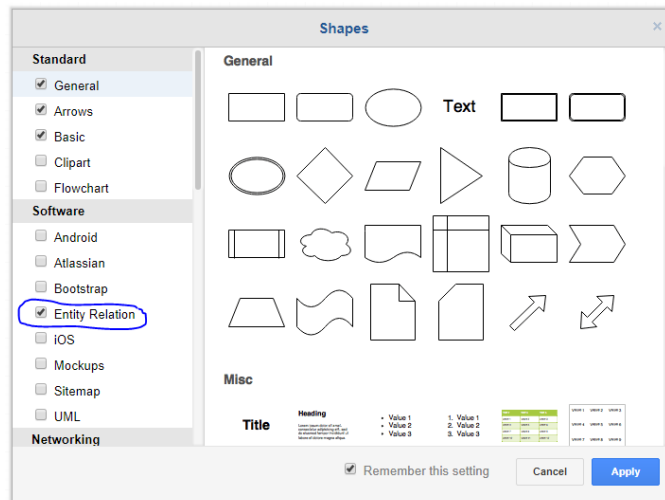
Step	Task
1	In draw.io, create a new blank diagram. Name it "Lab 01 – Basic ERD" or similar.

Click "Create" to start designing. |
| **2** | When in the application, the left-hand side of the screen is the tool palette. The center is your document, and the right-hand side is a list of properties. From here on out, we will call the left-hand side the Toolbox, the center portion of the screen will be your document (or diagram) and the right-hand side will be called the Properties.
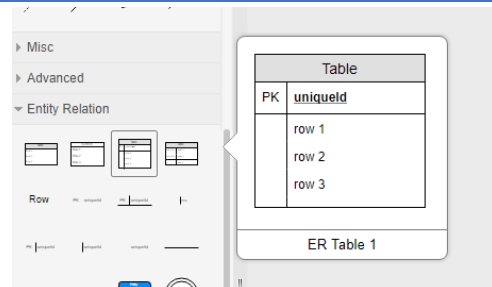
In the toolbox, we will be working mostly with the Entity Relation set of tools. Look for it in your toolbox. If you don't see it right away, click More Shapes (on the bottom) and select Entity Relation from the list by checking its box.
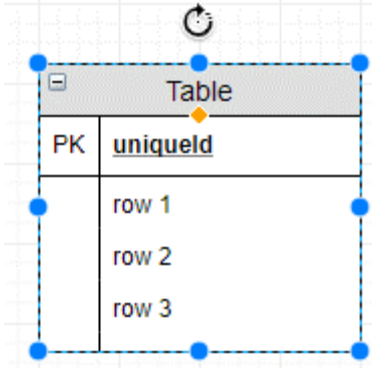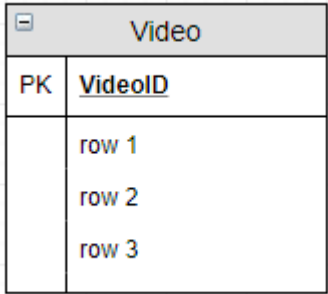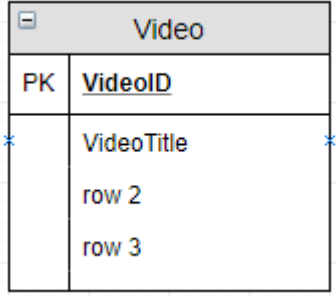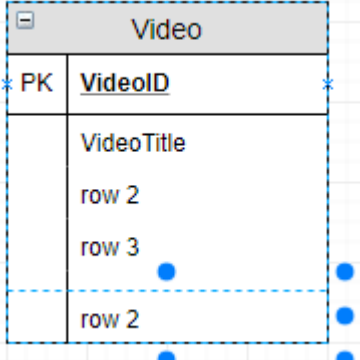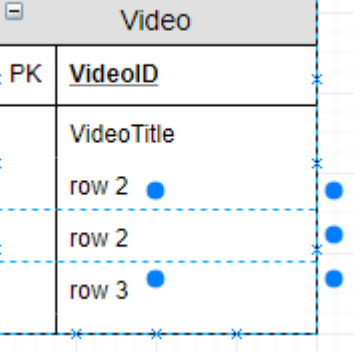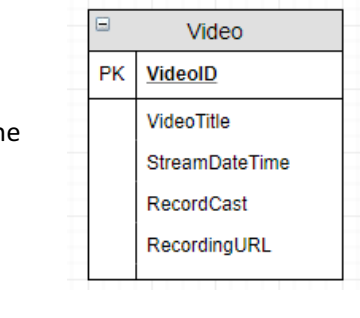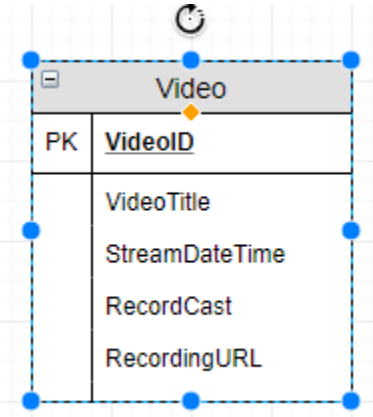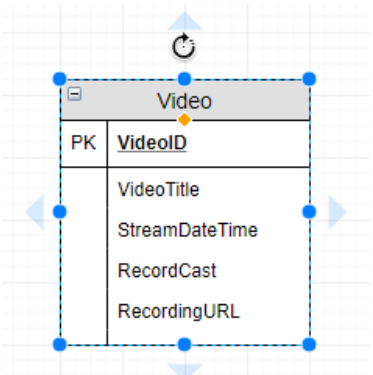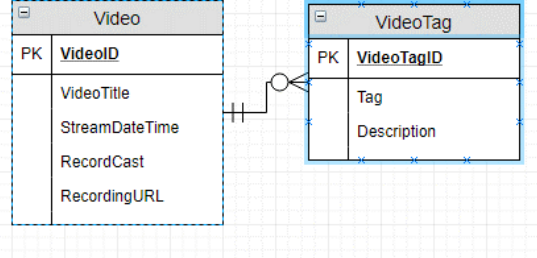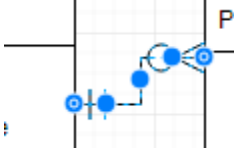

Click Apply to return to your document. |
| **3** | In the Toolbox, expand the Entity Relation group. If you don't see this group, please be sure to go through Step 2 above.

In the Entity Relation group, hover over each shape to see a tool tip with its name. For the purposes of this lab, we're going to use ER Table 1.

 |

4	Click and drag a copy of the ER Table 1 shape onto your document.
5	Change the shape's title by double-clicking in the grey area at the top of the shape where it reads, "Table". Change the word "Table" to "Video" (without the quotes). This changes the name of our entity to Video, indicating that Video is an object or concept important enough to warrant inclusion in our database.
6	Primary Key, or "PK" is a term we will explore in greater depth later. For the purposes of this lab, we will acknowledge that we need some way to uniquely identify each individual video in our database. In the completed database, SQL Server will provide this value for us. For now, let's just indicate that it exists and call it VideoID. Double-click the word uniqueid in the diagram and change the text to VideoID. Your shape should look like the image to the right.
7	We will need to add some other attributes to our Video entity. These are the facets of the video that are important to us to help us find an organize each video. Double-click the text "row 1" and change that text to VideoTitle. This is what users will name their videos when they create them. Your shape should look like the one shown in the image to the right.

8	We're going to need one more "row" beyond the 3 that the shape provides by default. We add another row by duplicating an existing one and modifying it. Right-click on the "row 2" text and click Duplicate in the context-menu. You should get a duplicate of "row 2" at the bottom of the shape as shown in the image to the right. Note that it added it below the spacer that pads the bottom of the shape.	
9	Move the new row 2 upabove the spacer by clicking and dragging the new "row 2" text above the "row 3" text. This can be tricky in draw.io. If you drop the "row 2" and it doesn't drop where you want it, simply Undo (Ctrl-Z on the keyboard or Undo from the Edit menu at the top left of the screen) to revert to the prior state. Once you have moved your last row above the spacer, your shape should look like the one in the image to the right.	
10	Change the text from the default "row #" to the following, in order: StreamDateTime RecordCast RecordingURL Once complete, your shape should look like the one shown to the right.	

11	Using steps 4 through 10 above as a guide, create another shape to the right of your Video shape. Make the following changes to your shape:
	  1. Change its title to VideoTag.
	  2. Change its uniqueid to VideoTagID (again, we will let the software provide a value for this attribute later).
	  3. Change "row 1" to "Tag" (without the quotes).
	  4. Change "row 2" to "Description" (without the quotes).
	  5. Delete "row 3" by right-clicking on the text and clicking Delete on the context-menu.
	Your shape should look like the one in the image to the right.

12	Click once on the Video entity to select it. To ensure you are selecting the whole shape and not just a row in the shape, click on the grey area at the top where the entity name is. Once selected, your shape should look like the one shown in the image to the right.	
13	Hover your mouse cursor over the title of the shape. 4 light-blue triangles should appear around the shape at the center of each of its four sides. The shape will look like the one in the image to the right.	
14	Click-and-drag the blue triangle on the right side of the shape over to the VideoTag shape. This part can be tricky. We want to connect this line to the whole shape, not just a row within the shape, so try to drag the line to the title of the VideoTag shape so that the entire shape is highlighted with a blue border as shown in the image to the right. Once the blue border appears, let go of the mouse button to attach the shapes together with a line. If you make a mistake, Undo and try again. Note: the ends of your line may not look exactly like the ends shown in the image. We will fix this in the next steps.	
15	Ensure the line between the shapes is selected. When you created the line, it was selected by default. If it is not selected, as indicated by several blue dots along its length and ends, simply click once on the line to select it. It should look (roughly) like the image to the right.	

16	When the relationship line is selected, the Style tab of the Properties on the left side of the screen will show the properties of this line. We want this line to represent a "many to many" relationship between these entities. We will cover many-to-many relationships in a later topic, but in a nutshell we are saying that each Video can have many VideoTags and each VideoTag can be assigned to many videos. Find the Line Start and Line End drop-downs in the Style tab by hovering over each of the drop downs to see what they're for. They are circled in the image to the right.	
17	Change both of them to the Many icon by clicking the down arrow and clicking the ⇒── icon (fourth from the bottom) for the Line Start and the ──≼ icon (also fourth from the bottom) for the Line End. Change the Size boxes for both Line Start and Line End to "13 pt" (without the quotes). Your Style section should look like the image to the right.	
18	Click and drag your VideoTag shape to the right to give ample space between the shapes. We're going to add some text to the line we just created, so we need to ensure we have enough room for it to show. If you move it too far or not enough, you'll be able to fix this later by dragging and dropping either of the shapes to an arrangement of your liking. Feel free to experiment! Take note of how the line between the shapes moves when you move one of the shapes. This is because the line is "glued" to both shapes. The image below shows roughly enough space for your text. Again, yours may differ slightly. This is okay.	

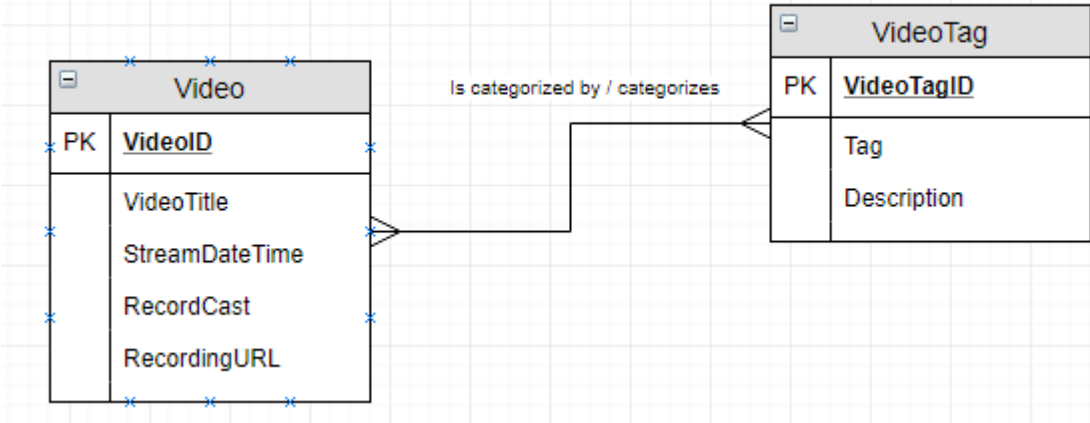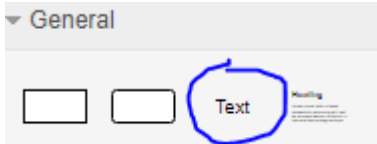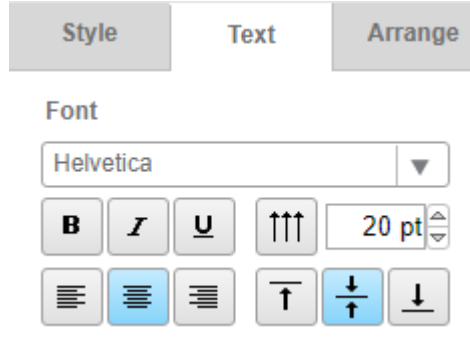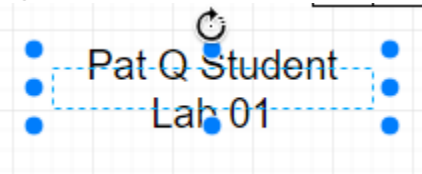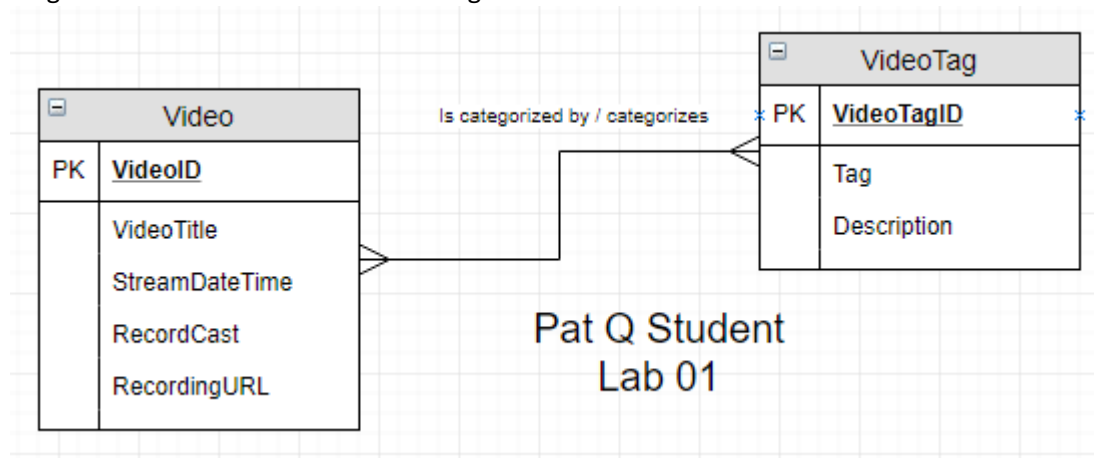|	
19	Add text to the line by double-clicking on the line. The text should read: "is categorized by / categorizes" (without the quotes). This helps us read the relationship in both directions like this: Each **Video** *is categorized* by Many **VideoTags** Each **VideoTag** *categorizes* Many **Videos** When you've added your text, click anywhere else in the document to commit it to the diagram. Move one of the shapes around (click-and-drag) to ensure all of the text is legible. You can move the text you just added relative to the line by clicking once on the text to select it and dragging the yellow circle that appears in the center of the text: A good practice is to drag the text to slightly above the line. When done, your diagram should look (roughly) like the one shown below. Remember: if you make a mistake, simply Undo the last change and try again.
20	Add your name to the diagram By dragging a Text shape (found on the General tab) to your diagram.

Use the Text Tab in the Properties section to change the Font Size to 20 pt.

If necessary, use the blue handles around the Text object to resize the text box. Note that it will overflow nicely if the box is too small. Just make it legible. You can click and drag the box to wherever you like on the diagram.

Change the default text to your name followed by "Lab 01" without the quotes. Your final diagram should look similar to the image below:

Remember: your diagram need not look exactly like this one. All elements shoould be there and I seriously doubt your name is Pat Q Student, but don't spend too much time making the orientation of the shapes precisely match the sample.

| 21 | Export your diagram as a JPEG to be inserted into your answer document. To do this, Click the File Menu in the top left, then Export As, and select JPEG. |

Ensure the Image dialog looks like the following and click Export.

In the ensuing dialog box, feel free to use whichever option is convenient for you. It is probably easiest to leave the filename as the default and click Download to download a copy of the file to your computer. You can then insert this image into the bottom of your Word document from the Pictures icon on the Insert ribbon in Word.

If you downloaded the image, it should be in the folder where your browser downloads files. On Windows, this is usually in your user's Downloads folder, but this may be different depending on your OS and Browser setup.

Finally, save your document and submit!

Next week, we will explore some of the topics introduced here and expand our diagram to include more entities, attributes, and relationships.

Appendix – Tables and Diagrams used in this lab

Table 1 -VidCast Datasheet

User Name	User Tags	Followers	Video Title	Video Tags	Stream Date	Video Duration	File Location
ChadOnData	Data, SQL, SQLServer	7	Running a Query	SQL Server, SQL	3/8/2018	43 minutes	/videos/12354.mp4
			Creating a database	SQL		22m	/videos/123.mp4
Tyrone Rugen	Machinery, Polydactyly	Prince Humperdink; Clergyman, Impressive	There's a lunatic following me	Help	April 1, 2018	5m	
Saul Hudson	Guitar, Rock	ChadOnData, Reginld Dwight, Adam Neely	String changing exercises as hit songs	GnR, Gibson, Guitar, Msic Throey	3/7/2018	00:06	/videos/563456.mp4
Reginald Dwight	Piano, Soundtraqcks	15	England Rose	Princess, Tribute	18/3/2018	1 hour, 5 minutes, 16 seconds	/videos/7345.mp4
			Norma Jean	Starlet	20/2/2018	6 minutes, 12 seconds	/videos/9834.mp4
Charlie and the Biebs	Hoops, Basketball, MS SQL Server	67	God, Country, Boeheim Weekly	SU Orange, Basketball	3/8/2018, 3/15/2018, 3/22/2018	1hour 43 minutes	/videos/2345.mp4 /videos/2347.mp4 /videos/2346.mp4
Inigo Montoya	Revenge, Swordplay	Fezzik, Buttercup, Westley	The Six-Fingered Man: I found him	Revenge			