We have five entity sets - Videos, Channels, Thumbnails, Comments, and Users. The attributes of the first four entities will come from the YouTube API (https://developers.google.com/youtube/v3/docs/), and each entity comes with a unique identifier directly from the YouTube API (Channels have a channel id, Videos have a video id, comments have a unique comment id across all of YouTube, and we are going to use the URL to uniquely identify thumbnails).

For each channel on YouTube, there are three associated playlists where we can find important information: Uploads, Likes, and Favorites. Each of these playlists is a list of videos. We keep track of the channels that our users subscribe to and keep all of the videos in each of these channels' playlists as elements of the Videos entity, relating back to each channel using the Uploaded_By, Likes_2, and Favorites relationships.

Each channel/video/user has at least one thumbnail which is a participation constraint that cannot be expressed in the CREATE TABLE statements. Each thumbnail is uniquely identified by its URL. These URLs come from YouTube's API or (for user profile thumbnails) from locally hosted files or imgur. If there is no YouTube-assigned thumbnail or the user chose not to have a thumbnail, we will create a default thumbnail so each channel/video/user has at least one. There could be multiple thumbnails per channel/video/user because they could be of different heights and widths for different use cases.

Each comment is attached to exactly one video. Each video has zero or more comments on it. YouTube assigns a unique comment ID for each comment on their site (if they didn't we'd have to have a weak entity set).

Each video has many attributes and properties. We keep track of each video's channel id because we are not keeping track of *every* channel on YouTube, just the ones our users are interested in. Therefore, we could have videos that have not been uploaded by a specific channel we are keeping track of (we could eventually suggest channels for a user to subscribe to). There could be videos that are in the entity set that have not been uploaded by, liked by, or favorited by a channel we are keeping track of. This will allow us to keep videos a user likes even when they delete the channel from their subscriptions. An important attribute for each video is the Embed Code of that video. This allows us to imbed each video inside our website so the user views it on our site, without having to leave our site.

The last entity set we have does not come from YouTube. This is the Users entity where we keep track of the users of our site. We give each of our users a unique ID and the user chooses a unique username. Each user also has the option of uploading a profile picture to use across our site. If they

choose not to, we will assign them a default profile picture. We will also keep track of which videos the user liked and which videos they skipped. This information will be used to suggest videos for them to watch. We will also keep track of the videos a user has watched previously and when they watched it. This way, we can say "don't recommend a video they have seen in the past few days" or something like that.