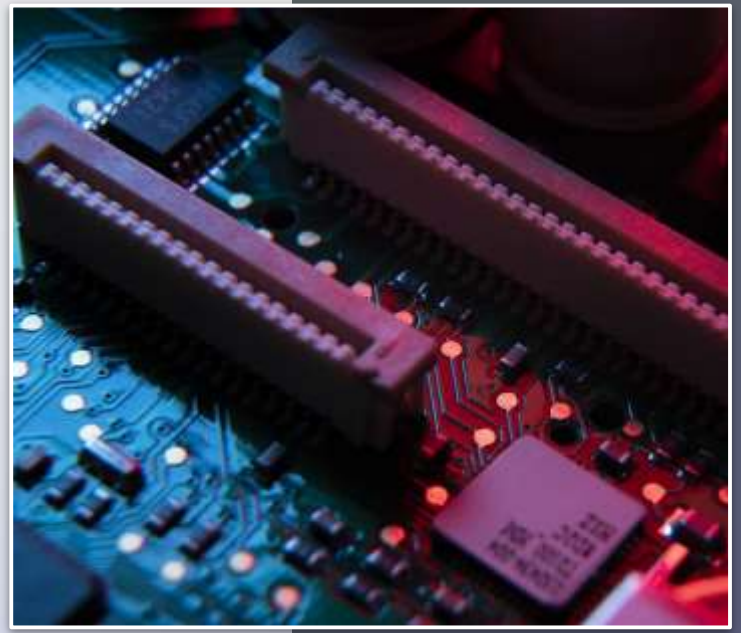
EDA Database

Final Presentation

Group: Mat Yohannes, Yana Zaynullina, Jason Muturi



May 9, 2024

Abstract

EDA Project - Electronic Design Automation

The goal is to design and create a database of electronic components that will be used to communicate with the graphic user interface.

Front End - GUI team

Back End - SQL team

Goals:

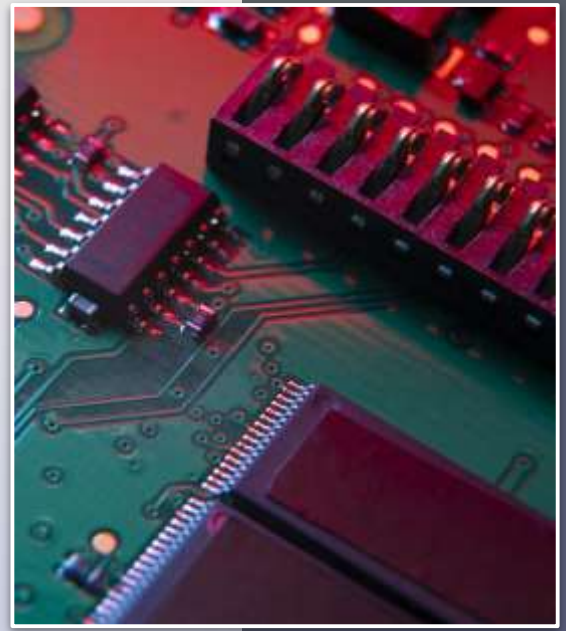
- Upload DigiKey data to MySQL
- Collaborate with GUI team to connect Front to Back

For who:

This program is created for use by Professor Jeffrey A. Wiegley

Final Product

- Delivered organized database of DigiKey components following the schema created earlier in the Fall semester
- The data was pulled from the distributor's official APIs and formatted to follow the desired structure
- Current files consider the possibility of future updates, allowing the user to make these modifications with ease. In case an update fails, the changes will not be executed
- Due to the size of files, the pulling and updating will require significant amount of time



What We Are Doing

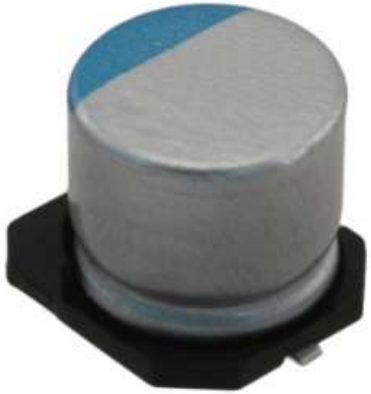


Image shown is a representation only. Exact specifications should be obtained from the product data sheet.

APXF6R3ARA151ME40G

DigiKey Part Number	565-APXF6R3ARA151ME40GTR-ND - Tape & Reel (TR) 565-APXF6R3ARA151ME40GCT-ND - Cut Tape (CT) 565-APXF6R3ARA151ME40GDKR-ND - Digi-Reel®
Manufacturer	Chemi-Con
Manufacturer Product Number	APXF6R3ARA151ME40G
Description	CAP ALUM POLY 150UF 20% 6.3V SMD
Manufacturer Standard Lead Time	22 Weeks
Customer Reference	
Detailed Description	150 µF 6.3 V Aluminum - Polymer Capacitors Radial, Can - SMD 20mOhm 3000 Hrs @ 105°C

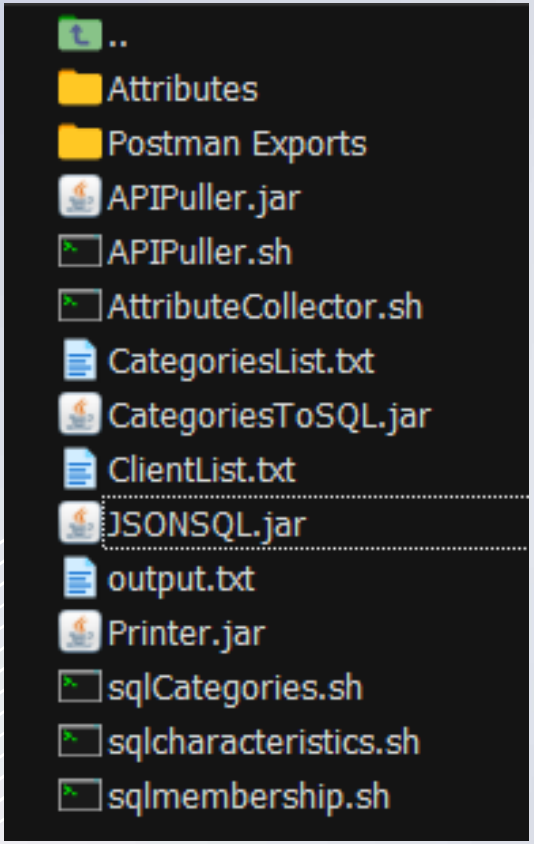
What We Are Doing

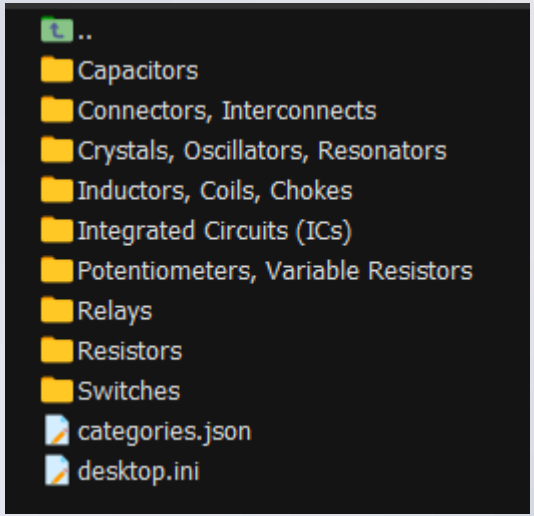
Product Attributes

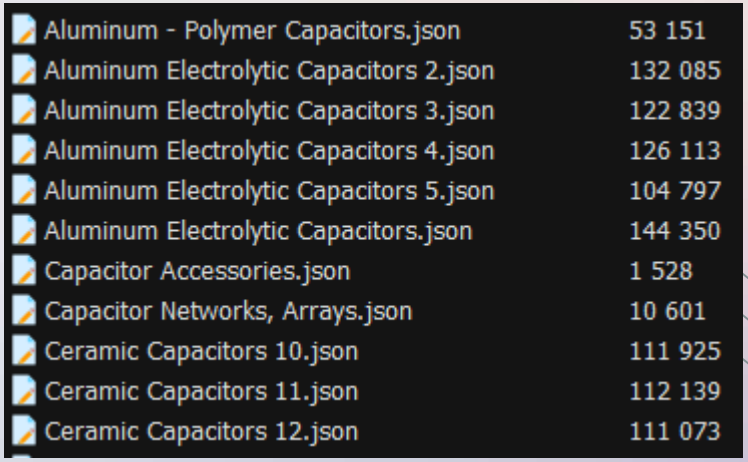
TYPE	DESCRIPTION
Category	Capacitors Aluminum - Polymer Capacitors
Manufacturer	Chemi-Con
Series	NPCAP™-PXF
Packaging	Tape & Reel (TR) Cut Tape (CT) Digi-Reel®
Part Status	Active
Type	Polymer
Capacitance	150 µF
Tolerance	±20%
Voltage - Rated	6.3 V
ESR (Equivalent Series Resistance)	20mOhm

Voltage - Rated	6.3 V
ESR (Equivalent Series Resistance)	20mOhm
Lifetime @ Temp.	3000 Hrs @ 105°C
Operating Temperature	-55°C ~ 105°C
Ratings	-
Applications	General Purpose
Ripple Current @ High Frequency	2.7 A @ 100 kHz
Lead Spacing	-
Size / Dimension	0.197" Dia (5.00mm)
Height - Seated (Max)	0.165" (4.20mm)
Surface Mount Land Size	0.209" L x 0.209" W (5.30mm x 5.30mm)
Mounting Type	Surface Mount
Package / Case	Radial, Can - SMD

File Directory Structure







The Meat

Main files to interact with the project:

AttributeCollector
DigiKeyAPI3
categoriesFile
CategoriesToSQL
JSONFileReader

Helper Files:

ClientScanner
CategoryHeaders
DirectoryFiler
JDBC
characteristics2Table
membershipTable
Characteristics
CategoriesCheckList

Shell Files

Java File	Shell Files
AttributeCollector	AttributeCollector.sh
CategoriesToSQL	sqlCategories.sh
DigKeyAPI3	APIPuller.sh
JSONFileReader for membership	sqlcharacteristics.sh
JSONFileReader for characteristics	sqlmembership.sh

APIPuller.sh

```
java -Xmx4g -jar APIPuller.jar
```

sqlCategories.sh

```
java -jar CategoriesToSQL.jar
```

ClientList.txt

ClientID Delimiter " | " **ClientSecret** Delimiter " | " **Status**

Status:

X - incomplete

O - complete

CategoriesList.txt

The subcategories name on the left

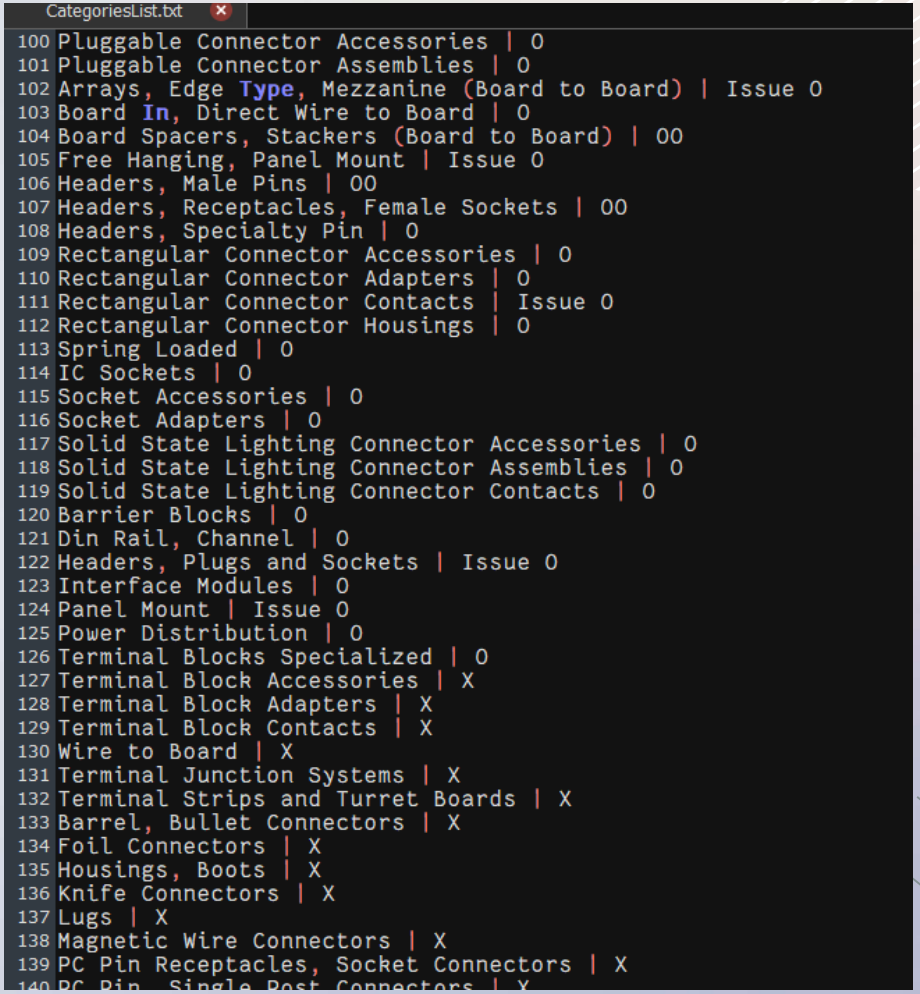
Delimiter “ | ”

Status:

X - incomplete

O - complete

OO - over 120k rows

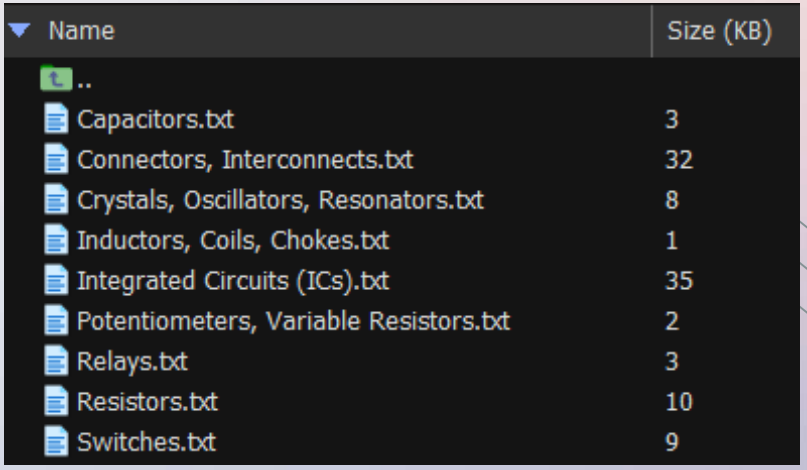


sqlcharacteristics.sh/sqlmembership.sh

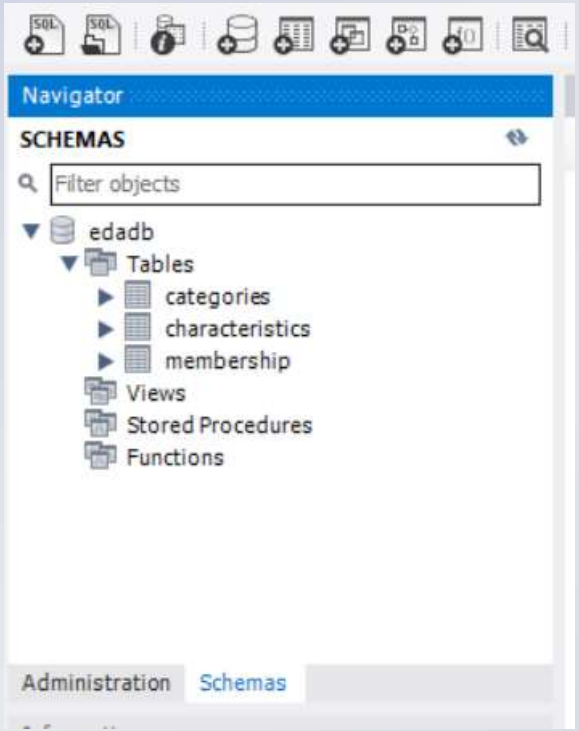
```
# List of categories

categories="Capacitors 'Connectors, Interconnects' 'Crystals, Oscillators, Resonators'

# Iterate over each category in categoies

for category in $categories
do
        java -jar JSONSQL.jar $category "c"
done
```

AttributeCollector.sh

```
directory="/root/EDAProject/Postman Exports"

#Check if directory exists
if [ -d "$directory" ]; then
        # Loop through each entry in the direcotory
        for entry in "$directory"/*; do
                #Check if the entry is a directory
                if [ -d "$entry" ]; then
                        substring=$(echo $entry | cut -d'/' -f5-)
                        echo "$substring"
                        java -jar Printer.jar "$substring" > Attributes/"$substring".txt
                fi
        done
else
        echo "Directory does not exist."
fi
```

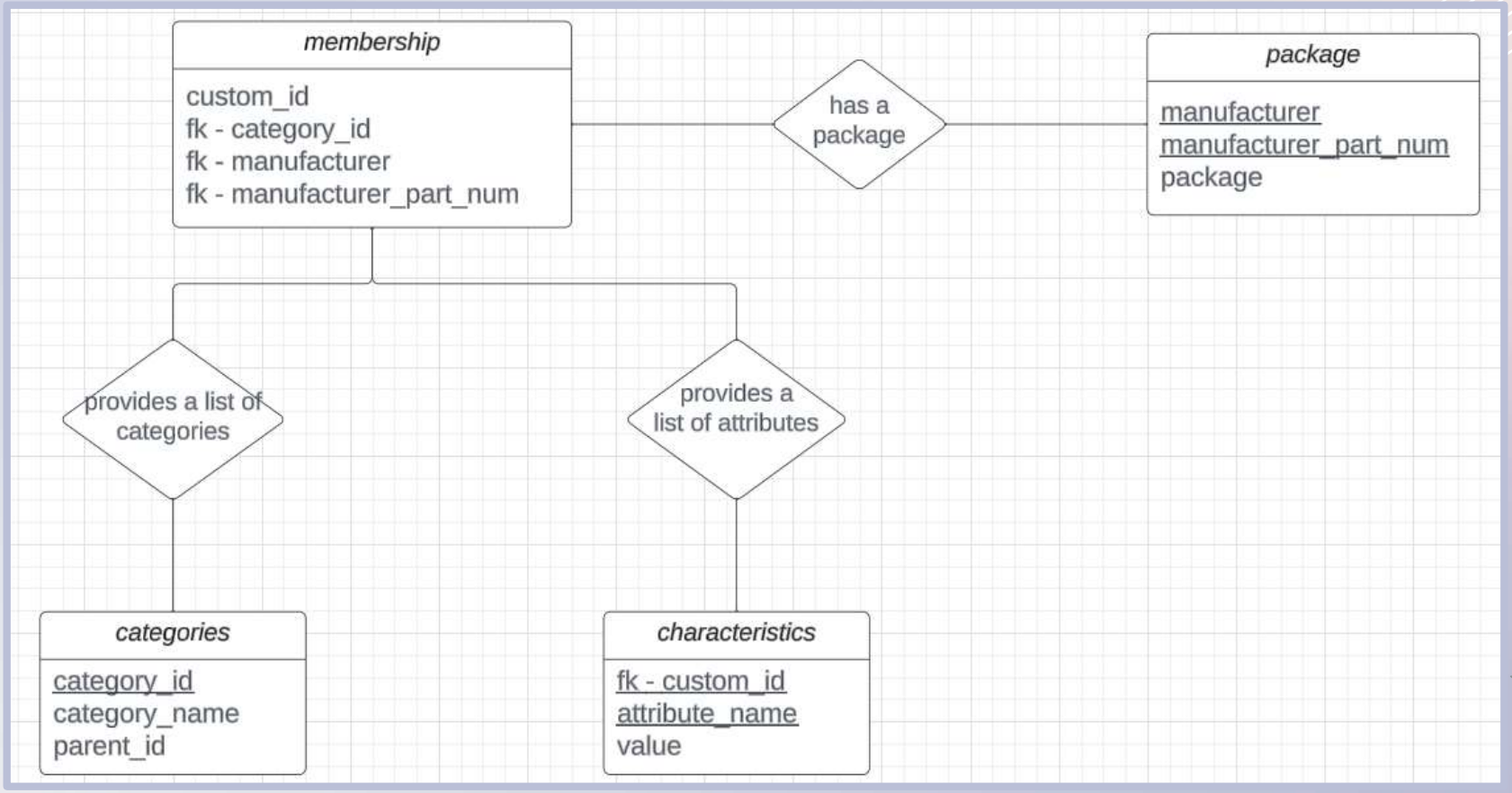


SQL Tables


Navigator
SCHEMAS
Filter objects
edadb
Tables
categories
characteristics
membership
Views
Stored Procedures
Functions
Administration
Schemas


MySQL®

E-R Diagram


membership
custom_id
fk - category_id
fk - manufacturer
fk - manufacturer_part_num
has a package
package
manufacturer
manufacturer_part_num
package
provides a list of categories
provides a list of attributes
categories
category_id
category_name
parent_id
characteristics
fk - custom_id
attribute_name
value

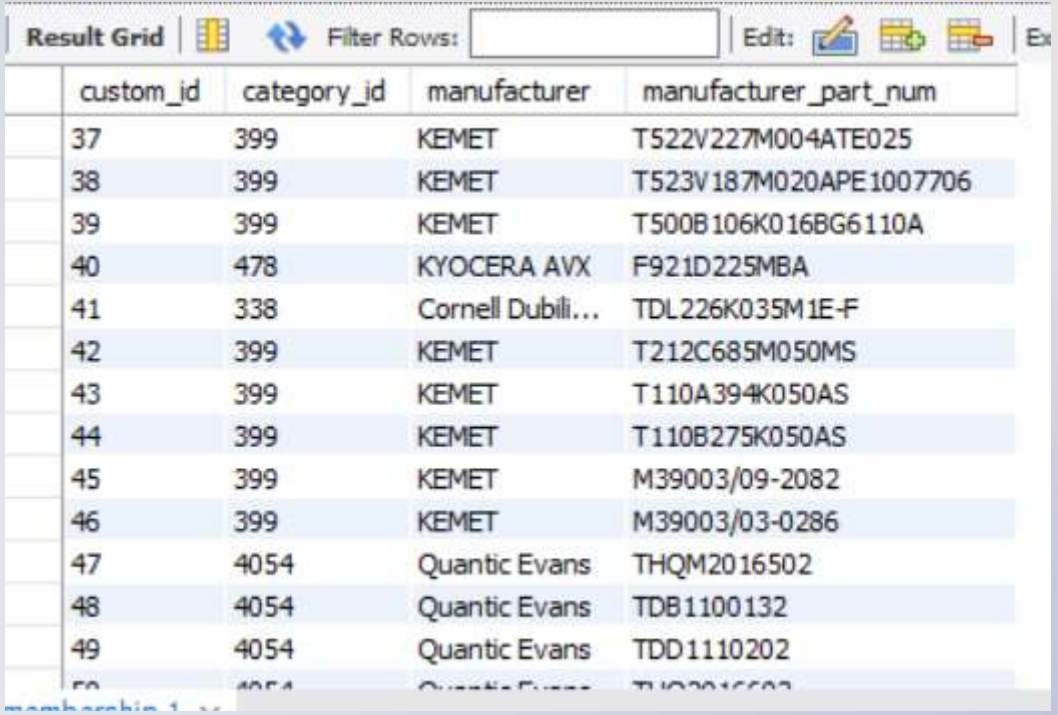
Categories Table

Result Grid | Filter Rows: | Edit:

category_id	category_name	parent_id
1	Uncategorized	0
2	Resistors	0
3	Capacitors	0
4	Inductors, Coils, Chokes	0
5	Potentiometers, Variable Resistors	0
6	Battery Products	0
7	Optoelectronics	0

categories 1

Membership Table



Result Grid | Filter Rows: | Edit:

custom_id	category_id	manufacturer	manufacturer_part_num
37	399	KEMET	T522V227M004ATE025
38	399	KEMET	T523V187M020APE1007706
39	399	KEMET	T500B106K016BG6110A
40	478	KYOCERA AVX	F921D225MBA
41	338	Cornell Dubili...	TDL226K035M1E-F
42	399	KEMET	T212C685M050MS
43	399	KEMET	T110A394K050AS
44	399	KEMET	T110B275K050AS
45	399	KEMET	M39003/09-2082
46	399	KEMET	M39003/03-0286
47	4054	Quantic Evans	THQM2016502
48	4054	Quantic Evans	TDB1100132
49	4054	Quantic Evans	TDD1110202

Characteristics Table

Result Grid | Filter Rows: | Edit: | Export/Import:

custom_id	attribute_name	value
47	Type	Hermetically Sealed
47	Voltage - Rated	16 V
48	Capacitance	1.3 mF
48	ESR (Equivalent Series Resistance)	125mOhm
48	Features	Hybrid Wet Tantalum
48	Height - Seated (Max)	0.344" (8.74mm)
48	Lead Spacing	0.400" (10.16mm)
48	Lifetime @ Temp.	2000 Hrs @ 85°C
48	Mounting Type	Through Hole
48	Operating Temperature	-55°C ~ 125°C
48	Package / Case	Radial, Can
48	Size / Dimension	1.000" L x 1.000" W (25.40mm x 25.40mm)
48	Tolerance	±20%
48	Type	Hermetically Sealed
48	Voltage - Rated	100 V
49	Capacitance	2000 µF
49	ESR (Equivalent Series Resistance)	85mOhm @ 1kHz

Tools We Used

- **Jira** - project management, tracking, initial documentation and project planning
- **Discord** - team communication
- **GitHub** - version control
- **IntelliJ** - IDE of choice to work with Java
- **MobaXterm** - X-server and SSH client
- **Postman** - receive and send API requests; later was discontinued
- **MySQL** - database to store our products

Challenges Faced

- Working with these technology for the first time required a lot of researching prior to start:
  - Using APIs to access files
  - Dealing with storage issues and eventually working on a remote Linux server
  - Dealing with very big databases in MySQL (over X rows)
- Working with a company's API requires careful reading of their documentation
  - Initially started with Postman to get the files
  - Due to singular and daily pull limits, had to write our own Java files to access the JSON files

Challenges Faced

- Coming up with the database schema
  - Had to keep in mind future updates and storage of several vendors
  - Navigating many attributes of the products, focusing on their relationships within the system and eliminating irrelevant features
- Some of the initial files were corrupted due to incorrect indexing, they were fixed once identified
- Each file on our server is limited to 25,000 items to avoid heap issue. Directory filer creates a new file with indexes to keep track of all the items
  - This number of items grants the best performance time (4 seconds)

What We Learned

- Working with basic APIs using Postman and your own code
- Manipulating large amounts of data with attention to efficiency
- Utilizing and modifying JSON files to suit the needs of our database
- Interacting with online server to store our files and run Linux commands to manipulate them
- Reviewed basic SQL for database management
- Scheduling processes on Linux

Future Improvements for Next Generation

- Collaborating with the Front-end team to connect the parts
- Provide SQL procedures to run the required queries
- Add a new electronics vendor (Mouser)