University of Arkansas – CSCE Department

Capstone I – Preliminary Report – Fall/Spring 2019

JukeBoxer - A Playlist Importer/Exporter

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Abstract

Many people face the problem of needing to move from one streaming platform to another, or maintaining a playlist across multiple streaming platforms. The objective of this application would be to help users move and maintain their playlists across multiple streaming services. The application will be a website that stores playlists, and integrates with multiple streaming platform's APIs. The significance of this application is that it allows for easy movement from one platform to another, and it allows independent (not affiliated with the streaming services) playlist creators to establish a presence across multiple services.

1.0 Problem

Switching from or between music streaming services can be frustrating when you have large playlists you want to recreate on other platforms. It is also cumbersome maintaining a playlist between different platforms like Youtube, Spotify, Soundcloud, etc. when some platforms have certain tracks and others do not. Sometimes users want to know their most listened to songs or what genres they listen to the most so they know where to branch out and explore their tastes. Many of these platforms have this information but it is hidden most likely to reduce clutter.

2.0 Objective

Our web app would be a simple intermediary between these platforms where you can rip information from your playlists in other apps and create these same playlists in other platforms provided they have intersecting content. We would also like to see if we could play music from

the webapp using content from multiple platforms at once creating a playlist from multiple platforms. If possible we also have plans to give the user interesting data metrics about their listening habits overall and their tastes on individual platforms like Spotify that otherwise obfuscate data used to provide you listening suggestions, as well as giving a way for users to interact by sharing playlists or collaborating to create playlists.

3.0 Background

3.1 Key Concepts

A playlist is a list of media to access in a particular order that can be modified and shared by the user. In the context of music, they can be a passive stimuli, or "going on in the background". So someone may be listening to a playlist while jogging, studying, or playing video games. Playlists can also be an active experience that allows people to discover new content. With the rise of music streaming platforms, playlists have become the primary way people organize their music.

A streaming platform is an on demand online entertainment source for media. The revenue model is that listeners can either listen to advertisements, or pay for an ad-free experience. A factor specific to music streaming services is that content creators are paid per stream of one of their tracks. This gives content creators the incentive to upload their music for passive revenue.

An API is a set of routines, protocols, and tools for building software applications. APIs specify the ways software components should interact with eachother. Several music streaming services have APIs that allow developers to read / write to content such as playlists. These APIs will require a credential, normally called an API token. We intend to leverage these APIs to create a seamless playlist experience.

An ETL (Extract, Transform, Load) is an automated pipeline from one data source to another data source. First it extracts data from a source, normally a database. Then it transforms this data into another format suited for another source. Then it loads that transformed data into the other data source. An ETL will exist for each music streaming service to take a playlist from them, and store it on our database.

3.2 Related Work

What other researchers or developers have accomplished in this project area including references in [ref number] format, e.g., [1]. What are the problems with those implementations that yours will solve or why will yours be better or different?

Most platforms we have come across typically either feature music datametrics for a very narrow range of platforms or playlist conversion and music streaming services themselves attempt to reduce clutter by obfuscating their suggestion algorithms and music datametrics. We would like to maximize the users ability to explore their tastes by clarifying how our app measures a song's sonic qualities, displaying that data in creative ways, and making it easier for the user to switch streaming service platforms. Services like Soundizz (https://soundiiz.com/) and PlaylistConverter already make switching streaming service

platforms easier by allowing the user to transfer their, artists, albums, playlists and songs between services but we would like the user to able to modify and tailor their playlists from within our app. This is because not every streaming service features the same content. After porting your favorite running playlist from Tidal to Spotify, all of your exclusive Tidal content would be lost and your playlist would simply show up on Spotify shorter and feeling hollow. Ideally, in the event a song is lost, we would like to recommend the user similar content based on the original qualities of the playlist and the user's personal taste, or at the very least allow the user to fix their own playlist before it finally gets ported to Spotify. Websites like http://playlistmachinery.com/# allow the user to make very specific playlists but only on Spotify and only utilizing Spotify's own datametrics. By accessing https://acousticbrainz.org/, a crowd sourced database of song datametrics, we hope to make our datametrics universally applicable to all music that our software encounters and allow the user to specifically create playlists with different streaming services in mind. We want to design an application with a wide range of services to transfer music between as well as giving the user the ability to share their curated content lists and giving them analytics/suggestions on their listening habits to promote music discovery.

4.0 Design

4.1 Requirements and/or Use Cases and/or Design Goals

- User wants to import data from a playlist on a music streaming service into JukeBoxer
- User wants to export data from playlist on JukeBoxer onto a playlist on a music streaming service
- User wants to construct playlists for DJing, and uses the data we aggregate to construct a better playlist
- User wants to share playlist from JukeBoxer with friend
- User wants to collaborate and build playlist with friend on JukeBoxer
- User wants to know more about their listening habits

4.2 [High Level / Detailed] Architecture

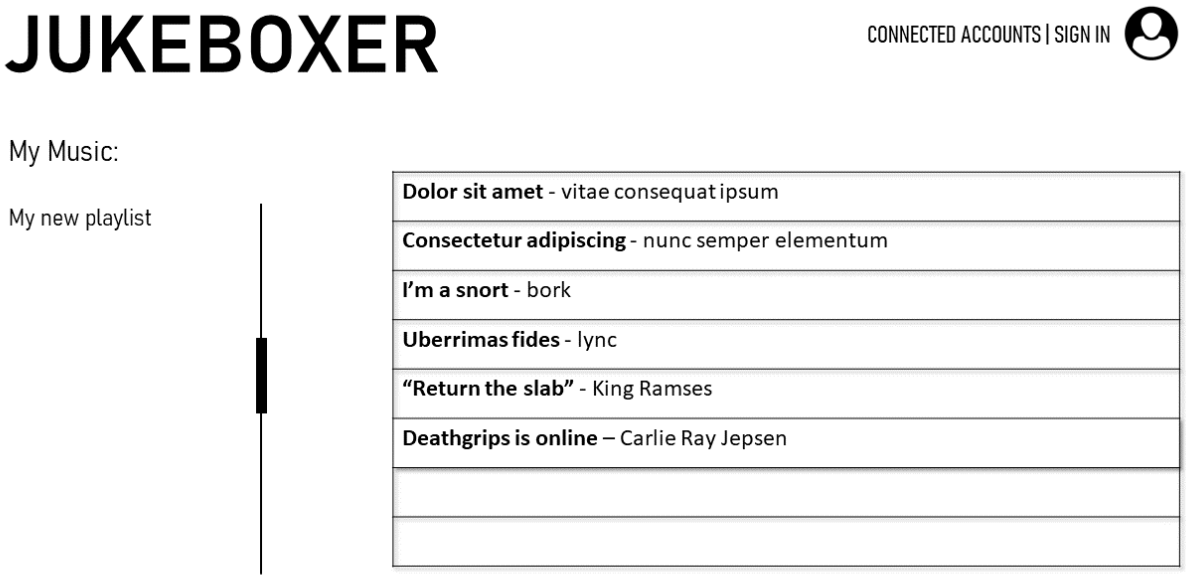
Landing page:

CONNECTED ACCOUNTS | SIGN IN

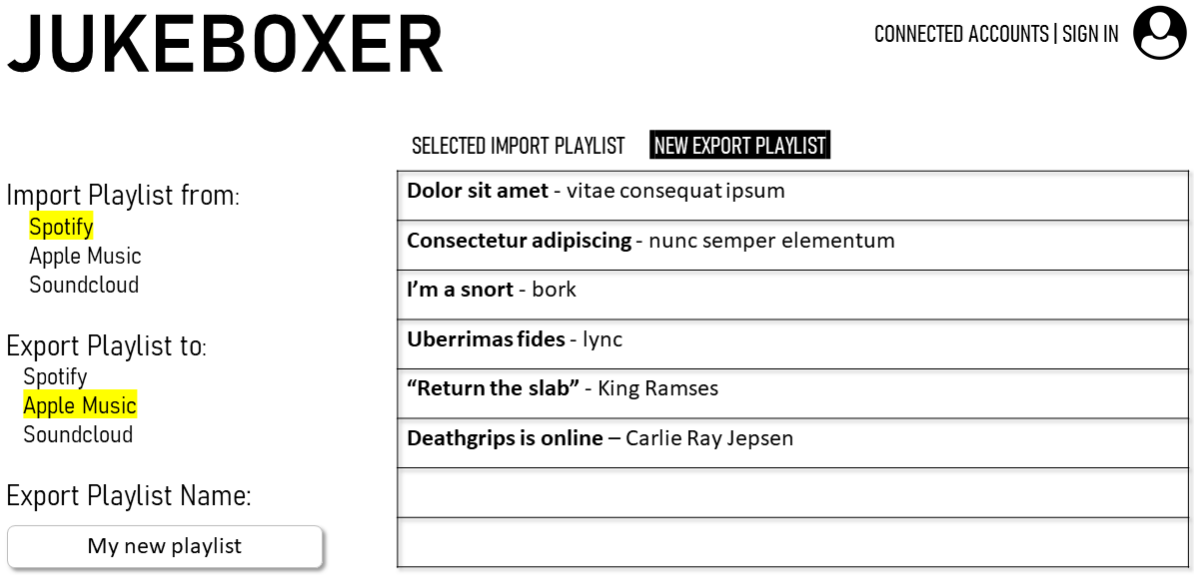
JUKEBOXER

Playlist Import Export
My Music
Metrics

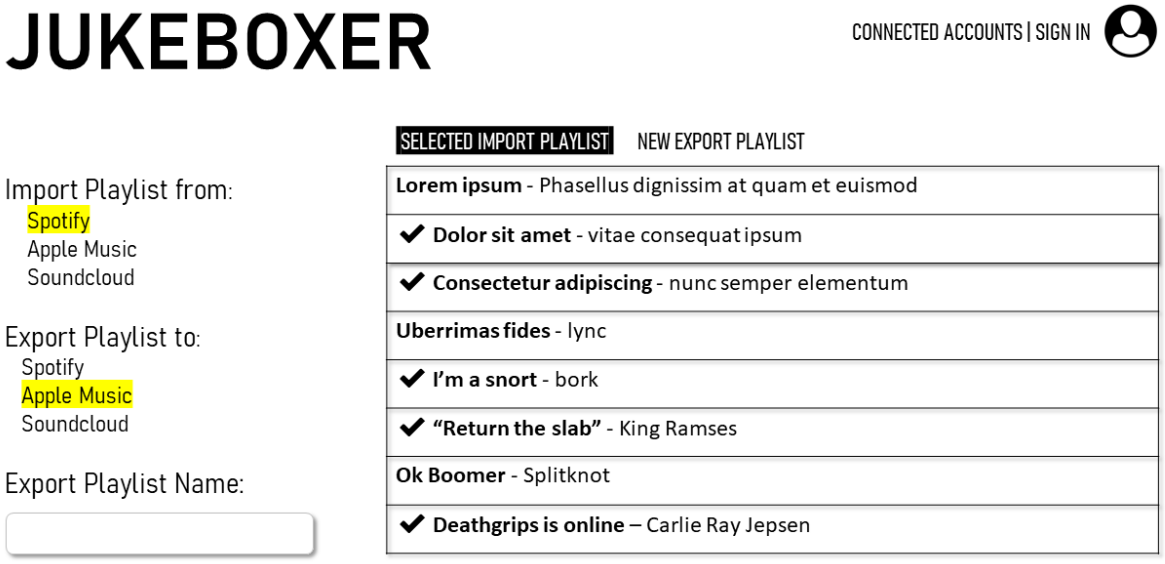
My Music:



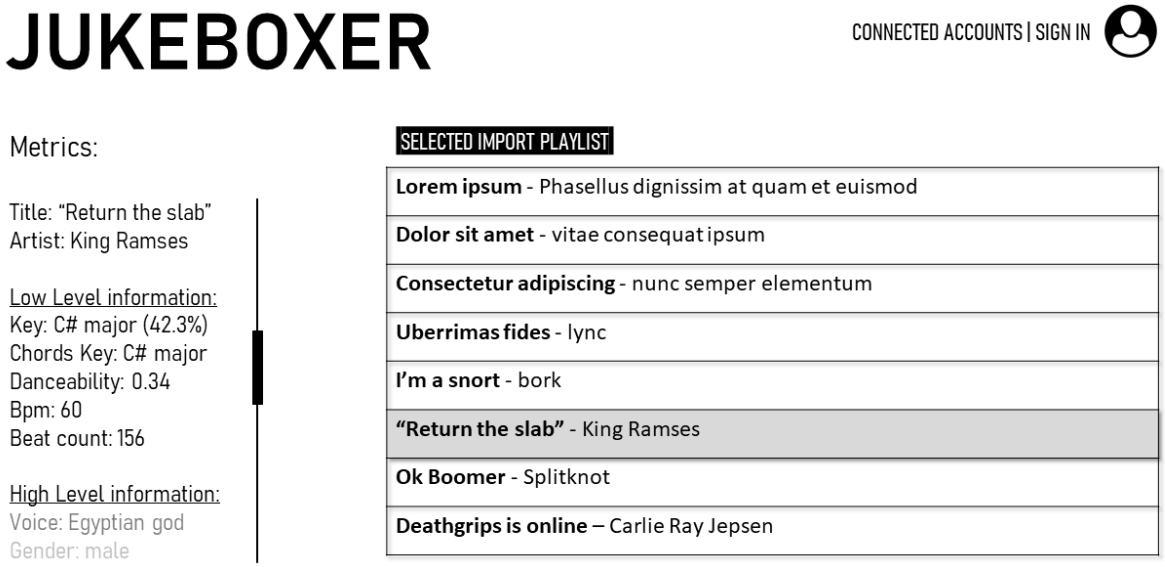
Playlist Import/Export: (Import)



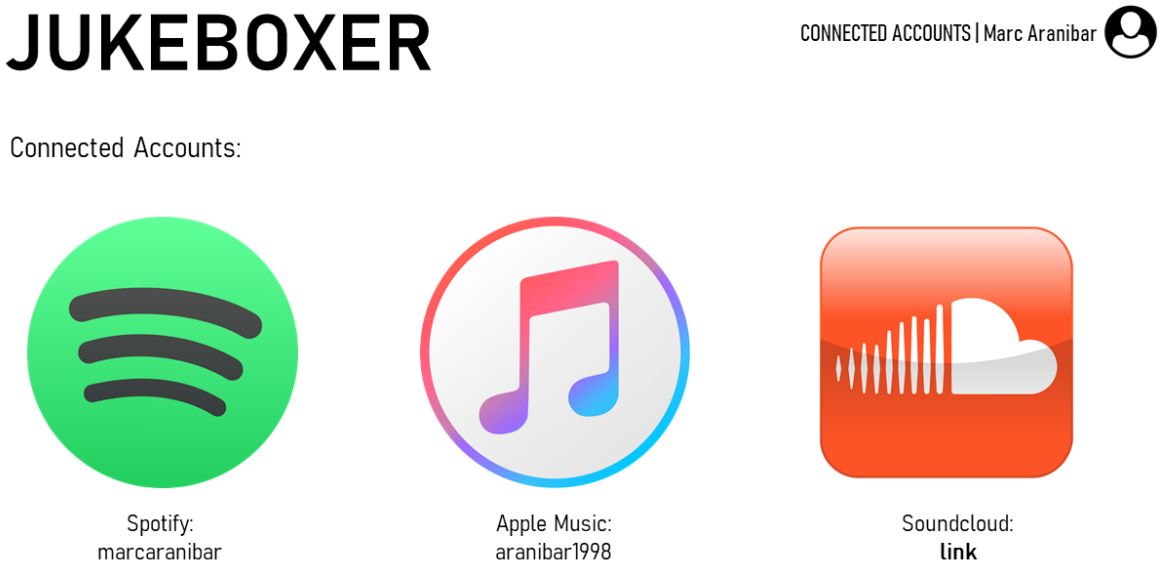
Playlist Import/Export: (Export)



My Metrics:



Connected Accounts:



The application will allow you to import your playlists from multiple music subscription services, export your desired playlist to the platform of your choice, and show analytics about the tracks in your playlist. The services supported include Spotify, Apple Music, and

SoundCloud. These services were chosen because their APIs allow read / write access to playlists. We intend to integrate with each of these services via OAuth, an open-source standard that gives access to a third-party service without giving credentials such as a password.

This service will be a website with an Express.js backend and React.js frontend. We chose these technologies because of our team's familiarity with JavaScript from work experience and the software engineering class. Using a website also avoids the need to create a mobile app for both Android and iOS, by providing a mobile website. The backend and frontend will be hosted on a Heroku instance. Heroku is a cloud server hosting platform. Both our backend API and our frontend will be hosted on the same Heroku instance to avoid issues with CORS (Cross-Origin Resource Sharing). We chose Heroku because of its simplicity and cheapness compared to other cloud services.

For the importing of the playlist from each service, there will be an ETL process written in NodeJS that extracts the playlist data from the endpoint they expose. After taking this data, it will transform it into a data format for storage in our PostgreSQL database. Then each track in the playlist will have analytics added to them. Note that this requires us to persist the playlist to the database, and not just send the playlist data to the other music streaming service. This also avoids any need to create an ETL procedure for each pair of music streaming services. Instead only one format will need to be considered when exporting the playlist to another music streaming service.

The exporting of the playlist will be accomplished using another ETL procedure written in NodeJS, that extracts the data from our database, and does any necessary transformations to load it into the music streaming service's API. In more detail, the ETL will create a playlist with the specified name in that music streaming service. Then ETL will take each track in the playlist on the database, and use an endpoint in the service's API to check if the track exists. If the track exists, the ETL will add it to the playlist in the music streaming service using the music streaming service's API. If the track does not exist, it will be added to a notification in the end displaying what songs could not be imported.

The analytics of each track will be sourced from AcousticBrainz, a research project that crowdsources the acoustic analysis of songs. This analysis includes data such as danceability, tempo, genre, and mood. Upon the importing of a playlist into our database, there will be a script written in NodeJS that goes through each song in the playlist. The script will check if the analytics for the song already exist in our database. If the analytics already exist, the script will link the analysis to that song. If the analytics do not exist, it will attempt to import the data from the song into our database. There is a possibility that the song is not in the AcousticBrainz database, in which case we cannot provide analytics about that song. If analytics about that song are in the AcousticBrainz database, the script will import them into our database, and link them to the song. The AcousticBrainz project does provide a database dump we could import, however, we decided against that because of the costs associated with storing such a large amount of data.

4.3 Risks

Risk	Risk Reduction

Copyright Lawsuit	The terms and services of the streaming services we currently plan to add specify that accessing their content with an api, as long as it is for personal use and is freeware, is fair game. Even if we decide to play the music from in app, the user is simply accessing a service they already have the right to after authenticating with the streaming service in question. We do not provide the actual content or host any of it, just move it from one place to another. BitTorrent gets around with a similar strategy.
Privacy of information and linked accounts	Encrypt user data & use OAuth to avoid storing credentials from linked accounts.
Deprecation of Music Streaming Service's API	There is nothing that can be done to prevent this from happening. However, we can inform users when it occurs, and add support for additional music streaming services.

Tasks –

1. Gain background knowledge of all service provider APIs.
2. Design the basic implementation of what API calls we will need to make, as well as how they will feed into our website.
3. Get basic server architecture and database structure running.
4. Program the home page of our application.
5. Make the web page for playlist import and export.
6. Connect to each of the music streaming services via OAuth
7. Import playlists from each of the music streaming services via their API
8. Export playlists on the website to each of the music streaming services via their API
9. Pull information from AcousticBrainz about tracks in playlists
10. If time allows, create functionality to allow for the following and creation of a friends list.

4.5 Schedule

Tasks	Dates	Total Time
1. Background investigation of APIs	01/02/2020 - 01/09/2020	1 week
2. Design of basic API calls	01/09/2020 - 01/23/2020	2 weeks

3. Get basic server architecture & database structure running	01/09/2020 - 01/23/2020	2 weeks
4. Program the home page of the website	01/23/2020 - 01/30/2020	1 week
5. Make the web page for playlist import / export	01/30/2020 - 02/13/2019	2 weeks
6. Add the connection to the music streaming services	01/30/2020 - 02/27/2020	4 weeks
7. Import playlists from the music streaming services	02/27/2020 - 03/20/2020	3 weeks
8. Export playlists to music streaming services	03/20/2020 - 04/10/2020	3 weeks
9. Pull & display analytic information from AcousticBrainz	04/10/2020 - 04/24/2020	2 weeks
10. Add friends list	04/24/2020 - 05/07/2020	2 weeks

Deliverables –

- Design Document: Contains a listing of each major hardware and software component.
- Database scheme and initial data: The DB schema is for a PostGreSQL database.
- Website code: The NodeJS, HTML, and CSS associated with the website and it's functionality
- Final Report

5.0 Key Personnel

Aaron Tucker - Is a senior pursuing a B.S. in Computer Science in the Computer Science and Computer Engineering Department and a Chinese minor in the Asian Studies department at the

University of Arkansas, He has completed Programming Foundations I and II, Operating Systems, Programming Paradigms, and Software Engineering.He was a software engineer for J.B. Hunt working with REACT NodeJS platform as well as the HTML/CSS languages.

Marc Aranibar - Is a senior pursuing a B.S. in Computer Engineering in the Computer Science and Computer Engineering Department at the University of Arkansas. He has completed Programming Foundations I and II, Operating Systems, Programming Paradigms, and Software Engineering. He is a professional YouTuber focusing on building computers and reviewing commercial computer parts.

Rhett Brandon - Is a senior pursuing a B.S. in Computer Science in the Computer Science and Computer Engineering Department at the University of Arkansas. He has completed Programming Foundations I and II, Operating Systems, Programming Paradigms, and Software Engineering. He is a Database Administrator for Walmart, working on automating daily tasks using Ansible, Python and Korn Shell.

Noah Holt - Is a senior pursuing a B.S. in Computer Science in the Computer Science and Computer Engineering Department and a Philosophy minor in the Philosophy Department at the University of Arkansas. He has completed Programming Foundations I and II, Operating Systems, Programming Paradigms, and Software Engineering. He was a Software Engineer for Walmart doing work with security working in the NodeJS and Python languages.

Tyler Gay - Is a senior pursuing a B.S. in Computer Science in the Computer Science and Computer Engineering Department at the University of Arkansas. He has completed Programming Foundations I and II, Operating Systems, Programming Paradigms, and Software Engineering. He is a Software Engineer for Pivital, Inc., building a website for integration solutions and tools used internally as well as by technicians in the field.

6.0 Facilities and Equipment

- Subscription services for Spotify, Soundcloud, Pandora, etc. for testing
- Database server
- Application server

7.0 References

Richer, Justin. “End User Authentication with OAuth 2.0.” OAuth, OAuth, oauth.net/articles/authentication/.

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Soundiiz. “Transfer Playlists and Favorites between Streaming Services.” *Soundiiz*, soundiiz.com/.

“Playlist Converter - Convert & Share Playlists and Transfer Them between Spotify, Napster, Deezer.” *Http://Playlistconverter.net/*, playlistconverter.net/.

“Playlist Machinery.” Playlist Machinery, www.playlistmachinery.com/.