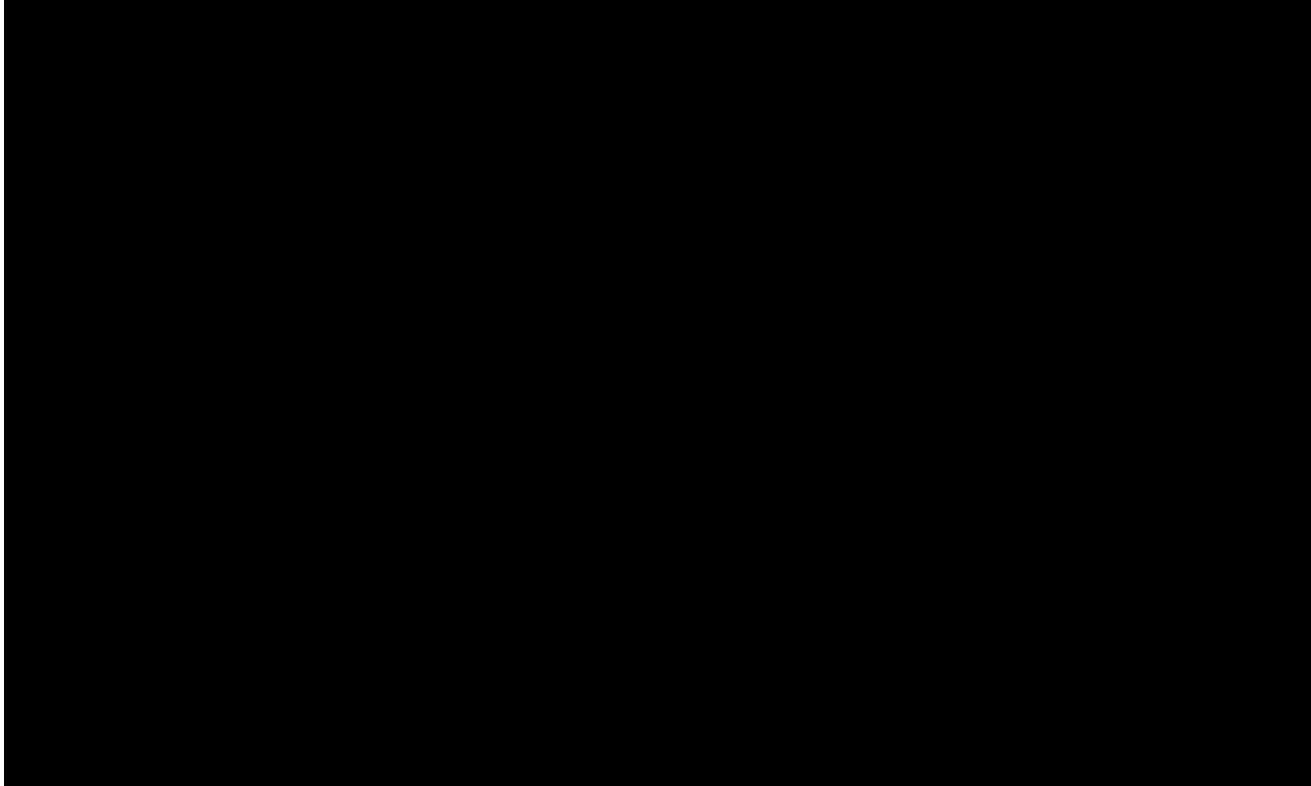


# Welcome!

Our presentation will be starting shortly.



# Dean Emily Allen's Message



# Mike Thorburn's Message



<http://www.calstatela.edu/ecst/seniordesign>

# DirecTV Video Quality Rating & Analysis Tool

## Team Members:

Deanna Thomas  
George Beltran  
Ponaro Eab  
Nelson Huynh  
Daniel Ramirez



AT&T

## Advisors:

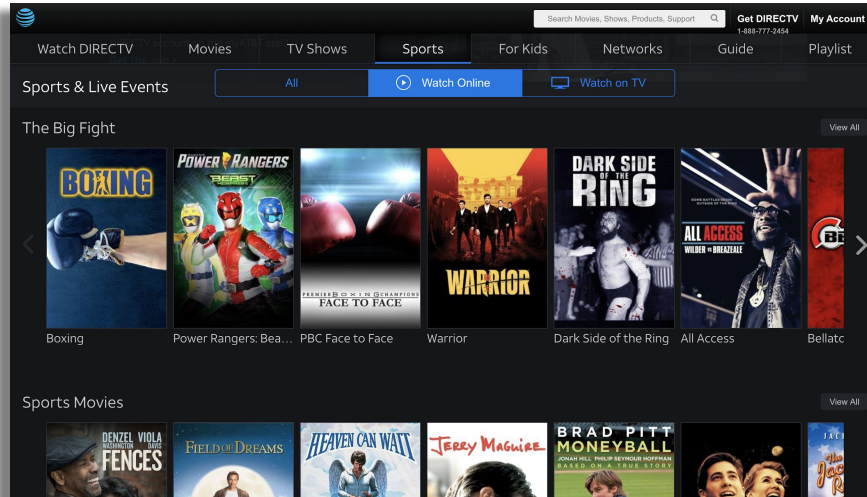
Mark Sargent and Eun-Young  
Elaine Kang

## Liaisons:

Peshala Pahalwatta  
Harrison Hays  
Ross Castillo

# Motivation

- DirecTV's business model is changing from satellite to streaming services.
- Costs increase per stream depending on the video bitrate.
- **How can we minimize cost while maximizing video quality?**



# What We Want to Know

From the user's perspective:

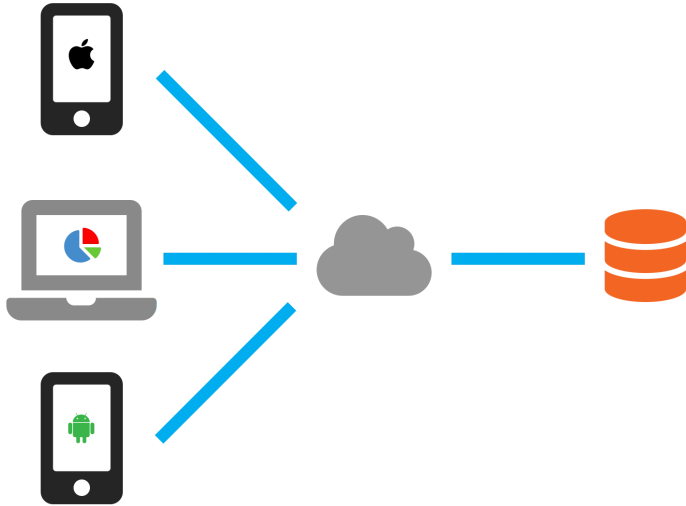
- Does higher frame rate look better than higher resolution?
- Can we predict user preference according to bit-per-pixel value?
- Can users tell the quality difference between bitrate variants?
- According to HTTP Live Streaming protocol, it is recommended to use 50% more bitrate than needed (in Adaptive Bitrate Ladder). Is video quality noticeably better?
- In low bitrate, does HEVC (High Efficiency Video Coding) still provide better quality than AVC (Advanced Video Coding)?

# History

- DirecTV's current Video Rating lab cost around \$500,000 in equipment.
  - 4k TVs, 1080p TVs, Amazon Fire Sticks, Special Lighting, Servers, etc.
- The lab can only collect in-person, one rating at a time.
- Need a new system that can collect data more efficiently.



# System Design



- **Data Collection**
  - iOS, tvOS, and Android apps
  - Comparison app and Absolute Rating app
- **Data Analysis and Management**
  - Web Admin app
- **Communication**
  - Cloud API
- **Storage**
  - MySQL Database



# Initial Project Status (Fall 2019)

- The Comparison app had issues and only compatible with iPad.
- Absolute Rating apps was not a constraint.
- Web app can Add and Delete videos but lacks other functions.
- The database used Google Firebase.

# Requirements

- **Mobile Apps**

- Comparison app for iOS, Android, and Apple TV.
- Absolute Rating app for iOS, Android, and Apple TV.

- **Web App**

- Implement Custom Query and Data Analysis Tools for Web app.

- **Database and API**

- Move database from Firebase to MySQL database.
- Rework all API's to accommodate the new database.

- **User Experience**

- Fun and intuitive user interface.

# Comparison Rating App

- Separate apps for Android, iOS, and tvOS
- Watch two videos with the same content but different video settings
- Rate which video looked better



# Comparison Rating App Demo

- Login
  - As Username or Guest
- Choose a sequence or Random sequence
  - Settings
- Watch Video A and Video B
- Rate Videos
- Display Data
  - Video Details



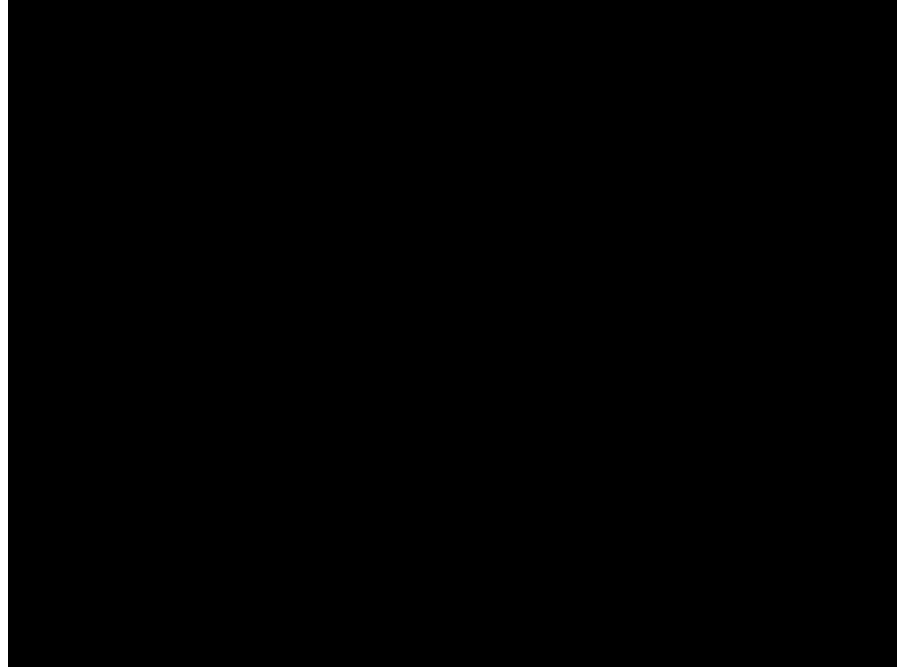
# Absolute Rating App

- Separate apps for Android, iOS, and tvOS
- What's the difference?
  - Rate a single video from 1 star to 5 stars
- Training Sequence
  - Sequence of videos used as a reference



# Absolute Rating App Demo

- Login
- Main Menu
- Training Videos Sequence
- Collections
- Video Player
- Rating
- Information
- Video Details
- Settings



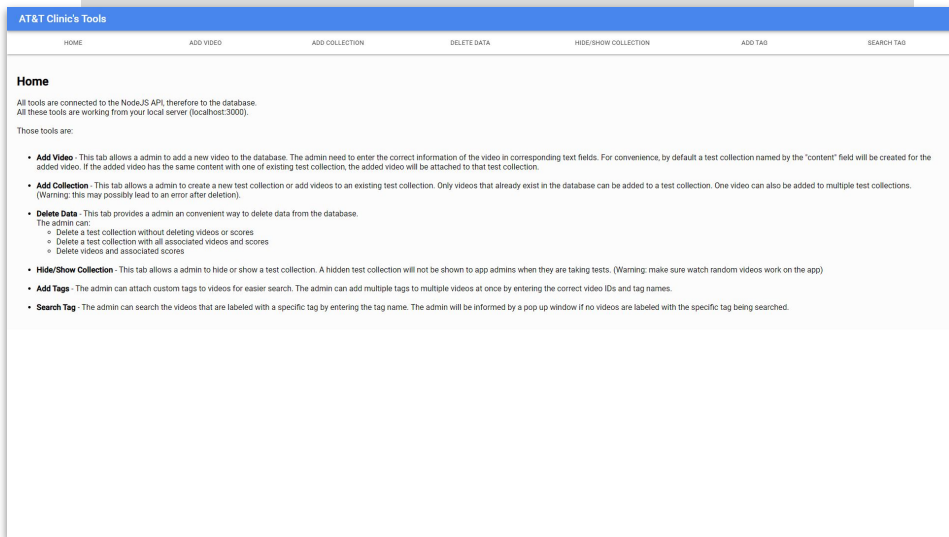
# Web Application - Admin Tools Dashboard

- Control system-wide settings
- Add and edit collections and videos
- Search videos
- Safely remove collections, videos, and their associated scores
- Run a custom query on our database
- Analyze data based on analysis queries from the API

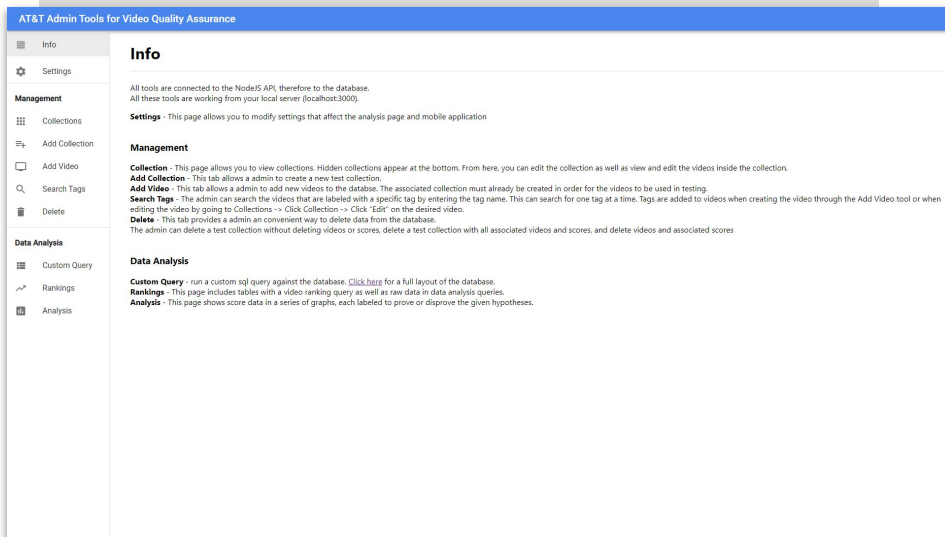


# Web App: Improved User Interface

## Before



## After





# Web App: Additional Admin Tools

## Collection Tool

AT&T Admin Tools for Video Quality Assurance

Info

Settings

Management

Collections

Add Collection

Add Video

Search Tags

Delete

Data Analysis

Custom Query

Rankings

Analysis

### Add a Collection

Name of Test Collection \*

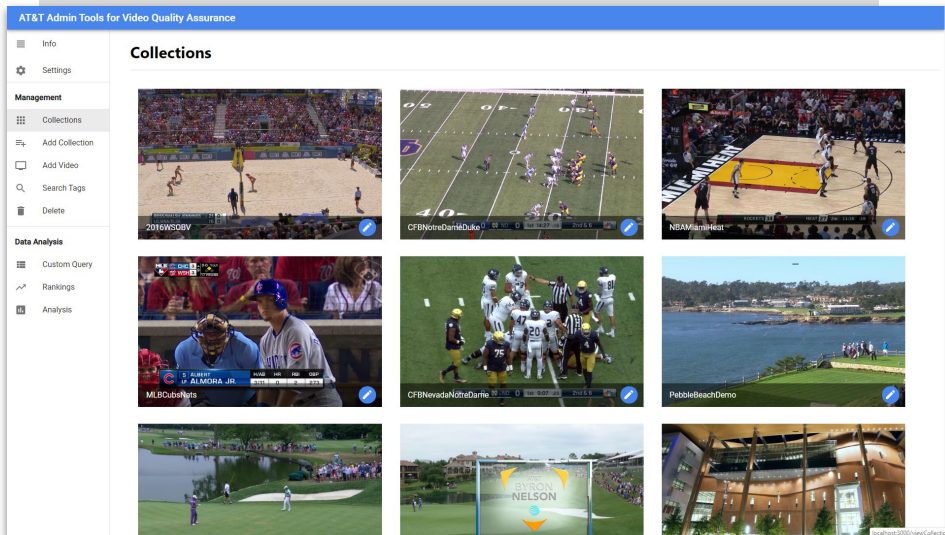
Note: Collection name cannot be edited after adding.

Hide Collection? ☐

Thumbnail URL \*

SEND

## Collection Viewer



Nelson Huynh

# Web App: Additional Admin Tools

## Video Tools

AT&T Admin Tools for Video Quality Assurance

Info

Settings

Management

Collections

Add Collection

Add Video

Search Tags

Delete

Data Analysis

Custom Query

Rankings

Analysis

### Add a New Video

Video general details

Video Name \*

Video Type

Collection

Video URL \*

Insert URL from AT&T source

Video resolution details

Video original width \*

Video original height \*

Output Resolution Width \*

Output Resolution Height \*

Width only

Height only

Video settings details

Codec \*

Color Space \*

Video bitrate \*

Video framerate \*

SDR = 10, 700, 4000 = 10, 2020

Bitrate should be in kilobits/s

Precise the video's framerate (fps)

Video Tags

Tags \*

Insert tags separated by commas

SEND

## Custom Query

AT&T Admin Tools for Video Quality Assurance

Info

Settings

Management

Collections

Add Collection

Add Video

Search Tags

Delete

Data Analysis

Custom Query

Rankings

Analysis

### Custom Query

Query \*  
SELECT \* FROM videos

RUN

VIEW DATABASE

DOWNLOAD

Shareable URL: <http://localhost:3000/customQuery?query=SELECT%20%20FROM%20videos>

id	bitrate	codec	color_space	content	ectf	frame_rate	original_resol...	original_resol...	output_resol...	output_resol...	url	name	tags
1	5300	HEVC	bt.709	2016WSOBV	SDR	60	1080	1920	720	1280	http://cdntes...	UHD_2016W...	test.football...
2	8000	HEVC	bt.709	2016WSOBV	SDR	60	1080	1920	1080	1920	http://cdntes...	UHD_2016W...	
3	3500	HEVC	bt.709	2016WSOBV	SDR	60	1080	1920	720	1280	http://cdntes...	UHD_2016W...	
4	2200	HEVC	bt.709	2016WSOBV	SDR	60	1080	1920	720	1280	http://cdntes...	UHD_2016W...	
5	850	HEVC	bt.709	2016WSOBV	SDR	29	1080	1920	720	1280	http://cdntes...	UHD_2016W...	
6	3500	HEVC	bt.709	2016WSOBV	SDR	60	1080	1920	1080	1920	http://cdntes...	UHD_2016W...	
7	5300	HEVC	bt.709	2016WSOBV	SDR	60	1080	1920	1080	1920	http://cdntes...	UHD_2016W...	
8	850	HEVC	bt.709	2016WSOBV	SDR	29	1080	1920	360	640	http://cdntes...	UHD_2016W...	
9	1300	HEVC	bt.709	2016WSOBV	SDR	29	1080	1920	540	960	http://cdntes...	UHD_2016W...	
10	1300	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	720	1280	http://cdntes...	UHD_ABlue...	
11	2000	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	720	1280	http://cdntes...	UHD_ABlue...	
12	3000	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	720	1280	http://cdntes...	UHD_ABlue...	
13	4500	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	720	1280	http://cdntes...	UHD_ABlue...	
14	850	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	720	1280	http://cdntes...	UHD_ABlue...	
15	3000	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	1080	1920	http://cdntes...	UHD_ABlue...	
16	4500	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	1080	1920	http://cdntes...	UHD_ABlue...	
17	7000	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	1080	1920	http://cdntes...	UHD_ABlue...	
18	1300	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	540	960	http://cdntes...	UHD_ABlue...	
19	850	AVC	bt.709	ABlueMoon	SDR	24	1080	1920	360	640	http://cdntes...	UHD_ABlue...	
20	1300	HEVC	bt.709	AdmstLoop1	SDR	29	1080	1920	720	1280	http://cdntes...	UHD_Adminer...	

Previous

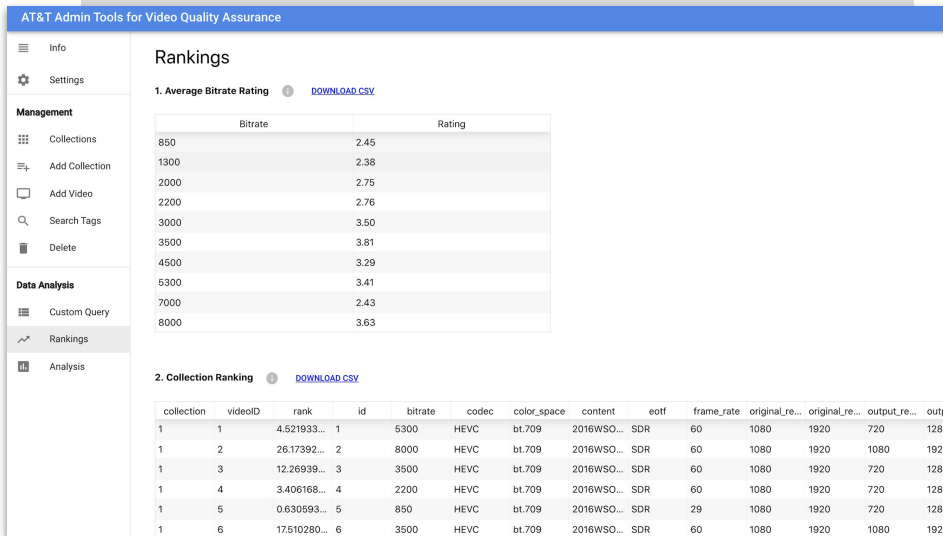
Page 1 of 19

20 rows

Next

# Web App: Data Analysis Tools

## Ranking



## Data Analysis

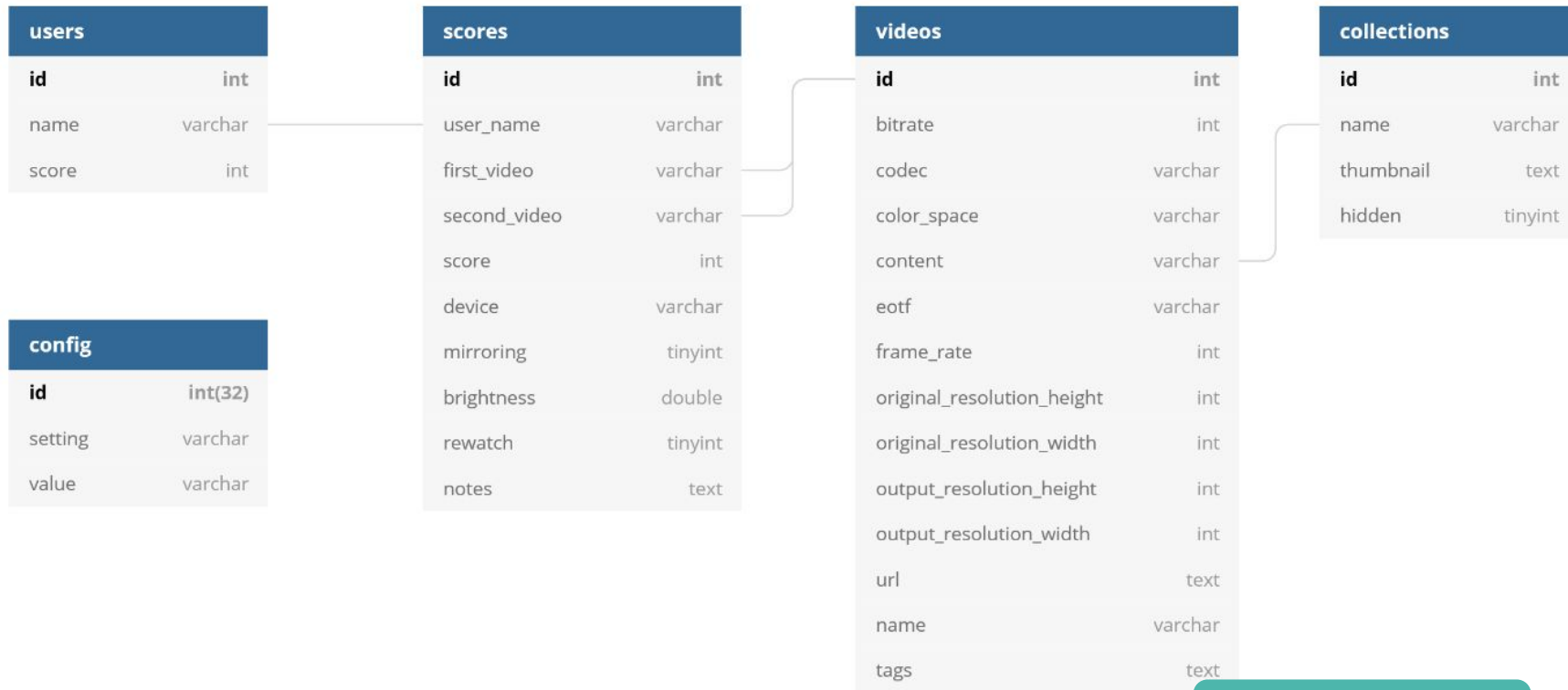


# API



- Completely refactored API to work with new database
- Hosted on the cloud via Heroku
- Secured via Bearer Token
- Any number of devices can access simultaneously
- Features:
  - Retrieve, add, edit, and delete Video Collections and Videos
  - Send score information and retrieve current results
  - Analyze data from the database
  - Safely run custom SQL queries
  - Control system-wide settings

# Database



# Conclusion

- Applications are complete, tested, and ready to be installed on any device
- API and database are live and ready to handle any amount of users
- Satisfies the requirement to allow AT&T to collect data and accurately determine user preferences
- Implementation goals and stretch goals were met

# Thank you!

Any questions/comments?

