

Software Design Description
StreamCam

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6.1 Introduction

Stream Cam is an Android application that will allow users to record and simultaneously stream videos to a remote database. Users can manage their videos on the database via a desktop web client.

6.1.1 System Objectives

The goal of StreamCam is to provide users a way to safely store videos that they record on their phones. By streaming their videos to a remote database, users can be sure that even if their phones are damaged or destroyed or confiscated their videos will remain saved.

Each video can have an associated location manifest which provides the user's location during the time the video was recorded. This is done in hopes that if user's need to provide legal evidence to support their account of a traffic accident, for example.

StreamCam should be able to handle losing connection to the database by streaming the stored video as soon as it gets internet connection.

Users will be able to manage their videos through a web client, which will provide a simple interface for them to manage and download their videos in the database.

6.1.2 Interfaces

The Android phone will communicate with the server in one of two ways. The client can provide server with HTTP requests for actions such as login, creating new users, or notifying the server that the phone is about to stream a video to the server. The Android phone will act as an RTP server to stream videos to the remote server, which will request the video stream from the client.

StreamCam API

The Android client will communicate with the StreamCam API and make general requests and authorized requests. General requests can be done by anyone, and they include login and creating new accounts. Authorized requests require that the user be signed in to StreamCam. Once they have been authorized through the use of web tokens, users can perform authorized requests.

1. The Android client can notify the server if the phone is about to start or end a stream.
2. The Android client can post the user's location when recording a video.
3. The web client can request to view a listing of the user's videos.
4. The web client can request to download a user's videos.
5. The web client can request to delete a user's videos.

Server-Database Interface

I make use the **pg** Node library, which allows me to write server-side CoffeeScript that interface with the database.

6.2 Architectural Design

My system will use a simple three-tier architecture. It will consist of clients, a server that will handle all the logic and requests from users, and a database that will store user information.

I have a three-tier architecture with three different servers that are used for specialized purposes. I have used a github server to host the web client. I have used an Amazon EC2 server to host the Wowza Streaming Engine, which allows users to stream their videos from their phones to the server. I also have a Heroku server which manages users and videos. This Heroku server is the central hub, as it handles all the logic from the clients and interfaces with the Amazon server to work with the streaming services.

6.2.1 Major Software Components

The major software components can be broken down into Android Client, Web Client, and Server.

Android Client

The Android client is the most complex component. It consists of three to five activities or screens that the user will interact with directly, as well as internal logic which will handle creating requests as well as streaming video to the server.

The activities will include a login screen, a create account screen, a camera screen, a settings screen, and possibly a video manager screen. The login screens and create account screens will be minimal, and will be the standard run of the mill login and create account screens. For now, StreamCam will not allow users to recover their accounts. This feature will be added if time permits. The Camera Screen is where the user will spend the majority of their time. It will present what the camera is capturing and will have a simple button to start and pause streaming. The settings screen will allow the users to manage their settings, such as whether or not they want the camera to remain on when they pause StreamCam(useful for recording while using another app such as a GPS). Finally, time permitting StreamCam will include a screen that will allow users to manage their videos.

The Android client will keep track of the user's location and send this information to the server. This feature is not enabled by default; the user must enable this feature. The Android client will have logic that will allow the phone to continue streaming video after an internet service interruption.

Web Client

The web client is the simplest component. The web client will allow users to login or create an account. When a user logs in they will have a simple screen similar to the view of a standard file management system that will allow users to manage and download their stored videos. Each file will have information such as duration, the date the video was recorded, and a text file that provides the user's location during the duration of the video. If the user did not enable this feature, the location manifest will not be present.

Server

The server has moderate complexity. The server will handle all client requests from Android and Web Clients and interact with the database to give users the information they require.

6.2.2 Major Software Interactions

User Login and Creating New Accounts

This interaction is between the Android Client or the Web Client and the server. During this interaction the user will either create a new account or provide credentials for an existing account. After doing either successfully the user will receive a token that will allow them to perform other actions.

Streaming

I'm still trying to figure out how to implement this.

Viewing User Videos

The web client will be able to make requests to the StreamCam server to view all the users videos. It will receive a list of videos with basic information such as duration, date the video was recorded, and a link to download the video. The user will also have the ability to delete videos that they have recorded.

6.2.3 Architectural Design Diagrams

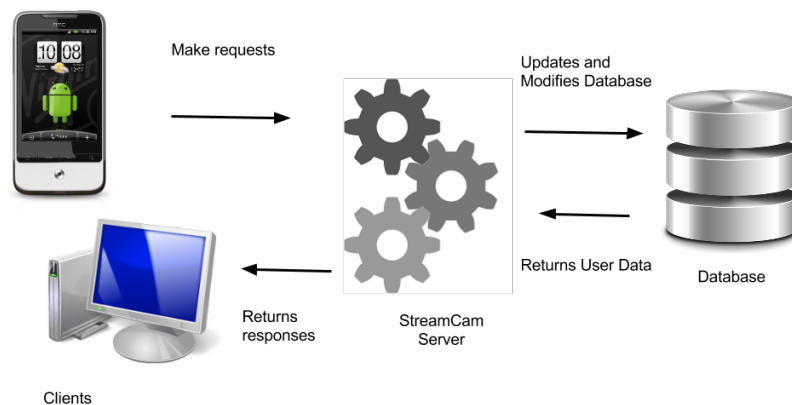


Figure 1: Figure of Architecture

Below is a figure that explains the streaming architecture.

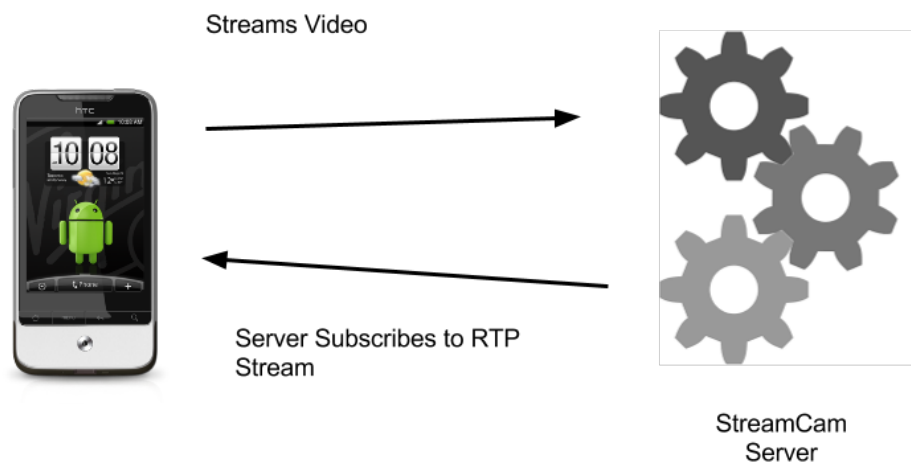


Figure 2: Figure of Architecture

Below is a use case diagram for streaming.

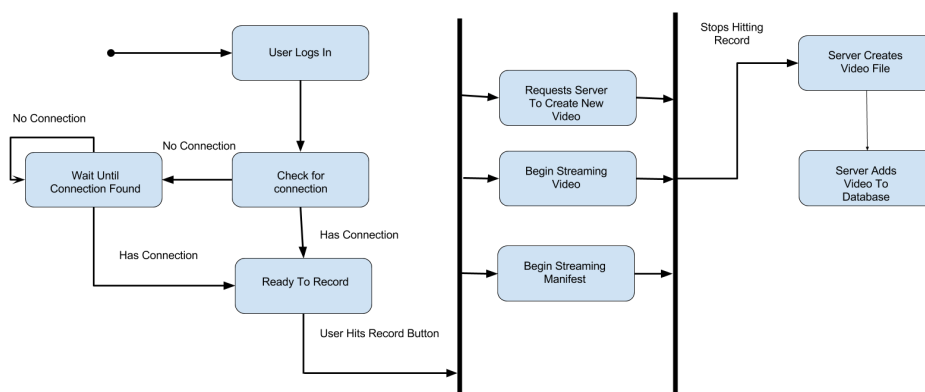


Figure 3: Figure of Architecture

Below is a UML diagram of classes used for the Android Client.

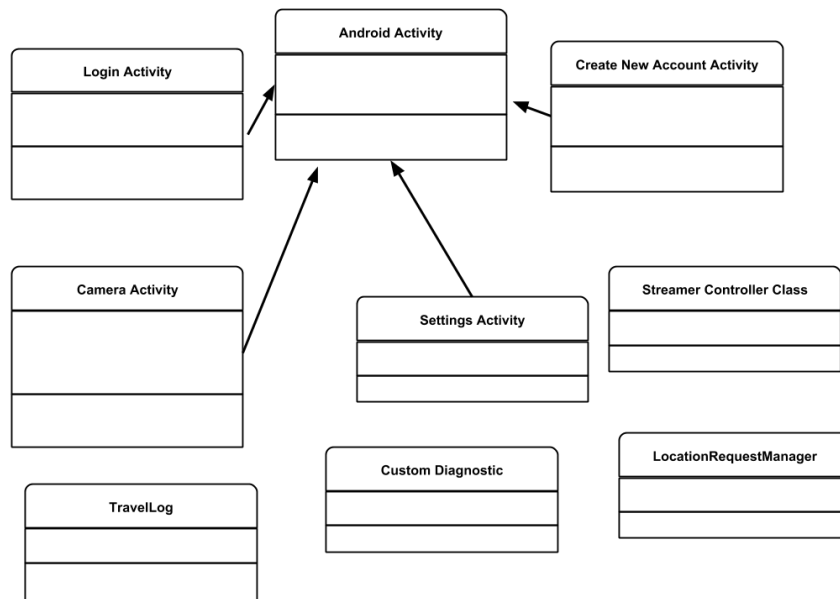


Figure 4: Figure of Architecture

6.3 CSC and CSU Descriptions

I have server side code, Android client code, and web client code. The most complex is the Android client. Android screens are classes called activities. Each of these has code that contains the functionality for the screen that the user will interact with at that particular part of the phone app. All of them inherit methods from the Activity class. The Activity class has basic methods such as onCreate, onPause, and onEnd that specify what is done when a particular screen is created, paused, or destroyed. I will focus on the functionality of each screen.

6.3.1 Class Descriptions

The following are class descriptions for the Android client.

Login Activity

The login activity is a simply screen with text fields for users to enter their username and password. It also has two buttons: one for login in and the other to go to the Create Account Screen. The Login Screen has very few fields and methods.

FIELDS

1. mUsername - (String) Stores the provided username.

2. `mUsernameTextView` - (`TextView`) A reference to the input field where the user provides their username.
3. `mPassword` - (`String`) Stores the provided password.
4. `mPasswordTextView` - (`TextView`) A reference to the input field where the user provides their password.

METHODS

1. `onCreate` - void. Setups the activity.
2. `onLoginButtonClicked` - void. Handles logic for when login button is clicked.
3. `goToCameraActivity` - void. Used to go to the Camera Activity.
4. `goToCreateAccountActivity` - void. User to go to the Create Account Activity.
5. `handleHTTPResponse` - void. Handles HTTP response from server.

Create Account Activity

This activity is a simply screen with text fields for users to enter their username and password. It also has one button that is used to submit data to create a new account. There are three textfields, one for a user name and two for the password. The second textfield is used to confirm the user's password.

FIELDS

1. `mUsername` - (`String`) Stores the provided username.
2. `mUsernameTextView` - (`TextView`) A reference to the input field where the user provides their username.
3. `mPassword` - (`String`) Stores the provided password.
4. `mPasswordTextView` - (`TextView`) A reference to the input field where the user provides their password.
5. `mPasswordConfirm` - (`String`) Stores the provided confirm password.
6. `mPasswordConfirmTextView` - (`TextView`) A reference to the input field where the user provides their confirm password.

METHODS

1. `onCreate` - void. Setups the activity.
2. `onCreateAccountButtonClicked` - void. Handles logic for when login button is clicked.
3. `goToCameraActivity` - void. Used to go to the Camera Activity.
4. `handleHTTPResponse` - void. Handles HTTP response from server.

Camera Activity

This activity is the most complex. It is not yet fully implemented. It has the necessary code to show the camera screen and retrieve the user's current location.

The following are class descriptions for server.

server.coffee

This class is the server that the Android client will communicate with. This class will not have any logic, rather, it will set up the routes for the API.

login.coffee

This class has the logic for login in and creating new users. It has just two methods, loginUser and createNewUser. Both of these return a JSON response that will be parsed by the JSON client.

METHODS

1. loginUser - Takes in an HTTP request variable. Returns an HTTP response. It checks that the login credentials provided in the request body are valid, and if so provides the user with a web token.
2. createNewUser - Takes in an HTTP request variable. Returns an HTTP response. It checks that the username provided by the user is available, and if so creates an account and returns a web token with the response.

token.coffee

This class stores the JSON web tokens that are created to authenticate users. It has two methods, createToken and decodeToken. While this functionality could be included in some other class, it makes sense to separate the tokens in their own class for separation of concerns.

METHODS

1. createToken - Takes in a username. Returns a web token.
2. decodeToken - Takes in a web token. Returns a decoded web token for the use of the server to authenticate the user.

manifest.coffee

This class has the logic that deals with the video manifest. It has code for appending to the manifest in the database, creating a string representation of the manifest, and returning manifests for a particular video. Not implemented completely.

stream.coffee

This class has the logic for creating threads to listen to users' streams. No idea how to do this yet.

6.3.2 Detailed Interface Descriptions

The interfaces for my project are my server and the middleware routes.

6.3.3 Detailed Data Structure Descriptions

The manifest, which is not fully implemented, is a linked list. Since we will constantly be appending to the manifest, I chose a linked list because we avoid having to resize the array. The manifest will have a pointer to the current location. This allows us to keep track of which location has been sent to the server so we can send locations in chronological order.

6.3.4 Detailed Design Diagrams

Please refer to architecture section for diagrams.

6.4 Database Design and Description

The database contains information about users and their videos. It stores user credentials, information about videos, including duration, date, and a manifest with the user's location at the time the video was made.

There is a one-to-many correspondence between users and videos. Each user can have many videos, and a video is owned by a single user. There is a one-to-one correspondence between a video and a manifest. Each video has a single manifest, and a manifest belongs to a single video.

6.4.1 Database Design ER Diagram

Entity Relationship Diagram

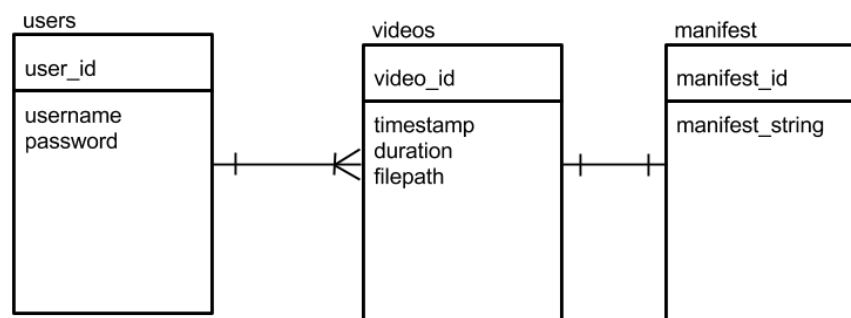


Figure 5: Figure of Architecture

6.4.2 Database Access

As of now only the server is the sole user of the database.

6.4.3 Database Security

As of now only the server is the sole user of the database. I will have to provide additional security features later.

7. Notes

8. Acronyms and Abbreviations