Software Requirements Specification

for

YOUTUBE

Version 1.0 approved

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Table of Contents

Revision History

Name	Date	Reason For Changes	Version

1. Introduction

1.1 Purpose

This document describes the software requirements and
specification for a video streaming website – YouTube. It will explain the features of the system, the interface of the system and constraints that it must operate under.

1.2 Document Conventions

Standards: The SRS was written following the IEEE Std 830-1998, a standard for writing software requirements specifications. This standard provides the structure and the content requirements for an SRS.

Typographical Conventions: Specific fonts and highlighting were used to denote different sections and information types. For example, headings were bolded for emphasis, and bullet points were used for listing items. Code snippets or technical terms were represented in a monospace font.

Requirement Priorities: Each requirement was assigned its own priority level. This helps in understanding the importance of each requirement and aids in planning the development process. The priorities were not assumed to be inherited by detailed requirements from higher-level requirements. Each requirement, whether high-level or detailed, was evaluated individually based on its impact on the system, its feasibility, and its alignment with the business goals.

1.3 Intended Audience and Reading Suggestions

The document is intended for all the stakeholders customer and the developer
(designers, testers, maintainers).
The reader is assumed to have basic knowledge about the video streaming sites and their working.
Knowledge and understanding of DFD's and UML
diagrams are also required.

1.5 Project Scope

This document encompasses the development of a comprehensive online video-sharing platform YouTube. This includes user account management, video uploading, playback, and interaction features such as commenting, liking, and sharing as well as searching. The scope extends to channel creation and customization, enabling users to establish their unique presence on the platform. Additionally, the SRS covers functionalities related to content discovery, search, and recommendation algorithms to enhance user engagement. Monetization features and including advertising fall within the project scope. The scope also addresses scalability and performance requirements to accommodate increasing user traffic and content volume. Integration with social media platforms and external services is included for seamless cross-platform interaction.

1.6 Product Perspective

YouTube provides a comprehensive set of tools for uploading, managing, and promoting their content. This includes features such as video uploading, where creators can easily upload videos in various formats and qualities, along with options to add titles, descriptions, tags, and custom thumbnails to optimize discoverability. Creators can also organize their videos into playlists, and manage their channel settings, including customization options for channel layout and branding.

Moreover, YouTube empowers creators with analytics tools that offer insights into their audience demographics, viewing behavior, and video performance metrics such as watch time, engagement rates, and revenue generation through advertising. Monetization options enable creators to earn revenue from advertisements displayed alongside their videos, as well as through channel memberships. Beyond content creation, YouTube fosters community engagement through features like comments, likes, and shares, allowing creators to interact directly with their audience. For viewers, YouTube offers a vast library of content across diverse genres, accessible via personalized recommendations based on viewing history, preferences, and trending topics. The platform supports seamless video playback on various devices, with options for quality settings, closed captions, and subtitles to enhance accessibility. Viewers can also subscribe to their favorite channels, receive notifications for new uploads, create playlists, and share videos with friends and followers across social media platforms. Additionally, YouTube provides robust search functionality, enabling users to discover content based on specific keywords, topics, or channels of interest, further enriching the viewing experience.

User interfaces

User
The user interface should be intuitive, easy to use and
Recommendations based on history for more engagement.
Maintenance Team
The maintenance team is responsible for maintaining server and service
And to make sure it keeps working properly. The team also handle user reports
And platform policies for content.

1.7 Product Features

YouTube, a leading video-sharing platform, offers a plethora of features that have solidified its position as a cornerstone of online entertainment. Users can effortlessly upload content to their personalized channels, where they can amass subscribers and curate their video collections. Through a sophisticated recommendation system and robust search functionality, viewers can explore a vast array of content tailored to their interests. Creators can monetize their videos through various avenues, including advertising and channel memberships, while engaging with their audience through live streaming and community interaction. YouTube also provides analytics tools for creators to track their video performance and audience demographics. With mobile app integration, accessibility features, and customization options, YouTube ensures a seamless and personalized viewing experience for users across devices. Additionally, YouTube Premium offers an ad-free experience and exclusive content, further enhancing the platform's appeal. Through its comprehensive suite of features, YouTube continues to shape the landscape of online video consumption.

1.8 Operating Environment

YouTube can be operated on any system which supports a browser and an internet connection.
The hardware and software used should have following specifications:
• Min. RAM: 2 Gigabytes
•Latest version of browser
•Internet connection with 500+ Kbps speed
•Operating system: Windows 7+, macOS X 10.7+ or Ubuntu 10+ or Android 6+

1.9 Design and Implementation Constraints

Login
Validate User Credentials • Validate for correct username • Validate that the username is not blank • If username is blank, prompt error message “Please provide username” • Validate that the password is not blank • If password is blank, prompt error message “Please provide password” • Validate that the password entered matches the password on file • If password does not match, prompt error message “Password is Incorrect”

Lock Account • If the number of consecutive unsuccessful logins exceeds three attempts, lock account • Maintain Consecutive Unsuccessful Login Counter • Increment Login Counter • For every consecutive Login attempt, increment logic counter by 1. • Reset login counter to 0 after login is successful.

Video Upload • Validate video format and size • If video format is not supported or size is too large, prompt error message “Invalid video format or size”

Video Playback • Validate that the video can be played • If video cannot be played, prompt error message “Video cannot be played”

Comment Posting • Validate that the comment is not blank • If comment is blank, prompt error message “Please provide a comment” • Post the comment if it passes the validation

Subscription • Validate that the user can subscribe to a channel • If subscription fails, prompt error message “Subscription failed. Please try again.

1.10 User Documentation

User Manuals: YouTube provides comprehensive user manuals that guide users on how to use the platform. These manuals cover everything from creating an account, uploading videos, managing your channel, to understanding YouTube’s policies and guidelines.

Online Help: YouTube has a robust online help center that provides answers to frequently asked questions, troubleshooting guides, and tips for optimizing your use of the platform. It covers a wide range of topics including account management, content creation, monetization, and more.

Tutorials: YouTube offers a variety of video tutorials on its official YouTube channel. These tutorials provide step-by-step instructions on how to use different features of YouTube. Topics include how to upload a video, how to create a playlist, how to live stream, and more.

Community Forums: YouTube has a community forum where users can ask questions, share ideas, and get help from other YouTube users and experts. It's a great place to find solutions to common problems or learn new ways to use YouTube.

YouTube Creator Academy: This is a free resource provided by YouTube where users can learn about creating content, growing their channel, and making the most of the tools available on YouTube. It includes courses, tips, and examples from successful creators.

API Documentation: For developers, YouTube provides detailed API documentation. This includes technical instructions on how to integrate YouTube videos and functionality into websites and applications.

1.11 Assumptions and Dependencies

- Hardware never fails.
- The network must be robust enough to handle bandwidth demands of high-definition video content to millions of users simultaneously.
- YouTube employs distributed file systems, redundant storage arrays, and scalable architectures to manage its extensive video and multimedia content, ensuring data reliability and availability at scale.
- Dependencies include software for content fingerprinting, digital rights management (DRM), and user authentication.

2. Specific Requirements

2.1 Functional Requirements

2.1.1 Sign Up/Sign In

- **Description:** Allows user to sign up / sign in
- **Input:** E-mail Id, Password
- **Processing:** When user sign up, system create new database and register that user and when user sign in it matches the login credentials from the database and if matches then grant the access.
- **Output:** Allows user to register their account on sign up and allows user to access on signing in.

2.1.2 Search

- **Description:** Allows user to search any video through entering keyword.

- **Input:** Input Keyword
- **Processing:** Matches the keyboard in the database and displays videos according to that.
- **Output:** Display videos related to keywords.

2.1.3 Share Videos

- **Description:** Allow user to share content with friends and contacts
- **Input:** Click share button and select the person from the list
- **Processing:** it sends the video/post link to that person
- **Output:** opens the sharing interface of YouTube/App.

2.1.4 Upload Videos

- **Description:** Allow users to upload videos into his channel.
- **Input:** Click Upload button
- **Processing:** Upload the video to the server with caption and other details and compress it accordingly.
- **Output:** Video is posted into the user's channel

2.1.5 Download Videos

- **Description:** Allow user to download videos
- **Input:** Click the download button
- **Processing:** Fetch the video from the server and send it to the user's device
- **Output:** Popup appeared that the download has been started/video is downloaded

2.1.6 Home

- **Description:** This the main user menu
- **Input:** Log In /Click on Home button
- **Processing:** Several videos based on user's history, search, subscription and interest
- **Output:** A list of videos

2.1.7 Subscription

- **Description:** It displays all the channels subscribed to by the user.
- **Input:** Click on Subscribe
- **Processing:** System checks the subscribed channels by the user in the database and displays the videos of their channel.
- **Output:** Display all the channels subscribed by the user

2.1.8 History

- **Description:** it shows all the videos that were watched by the user
- **Input:** Click on History
- **Processing:** Checks the videos watched by the user in the database and displays them
- **Output:** Shows all the videos watched by the user so far.

2.1.9 Watch later

- **Description:** It shows all the videos that user has added to the watch later category
- **Input:** Click on Watch later
- **Processing:** Checks user data in the database and displays all the videos that have been added to the watch later category.
- **Output:** Displays all the videos that are added to watch later.

2.1.10 Playlist

- **Description:** This has 3 options: 1. Liked Videos 2. Create Playlist 3. Your Videos
- **Input:** Click on Liked Videos/Create Playlist/Your Videos
- **Processing:** System retrieves the Liked Videos/Videos uploaded by the user OR asks the user to create a playlist.
- **Output:** Display the Liked videos/Your Videos OR Playlist has been created successfully

2.1.11 Premium

- **Description:** YouTube Premium offers an ad-free experience, access to exclusive content, and offline viewing for subscribers.

- **Input:** Payment of Rs. 129.00/month
- **Processing:** Remove all the ads and unlocks exclusive content and offline viewing for the user account.
- **Output:** Add free, Offline working YouTube.

2.1.12 Shorts

- **Description:** Portrait videos with duration not more than 60 seconds.
- **Input:** Click on shorts
- **Processing:** System retrieves short videos related to user interest/subscription
- **Output:** Displays short videos relevant to user's interest

2.2 Non-Functional Requirements

2.2.1 Safety Requirements

If there is extensive damage to a wide portion of the database due to catastrophic failure, such as a server crash, the recovery method restores a past copy of the database that was backed up to archival storage (typically tape) and reconstructs a more current state by reapplying or redoing the operations of committed transactions from the backed-up log, up to the time of failure. And in the meanwhile, the server switches to the backup servers to keep the site working.

2.2.2 Software Quality Attributes

2.2.3 Scalability

Ability to handle a huge number of concurrent users and videos without performance degradation.

2.2.4 Compatibility

Supporting various devices, browsers, and operating systems.

2.2.5 Security Requirements

Protecting user data, preventing unauthorized access, and ensuring secure transactions. All the Private data uploaded by the user is confidential to the other users. User can also report for if the find any suspicious activity in the YouTube, so the security department can take care of that.

2.2.6 Monitoring and Analytics

Implementing tools to monitor performance, analyze user behavior, and gather insights for continuous improvement.

2.2.7 Backup and Recovery

Implementing robust backup and recovery mechanisms to prevent data loss and ensure continuity of service in case of failures.

3. External Interface Requirements

3.1 User Interfaces

The customer user interface should be attractive, easy to understand and enable user to access Home page, navigation menu, subscriptions, search bar, notifications etc.

3.2 Hardware Interfaces

The hardware should have following specifications:

- Should have a supported Operating System (OS)
- Should be able to connect to the internet
- Should have a screen to display content

3.3 Software Interfaces

The software interfaces are specific to the target banking software systems**.**

4. Other Nonfunctional Requirements

4.1 Performance Requirements

- It must be able to ensure fast loading time
- It must play videos smoothly with minimal buffering
- Must be able to hand a huge amount of traffic and terabytes of content

4.2 Safety Requirements

• Must be able to have backup of data
• Must have a backup server to run on incase of failure
• All the transactions should follow the ACID properties
• Data must be stored in encrypted format

4.3 Security Requirements

• Content filtration algorithms should be used
• Content id must be available to handle Copyright Protected Content
• Parental controls option must be available for an account for child safety measures
• Firewall and protection algorithms must be used for security purpose

4.4 Software Quality Attributes

- *AVAILABILITY: The site is available for users 24x7.*
- *MAINTAINABILITY: The developers and a team of software engineers work on the maintenance and the updates of the site.*
- *USABILITY: The site can be used anywhere if the connectivity to the internet and a device.*

5.4.1 Availability

The Website/application should be working 24x7 365days.

5.4.2 Security

The network should provide maximal security. To make that much more
Transparent there are the following requirements.

1. It must be impossible to plug into the network.
2. There must be a backup program to restart the network in case it goes down

5.4.3 Maintainability

Only maintainers are allowed to connect to the server's control hub.

5. Other Requirements

Server

To set up a server for hosting YouTube-like video content, you need to consider various factors including storage, bandwidth, processing power, and software requirements. Here's a basic rundown of server requirements for a YouTube-like service:

1. Storage: You need ample storage space to store all the videos users will upload to your platform. This includes both original uploads and various renditions (different resolutions and formats) for adaptive streaming. Storage requirements can grow rapidly as your user base increases.

2. Bandwidth: Video streaming consumes a significant amount of bandwidth. You need to ensure that your server and network infrastructure can handle the bandwidth requirements for streaming videos to multiple users simultaneously, especially for high-definition content.

3. Processing Power: Video transcoding, which involves converting uploaded videos into multiple formats and resolutions for adaptive streaming, requires substantial processing power. You'll need powerful CPUs to handle transcoding efficiently.

4. RAM: Sufficient RAM is needed to support video transcoding and handle concurrent user sessions efficiently.

5. Network Infrastructure: A robust network infrastructure with high-speed internet connectivity is crucial to ensure smooth video streaming without buffering or interruptions.

6. Content Delivery Network (CDN: Utilizing a CDN can help distribute your video content globally, reduce latency, and improve streaming performance by caching content closer to users.

7. Streaming Software: You'll need streaming software capable of handling video uploads, transcoding, and streaming. Popular choices include FFmpeg, Wowza Streaming Engine, and nginx-rtmp.

8. Database: You'll need a database to store metadata associated with videos, user accounts, comments, likes, etc. Choose a database system that can handle high read and write loads efficiently.

9. Security: Implement robust security measures to protect user data, prevent unauthorized access, and mitigate potential security threats such as DDoS attacks.

10. Scalability: Design your server infrastructure with scalability in mind to accommodate future growth in user traffic and content volume.

11. Monitoring and Analytics: Implement monitoring tools to track server performance, identify issues, and optimize resource utilization. Analytics tools can provide insights into user behavior and preferences.

12. Backup and Redundancy: Set up regular backups and implement redundancy measures to ensure data integrity and minimize downtime in case of hardware failures or other emergencies.

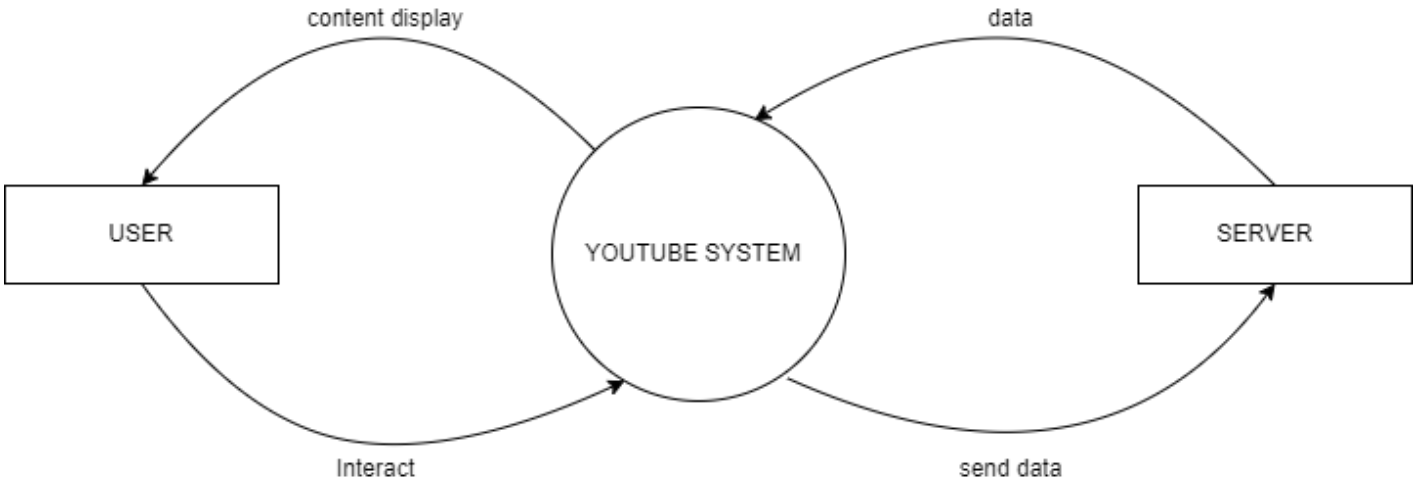
Data Base

YouTube's database requirements are formidable due to its immense scale and complexity. It necessitates a highly available and scalable database system capable of handling millions of concurrent transactions and queries efficiently while ensuring uninterrupted access to user data and video metadata. Reliability is paramount, with failover and disaster recovery mechanisms in place to minimize downtime and data loss. Data consistency across distributed databases and caching layers is crucial, as is effective data partitioning to distribute data across multiple servers for improved performance. Integration with a Content Delivery Network (CDN) is essential for caching and delivering video content closer to users, reducing latency. Security measures such as encryption and access controls are imperative to protect user data and comply with privacy regulations. Additionally, YouTube relies on its database for analytics and reporting, necessitating systems capable of processing large volumes of data to generate insights into user behavior, content performance, and advertising metrics. Efficient content management capabilities are also vital for storing and retrieving multimedia content efficiently.

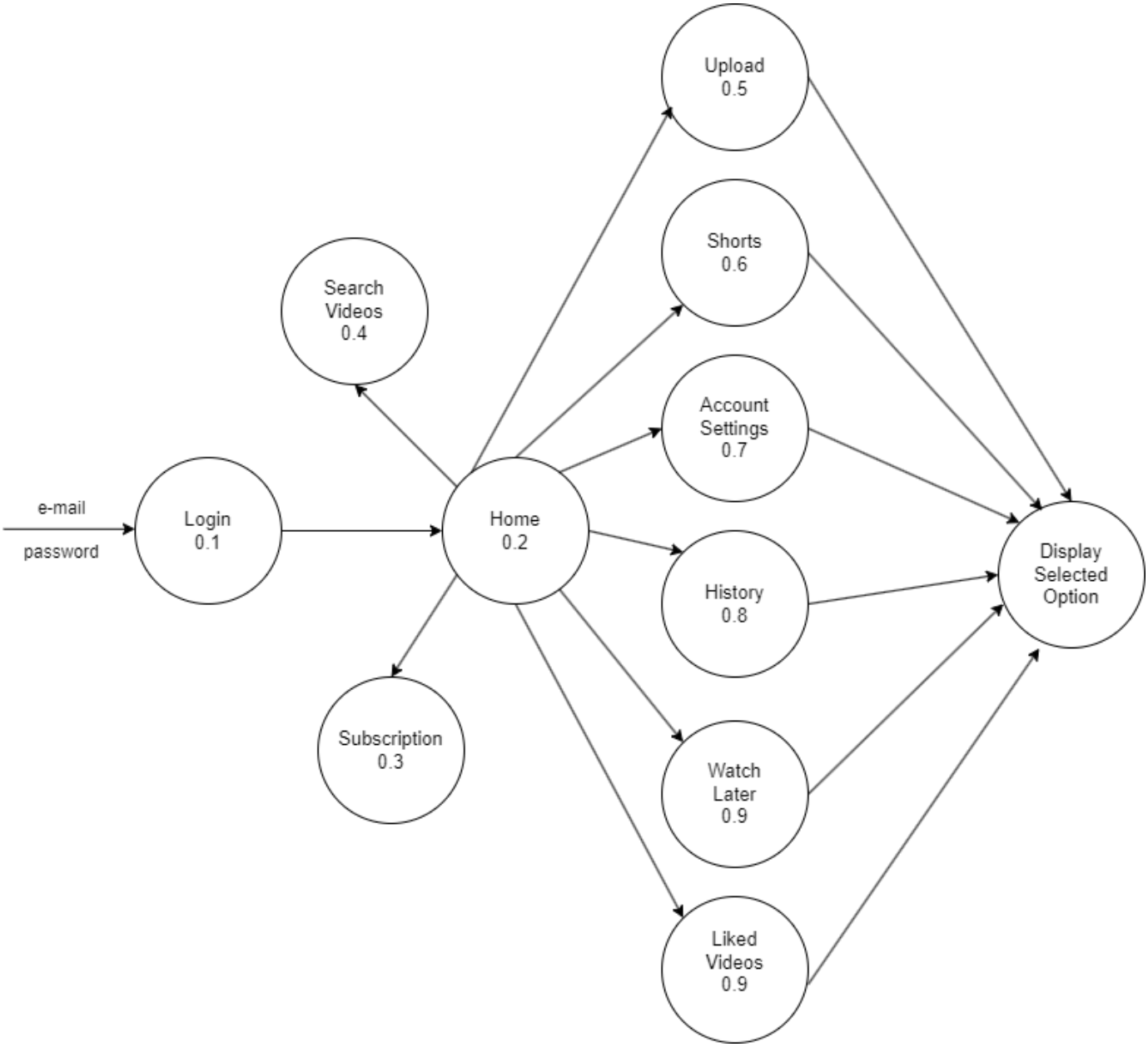
6. Design Phase

6.1 Data flow diagrams (DFD's)

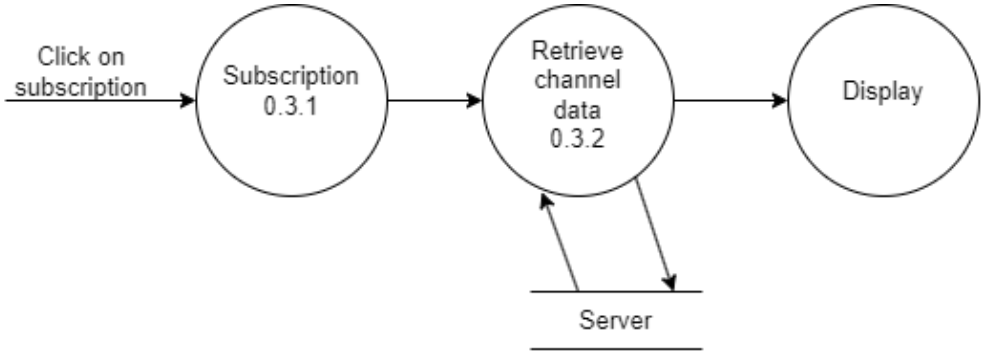
LEVEL 0

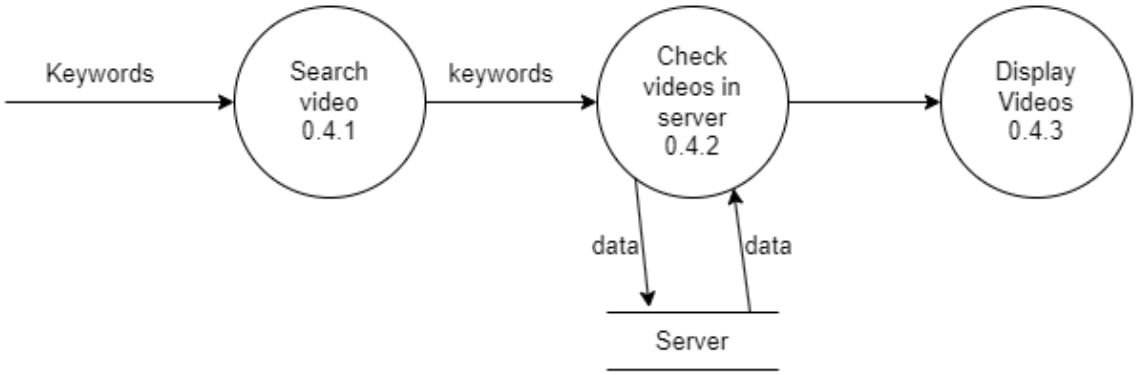


LEVEL 1

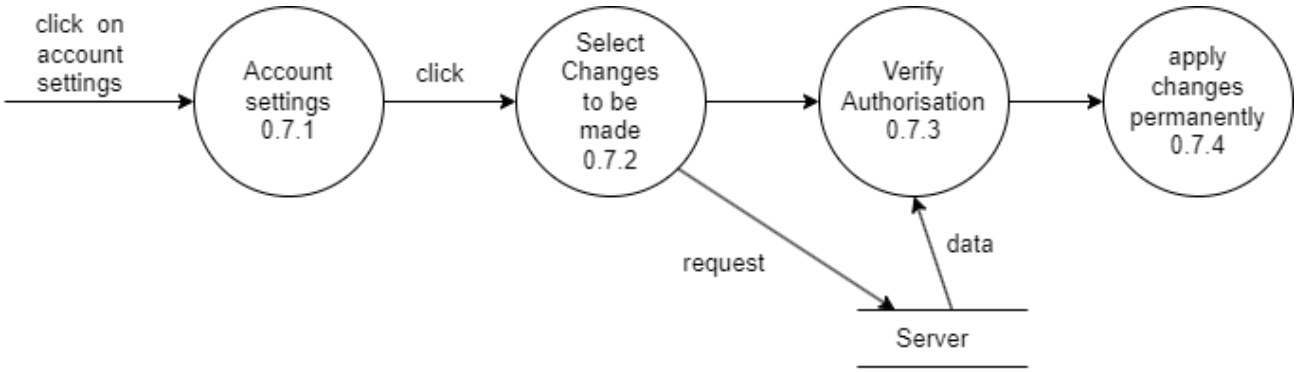

e-mail
password
Login
0.1
Search
Videos
0.4
Subscription
0.3
Home
0.2
Upload
0.5
Shorts
0.6
Account
Settings
0.7
History
0.8
Watch
Later
0.9
Liked
Videos
0.9
Display
Selected
Option

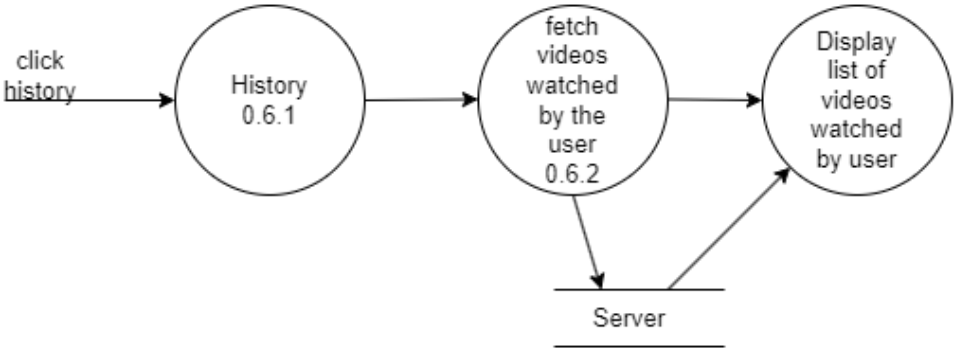
LEVEL 2

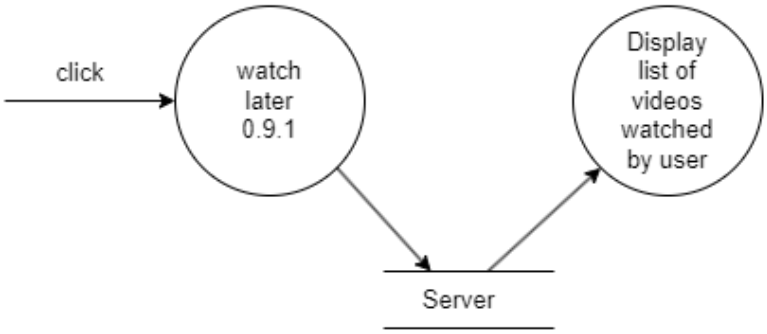

Click on subscription
Subscription 0.3.1
Retrieve channel data 0.3.2
Display
Server

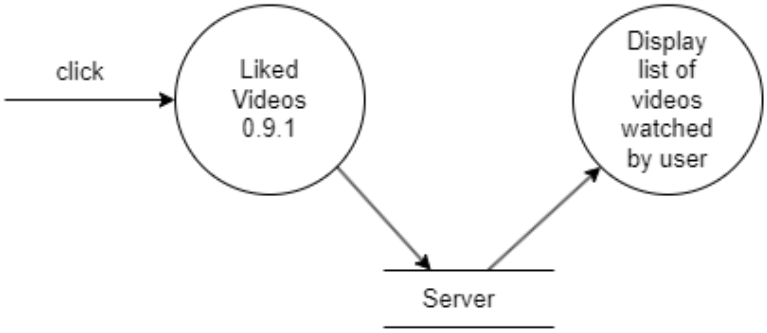

Keywords
Search video 0.4.1
keywords
Check videos in server 0.4.2
Display Videos 0.4.3
data
data
Server


Click Upload
Upload 0.5.1
keywords
select file 0.5.2
give information and click upload 0.5.3
Message:- "uploaded successfully" 0.5.4
data
data
Server

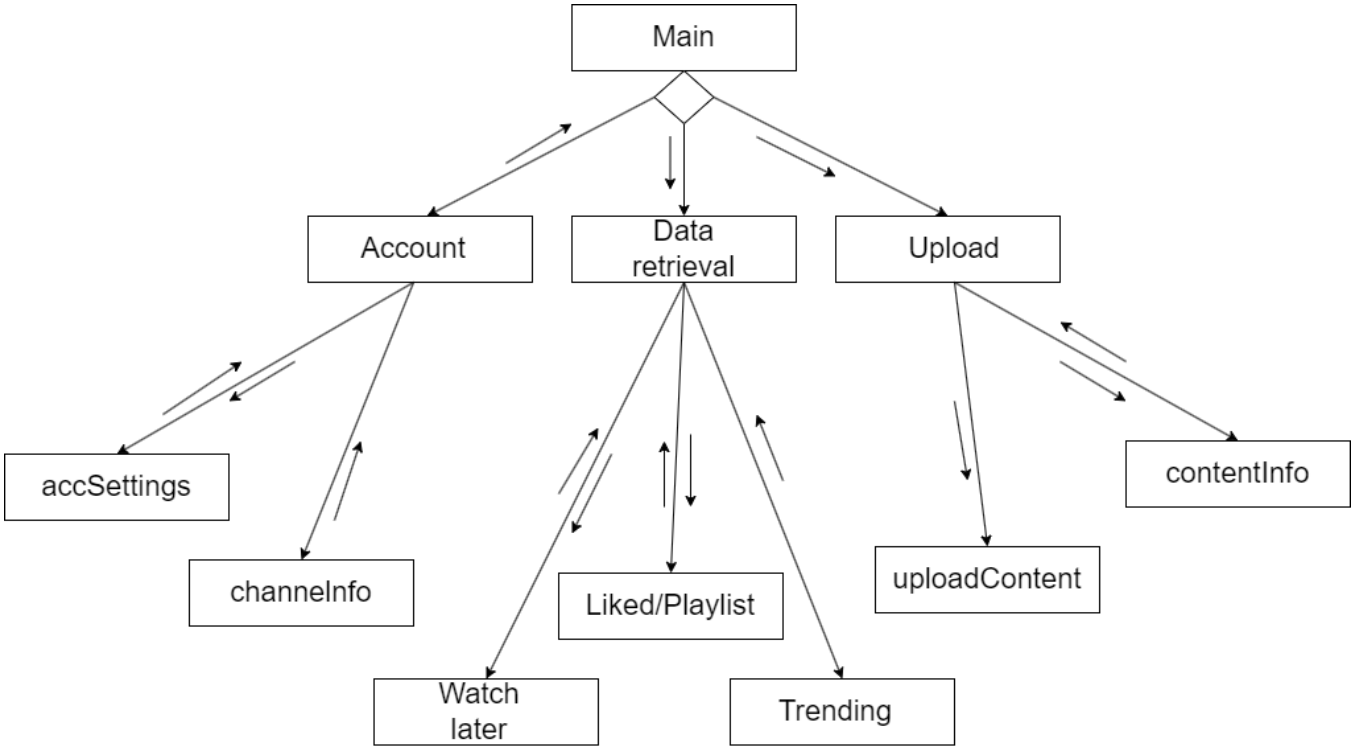

click on account settings
Account settings 0.7.1
click
Select Changes to be made 0.7.2
Verify Authorisation 0.7.3
apply changes permanently 0.7.4
request
data
Server


click history
History 0.6.1
fetch videos watched by the user 0.6.2
Display list of videos watched by user
Server


click
watch later 0.9.1
Display list of videos watched by user
Server

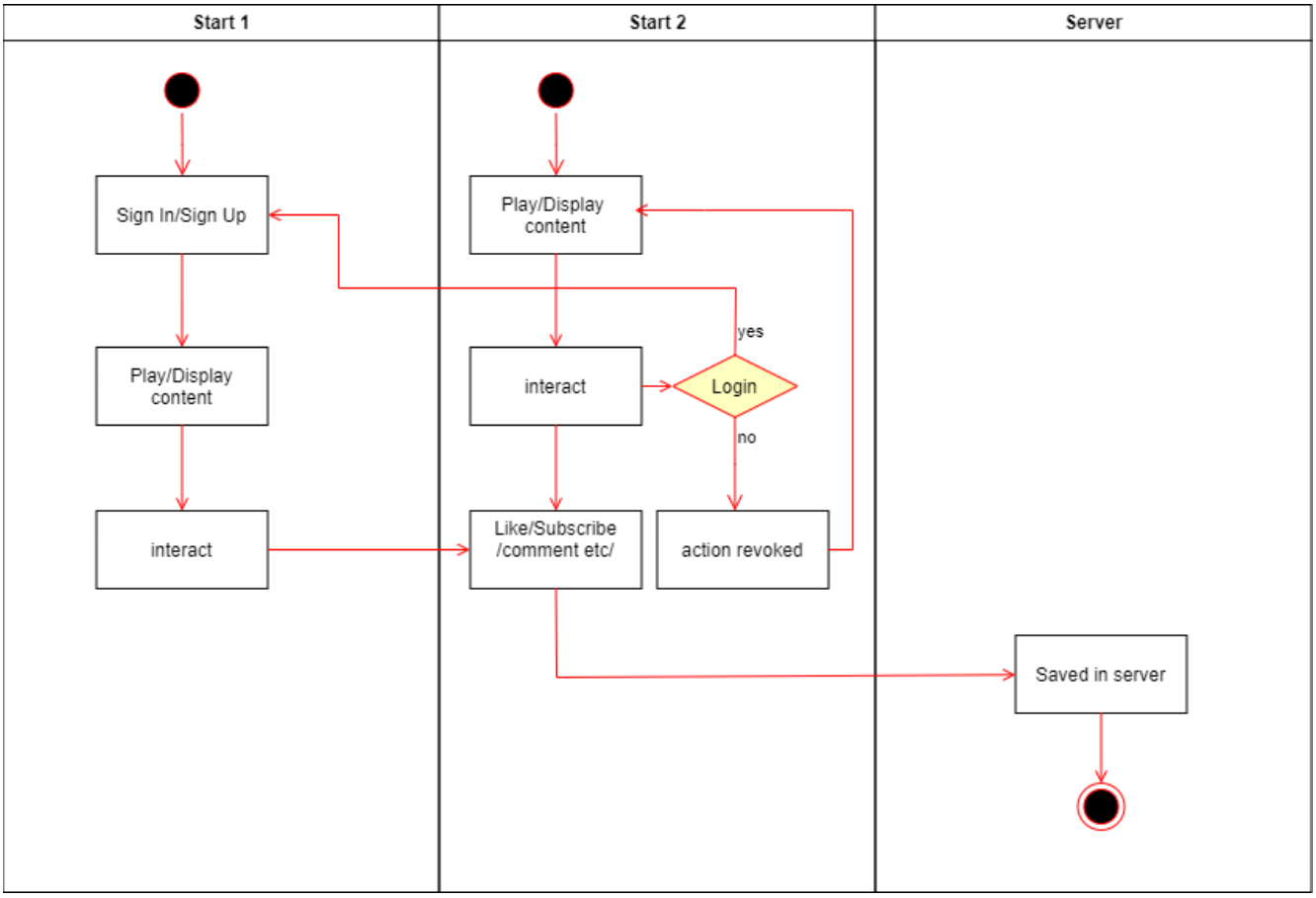

click
Liked Videos 0.9.1
Display list of videos watched by user
Server

6.2 Structured Charts

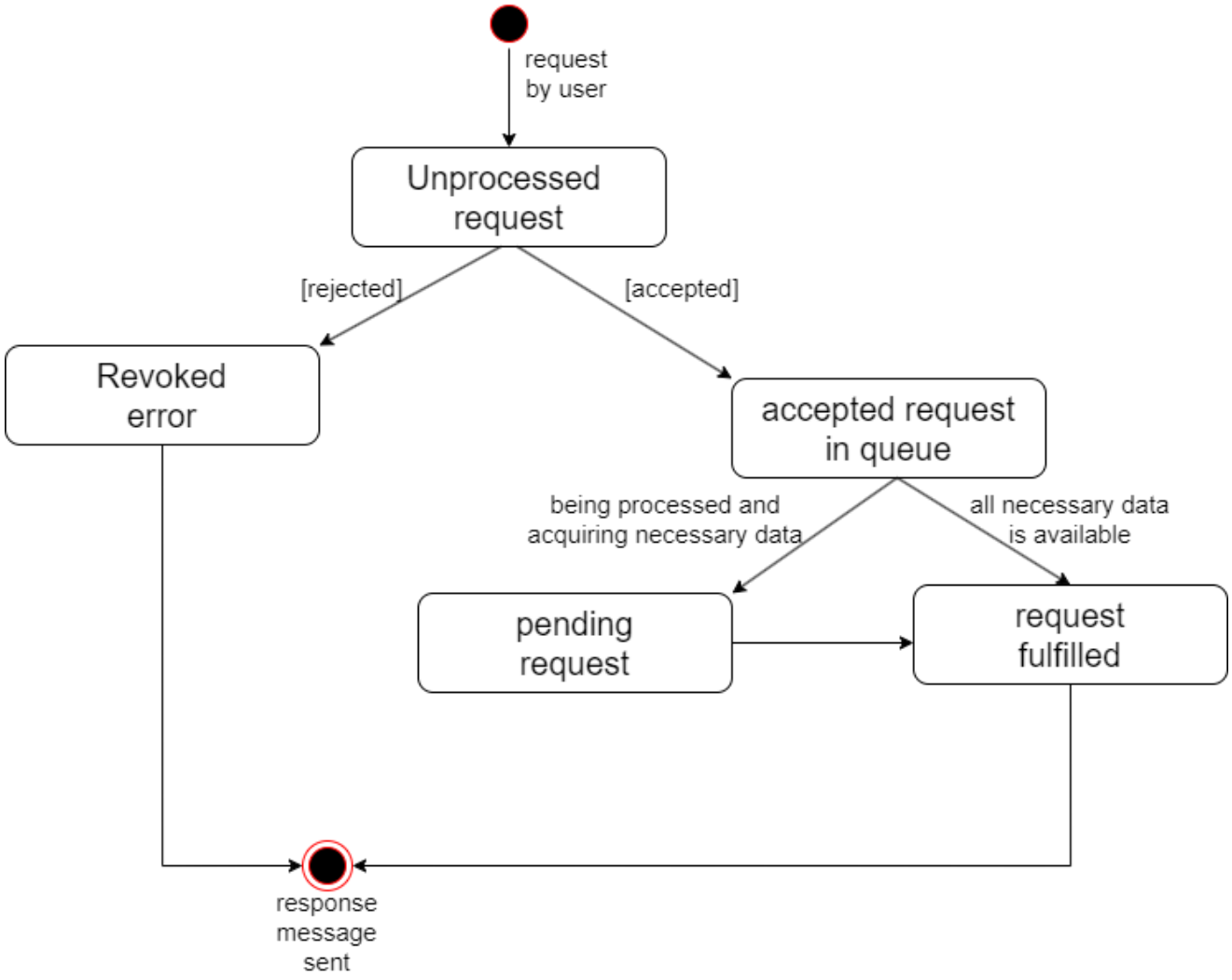


6.3 Unified Modelling Language (UML)

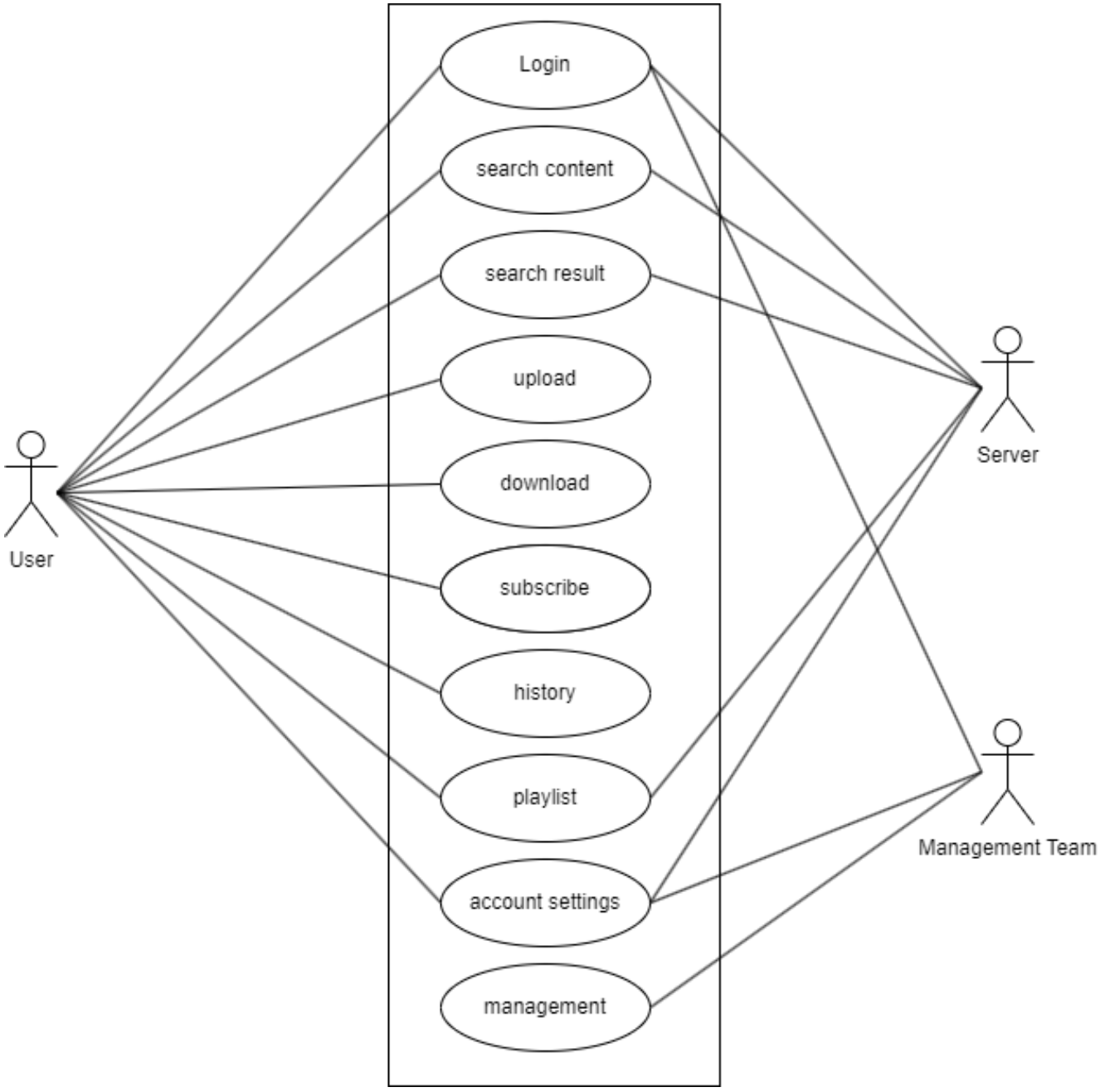
6.3.1 Activity Diagram



6.3.2 State Diagram



6.3.3 Use Case Diagram/Model



7. Test Cases

Test_id	Test_name	Objective	Steps to follow	Expected Result	Actual Result	Status
T_01	Valid Search	To check whether the relevant videos are available according to keyword	Write any keyword in the search box and check that the videos are related to the keyword	The result should match some keywords	The result is matching keywords	**Pass**
T_02	Home Page	To check whether homepage is working or not	Click on the youtube.com	Homepage of YouTube is displayed	Homepage of YouTube is displayed	**Pass**
T_03	Sign Up	To register the new user to the system	Enter all the necessary info after clicking sign up	the user is registered in the database	the user is registered in the database	**Pass**
T_04	Sign In	Grant access to a particular existing account	Enter email and password	User is able to access his/her account	User is able to access his/her account	**Pass**

T_05	Search	To check which content is displayed if the keyword related content is not available	Enter a keyword	The content should be displayed that is even closely related	Irrelevant content is also displayed	**Fail**
T_06	Share Content	User is able to share content	Click share	Video is shared	Video is shared	**Pass**
T_07	Download	User is able to see videos offline	Click download	Videos has been downloaded	Videos is downloaded	**Pass**
T_08	Upload	User is able to upload content to his channel	click upload and select file, give information regarding video	The videos has been uploaded	The videos is uploaded	**Pass**
T_09	Navigation	User is able to access all the options to navigate in youtube	Click on navigation	The navigation bar is shown	The navigation bar is shown	**Pass**

T_10	Subscription	User is able to subscribe to his interested YT channel	Click on Subscribe button of any channel	This channel has been subscribed	Subscribed!!	**Pass**
T_11	Library	User is able to create libraries to store different type/genre content	Click on create library and give name and click add to library of a video	Library has been created	Library is created	**Pass**
T_12	History	User is able access his previously watched videos	Click on History	A list of videos watched by user is shown	A list of videos watched by user is shown	**Pass**
T_13	Watch later	User can view the videos added to watch later	Click on watch later	All the videos in the watch later is shown	Watch later videos are shown	**Pass**
T_14	Liked Videos	User can see videos liked by him/her	Click on liked videos	All the videos liked by the user account	Videos through user's account	**Pass**