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**Department of Informatics**

**University of Leicester**

**CO7201 Individual Project**

**Preliminary Report**

**[Stream Sense- An Online Video Platform]**

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**Word Count: [1963]**

**[27/06/2023]**

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# **Motivation**

The rapid growth of the video consumption by users all around the world and the need for user friendly platform to share and explore all the available videos has motivated for the development of this particular project. As a Cloud Engineer, the goal is to develop a rapid scalable system that provides a seamless user experience and to ensure user data is highly secure. This project is motivated to build the gaps between user satisfaction and the data privacy, and to create a platform where user could share their creative content with robust backend functionalities.

Furthermore, the project aims to tap into immense potential of existing online video platforms like YouTube that has revolutionized the way people has to view and share videos online. In addition to YouTube, I have also got motivation from other video platforms like Vimeo, Daily motion. These platforms have created a specific environment for different kinds of content to be shared. I believe the project can bridge the gaps between the different platforms.

# **Aims and Objectives**

The main aim of the project is to develop an Online video Platform which allows user to Register, Login, manage profile, Set Video Preferences, upload videos, search and stream videos online.

The project may face challenges while,

* Ensuring security of data uploaded to the Bucket, and Encrypting the stored data.
* Integrating recommendation algorithm for personalised video content.
* Implementing advance search functionality on the stored video data.
* And during optimizing the platform for high scalability and availability.

# **Requirements**

The requirements include,

* Implementation of user authentication using login service.
* Managing session while traversing through the services internally.
* Encrypting password stored in database using hashing algorithm.
* Encrypting the object storage for the videos uploaded in the bucket for data security.
* Designing seamless user experience UI.
* Developing a good schema for database to store and manage both user data and video data.
* To implement the advanced search functionality algorithm to perform an advance search operation.
* And to design an algorithm to fetch user preference video type to show on screen when logged in.

# **Technical Specification**

There are multiple languages, tools, frameworks, cloud services involved in the development of the Online Video Platform project which I have described all of them below.

* Backend Development:

Java will be used as a programming language for the backend development, and spring-boot will be used as the development framework for developing efficient and scalable server-side infrastructure. The following are the planned webservices to be implemented in the backend and might change in the future to improve or improvise,

* POST: Registration
* POST: Login
* Session Management (as a header along with other services- session-id)
* POST: Preferences and GET: Preferences
* PUT: Update Profile
* PUT: Change Password
* POST: Upload Video
* GET: Home
* GET: Search Video
* PUT: Edit Video (meta-data)
* DELETE: Delete Video

The other algorithms or functionalities that are planned to be implemented as an internal flow between the services are,

* Advance Search
* Personalised Video Content for home page.

And other implementations include Exception handling both with built in exceptions and custom exception handling along with global error handling methods.

* Frontend Development:

Angular JS will be used for developing a modern user-friendly interface which provides seamless browsing through videos. Below are the key components and functionalities that are planned to be implemented in the project.

* User Registration and Login Page to securely login to the platform.
* Home Page which shows engaging personalised video content.
* User Profile page to update preferences and manage user data.
* Video upload page to allow user to add video to the platform along with video meta-data.
* Video Search component in the home page which allows user to search and stream videos.
* Error Handling and validations to handle errors that are received from the backend functionalities.
* Integration with Backend Restful Services to fetch and display data to the user.

There is always room for improvement, will implement additional functionalities whenever and wherever possible.

* Storage:

Ensuring efficient handling of data is important to design a scalable efficient system and below are the functionalities that are planned to be implemented in current design and some of the functionalities can be implemented when scaling is necessary.

* Object Storage: AWS S3(Simple Storage Service) will be used as primary storage for video content. Videos uploaded by user will be securely stored in S3 buckets providing us high scalable options, high durability and availability.
* User Data and Meta-Data Storage: AWS RDS (Relational Database service) with the MySQL Engine will be used to store user data, meta data and other necessary information. RDS offers a reliable and scalable system to handle data for efficient storage and data retrieval
  + - Some functionalities to scale the database in future to improve the platform are listed below,
      * + Read Replicas
        + Database Sharding.
* A Robust efficient Database schema will be designed in order to handle both user data and metadata. Robust schema is essential to implement advance search algorithms and generating personalised video content.
* Data Backup and Recovery: Regular Backups and Snapshots can be enabled when needed to protect data loss or system failures.
* Security:

Ensuring security of data, preventing unauthorised access and safeguarding the integrity of video uploaded to the Online Video Platform. Below are the security measures and functionalities that will be implemented in this project.

* User Authentication and authorisation: A robust mechanism to verify the identity of the users will be implemented, Username and password will be obtained during registration process and be verified with that during login. Authorisation to other services will be handled using session-id, which is a random id generated during login process.
* Password Protection and Encryption: Password will not be directly used or stored in the database. The password will be encrypted using hashing algorithm which is irreversible (i.e., password cannot be reverse engineered) and then stored in database. (Gauravaram, 2012)
* Video Encryption: The Videos uploaded will be stored in S3 and will be encrypted using SSE-KMS (Server-Side Encryption- AWS Key Management System). It is an encryption algorithm which can be used to encrypt objects stored in the S3 bucket along with keys generated by AWS.
* Regular Security updates and patching: The project will follow best security practices to update dependencies involved in spring framework and libraries with latest security features to mitigate any vulnerabilities.

# **Requirements Evaluation Plan**

The evaluation of the implemented functionalities of the Online Video Platform can be done as below,

* Deploying the war file in local server such as tomcat and check for database connectivity and logging activities.
* Using Postman for testing the backend services of types POST, GET, PUT, and DELETE for responses and error handling methodologies.
* Integrating the UI functionalities with backend services, to perform Unit test on each and every functionality tested.
* Using Cloud watch to monitor the activities carried out in S3 bucket which acts as our object storage for videos uploaded.
* Using MySQL Workbench to monitor the database changes done in AWS RDS which acts as our storage to user data and meta data.

# **Background Research and Reading list**

**Background Research:**

It is crucial to understand and conduct a thorough background research to understand various trends. Some of the key areas to explore are,

* Online Video Consumption Trends: To investigate the current trends in online video platform, that includes the rise of video streaming platforms with different content genres and personalised content.
* User Experience Design: To explore the best practices of user experience (UX) design suitable for the video platform, with intuitive navigation, response design and effective personalisation.
* Data Privacy and Security: To explore the best practices for ensuring the data security and privacy. Learning about encryption methods and technologies to be implemented along with the design.
* Recommendation Algorithm: To investigate the different recommendation algorithms used by different platforms to provide personalised content for the user such as collaborative filter, content-based filter, etc. (Badrul Sarwar)

**Reading List:**

Below are some Books and Online resources which gave me a clear understanding of everything I should be doing in this project.

* Spring Boot in Action: Written by Craig Walls, this book provides a clear understanding and efficient guidance that should be followed while implementing an application with spring-boot. (Walls, 2015)
* AWS Security Cook Book: Written by Heartin Kanikathottu, this book provides the methodologies involving encryption techniques in S3 bucket, which we use for video storage. (Kanikathottu, 2020)

# **Time-plan and Risk Plan**

To ensure the successful completion of the project Online Video Platform in the given time frame, I have established a detailed time frame. The time plan will outline all the activities are to be involved in each step.

Phase 1: Project Initiation (week-0 to Week-2)

* Defining Project Scope and Objectives.
* Initial Research and Requirement gathering.
* Identifying technologies and tools to be used.

Phase 2: Backend Development (Week-2 to Week-5)

* Setting up Development Environment
* Implementing User authentication and Session Management.
* Developing a Database Schema and Integrating with RDS.
* Implementing Video upload and storage functionality.
* Implementing Search and managing meta-data functionalities.

Phase 3: Frontend Development (Week-6 to Week-7)

* Designing and Developing User Friendly interface using Angular JS
* Integrating frontend with the backend services.
* Testing front end components.

Phase 4: Optimizing and Enhancements (Week-8)

* Optimizing platform for scalability and performance.
* Integrating recommendation algorithm and advance search algorithm for improving performance.
* Performing Unit testing.
* Thorough testing and Bug fixing.

Phase 5: Finalization and Documenting every process (Week-8 to Week-10)

* Conducting Final testing.
* Writing Report on every process carried out.
* Address any remaining issues and make necessary adjustments.

Risk Plan:

There is a study which states that only less than 10 percent of project are delivered on time in software industry. So, it is essential to have a risk plan to identify risky circumstances and mitigate it with a plan, below are some identified risks in the project,

* Risk: Compatibility issues may occur between different technologies and frameworks.

Mitigation: Conduct thorough study on the frameworks and technologies used before integrating.

* Risk: Data breach and unauthorised access to user platform.

Mitigation: Implementing Robust security measures such as encryption of passwords and video content.

* Risk: Delay in development due to unforeseen circumstances.

Mitigation: Regularly review project timeline and have contingency plan in place.

# **References**

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