**DESIGN AND IMPLEMENTATION OF A RESTFUL API FOR STREAMING SERVICE**

**BY**

**MOMOH OSAZE SAMUEL 20/0263**

**A PROJECT SUBMITTED IN PARTIAL FULLFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE B.SC (HONS) DEGREE IN COMPUTER SCIENCE.**

**TO THE DEPARTMENT OF COMPUTER SCIENCE SCHOOL OF COMPUTING AND ENGINEERING BABCOCK UNIVERSITY, ILISHAN REMO OGUN STATE, NIGERIA**

**APRIL 2023**

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**DECLARATION**

We declare that the project work,design and implementation of a restful api for streaming service was carried out by the following people:

NAME SIGNATURE / Date

MATRIC NO

                                                                                                                  NAME SIGNATURE / Date

MATRIC NO

NAME SIGNATURE / Date

MATRIC NO

**CERTIFICATION**

We hereby certify that the project was carried out by the underlisted student under the supervisor of the Department of Computer Science, School of Computing and Engineering Sciences, Babcock University, Ilishan Remo, Ogun State.

MOMOH OSAZE SAMUEL 20/0263

MOMOH OSAZE SAMUEL 20/0263

MOMOH OSAZE SAMUEL 20/0263

NAME OF SUPERVISOR DATE

NAME OF EXTERNAL EXAMINER DATE

NAME OF HOD DATE

DEDICATION

To

**ACKNOWLEDGEMENT**

In order to complete my thesis project as well as my thesis report, I’ve received much help and advice from several parties, which I would like to thank for all their valuable work. Thank you Netlight Consulting AB for making this thesis project possible. From the first day of the thesis project you’ve met me with nothing but kindness and helpfulness of which I’m very grateful. Thank you my three internship supervisors; Nil Lakavivat, Mia Clarke and Albin Carnstam at Netlight for all your guidance help throughout the thesis project. You are all a source of inspiration and great knowledge and I’m very grateful for having received all your help throughout this project. Thank you Mikael Malmström and Amanda Adolfsson for proofreading my thesis report and providing valuable feedback. Your help has made it possible for me to reach a higher level of quality within my thesis report. Thank you Professor Kristian Sandahl for taking on the role as thesis supervisor from LiU for my thesis project. Your guidance have been a great help when figuring out my thesis project approach as well as refining my thesis report. Finally thank you Professor HE Ting for taking on the role as thesis supervisor from HIT for my thesis project. Thank you for your help, guidance and feedback to make sure that my thesis fulfilled all the requirements of HIT

**Abstract**

In the last ten years, online video streaming has witnessed a remarkable surge in popularity, since it has become a great source of both entertainment and learning. This surge in popularity has led to demands for better streaming quality, adaptive service and lower buffering times based on the user's personal preferences. These demands and expectations, along with an ever-increasing amount of Internet traffic, have presented streaming service providers with a number of obstacles to solve.

A qualitative research and development project was conducted out as partial fulfillment for my bachelor’s degree. The project's goal has been to examine common methodologies, standards, and practices linked to building a functional streaming service. Based on the findings of these studies, the goal has been to develop and implement a proof-of-concept streaming server that meets the objectives and specifications of this research.

The conclusion from research has been that there are at least five crucial components that must be critically evaluated in order to successful implement a streaming service. These essential components are: the application programming interface (API), the data storage solution, the structure of the service system, the service hosting solution and the streaming module. The decisions for the project implementation were made based on the findings of examination of common design approaches for each essential component.

The resultant system was developed using an event-driven system architecture framework Node.js. A REST (representational state transfer) API has been built in other to handle client request routing. The resultant system has been deployed in a corporate-wide cloud-based server solution. For my data storage solution I implemented a non-relational database management system MongoDB. Lastly for the streaming module, support for HTTP-based multimedia streams has been implemented due to due to the many benefits brought on by using HTTP, which include its multi-platform support, cost effiency and bandwidth optimization.

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**CHAPTER ONE**

**INTRODUCTION**

In the early days of the Internet there was a belief that users should be able to obtain media content through this new medium [1]. There was also a notion that while getting this content, the users should not have to put it on hold for the complete file to be received before beginning to watch it. However, due to the Internet's collaborative effort, there were a host of difficulties that had to be addressed before offering this service to the end user. In order for the user to enjoy a lag-free video viewing experience, the apps had to be able to manage difficulties like network latency and fluctuations in available bandwidth. This meant that in order to provide maximum user experience, the streaming applications needed different methods to adapt to the ever-changing conditions of the Internet.

Many different video streaming solutions have been proposed and used over the last two decades. However, in the last couple of years, a heavily discussed topic within the streaming community has been Hypertext Transfer Protocol-based streaming. (HTTP-based) media streams [1] HTTP, which has been widely used to handle structured text transaction since 1990, the Internet has relied on a well-established network infrastructure of Servers and caches [4].  These infrastructures were built to handle large amounts of data by distributing the work load among its numerous servers, to handle Internet traffic quickly and efficiently.  The servers and caches employed are also generally inexpensive, making the architecture more cost-effective to scale when compared to other server types for data management [5]. These characteristics have been identified as very suited not just for managing text transactions but also digital content [6]. Many HTTP-based streaming solutions have been introduced over the last couple of years. In addition to these alternatives, the streaming industry has advocated for an open standard for HTTP-based streaming [7]. In response to this request, the Moving Picture Experts Group (MPEG) launched a project in 2009 to develop such a standard. The initiative involved MPEG representatives as well as representatives from several major media streaming companies. The name given to the project was MPEG Adaptive Dynamic Streaming over HTTP (MPEG-DASH).

1. **Background of the study**

In recent time  a lot of people have transition from using cable or satellite television provider and are now increasingly turning to the Internet for everyday news and entertainment.

The use of the Internet is experiencing exponential growth, and eventually everyone will be utilizing it in some capacity, whether for communication, online surfing, playing games, file-sharing, or entertainment.

It was projected that globally, consumer Internet video traffic would grow 4.3-fold from 2017 to 2022, a compound annual growth at a rate of 34% as well as reach 240.2 EB per month by 2022, the equivalent of 60 billion

DVDs per month, or 82 million DVDs per hour.

Today, video dominates internet traffic and is has risen more than tenfold in the last few years with video accounting for 40% of it. Users have grown used to individualized services as the amount of personalization on the internet has increased (e.g., interest-based advertising and targeted advertisements). When it pertains to watching videos, there isn't really much you can do as a consumer to personalise the contents apart from playing, skipping, and pausing the videos. User-generated content (UGC) platforms like YouTube and Vimeo have been a major boost to the video community's creatives. With the addition of 360-degree interactive video to YouTube, users are now able to control the content they are seeing and watch a replay from any angle they like. What if video content became more participatory, allowing users to influence an entire narrative or follow a particular character in a movie or TV show? Imagine as a child seeing Snow White and the Seven Dwarves and being offered the opportunity to follow the dwarfs instead.

Wouldn't that be an intriguing and pleasant experience? Interactive branched video (formally known as non-linear and multi-path video) which allowed the viewers to not only watch the video but have them play an

active role in deciding how a story will unfold