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Implementation of large scale video storage system over distributed system

Goutam Prabhakar Naik
naikgautam257@gmail.com
Don Bosco Institute of Technology, Bangalore, Karnataka

Abhishek Vinayak
nabhishekv@gmail.com
Don Bosco Institute of Technology, Bangalore, Karnataka

Goutama B. R.
gouthamgowda500@gmail.com
Don Bosco Institute of Technology, Bangalore, Karnataka

Brahmesh Jain M. A.
brahmeshjain97@gmail.com
Don Bosco Institute of Technology, Bangalore, Karnataka

Geeta S. H.
blh_geeta@hotmail.com
Don Bosco Institute of Technology, Bangalore, Karnataka

ABSTRACT

In a world of the greater number of installed Closed-Circuit Television (CCTV), high bandwidth requirements and larger memory consumption are major considerations when designing a video storage system. Closed-Circuit Television (CCTV) is the most useful technology used for security. Traditional file-systems will not help for the receiving and storage of large-scale video clips. Paper presents a large-scale video storage system used for storing and maintaining thousands of video clips. Characteristics of this system are the scale-out architecture design which allows the performance to grow by adding a greater number of the hardware.

Keywords— *Storage system, Large-Scale, Metadata, Video surveillance, Distributed system.*

1. INTRODUCTION

The video surveillance market was valued at $30.37 billion in 2016 and is projected to reach $75.64 billion by 2022, at a CAGR of l5.4% between 20l7 and 2022 [1]. As data continues to grow at a faster rate, the need for change in the design of video storage systems is growing. Therefore, there are practical needs to set up a video storage system to satisfy those needs.

This paper presents a large-scale video storage system that receives and stores thousands of concurrent video clips. It allows users to use erasure coding to adjust data redundancy 1evels. It allows setting time frequency to upload the video after every time span completion. It may be in hours minutes or seconds depending on the need. The main aim of this work is:

- Design and implement a video storage system that can handle thousands of video clips concurrently.
- A network-based data striping strategy to achieve high throughput and high reliability.
- Storage of metadata in DB and on disks allows the system to scale to PB-level which is helpful in the Big Data environment.
- When greater hardware requirements are needed instead of adopting new hardware, we can use cloud resources to store the video clips.

2. RELATED WORKS

There is some previous work on the storage of video clips, but to the best of our knowledge, the problem of receiving and storing high concurrent videos clips into a PB-scale storage has not been mentioned in any of the literature. In recent years, governments have disconcerted smart city initiatives, leading to more cameras are fixed and coupled to the network. Rodríguez-Silva et.al. [2] figured a video surveillance system based on Cloud Computing that can securely store video clips in the cloud storage provider Amazon S3 [3]. Keeping data stored in the cloud is arguably for a situation, sensitive information should never be put in public clouds, where security measures are in place.

Wang et al. [4] presented a framework for efficiently storing and browsing of surveillance video clips based on video synopsis. The paper prominence on video analytics in place of video storage.

CANDELA [5] is a work that focuses on the blending of video content analysis into a storage and retrieval system to support fast search like vsStor, CANDELA stores video clips and metadata separately, however, and it is not modelled to scale out to a huge dataset.

DPPDL [6] is an energy efficient video surveillance storage system that dynamically allocates the storage space with an appropriate degree of partial parallelism according to performance requirement. However, for a large-scale live video storage system, the number of disks that have the chance to spin down is limited.

3. DESIGN

3.1 System architecture

It is built on hardware and consists of multiple nodes act as clients and/or servers. (Figure 1)

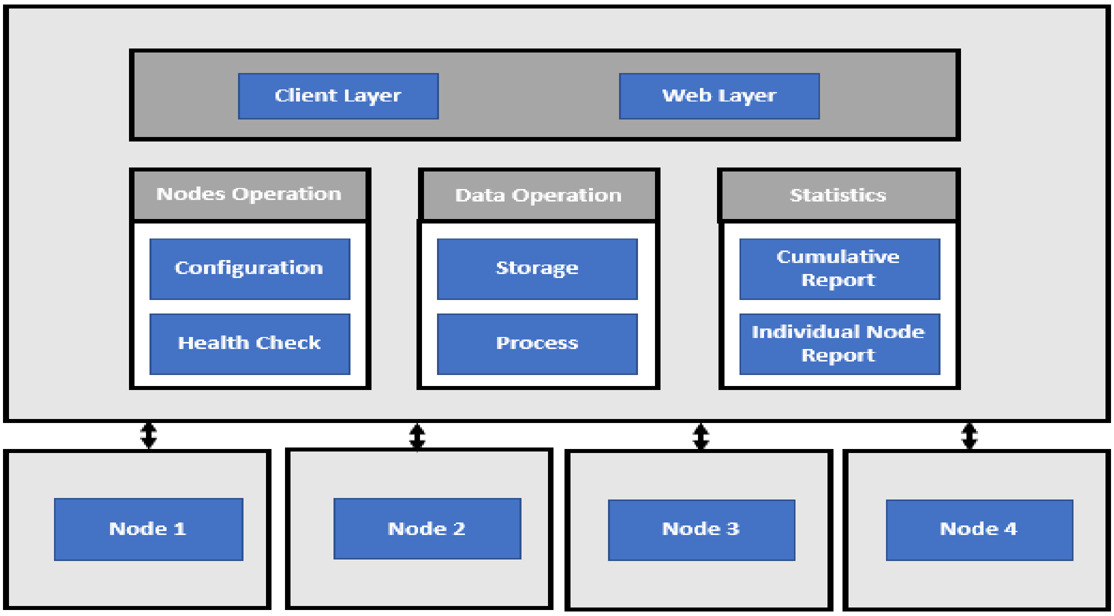

Fig. 1: System architecture

3.1.1 Nodes configuration: Here, the end users will be provided with the capabilities of adding any number of nodes to the system. A node is basically a server (computer) with hardware storage. The video streams will be stored on these nodes. Advantage of this module is that, whenever the storage space is running out in the nodes, the users can always extend the storage space by simply adding a new node

3.1.2 Nodes health check
This module allows the users to remotely check the health status of a node. This helps the user to find out if the remote node is working fine or corrupted for some reason.

3.1.3 Video input stream: Here, the end users can provide an input video stream to our application. Our application receives this video stream and stores the stream in some node (based on storage space available). The input video stream can later be integrated with a CC camera kind of things so that the input is given automatically.

3.1.4 Process video stream
Here, the end users can interact with any of the stored video streams. They can perform operations on the video streams like watching it, downloading it, and delete it.

3.1.5 System statistics
Here, the end users will be provided with the usage statistics reports like

- The maximum storage capacity of a node
- Amount of storage space used
- Amount of storage space available

3.2 Flowchart
The working of the design is shown in this flowchart step-by-step.

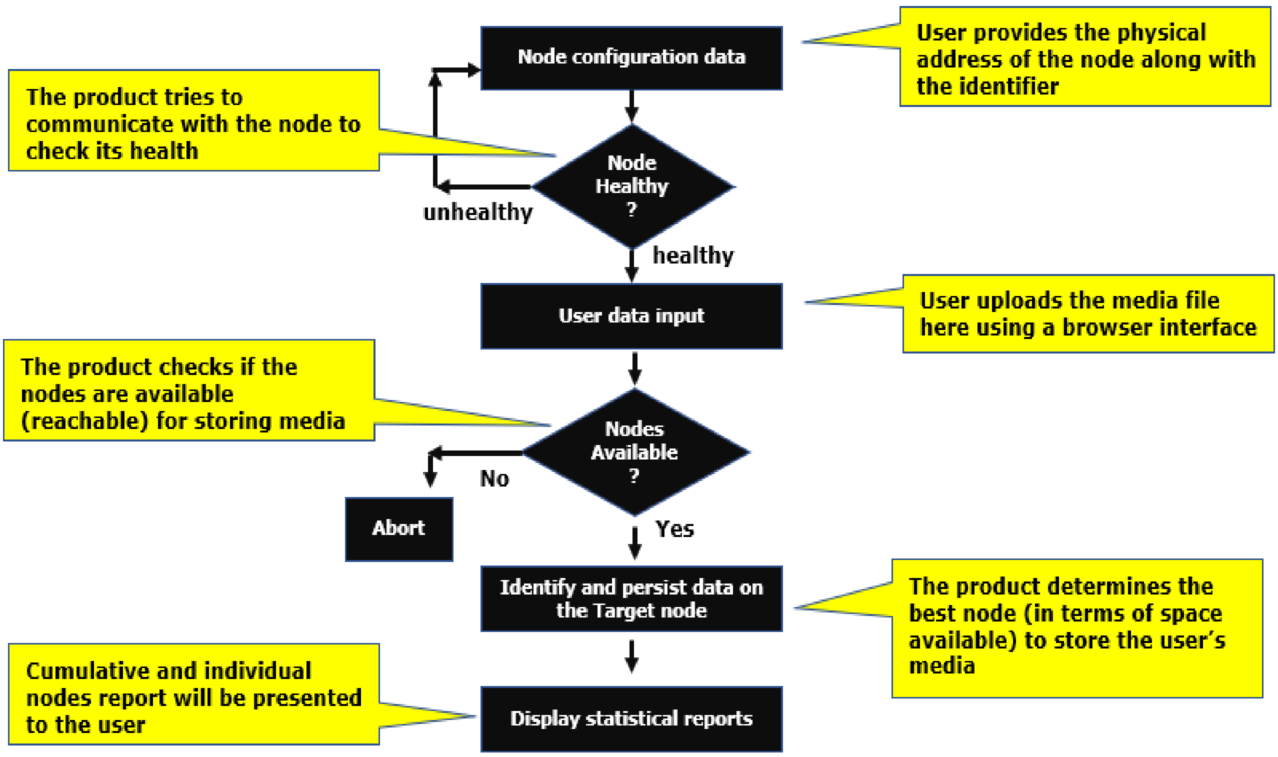

Fig. 2: Flowchart

4. IMPLEMENTATION

This project consists of over 6000 lines of Java code, excluding code borrowed from open source projects. MySQL database is a widely used, free relational databases. We store a subset of metadata for the fast response. HTML code is split from java code.

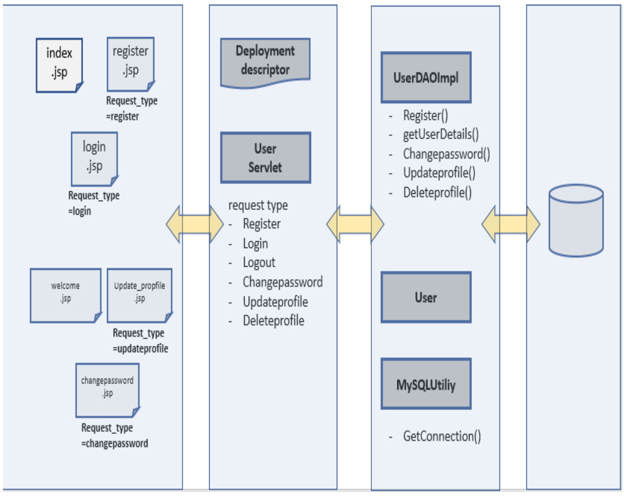

Fig. 3: Implementation

5. EVALUATION

There are 6 modules

5.1 Implementation of vs-Node

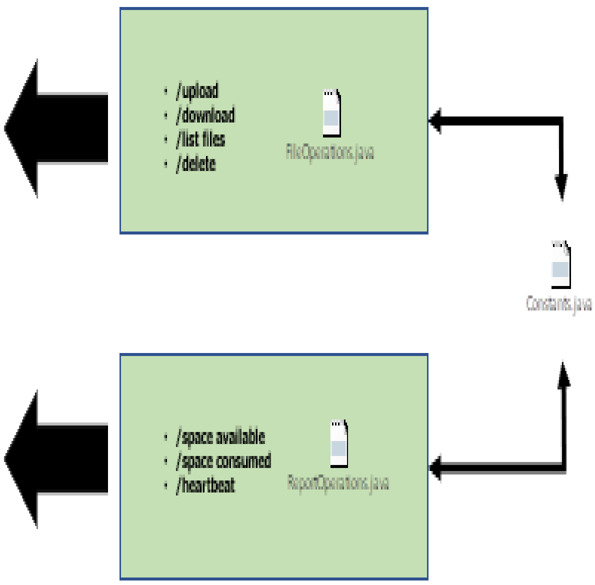

Fig. 4: Implementation of vs-Node

5.2 User account operations

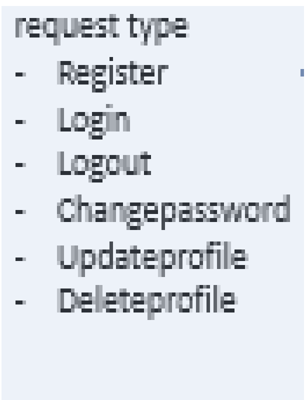

Fig. 5: User account operations

5.3 Configuration and health check of vs-Node

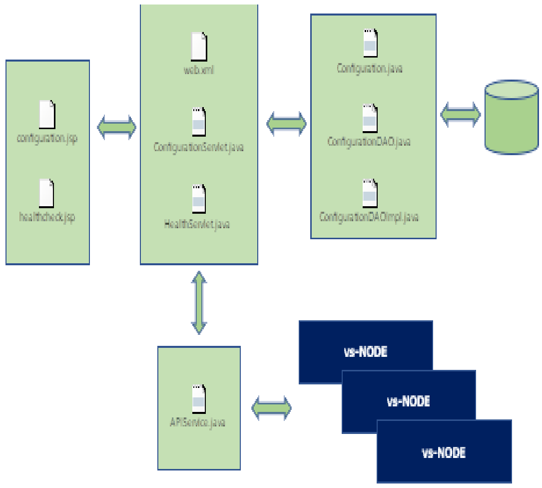

Fig. 6: Configuration and health check of vs-Node

5.4 Videos upload module

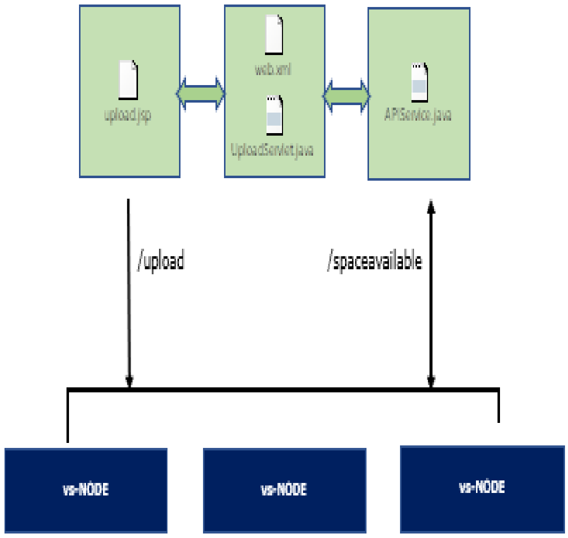

Fig. 7: Videos upload module

5.5 Videos access module

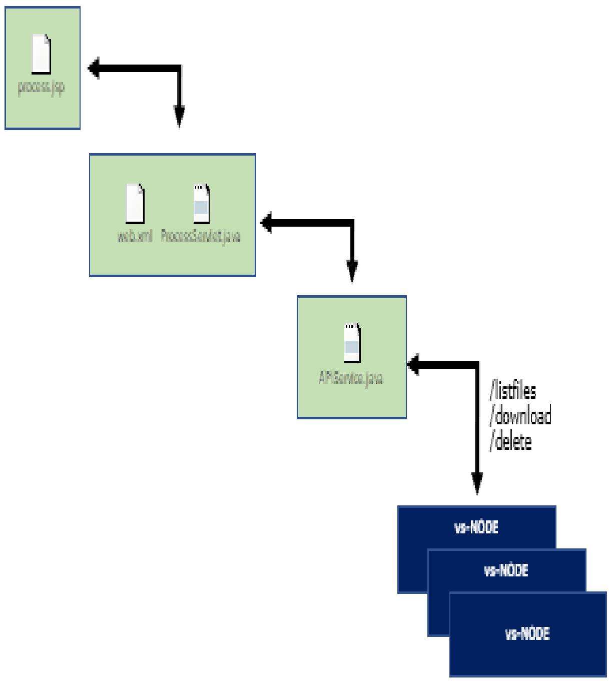

Fig. 8: Videos access module

5.6 Statistical reporting module

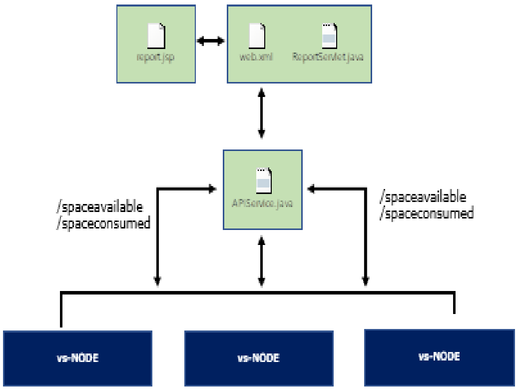

Fig. 9: Statistical reporting module

6. RESULT

Horizontally scalable. Hence the storage space literally won't run out of memory. Network bandwidth not compromised. To provide an ability for the users to scale the system horizontally when needed. To provide an ability to the users to know the health information of each of the machines in the cluster.

7. CONCLUSION

We proposed the design and implementation of the large-scale video storage system, a web service-based storage system used for storing largescale surveillance data. The large-scale video storage system is capable of simultaneously receiving and storing thousands of video streams. Another major characteristic is the scale-out architecture design which allows the performance to grow by adding more hardware.

8. REFERENCES

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