An Architecture for Video Surveillance Service based on P2P and Cloud Computing

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Outline

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INTRODUCTION

• For traditional distributed Video Surveillance Services, each video catcher will store its streaming data to server.
• It will create a great volume of data daily.
• In this paper, we propose a novel architecture based on well-developed peer to peer technology and emerging cloud computing for solving the issues.
• In this paper, we propose a novel architecture based on well-developed peer to peer technology and emerging cloud computing for solving the issues.

• The architecture exploits inherent characteristics of P2P and Cloud computing to provide an economic, scalable, reliable and efficient approach to store video data.
A. Hadoop

• The Apache Hadoop is a framework that allows distributed processing for large data sets across clusters of computers using a simple programming model.

• Hadoop is built up by two important parts, Mapreduce and Hadoop File System (HDFS).
• In the *Hadoop File System (HDFS)*, *it provides global* access to files in the cluster and is implemented by two kinds of node; the Name Node and the Data Node.
B. Surveillance System

• In this paper, we apply the data placement concept of Hadoop file system to provide fault tolerant and efficient video access and apply P2P technology to improve the scalability, reliability, robust, and server cost.

• Therefore, integrating both Hadoop concept and P2P technology can solve many issues of surveillance system.
A. System Architecture

• The proposed system has two kinds of node.
• One is Directory Node (DN) which is responsible for managing all FEs, but does not keep all video data.
• The other is Peer Node (PN) which is responsible for storing the video data using P2P technology.
• In the Hadoop concept, a piece of data generally has three replicas.
  1. Primary PN (P-PN)
  2. Secondary PN (S-PN)
  3. Secondary PN (S-PN)
B. Components and Functionality

- **Directory Node (DN):** The node provides the centralized directory services.
- It contains following components: Authenticator Module (AM), Replica Manager (RM), Replica Scheduler (RS), and a DN Database for the directory of whole system.
• Primary Peer Node (P-PN): The Primary Peer Node gets video data from FE directly.
• Video Dispatcher is responsible for transmitting and storing video data into its RG currently.
• The Video Dispatcher will store the caught video into local storage and deliver it to two replicas (S-PNs).
• The RM is to communicate with the RM of DN and other PNs for authentication and getting associated information of SPN.
• Secondary Peer Node (S-PN): Undoubtedly, an S-PN of a RG is also a P-PN of another RG.
C. Operation Flow

1. Peer Node Registration (UID, Peer Node Group, Bandwidth)
2. PN GetAuthentication
3. PN Authentication Response
4. Peer Node Registration Response
5. Get Secondary Peer Nodes
6. Get Replica Request
7. Check the PNs’ State
8. Get PNs’ State
9. PNs’ State Response
10. Add into Scheduler
11. Authentication Key Request
12. Authentication Key Assigning
13. Send PNs Authentication Key
14. Key Storing
15. Response Secondary Peer Nodes
16. Key Storing
17. Create Peer Node Channel with Key
18. Check Authentication
19. Prepare Video Receiving
20. Authentication Result
21. Prepare Video Transmitting
22. Digital Video Input
23. Video Transmitting
IMPLEMENTATION ISSUES

A. Peer Node State

• Here, we present some information and states inside a PN used for PN selection and video data access.

• The information comprises of peer node state contains the Unique ID, the peer node group, bandwidth, peer node’s replica state, authentication key and authorized state.
B. The PNs Scheduler in Video Recording

• We utilize the same replication scheme with Hadoop-like file system to store video data.

• When a PN registers itself into the DN, it will be grouped together with other PNs (replicas) using our PN scheduling algorithm that provides a lookup service which according to the Peer Node’s storage space state and bandwidth.
CONCLUSION AND FUTURE WORK

• In this paper, we have proposed an architecture for video surveillance service by integrating P2P and hadooplike file system technology.

• Adapting P2P is used for connecting with each PN and storing video data to replicas.
• It can improve scalability, cost and efficiency, while Hadoop is to improve reliability and efficiency.
• In the future, we want to implement the system to various embedded platform; and turn and evaluate the performance of the system.