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

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Outline

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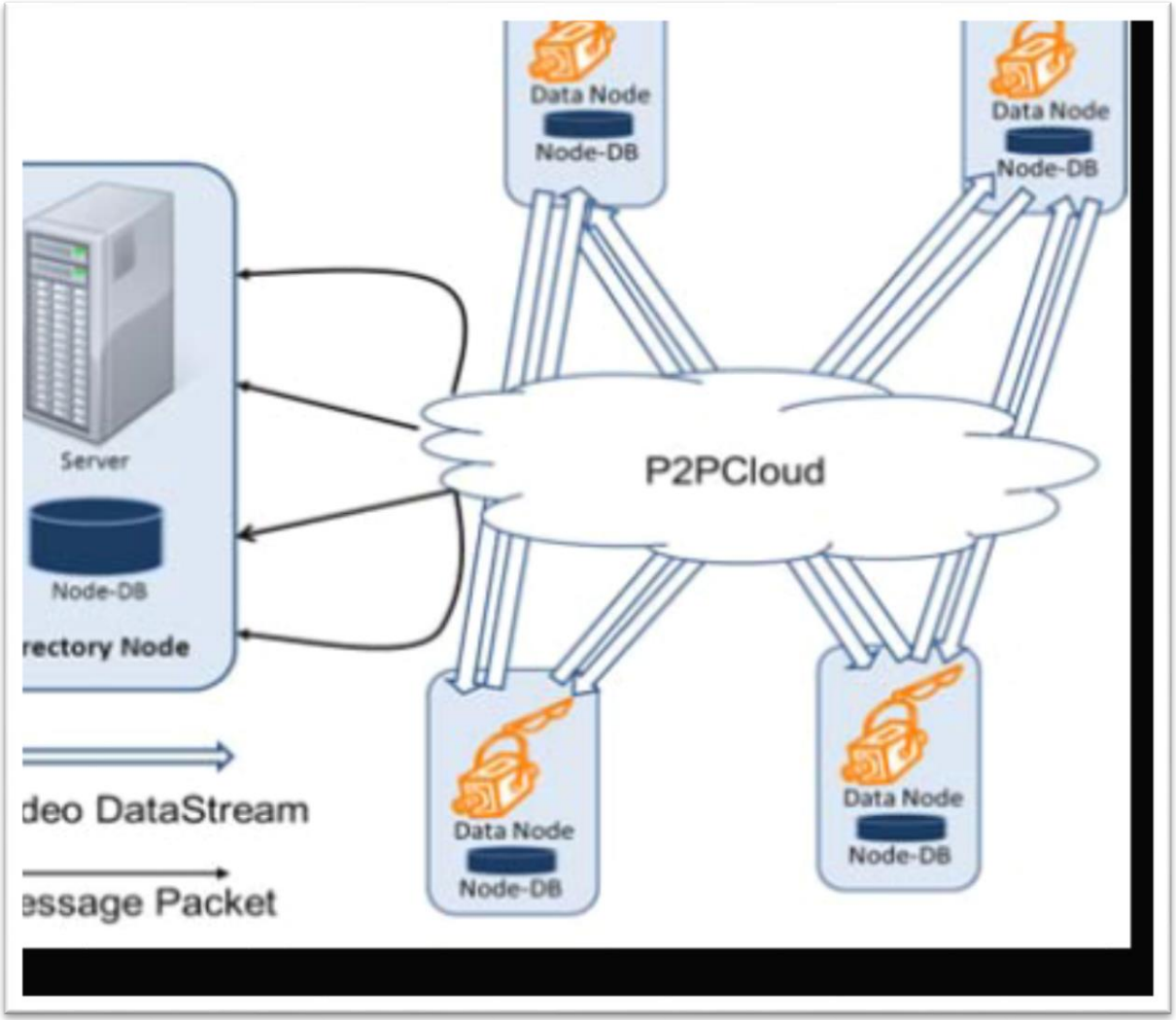
- BACKGROUND AND RELATED WORK
- SYSTEM DESIGN
- IMPLEMENTATION ISSUES
- CONCLUSION AND FUTURE WORK

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.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Data Node
Node-DB
Data Node
Node-DB

BACKGROUND AND RELATED WORK

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.

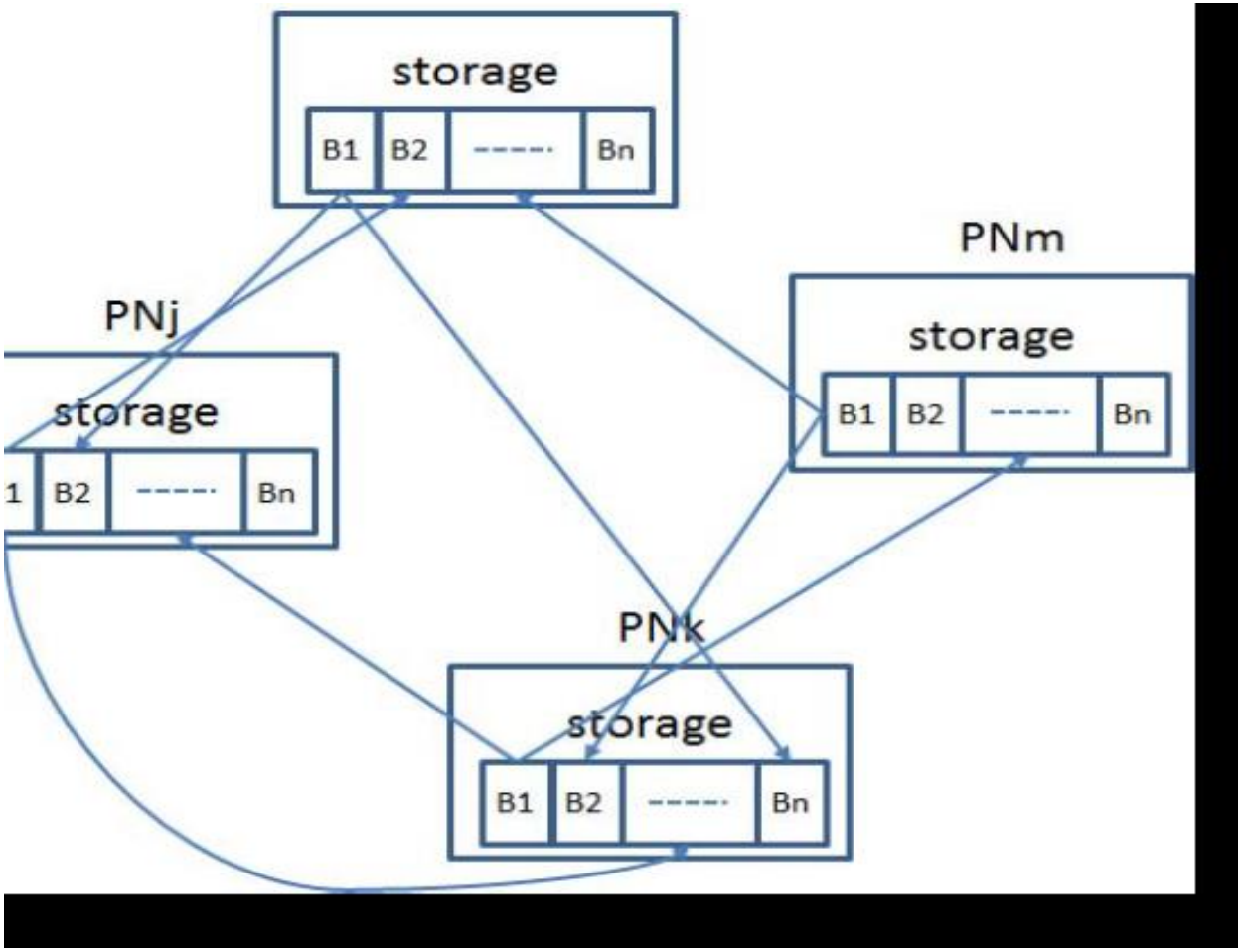
SYSTEM DESIGN

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)*

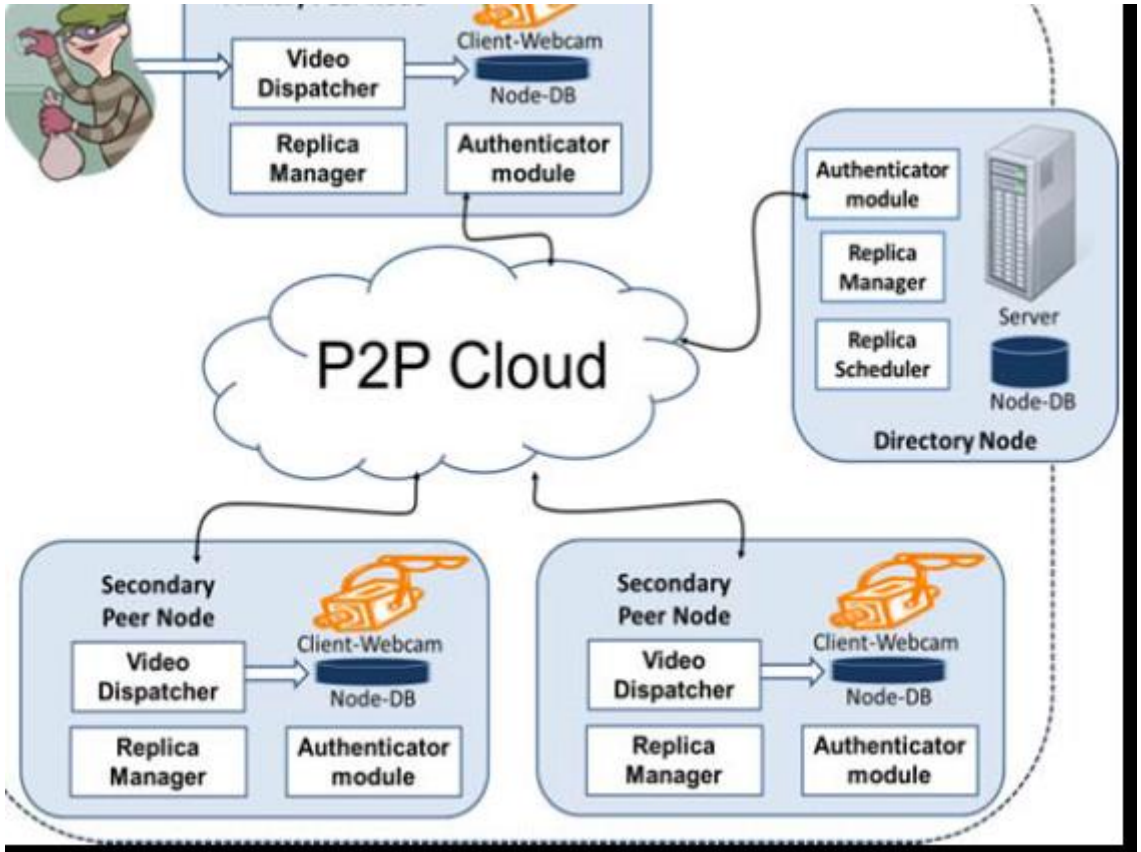

storage
B1
B2
Bn
PNm
storage
B1
B2
Bn
PNj
storage
1
B2
Bn
PNk
storage
B1
B2
Bn

B.Components and Functionality

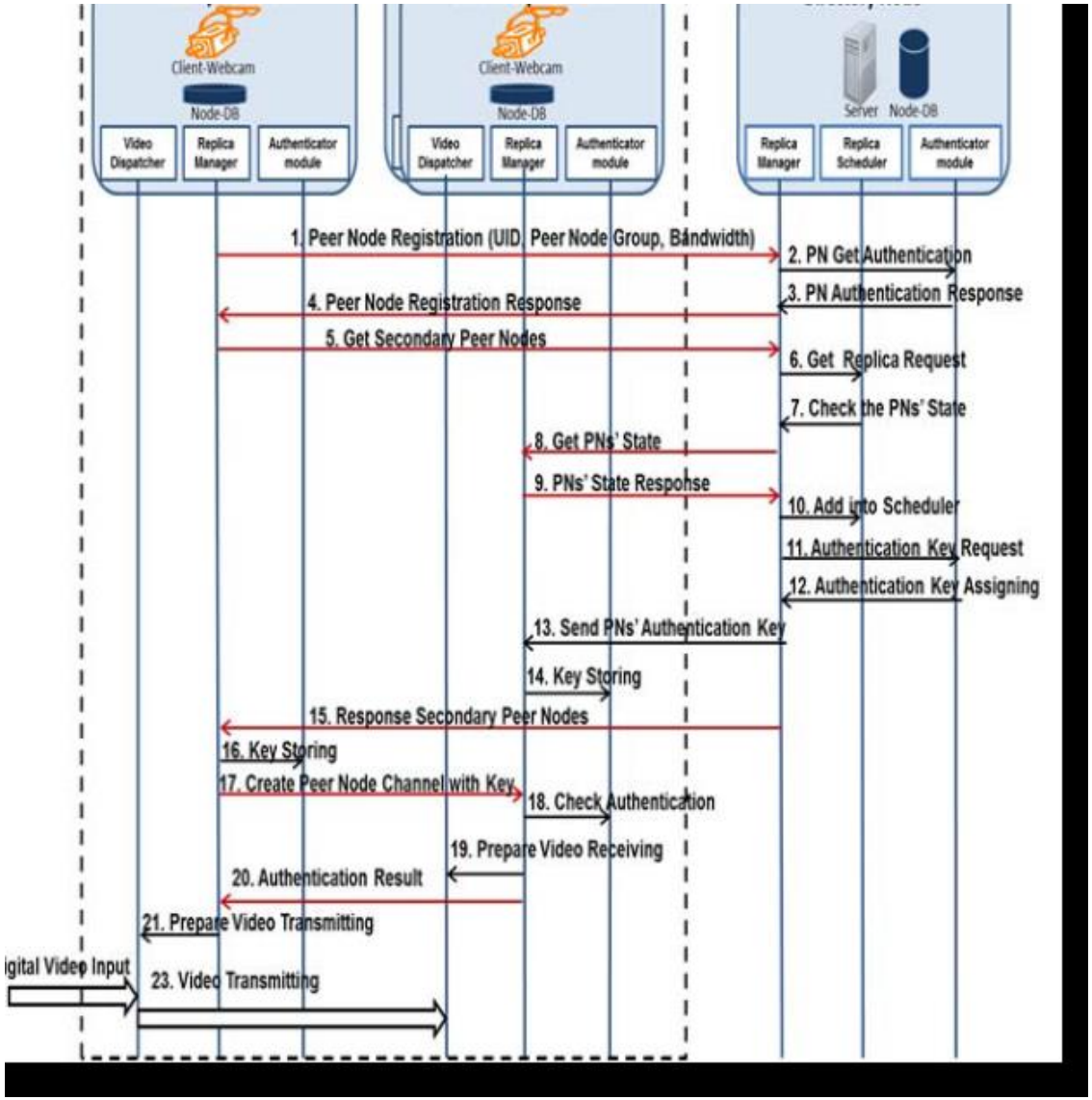
- *Directory Node (DN): The node provides the* centralized directory services.
- It contains following components: *Authenticator Module (AM), Replica Manager (RM), Replica Scheduler (RS), and a DN* Database for the directory of whole system.

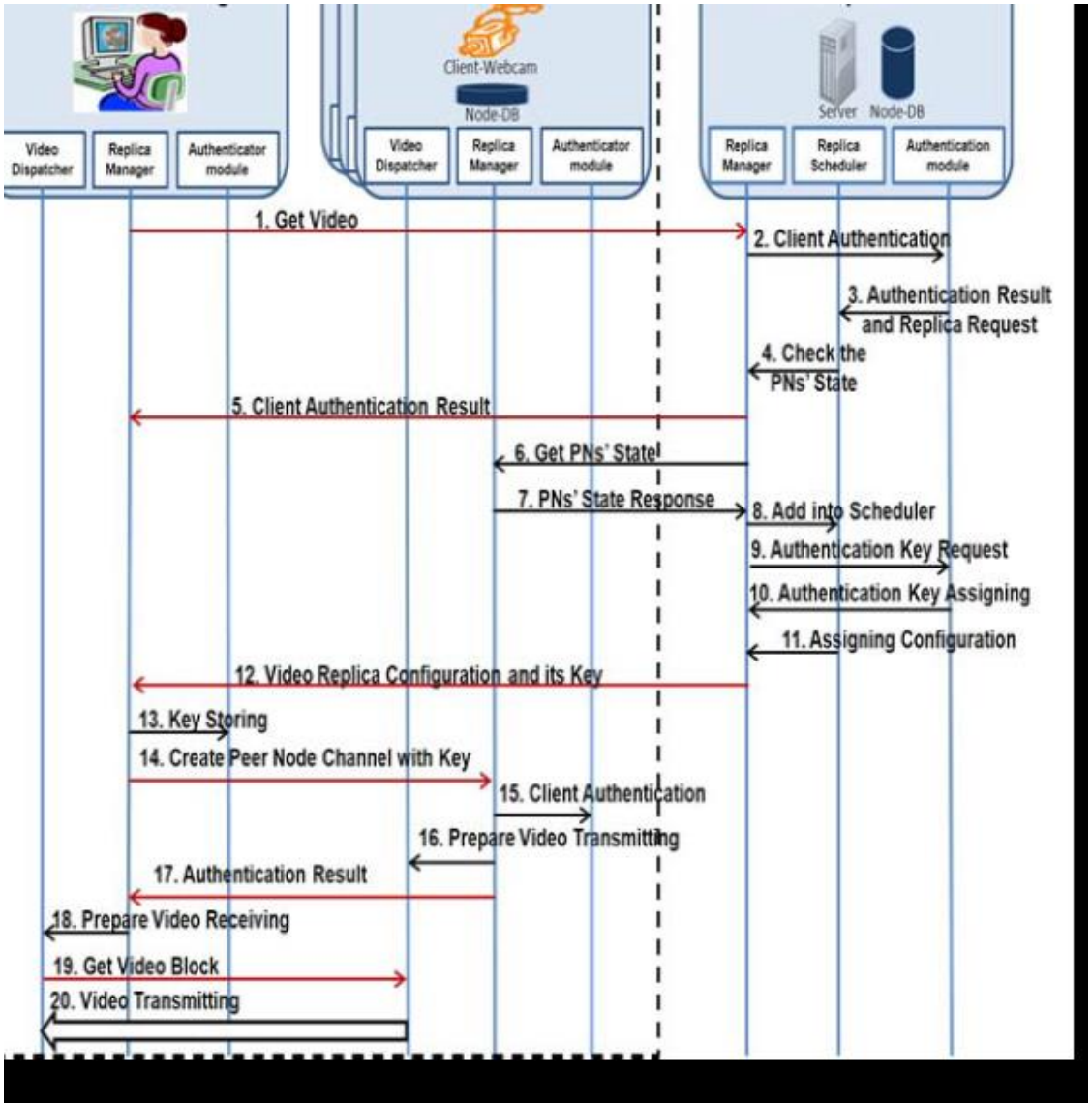
- Primary Peer Node *(P-PN): The Primary Peer Node* gets video data from *FE directly.*
- Video Dispatcher is responsible for transmitting and storing video data into its *RG currently.*
- The Video Dispatcher will store the caught video into local storage and deliver it to two replicas *(S-PNs).*

- 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.*


Video Dispatcher
Client-Webcam
Node-DB
Replica Manager
Authenticator module
P2P Cloud
Authenticator module
Replica Manager
Replica Scheduler
Server
Node-DB
Directory Node
Secondary Peer Node
Video Dispatcher
Client-Webcam
Node-DB
Replica Manager
Authenticator module
Secondary Peer Node
Video Dispatcher
Client-Webcam
Node-DB
Replica Manager
Authenticator module

C.Operation Flow




Client-Webcam
Node-DB
Server
Node-DB
Video Dispatcher
Replica Manager
Authenticator module
Video Dispatcher
Replica Manager
Authenticator module
Replica Manager
Replica Scheduler
Authentication module
1. Get Video
2. Client Authentication
3. Authentication Result and Replica Request
4. Check the PNs' State
5. Client Authentication Result
6. Get PNs' State
7. PNs' State Response
8. Add into Scheduler
9. Authentication Key Request
10. Authentication Key Assigning
11. Assigning Configuration
12. Video Replica Configuration and its Key
13. Key Storing
14. Create Peer Node Channel with Key
15. Client Authentication
16. Prepare Video Transmitting
17. Authentication Result
18. Prepare Video Receiving
19. Get Video Block
20. 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 *Hadooplike* 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.