

Video Data Security Sharing Transmission Mechanism and Best Practices in Cross-Domain Scenario

Xudong Shao
*Department of Information Security Technology, The
Third Research Institute of the Ministry of Public Security,
Shanghai, China*

Bo Yang
 <http://orcid.org/0000-0001-7710-3479>
*Computer Network Information Center, Chinese Academy of
Sciences, Beijing, China & University of Chinese Academy
of Sciences, Beijing, China*

Zhijie Fan
 <http://orcid.org/0000-0003-3578-7889>
*Department of R&D Center, Shanghai Chenrui Information
Technology Company, Shanghai, China & Department*

*of Information Security Technology, The Third Research
Institute of the Ministry of Public Security, Shanghai, China*

Deyang Qu
*Operation and Maintenance Department, Institute
of Information Technology of National Immigration
Administration, Beijing, China*

Weichao Hu
*Division of Research Management, Research Institute for
Road Safety of the Ministry of Public Security, Beijing,
China*

Shijun Xu
*Department of Science and Technology, Traffic Police
Detachment of Nantong Public Security Bureau, Nantong,
China*

Received: June 5th, 2025 | **Accepted:** March 16th, 2026

ABSTRACT

High real-time mobile video stream cross-domain secure transmission and sharing has become a research focus in the field of high-performance and secure communication. In this study, a more efficient method based on combining a zero-copy model with a one-way light transmission mechanisms is proposed. The method contains an effective integrated framework and layered design structure. The latest PF_RING (9.0.0) zero-copy model, memory routing table, multi-queue multi-threading, and related technologies are comprehensively combined to ensure the high-performance cross-domain secure transmission and sharing of video streams. At the same time, to ensure the safe transmission of shared mobile video data between different network domains, both a mobile video surveillance data transmission model and an anti-storage-based covert channel model are proposed. The experimental results show that the performance of the proposed method has increased by at least 10% in throughput, central processing unit utilization, and bit error rate.

KEYWORDS

Video Surveillance Network, Mobile Video Stream Data, Cross-Domain Secure Transmission and Sharing, Zero-Copy Model, Anti-Storage-Based Covert Channel

INTRODUCTION

In recent years, video surveillance technology has emerged rapidly along with the development of computers, networks, the Internet of things, big data, cloud computing, and other technologies. As intelligent network video surveillance becomes more popular, video surveillance system will

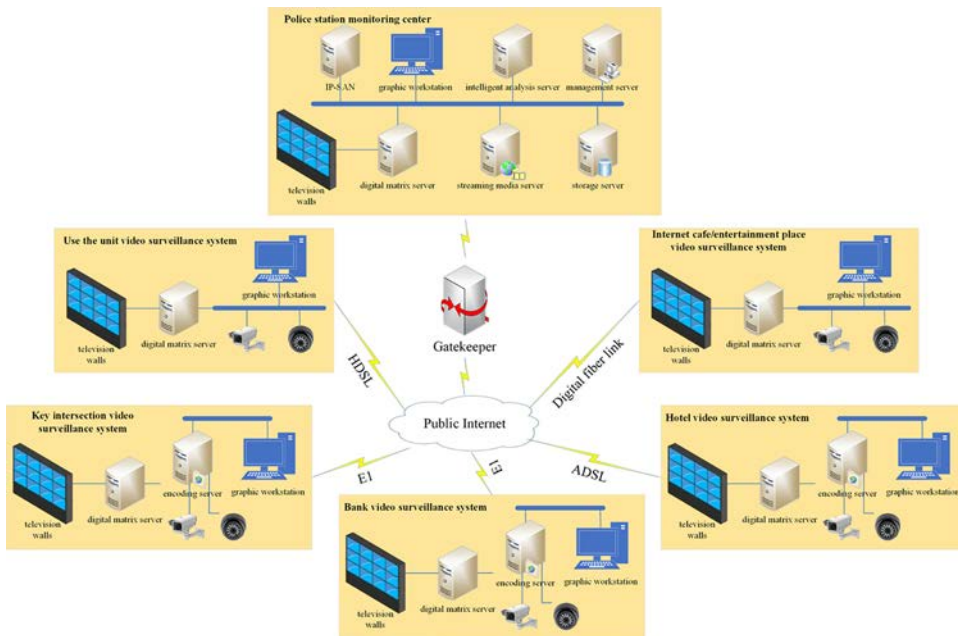
DOI: 10.4018/IJISP.405407

This article published as an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited.

continue to see exponential growth. According to a report by MarketsandMarkets, a market research and consulting firm in the United States, the global network monitoring market size was estimated to be approximately US\$1.67 billion in 2017 and US\$1.82 billion in 2018, respectively. Due to the gradual rise in network complexity and security issues, the video surveillance market reached US\$2.93 billion in 2023. The video surveillance market is expected to grow to US\$76.4 billion by 2027, with a compound annual growth rate of 9.4% between 2022 and 2027.

Video surveillance network systems integrate aspects such as network communications, video coding, computer processing, and software management. Figure 1 illustrates a typical video surveillance network system structure.

Figure 1. Structure of a Typical Video Surveillance Network System



Video services involved in Safe City include bayonet monitoring, key-area video surveillance, drone aerial photography, and emergency command video return. Due to different transmission and deployment modes within each service, it is necessary to integrate the heterogeneous networks carrying different services, synchronize the display on the unified application platform in the command center, and centralize the scheduling and management of video images from different networks.

From the perspective of video service traffic, despite the use of advanced H.265 encoding technology, the widespread deployment of high-definition video cameras and multi-angle monitoring in high-density core areas will still lead to a significant increase in the bandwidth demand of the access network. Stored video resources are often shared between multiple departments. The network must have the ability to carry bursty large bandwidth services when faced with concurrent multi-channel video retrieval, video download, video big data analysis, and other applications. This puts forward new challenges to the forwarding performance of network equipment, cache capacity, and network reliability (Cao, Fan, et al., 2024; Chen, Yang, et al., 2016; Collins, Lipton, et al., 2000; Kalbo, Mirsky, et al., 2020; Wu, Wang, et al., 2016).

27 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/video-data-security-sharing-transmission-mechanism-and-best-practices-in-cross-domain-scenario/405407

Related Content

Digital Forensics in Distributed Environment

Asha Josephand K. John Singh (2018). *Handbook of Research on Network Forensics and Analysis Techniques* (pp. 246-265).

www.irma-international.org/chapter/digital-forensics-in-distributed-environment/201614

Malware Detection by Static Checking and Dynamic Analysis of Executables

Deepti Vidyarthi, S.P. Choudhary, Subrata Rakshitand C.R.S. Kumar (2017).

International Journal of Information Security and Privacy (pp. 29-41).

www.irma-international.org/article/malware-detection-by-static-checking-and-dynamic-analysis-of-executables/181546

Sssh... AI Is Listening: Surveillance, Trust, and the Privacy-Personalization Paradox in Social Media Marketing

Shlok Manish Nayyarand Rahul Khurana (2026). *Surveillance, Trust, and the New Politics of Digital Marketing* (pp. 99-120).

www.irma-international.org/chapter/sssh-ai-is-listening/411645

A Tweakable Key Alternating Lightweight Cipher for Internet of Things

Mary Shamala L., Zayaraz G., Vivekanandan K.and Vijayalakshmi V. (2020).

International Journal of Information Security and Privacy (pp. 113-133).

www.irma-international.org/article/a-tweakable-key-alternating-lightweight-cipher-for-internet-of-things/262089

Unlocking the Power of Software-Defined Networking (SDN) in Revolutionizing Network Management

Manasa Kulkarni, Bhargavi Goswami, Joy Pauloseand Lavanya Malakalapalli (2025). *Advanced Cyber Security Techniques for Data, Blockchain, IoT, and Network Protection* (pp. 309-336).

www.irma-international.org/chapter/unlocking-the-power-of-software-defined-networking-sdn-in-revolutionizing-network-management/363032