

Response to RFI

Technologies for Addressing Issues Associated with Unauthorized File Sharing on the University and College Campus

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1 Introduction

Vobile's VideoDNA™ represents the state-of-the-art in fingerprinting technology for video identification. Not only does VideoDNA™ technology provide an extremely accurate and effective solution to video identification, but it is also designed and built to be a highly scalable system. In the recent Content Recognition Study by the MPAA and MovieLabs that evaluated fingerprinting technologies from 13 vendors, Vobile's VideoDNA™ system excelled in both accuracy and scalability; it achieved zero false positive and very low false negative, and was found "massively scalable".

To date, Vobile has deployed VideoDNA™ systems and services in a number of application areas, including identifying and filtering copyright infringing content as well as tracking content distribution on the Internet. Vobile looks forward to the opportunity to work with colleges and universities for identifying, tracking, and managing unauthorized content distribution on the campus networks.

1.1 Features of the Technology

Vobile's VideoDNA™ technology falls into the category of "Matching, Screening and Filtering". It can be deployed on a client machine, a server machine, or over a network for video identification. In this response to RFI, description and discussion focus on the network deployment scenarios.

1.1.1 Network Architecture

For network deployment, Vobile provides an appliance known as the "Packet Video Inspector" (PVI). The PVI can be considered a DPI (Deep Packet Inspection) component that can be integrated with other network equipment such as a switch (see Figure 1). In a typical deployment, the PVI is not placed in-line; therefore, it will not cause latency to the normal network traffic. The PVI relies on a frontend network device to forward to it traffic of interest. It then extracts content signature and queries a database for identification, and notifies the frontend device the match results. The frontend device can enforce policies (e.g., filtering) based on the match results and the business rules associated with the identified content.

1.1.2 Scalability

In current trial deployment, the frontend device is a 10 Gbps switch, and a single PVI appliance can process 200 Mbps traffic that is forwarded to it from the frontend device. Because the frontend device does not wait for identification results, the PVI has no impact on the network latency.

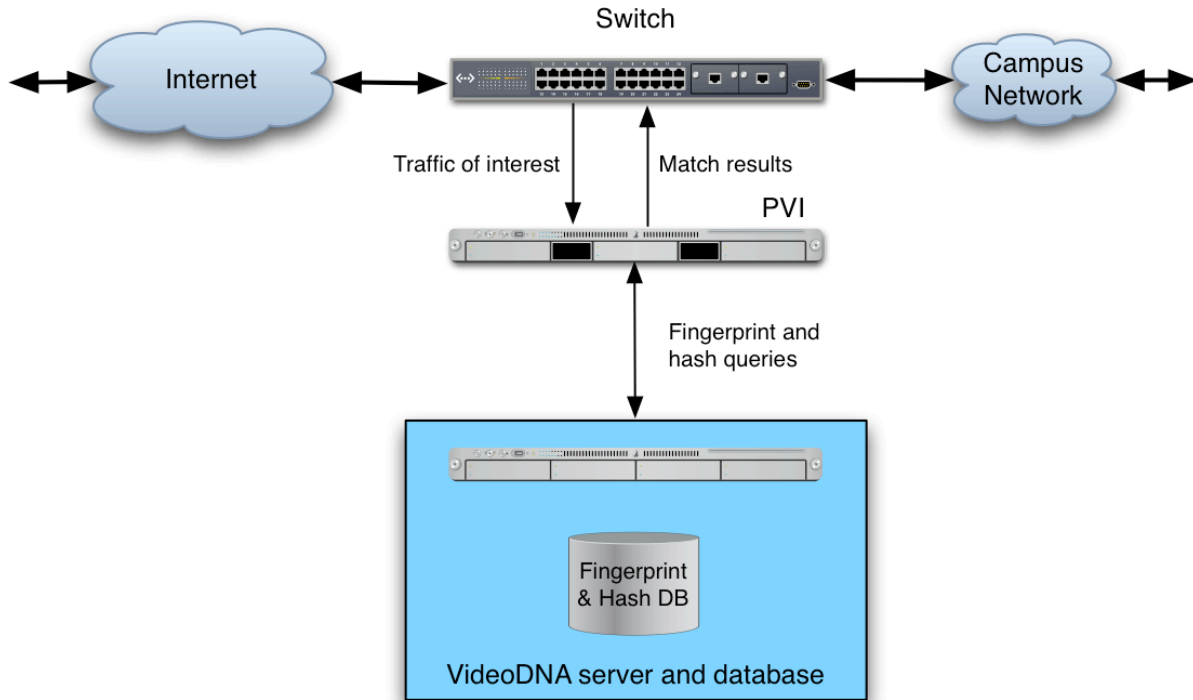


Figure 1: Network architecture for Packet Video Inspector (PVI) deployment.

1.1.3 Protocol Identification

The PVI relies on the frontend device for protocol identification and forward to it the traffic of interest for content identification. There are many products on the market that can be chosen as the frontend device that performs protocol analysis and identification.

1.1.4 Granularity of Protocols

Again, the PVI relies on the frontend device for protocol identification and forward to it the traffic of interest for content identification. The PVI does not process control messages or other type of data that is not video or audio content.

1.1.5 Product Configuration and Installation

The PVI is a plug-and-play appliance that can be integrated into a network with minimum installation and configuration time. Depending on the network setup, zero downtime is achievable for PVI installation and maintenance.

1.1.6 Content Identification

The PVI can identify compressed video and audio in common formats (e.g., mp3, mp4, AVI, mpg). It performs identification by extracting signature data from the content and querying it against a database. The signature data can be a hash in fixed length, or

fingerprint in variable length. When a positive identification is made through either hash or fingerprint, metadata as well as business rules associated with the identified content are sent to frontend device. Vobile maintains a hash and fingerprint database that is updated constantly with new ingest from content owners and their agents or affiliates.

1.1.7 Examination of Network Packets or File Content

The PVI employs Vobile's VideoDNA™ technology for content identification. To compute VideoDNA™ fingerprint, the PVI needs to reassemble and decode the audio and video content from the network packets.

1.1.8 Distribution Systems

The VideoDNA™ technology is applicable to content identification in most if not all distribution systems. However, current PVI implementation can inspect content that is distributed in the BitTorrent and HTTP protocols. Support for additional protocols will be added incrementally.

1.1.9 Resilience of the Technology to Countermeasures

The PVI can inspect all and only clear data (non-encrypted).

1.1.10 Testing and Installed Base

The PVI has not been commercially deployed. It is being tested by Vobile along with our ISP and network equipment partners.

1.1.11 Competitive Approaches

Current products on the market for content identification on the network are either pure hash-based or using only audio fingerprints. Vobile's solution uses both audio and video fingerprints for higher accuracy, and integrates both hash and fingerprint based identification for better scalability.

1.1.12 Third-Party Components

The PVI is expected to be integrated with a third-party frontend device for protocol identification and forwarding the traffic of interest for content identification. There are many products on the market that can be chosen as the frontend device to be integrated with the PVI.

1.1.13 Comparison with Hypothetical Scenario

Here is a hypothetical scenario of using Vobile's PVI and VideoDNA™ system on a college campus network.

- A user is downloading a pirated movie using BitTorrent client.
- The frontend device detects the traffic of interest (BitTorrent packets in this case) and forwards it to the PVI.
- PVI extracts info_hash from the BitTorrent packets, queries it against the database but gets no match.

- PVI continues to reassemble content data from the BitTorrent packets until it finds a video segment that is decodable and computes its fingerprint.
- PVI queries fingerprint database for identification until a match is found.
- PVI updates the hash database with identified content (so that next time the same content can be identified using hash)

1.2 Performance with Respect to the Requirements Described in the 2007 Workshop Report

1.2.1 Identifying Infringing Traffic at the Campus Border

Vobile's VideoDNA™ technology has extremely low false-positive rate. In the recent Content Recognition Study by the MPAA and MovieLabs, the VideoDNA™ stood out with zero false positives through three rounds of testing using thousands of test samples in terabytes. Furthermore, the sensitivity to both false-positive and false negative in the VideoDNA™ system is adjustable for each deployment.

1.2.2 Responding to Infringing Traffic at the Campus Border

Response to infringing traffic is achieved through the third-party frontend device that is integrated with the PVI. In returning the match results, the PVI provides sufficient information for the frontend to act upon, including full metadata of identified content and business rules set by the content owner. The exchange of business rules is compliant with the Content Recognition Rules specified by the MovieLabs.

1.2.3 Identifying Infringing Traffic Local to the Campus Network

The VideoDNA™ technology and the PVI appliance are fully applicable to identifying content within subnets.

1.2.4 Responding to the Traffic Local to the Campus Network

The PVI or a similar VideoDNA client can be deployed in many points on a network and operate in a distributed way.

1.2.5 Support the Campus Judicial System

The VideoDNA™ system logs all information about queries and matches. The match records containing timestamps and content meta are reported in XML and can be exported to other formats such as CSV and HTML.

1.2.6 Avoiding Disruption of All Non-Infringing Traffic

As described previously, Vobile's VideoDNA™ content identification is not an in-line operation; it works on a copy of the network data that is forwarded to it by the frontend device. As such the PVI will not cause latency or disruption of any network traffic.

1.2.7 Considering for Purchase and Operations

Vobile's VideoDNA™ technology is commercially deployed for content identification and management. Vobile offers reasonable and flexible pricing that covers installation, maintenance and upgrade.

1.3 Intellectual Property

Vobile has 4 patents pending related to the VideoDNA™ technology. These patents were filed in the U.S. and internationally through Patent Cooperation Treaty (PCT).

1.4 Corporate Characteristics and Resources

Vobile is a provider of video content identification and management products and services. Its core VideoDNA™ technology enables fully automated identification, tracking and management of any video and audio content with high performance, accuracy and scalability. Vobile operates a very large scale database of VideoDNA™ for content identification and video search services.

Founded in 2005, Vobile is privately held and funded by Steamboat Ventures, AT&T and angel investors. The company has 85 employees and is headquartered in Santa Clara, California with an office in Hangzhou, China. The company maintains several data centers worldwide including three in the U.S.

Vobile's customers include major content owners and content publishers. Specifics on customers and revenue cannot be disclosed at this time.

1.5 Pilot Testing

Vobile welcomes inquiries from colleges and universities that are interested in a pilot testing or trial of the VideoDNA™ system in the campus network environment. Full contact information is provided on the cover page of this document.

1.6 Commercial Terms

Vobile offers reasonable and flexible pricing for its VideoDNA™ products and services. Please contact us for more information.