

Characterizing digital media exchanges in a university campus network

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Abstract:

We present findings from the first large-scale quantitative assessment of digital media exchanges on a college campus based on network data, with a focus on Peer-to-Peer (P2P) exchanges of copyrighted material.

Deep Packet Inspection (DPI) appliances and Netflow collectors were used to gather data from a university campus over three monitoring periods: Spring 2007, Fall 2007 and Spring 2008. The collected data consists on records of network activity of three types: logs of P2P transfers of music and movies detected going across the border of the campus network; logs of all across-the-border communication sessions classified by protocol; and Netflow logs for a subset of intra-campus communication sessions as well as some across-the-border sessions.

This research presented significant challenges both in the data collection phase and in the subsequent data analysis phase. In data collection, anonymization procedures had to be developed to insure the privacy of monitored users, while making sure that the collected data could still yield relevant results. In the subsequent data analysis, the main challenge was in extracting relevant information out of the considerable amount of data collected (over 10 billion records overall).

The main outputs of this research are an assessment of the extent to which P2P was used to transfer copyrighted material, and characterizations of the demographics of P2P users, of the relative popularity of transferred material, and of how the burden on the campus network varied over time. We found that students of all demographics engaged in file sharing. In terms of percentage of students involved, in Spring 2007, at least 51% of students living on campus engaged in P2P, at least 42% attempted to transfer copyrighted material, and monitored students attempted to transfer a mean of 6 copyrighted titles per week. These figures decreased significantly both in Fall 2007 and Spring 2008.

Our research also provides insight on the use of DPI technology to reduce illegal use of P2P. We found that, given enough time, current technology effectively identifies users that attempt to transfer copyrighted material if their traffic is identifiable as P2P. However, encryption is available and can be easily activated in most P2P clients, preventing DPI from detecting whether transferred material is copyrighted. Using DPI for copyright enforcement by imposing penalties may give P2P users or P2P developers the incentive to use encryption as a way of evading detection.