

Efficient Real-time Similarity Detection for Video Caching and Streaming

Video Similarity Detection System

- Enterprise-level video cache system between Internet users and content providers
- Generalize a “cache hit”
 - Byte-wise identical
 - Similar, human perception-wise
- Upon cache hit, deliver an identical or similar version, compared to requested video
- Real-time detection
 - Small video signatures
 - Extract information from incoming video byte stream
- Motivations and benefits
 - Internet videos: Many duplicates and similars, due to diversity of processing situations
 - Codec/format agnostic
 - Reduce cache storage requirements
 - Reduce cache processing load
 - Enrich user experience and analytics

Similarity Metric

- Associate feature vectors with each video
- Each feature vector based on a subset of ***time-averaged DCT coefficients of I-frames within a time epoch, extracted directly and efficiently from the video byte stream***
- Similarity metric between 2 videos is the sum of the L2 norms between their respective feature vectors

Similarity Detection

- Cumulative error between 2 videos is their similarity metric up to a certain time in the videos
- Used thresholding to determine similarity

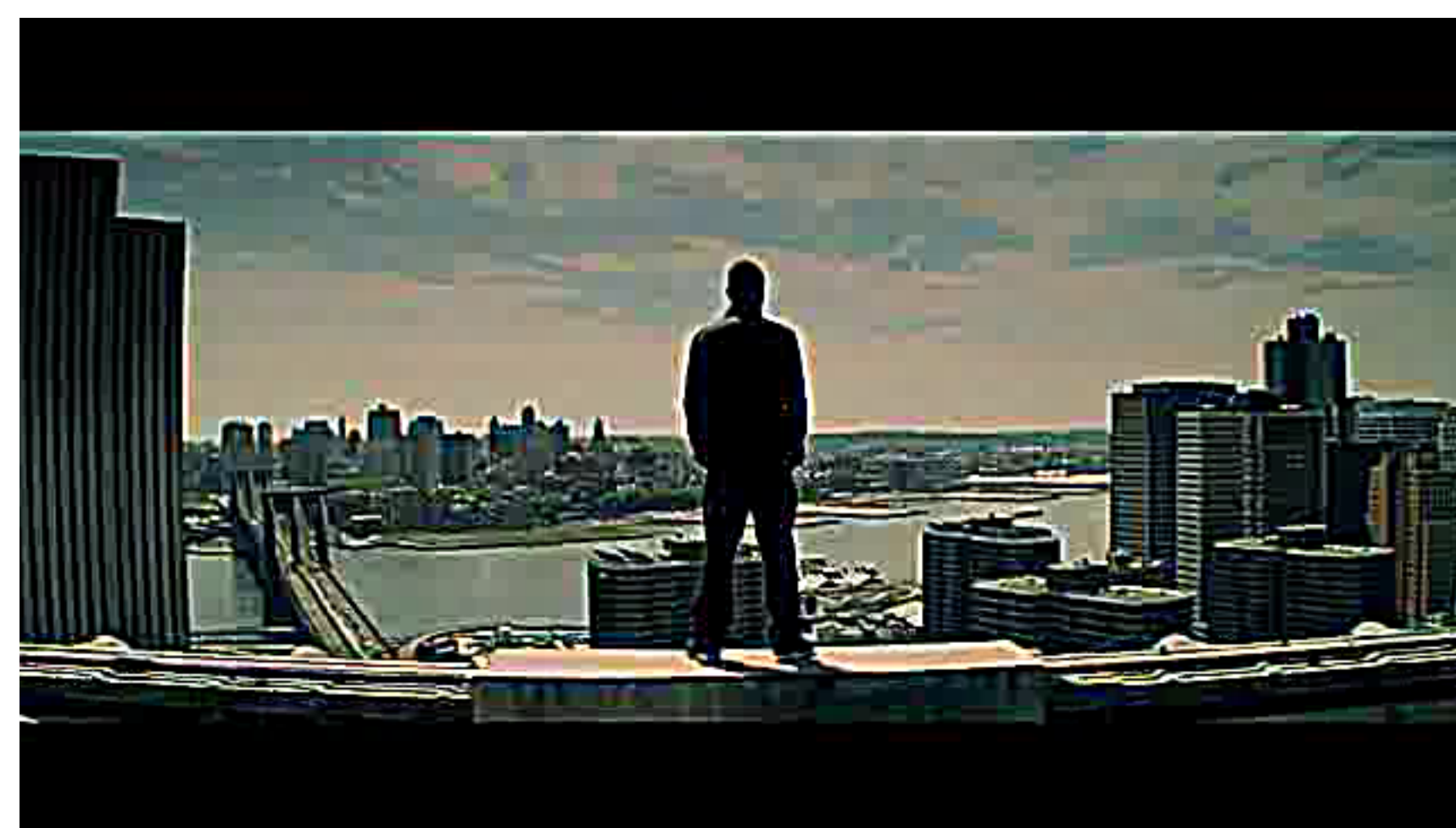
Experiments

- Take 20 YouTube videos, which are obviously dissimilar
- For each video, generate similar versions, using simple video processing (e.g. filtering) techniques
- We have ground truth of similarity
- Use metric to count similars
- Calculate empirical CDFs of cumulative errors of pair-wise similar and dissimilar videos
- Calculate false negative rates and false positive rates
- Results indicate that thresholding can be used to push both false negative rates and false positive rates to zero, simultaneously

Similar Videos



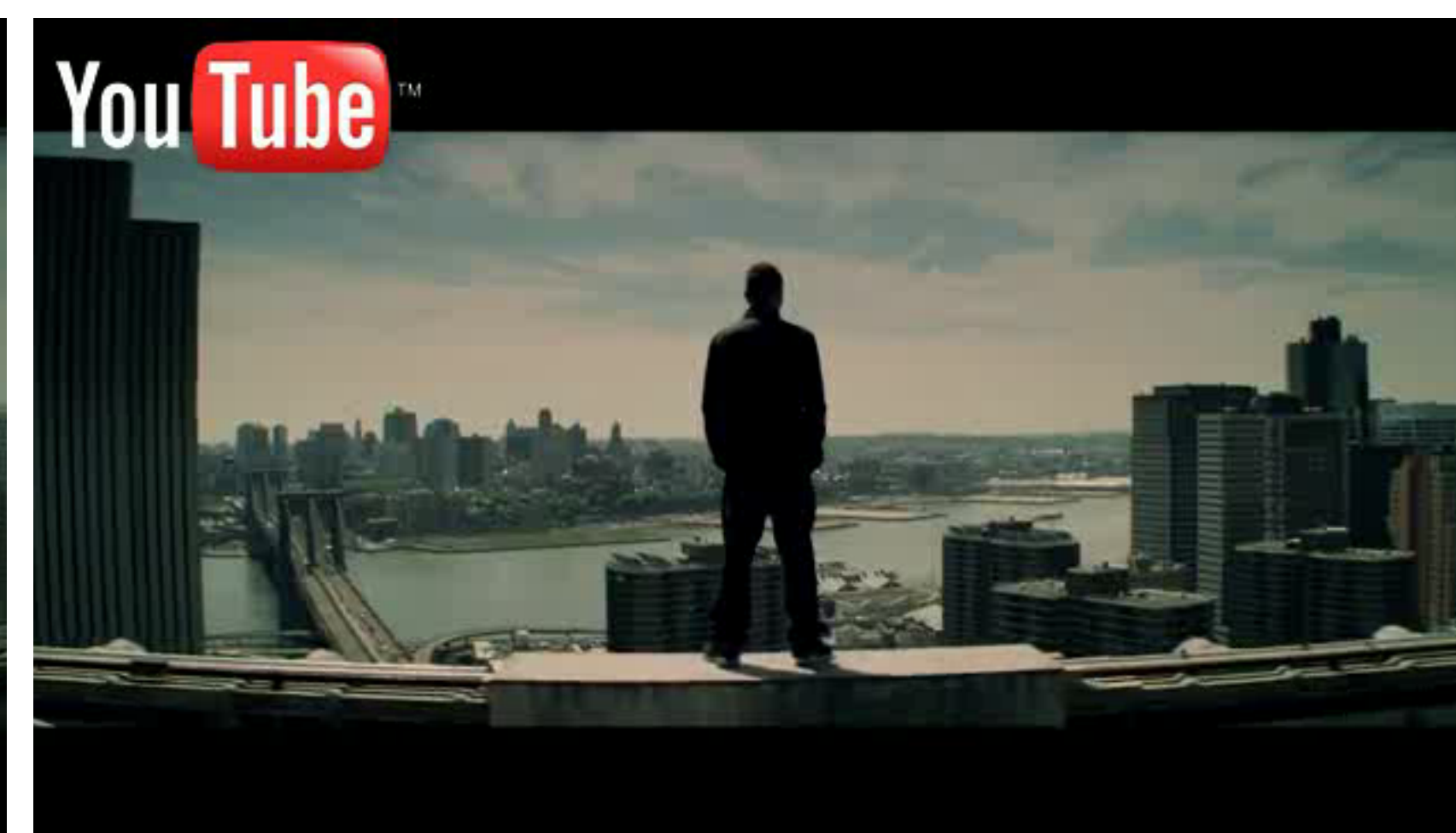
Original Video



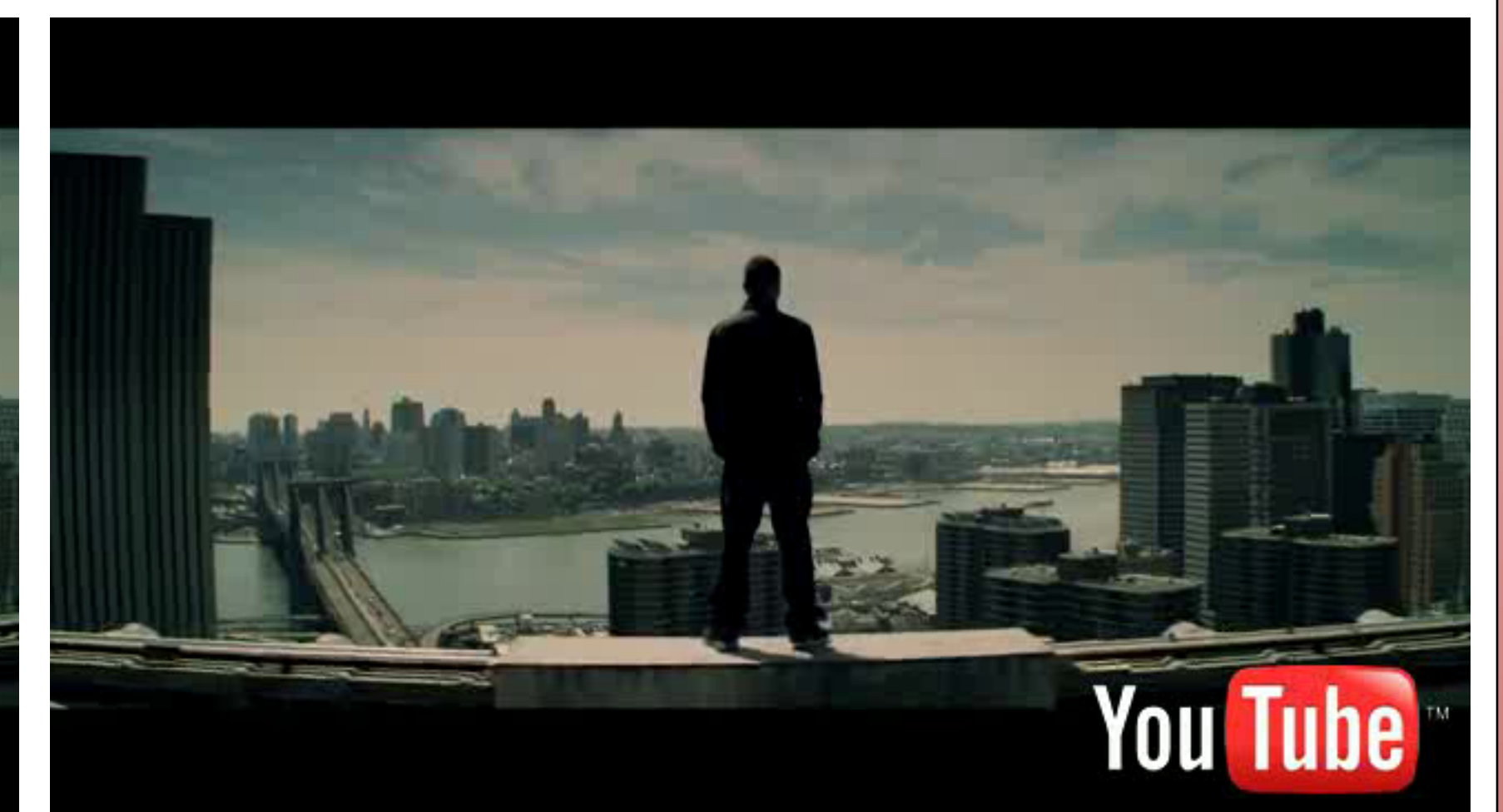
Sharpened Video



Blurred Video

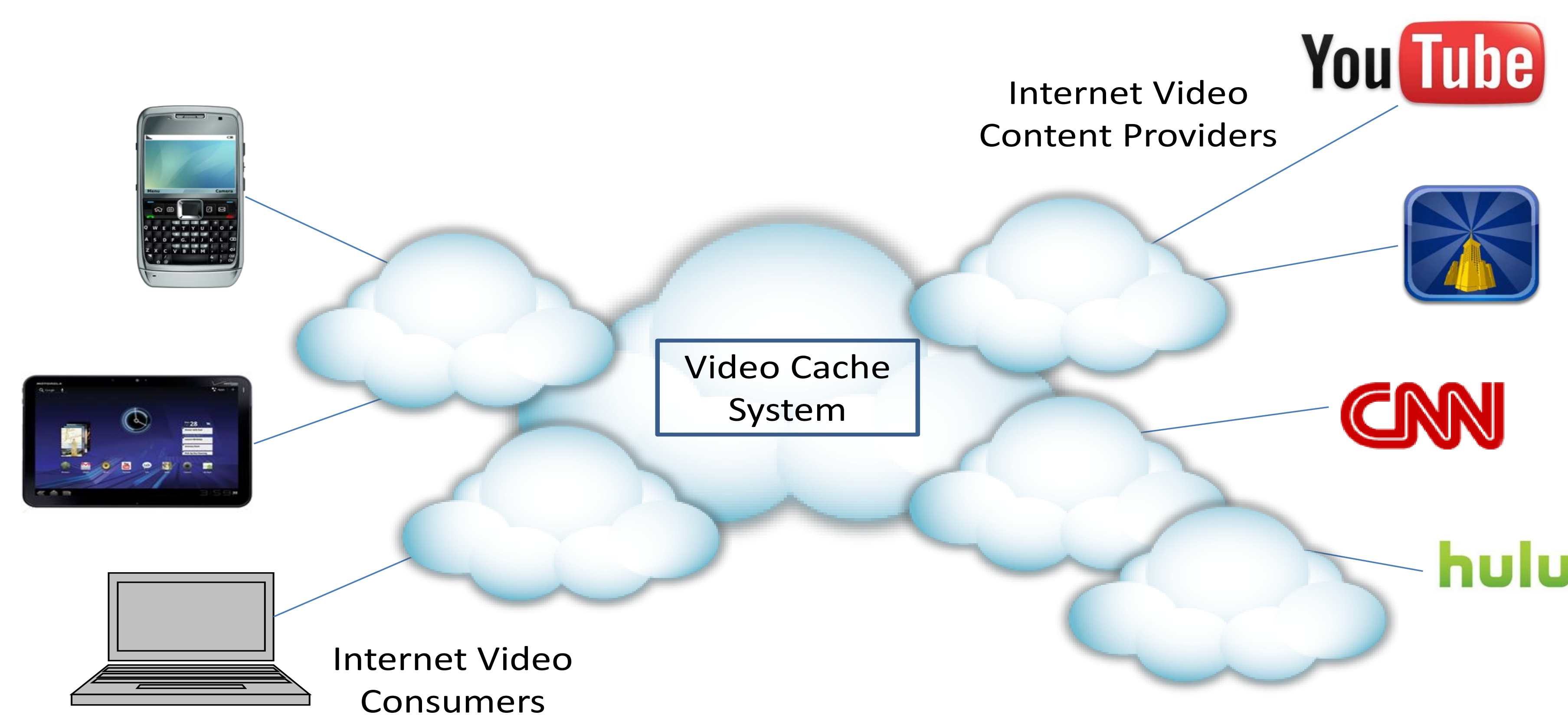


Logo in Top Left



Logo in Bottom Right

System Diagram



Results

