



Designing Active Measurements for YouTube

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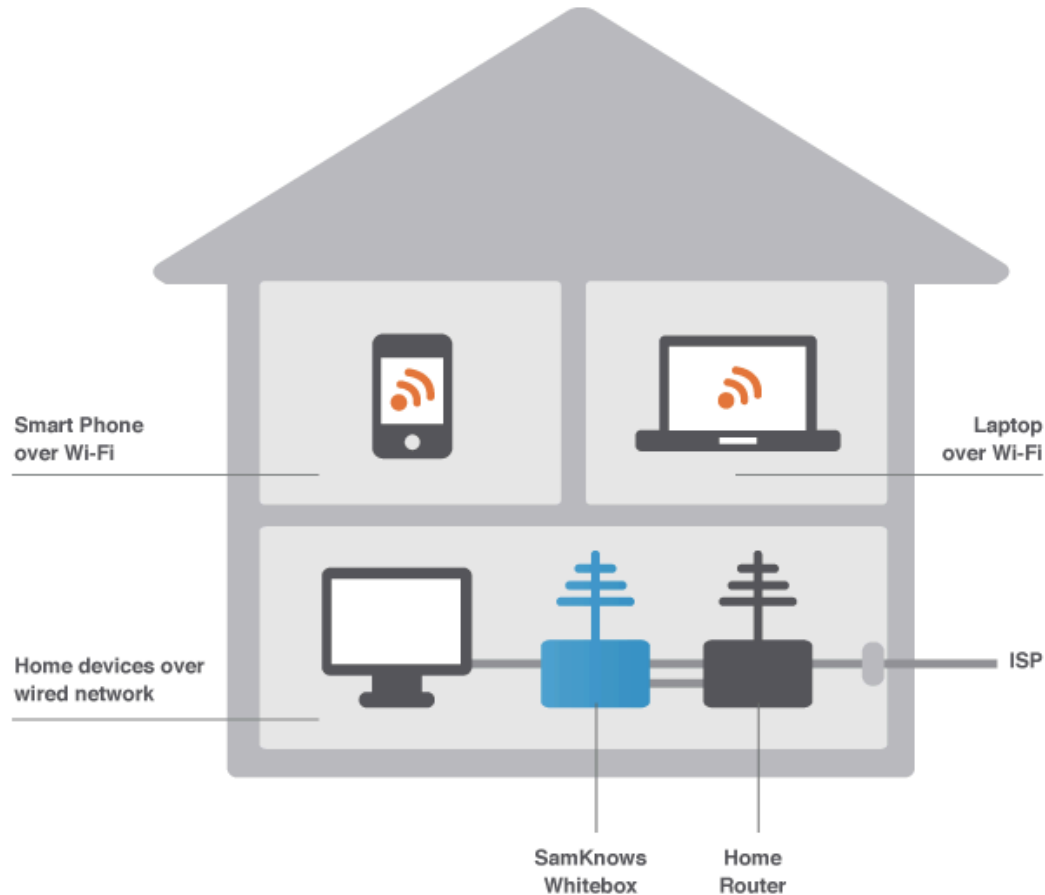
Agenda

- Background
- Data collection setup
- Results
- Conclusions

Why and What we are doing

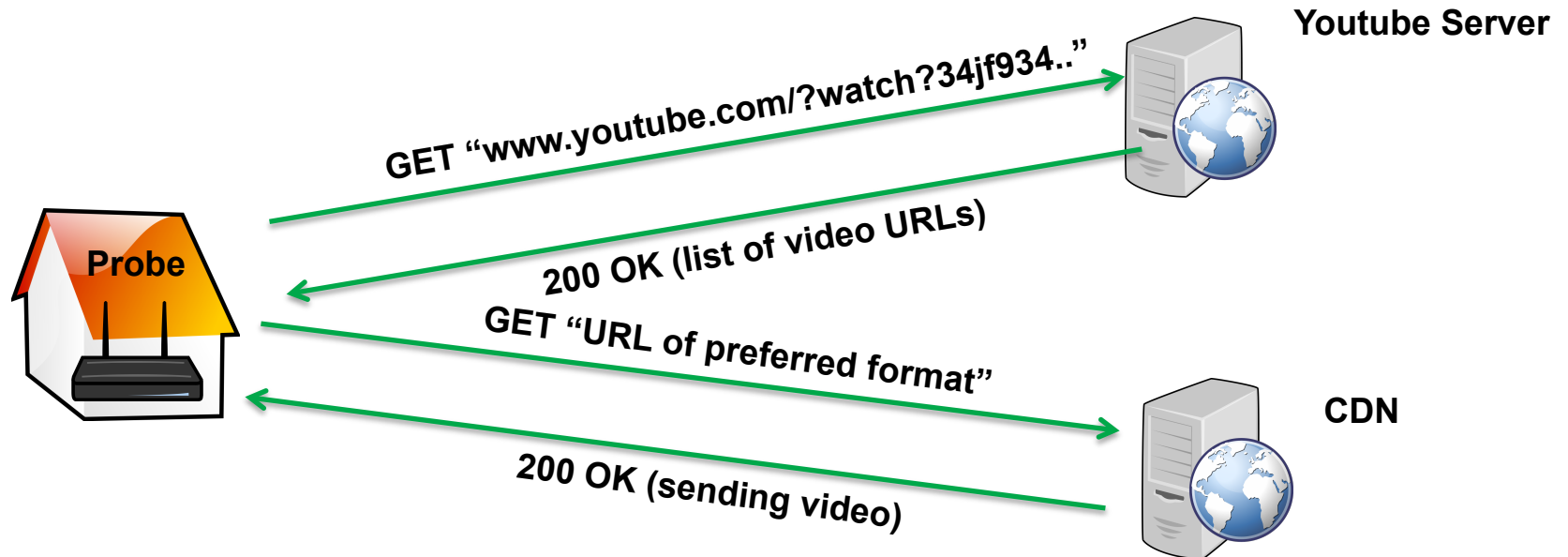
BACKGROUND

Measuring at the last hop



Source:
www.samknows.com

YouTube Active measurement client



- Capable of reading matroska and FLV timestamps from the videos.
- **QoE:** Based on the timestamps, it can measure and record stalling events (buffer underruns) during the download of the video.

Whose Quality of Experience?

You **Tube**

web ▶ m

720p



1080P



H.264
MPEG-4/AVC

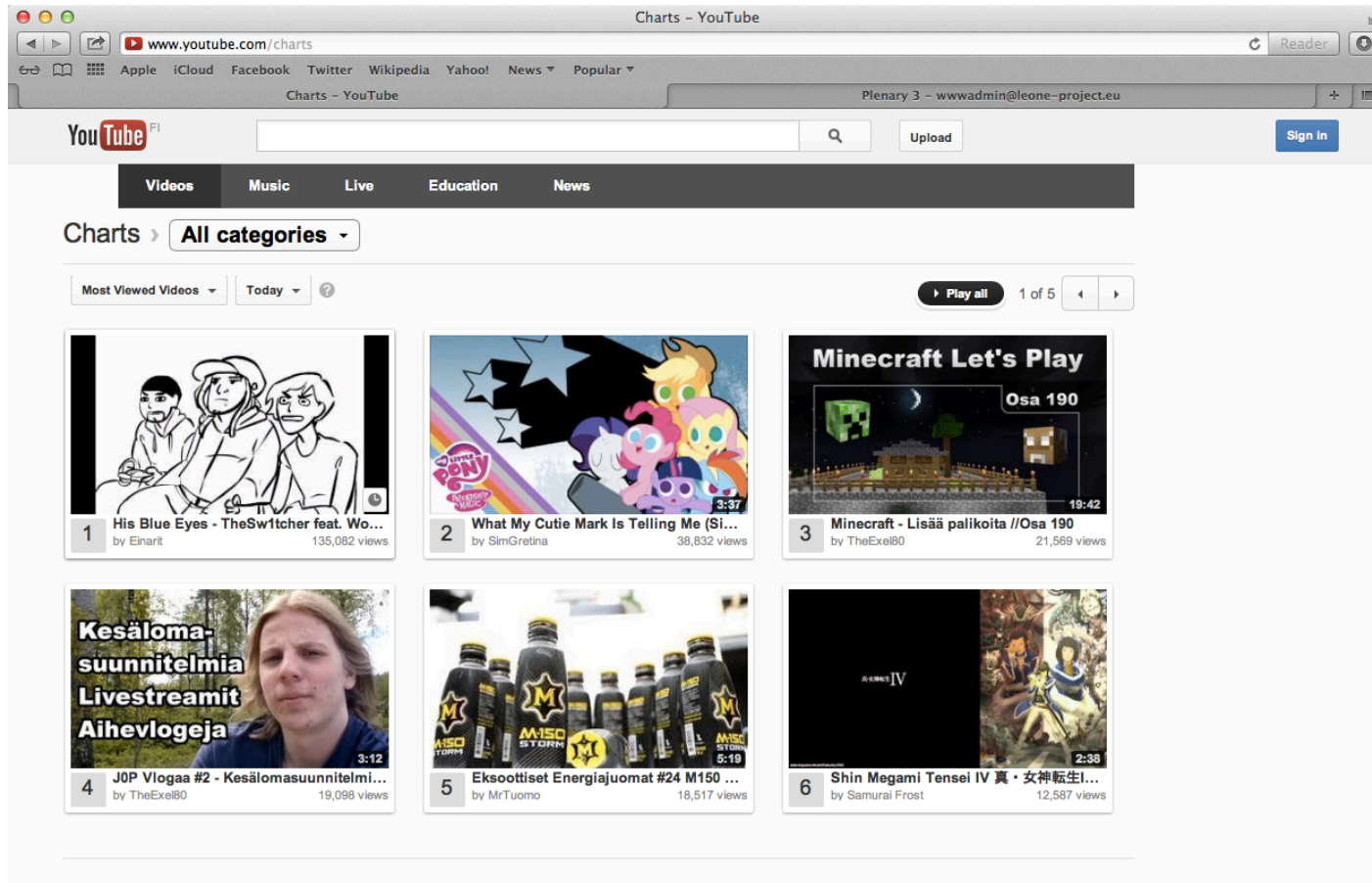


480P

360P

DATA COLLECTION

What videos did we download?



Resolution?

Format?

Duration?

Encoding rate?

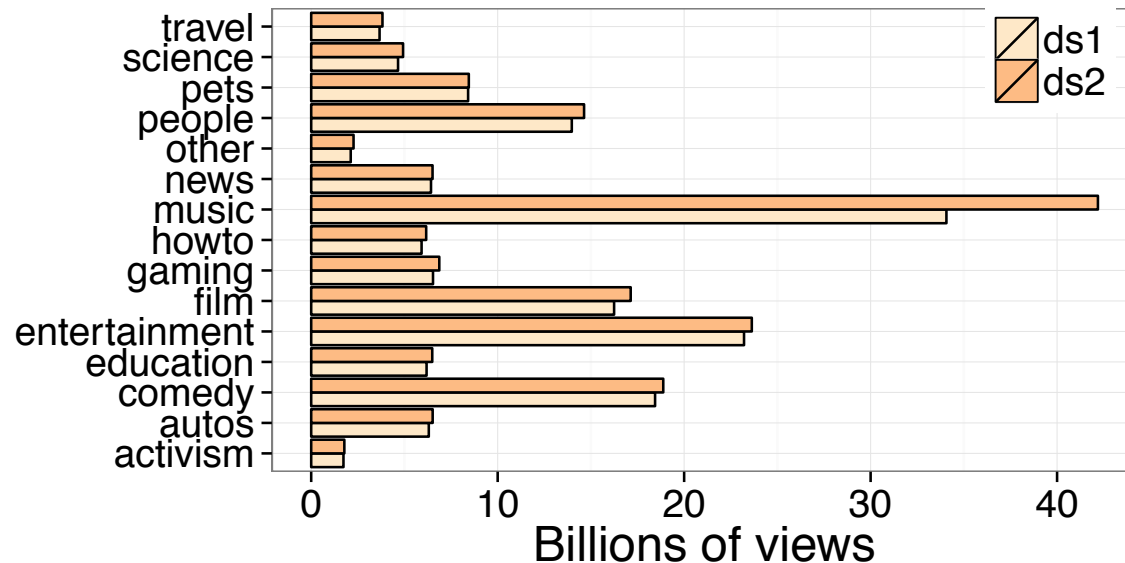
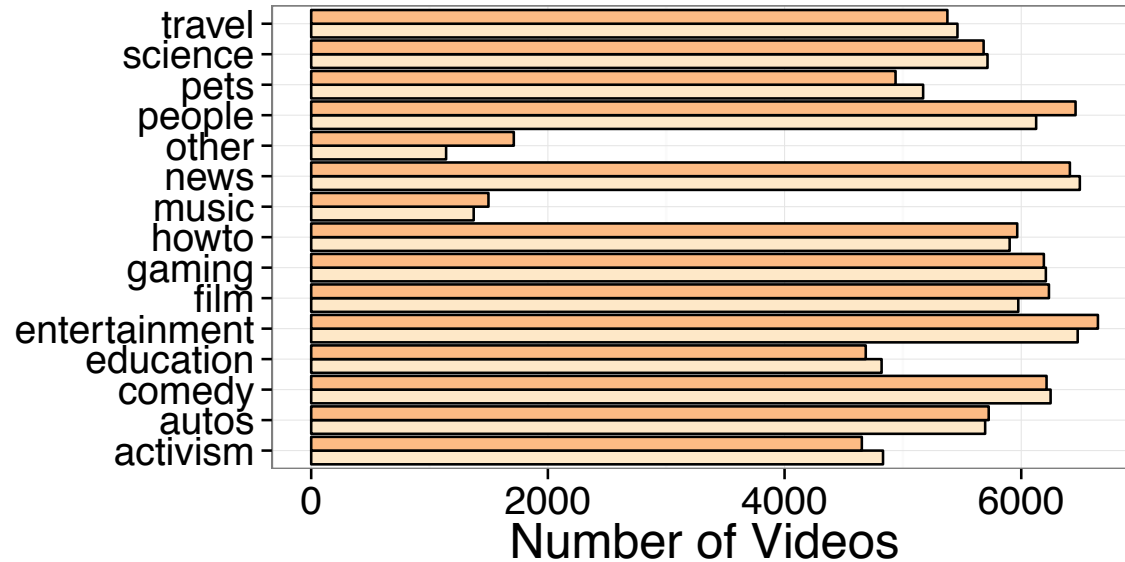
Characterize YouTube's popular videos

To find the answers: We studied YouTube charts for all categories and countries.

Test setup location : Aalto University network, Espoo, Finland.

Number of Videos	DS1 - July	DS2 - Sept
Total	75847	76065
Studied for HD	6591	0

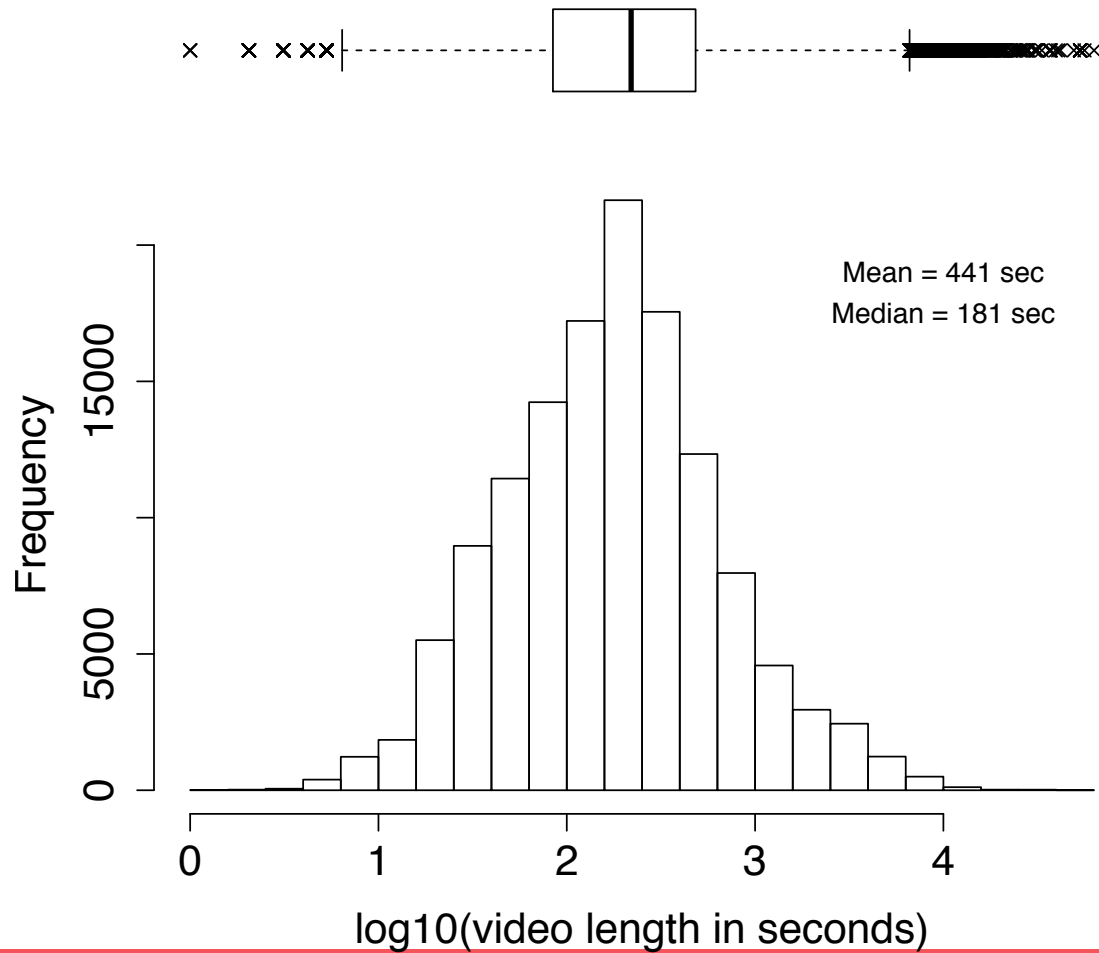
Distribution by Category



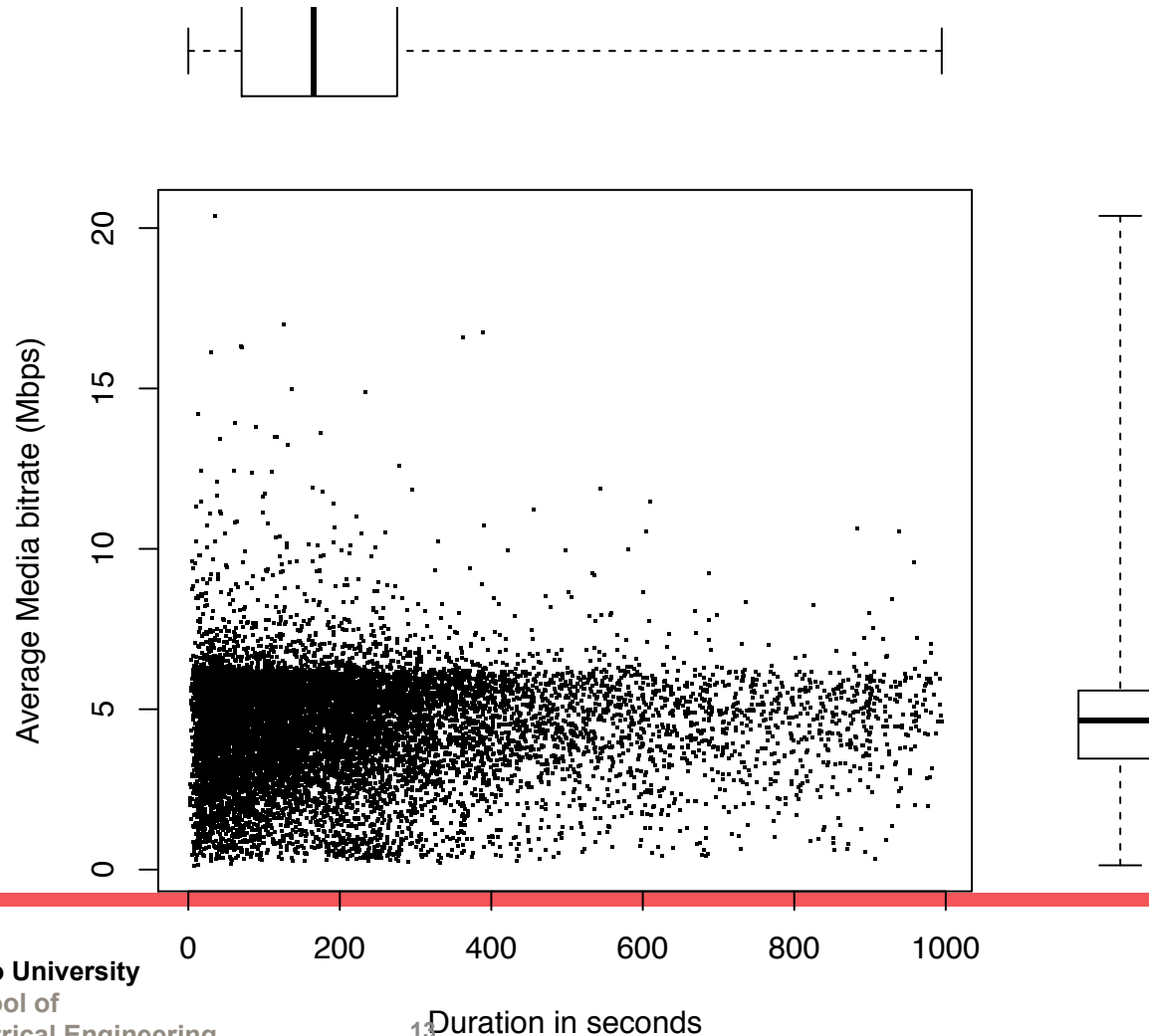
What we found

RESULTS

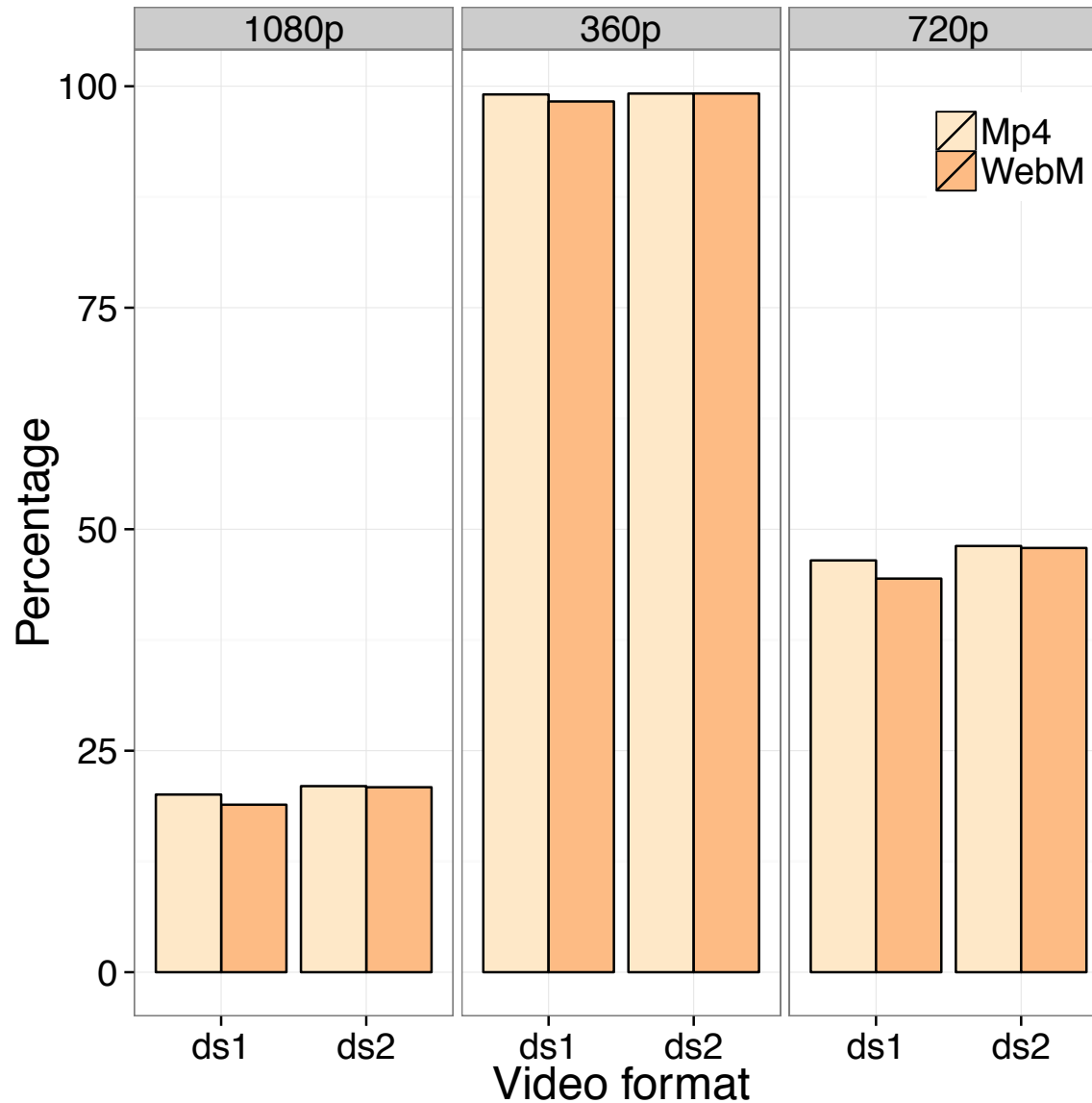
Duration of videos



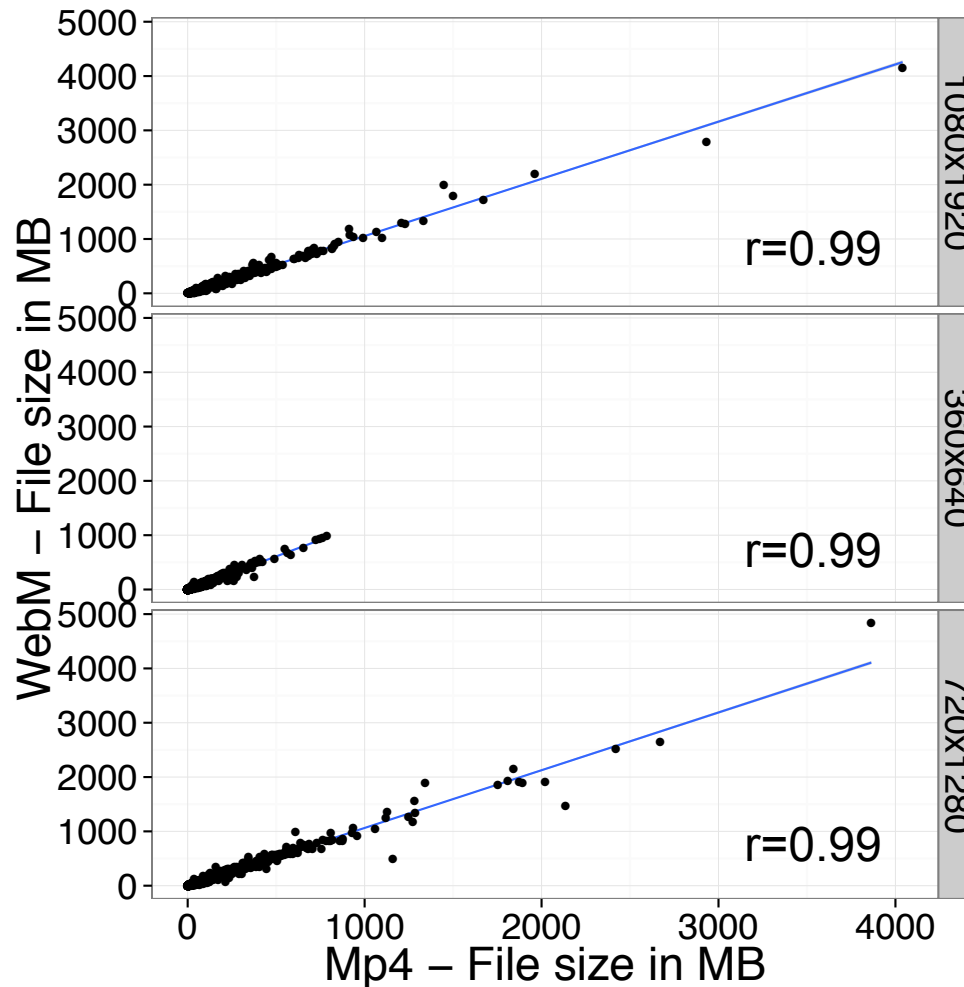
Duration vs. Media bitrates – HD 1080p videos



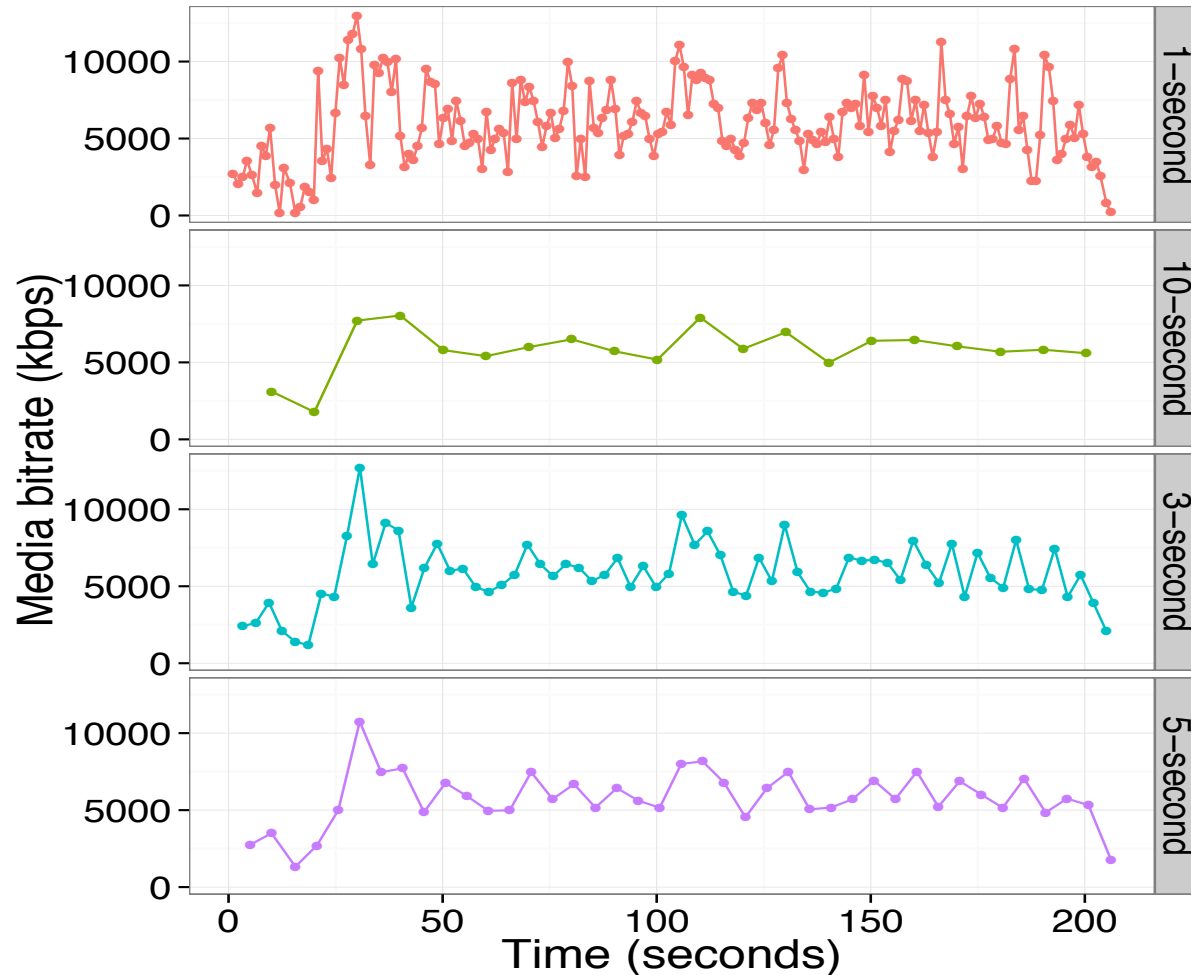
Availability of Formats



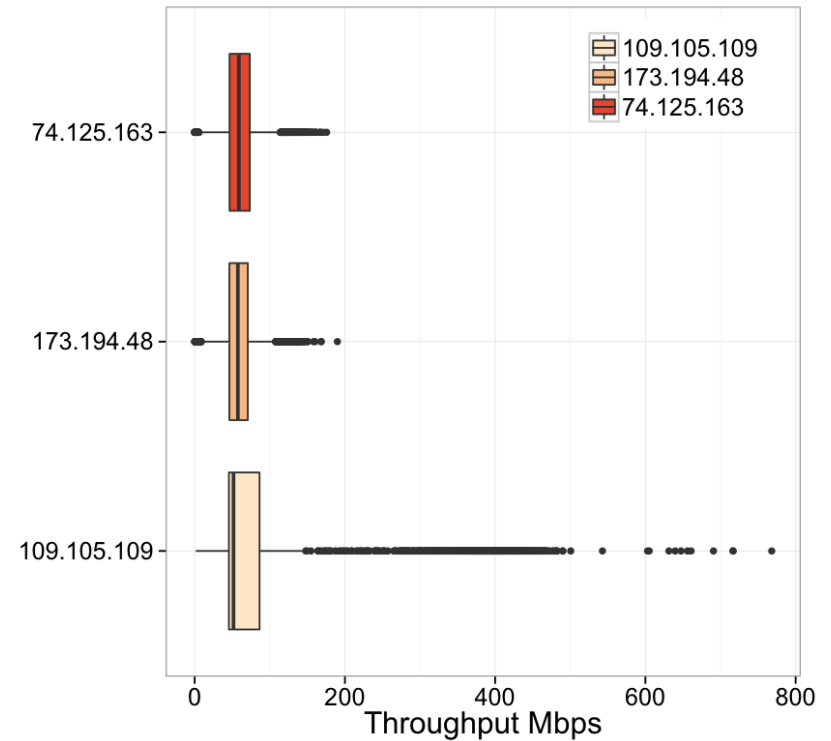
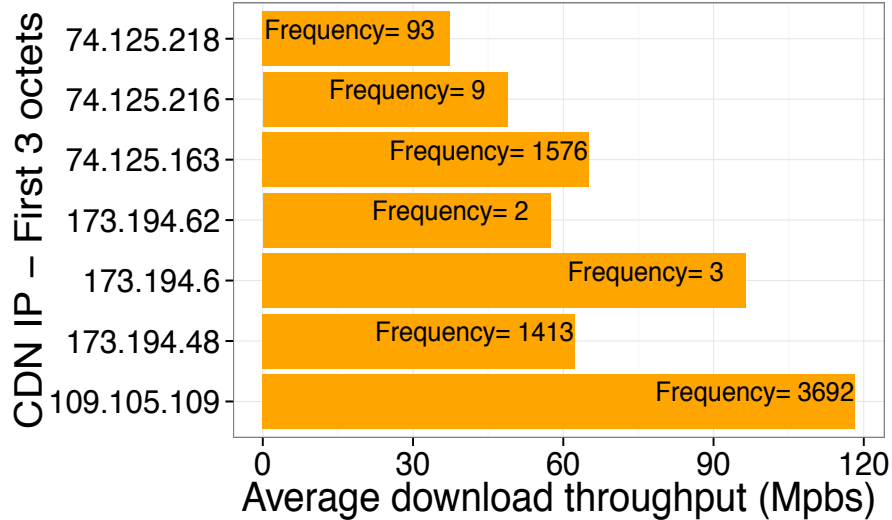
Video File sizes – Mp4 vs. WebM



Variations in the Media bitrate



CDNs



CONCLUSIONS

So.... What video do we download?

- Question 1: Which resolution to download?
Answer: Highest available – 1080p
- Question 2: Which format to download?
Answer: Correlation in File sizes indicates that both Mp4 and WebM have comparable encoding bitrates. Hence, measuring one *should* be enough.
- Question 3: What should be the duration of the video?
Answer: We want the test to run the length of a typical YouTube video but at the same time we don't want it to be too long. Hence, we pick the median video length at 3 minutes.
- Question 4: What media bitrate would the video have?
Answer: We measure for the median 5 Mbps average media bitrate for two videos. One with high std. dev. of 1 second instantaneous bitrate, and the other with low. We test for both. We also test for the most watched today video for the sake of QoE.