

# Measuring Decentralized Video Streaming: A Case Study of DTube

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Motivation

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# Motivation

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⇒ Comparing video streaming from centralized and decentralized services using YouTube and DTube

# Background



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Note: Several additions/changes to DTube's design since beginning of study in early 2019

# Methodology

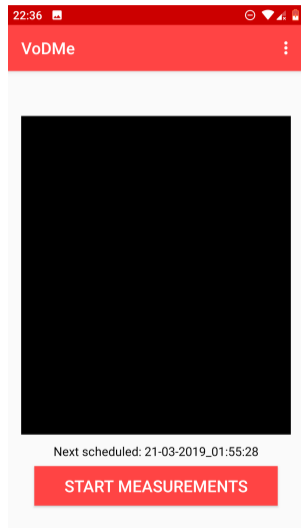
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# Methodology

## Measurement Process

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3. For each video:
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4. ICMP traceroute measurements to determined media servers
5. Save and upload all measurements, schedule next iteration



# Methodology

## Measurement Metrics

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- ▶ Total video duration
- ▶ TCP connect time to media server
- ▶ Startup delay
- ▶ traceroute: IP path length

# Methodology

## Measurement Experiment

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- ▶ February 2019–November 2019 (10 months)
- ▶ >8,500 videos measured from both platforms combined
- ▶ Over both cellular (LTE) and WiFi (University network)
- ▶ Four mobile phones
  - ▶ Three locations:  
Munich (DE), Prague (CZ), San Diego (US)
  - ▶ Four SIM card providers:  
T-Mobile (DE), Vodafone (DE), o2 (DE), SIMPLE Mobile (US)

# Analysis

# Analysis

- ▶ How does decentralized video streaming compare with centralized services in terms of performance?
- ▶ How distributed are such decentralized services?
- ▶ In which areas can decentralized video streaming be improved?

Motivation

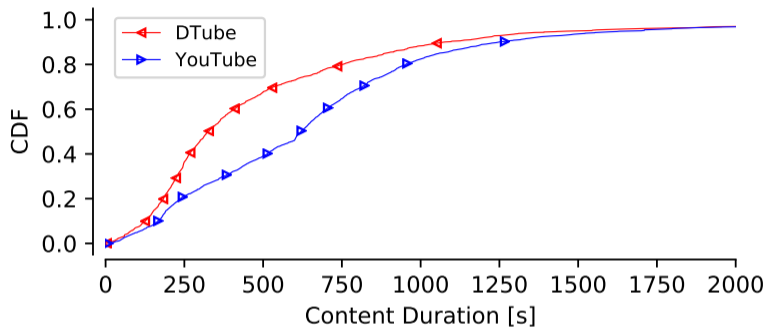
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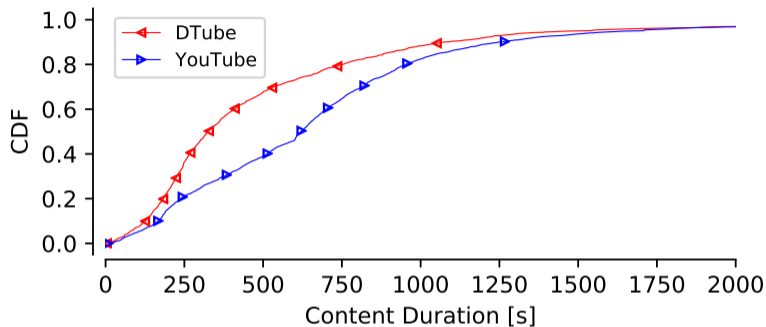
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- ▶ DTube: median 323 sec
  - ▶ Video length and monetization/incentive decoupled

# TCP Connect Time

Motivation

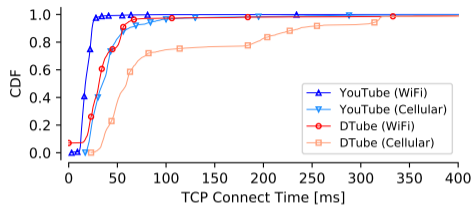
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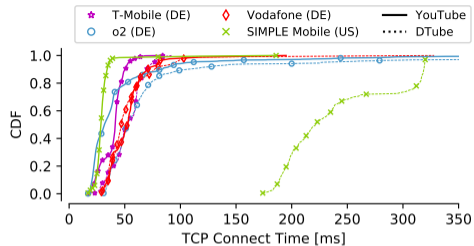
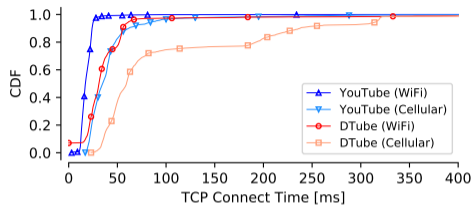
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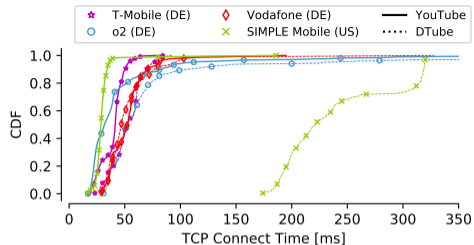
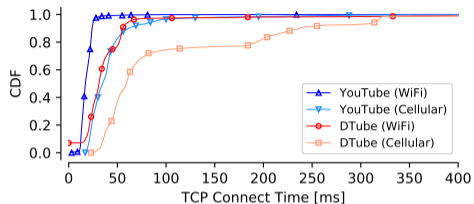
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TCP connections to YouTube established in about half the time compared to DTube, although roughly within same order of magnitude ( $< 100$  ms).

# Startup Delay

Motivation

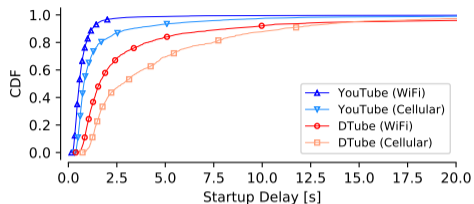
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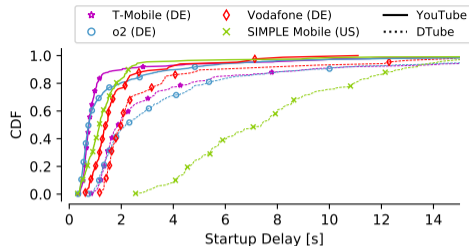
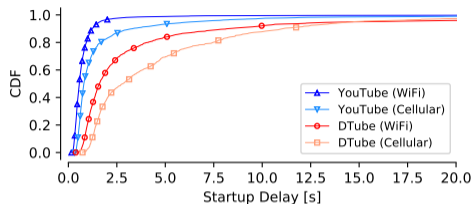
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- ▶ 75th percentiles by platform and network type:
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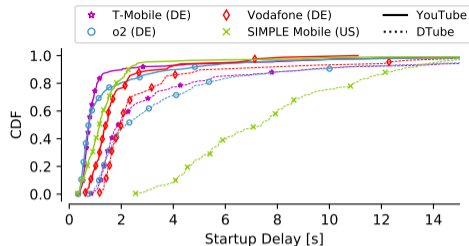
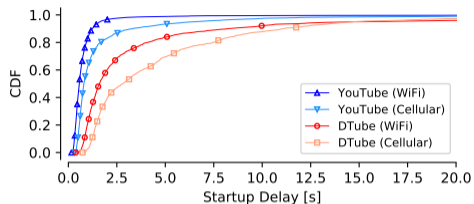
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Startup delay for DTube about four times higher compared to YouTube; cellular measurements from the US to DTube perform significantly worse.

# IP Path Lengths

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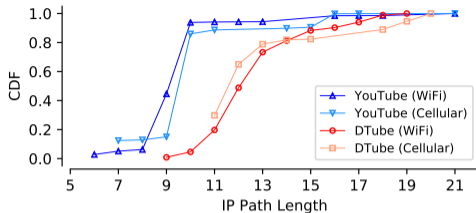
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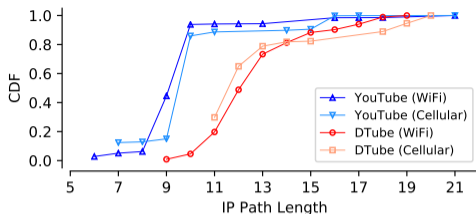
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- ▶ By platform and network type:
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  - ▶ DTube: reachable within 10 IP hops only for 4.6% (WiFi); minimum over cellular 11 IP hops (29.8%)
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traceroute success rates over cellular network highly depend on ISP.

Around 90% of the YouTube destinations within 10 IP hops;  
for DTube, more than 95% of the destinations beyond 10 IP hops.

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## YouTube

	Google LLC, US (AS15169)	MNET-AS, DE (AS8767)	O2, CZ (AS5610)	T-Mobile, US (AS21928)	TDDE-ASN1, DE (AS6805)	All
cellular	921 (18.9%)	0 (0%)	0 (0%)	105 (2.2%)	35 (0.7%)	1061 (21.7%)
WiFi	3623 (74.2%)	3 (0.1%)	196 (4.0%)	0 (0%)	0 (0%)	3822 (78.3%)
All	4544 (93.1%)	3 (0.1%)	196 (4.0%)	105 (2.2%)	35 (0.7%)	4883 (100%)

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	OVH, FR (AS16276)	All
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All traces to DTube end in OVH AS (FR), while YouTube traces end in ISP caches and Google ASes, indicating locational centralization for DTube.

# Conclusions

# Conclusions: Limitations

- ▶ Limited set of (network-related) measurement metrics
- ▶ Limited number of measurement configurations, geographical bias
- ▶ DTube as only representative for decentralized video streaming
- ▶ Several additions/changes to DTube (video sources, tokens, ...)

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<https://github.com/tv-doan/ifip-net-2020-app> (source code)

<https://github.com/tv-doan/ifip-net-2020-analysis> (artifacts)



App



Analysis

[ [trinhviet.doan](mailto:trinhviet.doan@tum.de) | [dat.pham](mailto:dat.pham@tum.de) | [markus.oberprieler](mailto:markus.oberprieler@tum.de) | [vaibhav.bajpai](mailto:vaibhav.bajpai@tum.de) ]@tum.de

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