

Dashlet: Taming Swipe Uncertainty for Robust Short Video Streaming

Zhuqi Li, Yaxiong Xie, Ravi Netravali, Kyle Jamieson



Short video streaming is popular



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TikTok was the top app by worldwide downloads in Q1 2022

The collage features three news snippets:

- Top Snippet:** From NBC NEWS, titled "YouTube is developing a rival to TikTok". It includes a sub-header "BUSINESS NEWS" and a "SHARE & SAVE" bar with social media icons.
- Middle Snippet:** From NPR, titled "YouTube is working on a rival to TikTok app". It features the NPR logo and navigation links for "SIGN IN", "NPR SHOP", and "DONATE".
- Bottom Snippet:** From BBC NEWS, titled "Facebook Launches Reels, Hoping To Lure TikTok Users". It includes the BBC logo, a "Sign in" button, and a navigation bar with categories like "Home", "News", "Sport", "Reel", "Worklife", "Travel", and "Future". The article is dated "August 5, 2020 - 1:32 PM ET" and is by "SHANNON BOND".

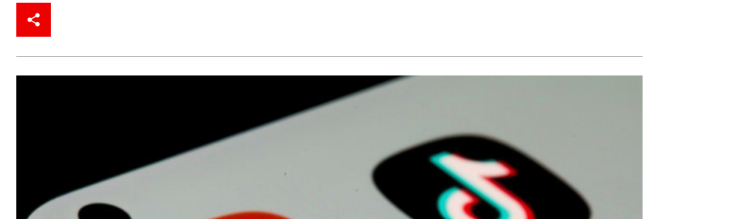
At the bottom of the collage, there are two smartphone screens: one showing the Facebook Reels sharing interface and another showing the TikTok logo.

NEWS

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TikTok overtakes YouTube for average watch time in US and UK

6 September 2021



What is different about short video streaming?

Past work on video streaming:

FESTIVE'12, BBA'14, MPC'15, Bola'16, Pensieve'17,
Oboe'18, NAS'18, Fugu'20, Swift'22

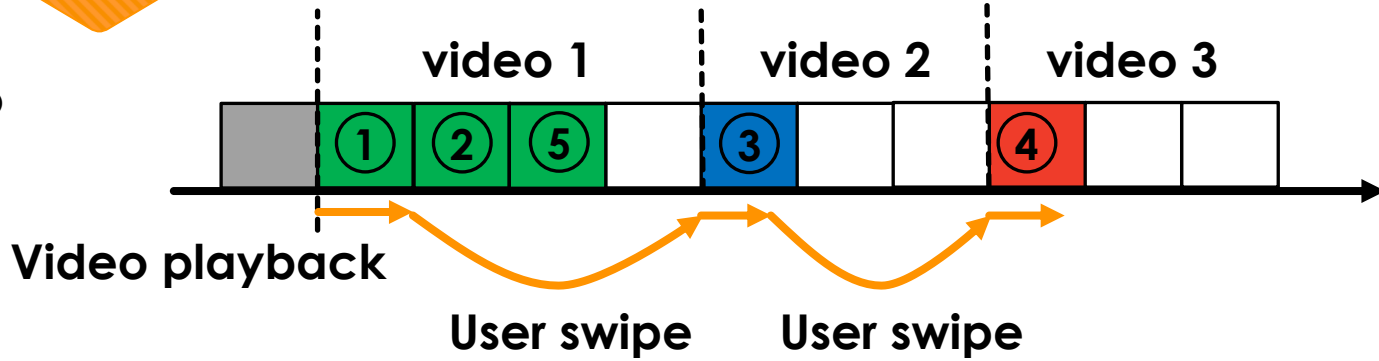
Short video differences: swipes cause

- (1) Skipping parts of some content;
- (2) Non sequential playback;

Takeaway: we need a new design for short video

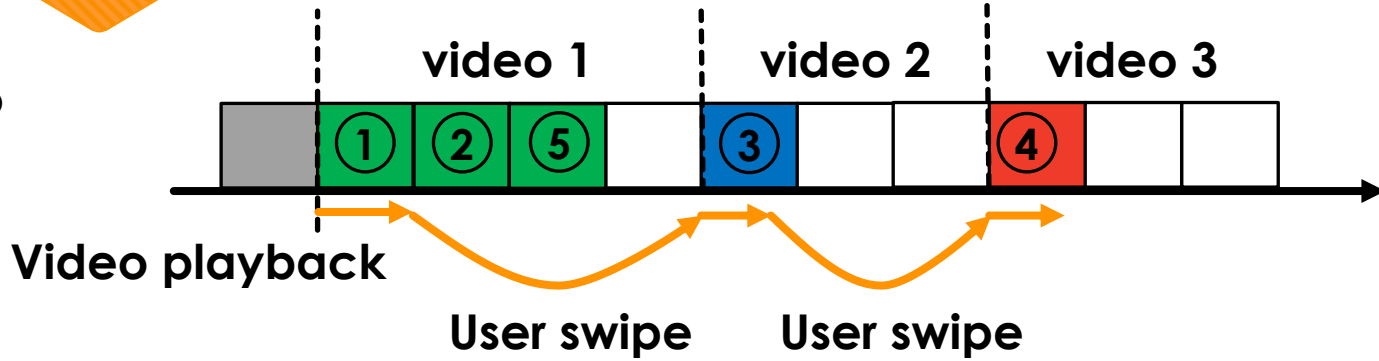
Traditional vs Short video streaming

Short video streaming

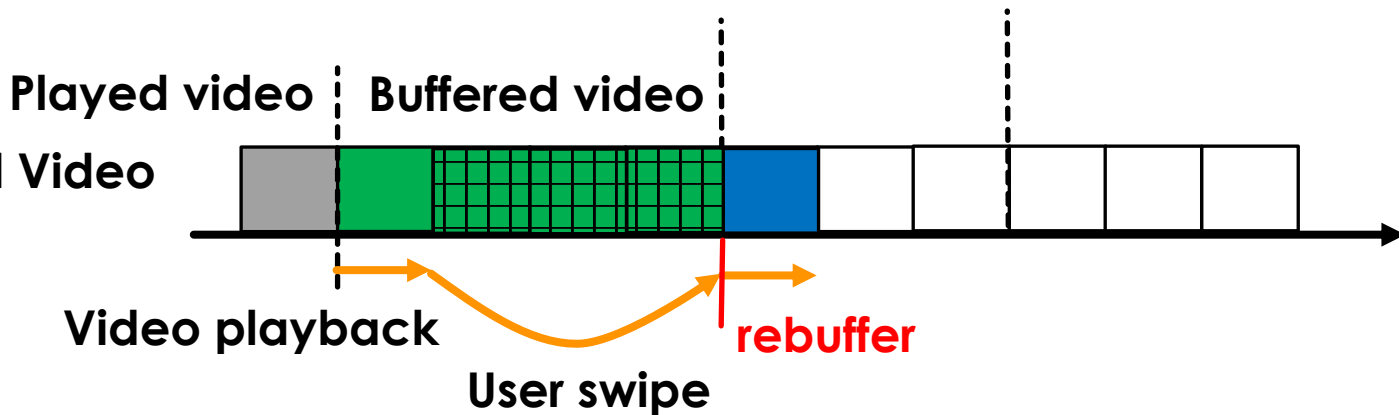


Traditional vs Short video streaming

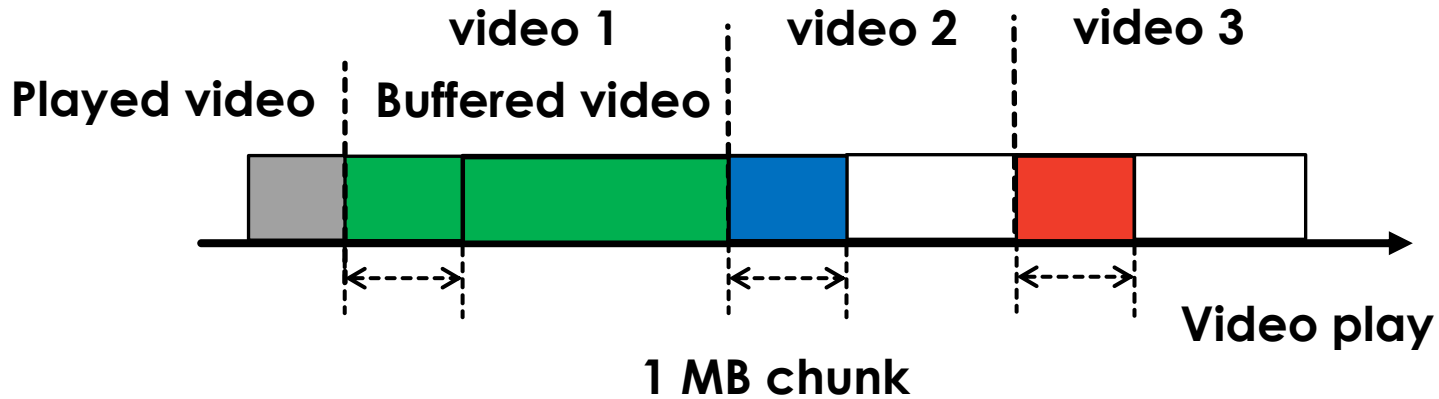
Short video streaming



Traditional Video streaming

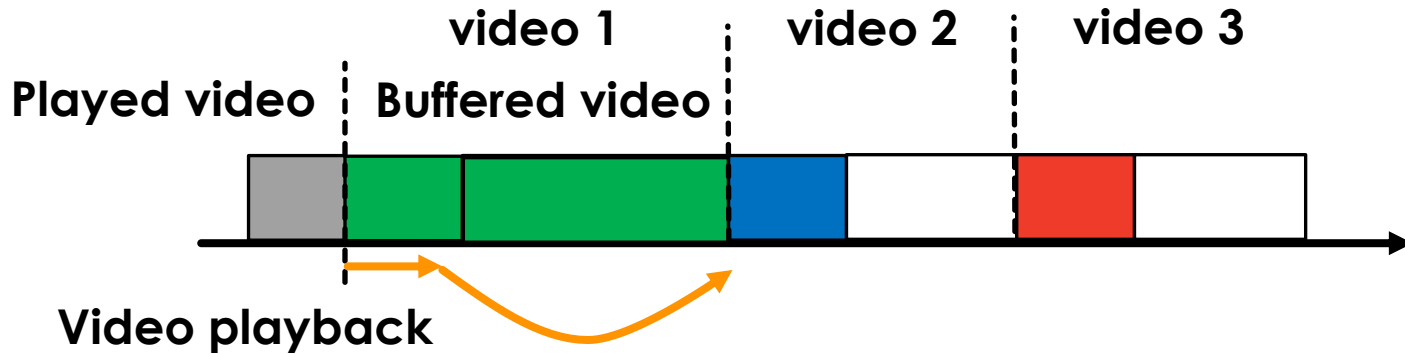


TikTok's solution



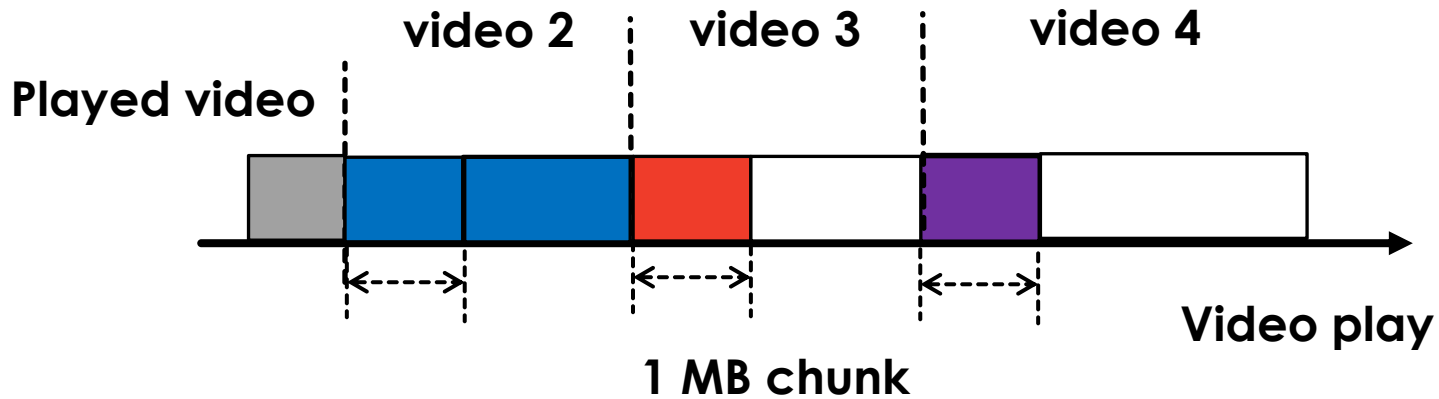
- Fixed 1 MB first chunk
- Prebuffer future first chunks

TikTok's solution



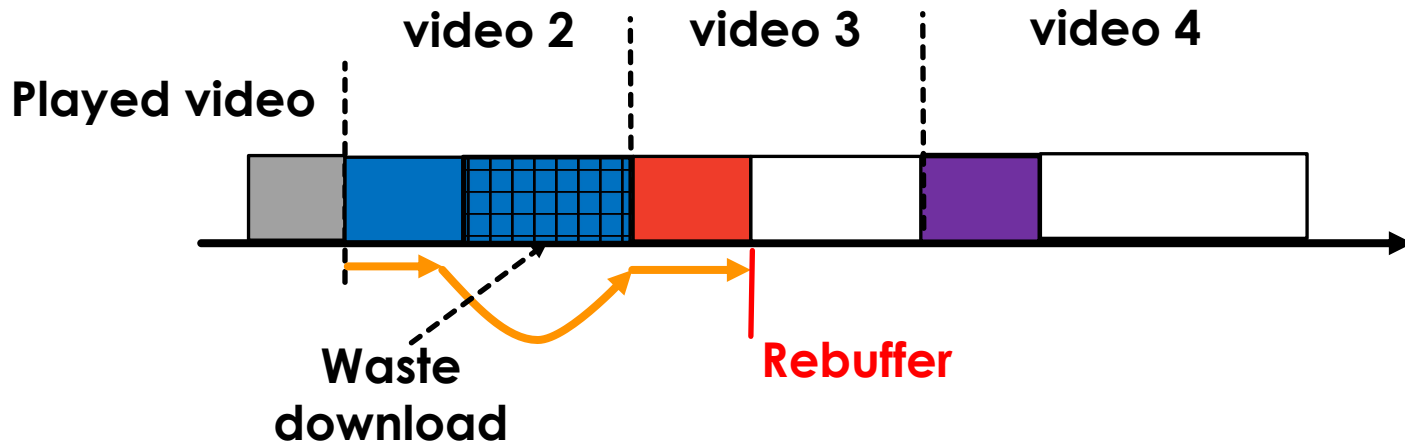
- Fixed 1 MB first chunk
- Prebuffer future first chunks

TikTok's solution



- Fixed 1 MB first chunk
- Prebuffer future first chunks
- Prioritize the chunk in the playing video

TikTok problem: no adaptation to swipe

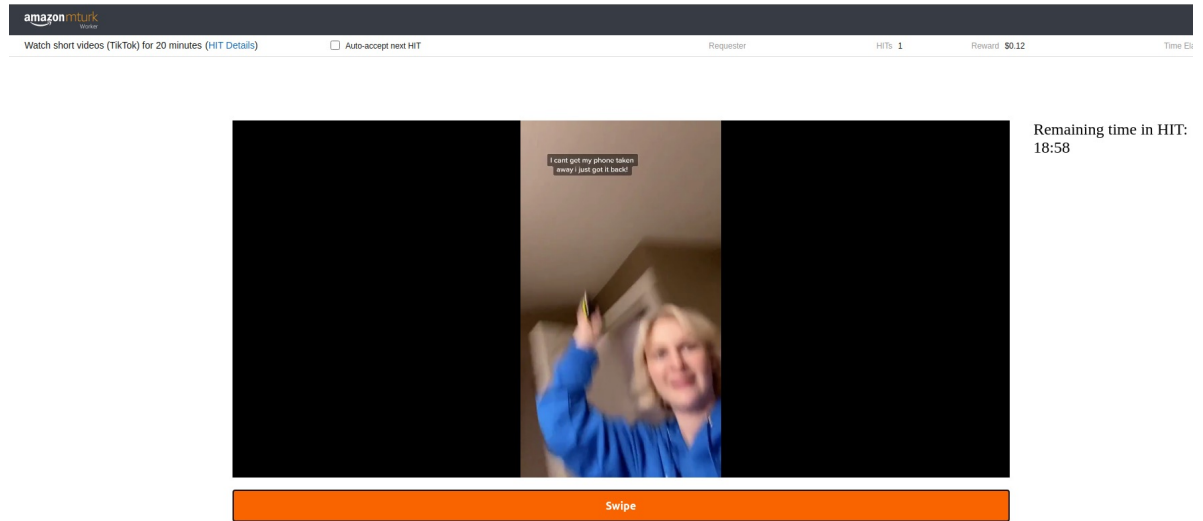


Key problem: TikTok does not adapt to users' swipe pattern

Understand users' swipe pattern

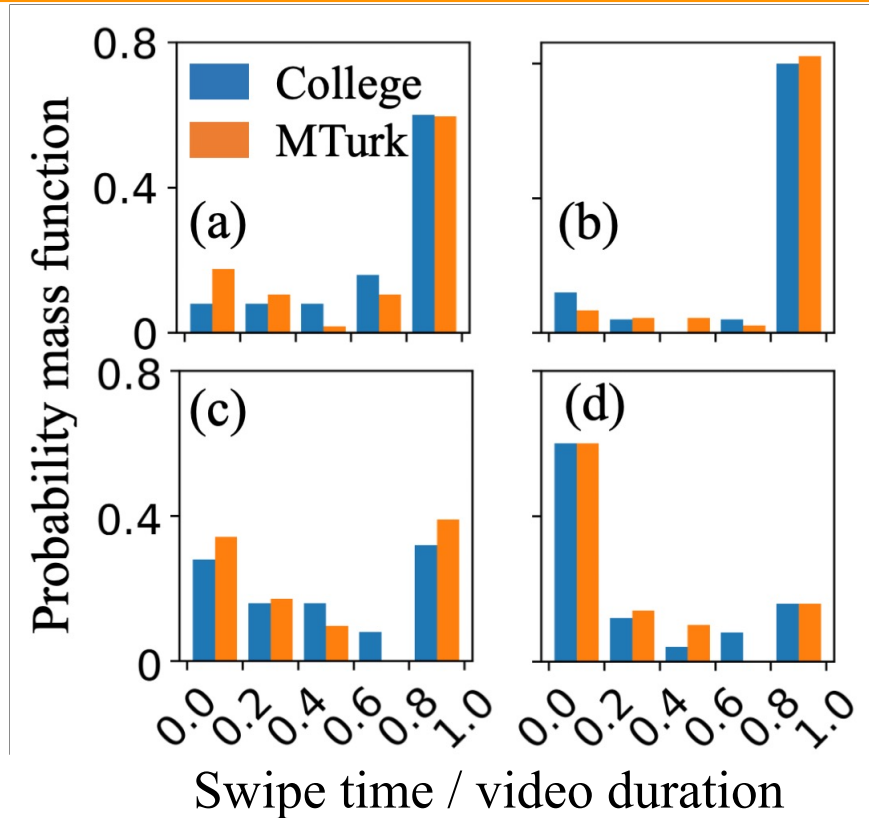


College students

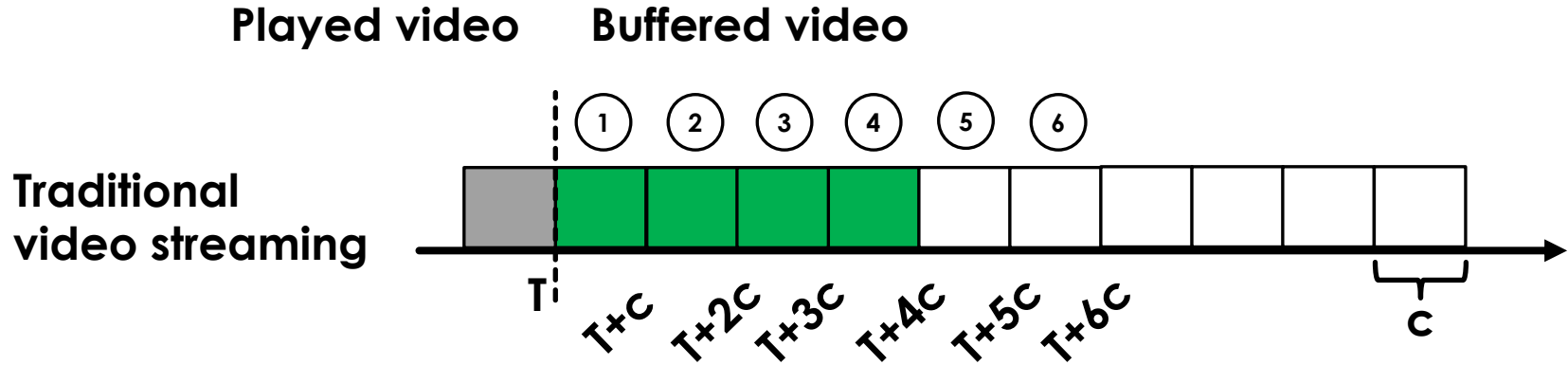


Amazon Mechanical Turk

Swipe distribution across dataset is stable



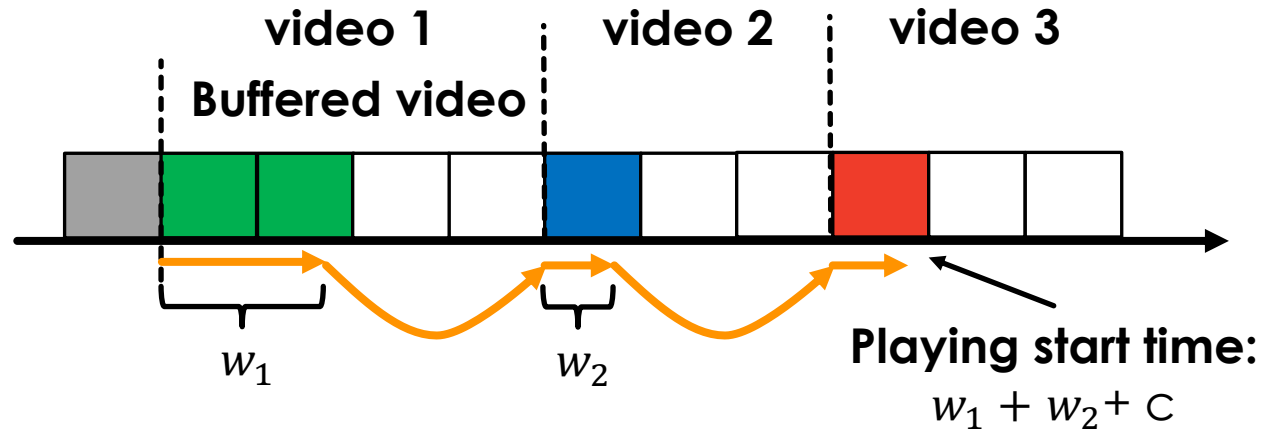
Buffer order in traditional video streaming



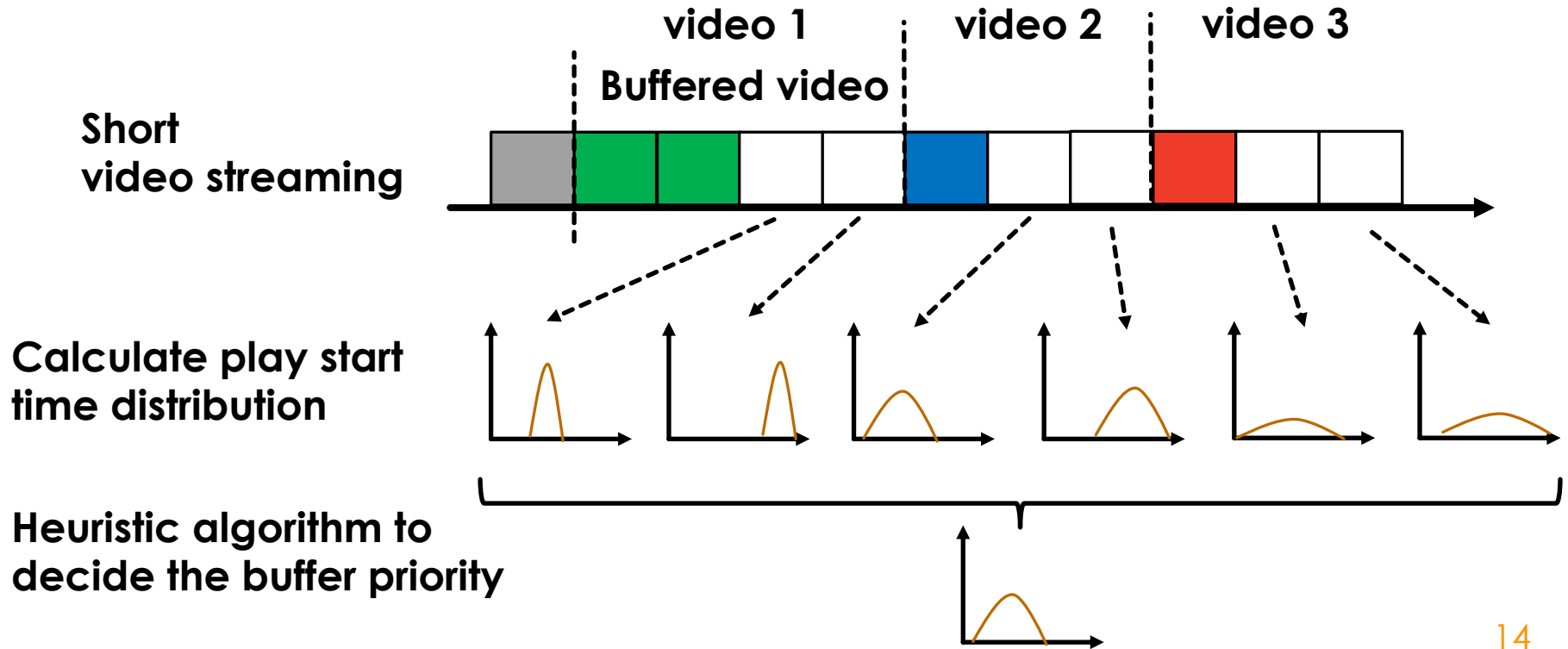
Buffer order: the video chunk that will be played earlier is downloaded earlier

Dashlet: play start time

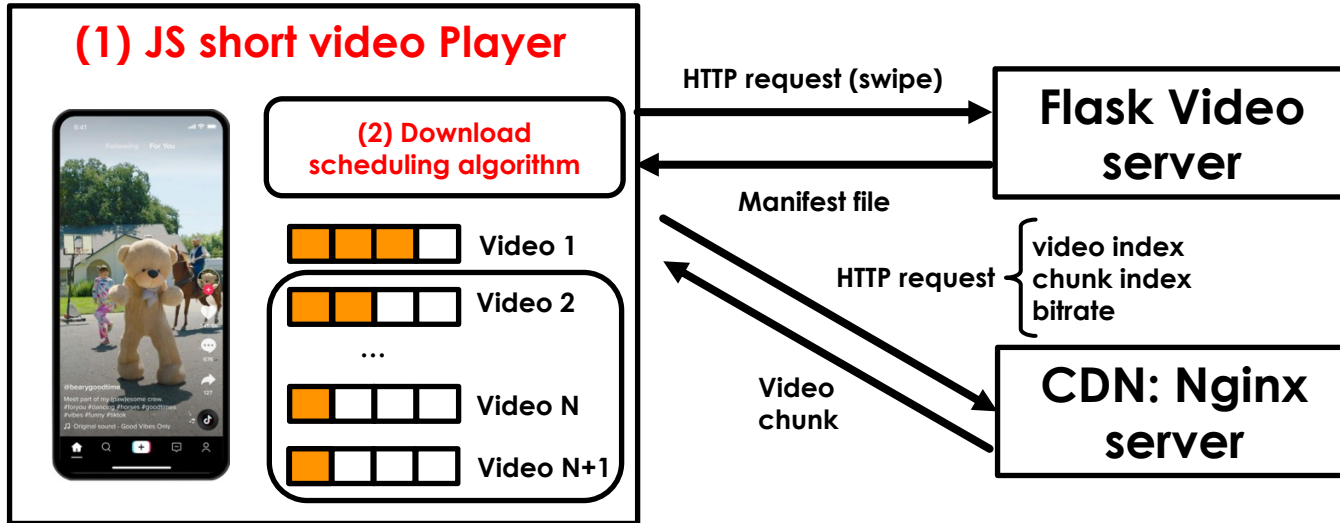
Short
video streaming



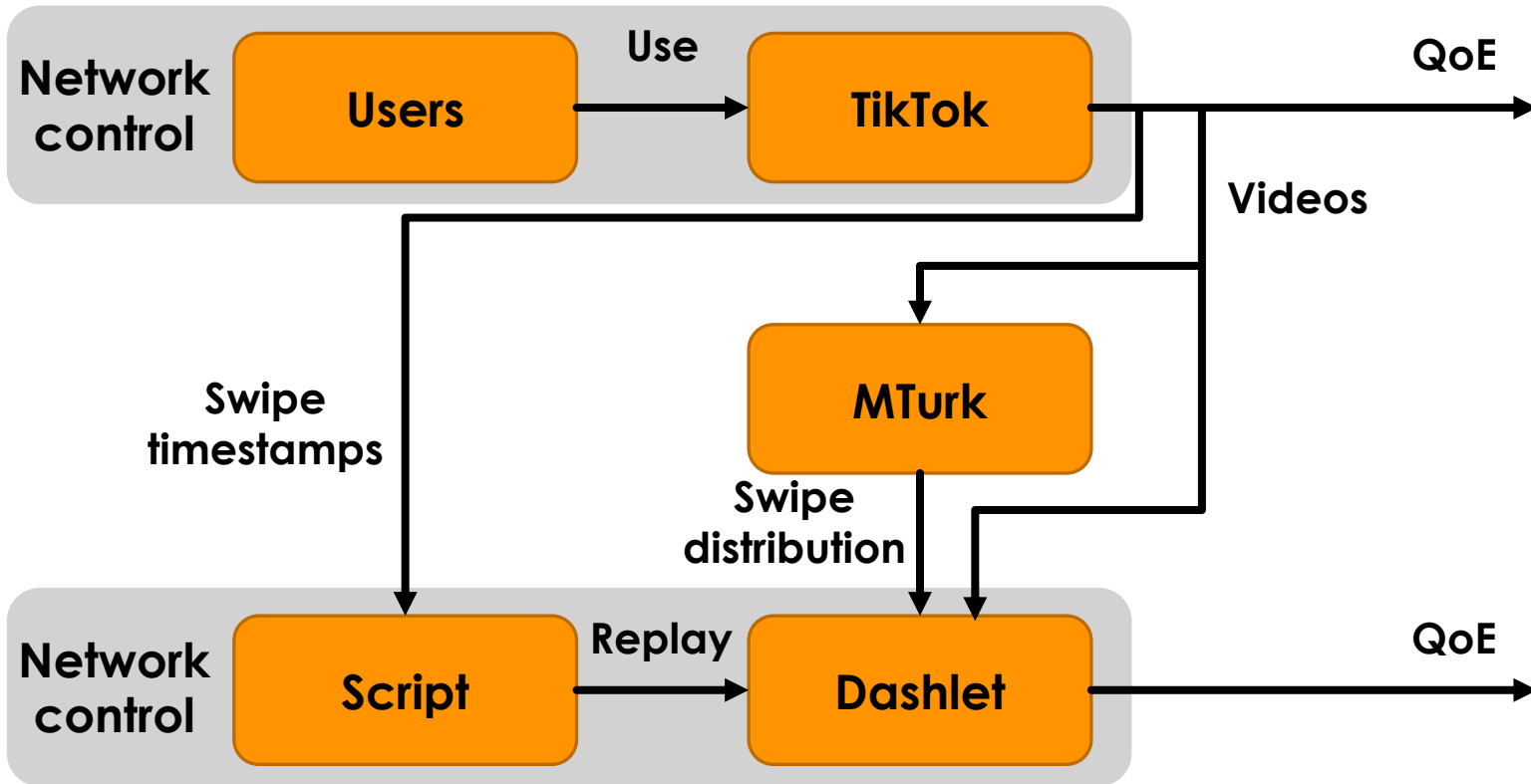
Dashlet: Algorithm



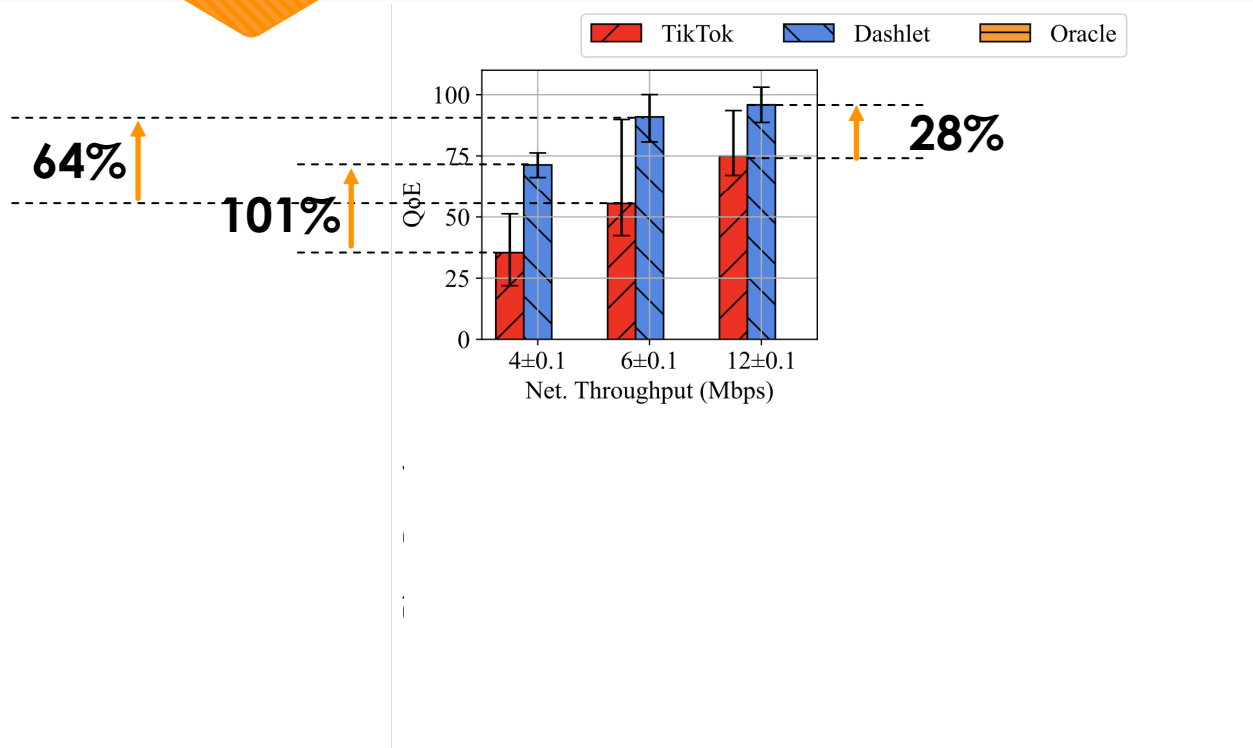
Implementation



Evaluation methodology

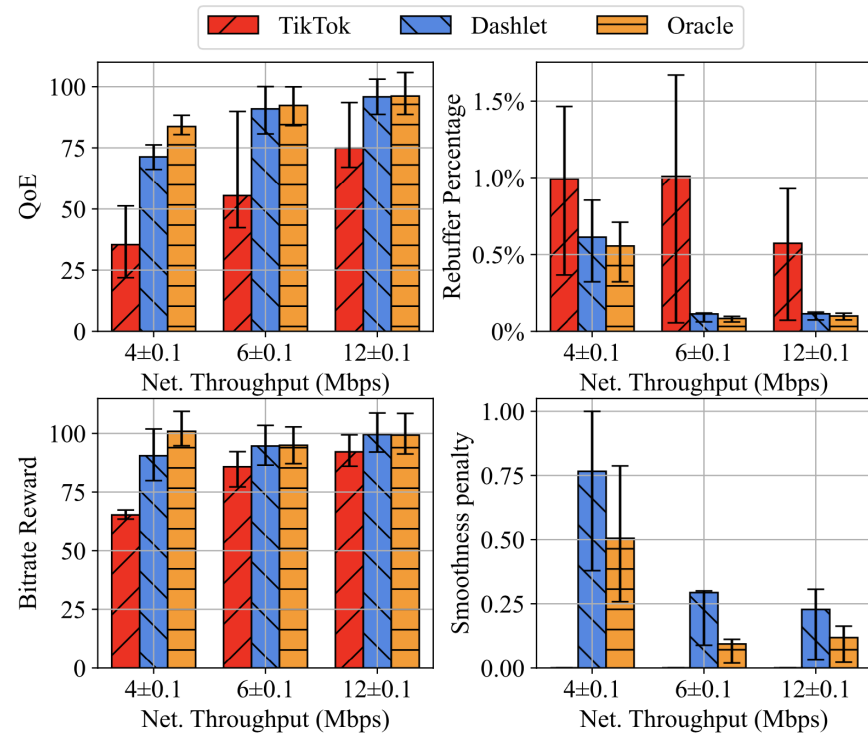


Key results



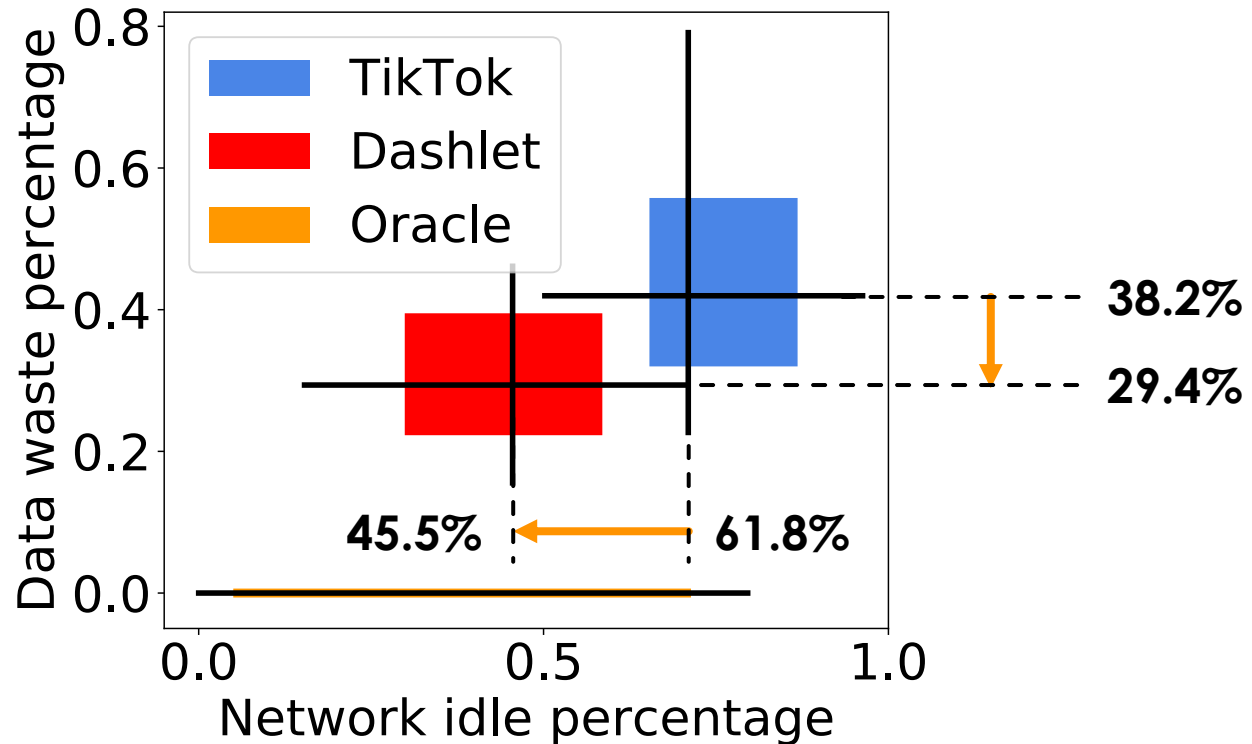
QoE = Bitrate reward - Rebuffer penalty - Smoothness penalty

Key results



$$\text{QoE} = \text{Bitrate reward} - \text{Rebuffer penalty} - \text{Smoothness penalty}$$

Dashlet reduces data waste and network idle



Conclusion

- We design and implement Dashlet system with the following insight:
 - Users' swipe is a critical information for short video streaming
 - Video specific swipe distribution is powerful enough to achieve high QoE
- Evaluation result shows Dashlet significantly improves the QoE by 28%-101% compared with the TikTok.
- We release our code: <https://github.com/PrincetonUniversity/Dashlet>