



# HTTP/2 PUSH 기반 HTTP Adaptive Streaming

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TEAM | Fasttp2

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## Video Streaming

The Netflix logo, consisting of the word "NETFLIX" in a bold, red, sans-serif font, centered on a solid black rectangular background.The Naver TV logo, featuring a white play button icon on the left, followed by the words "NAVER TV" in a bold, white, sans-serif font, all set against a teal-to-cyan gradient background.

## Motivation

# Video Streaming - VOD



**Start-up time** = Actual start - Request time

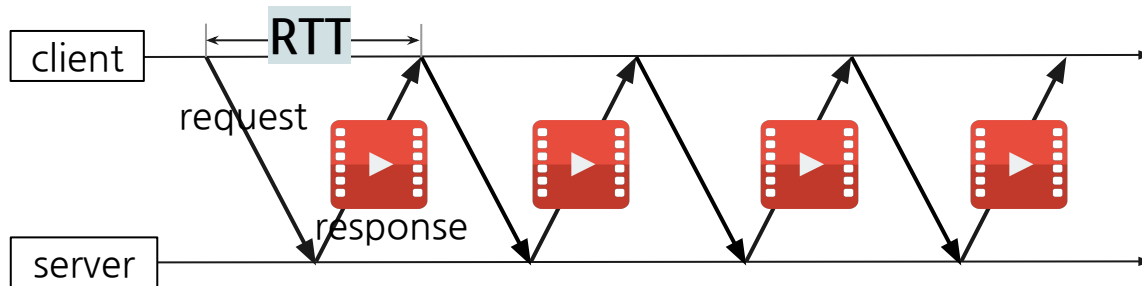


**Buffering time** = Time until next frame is arrived

# Problem



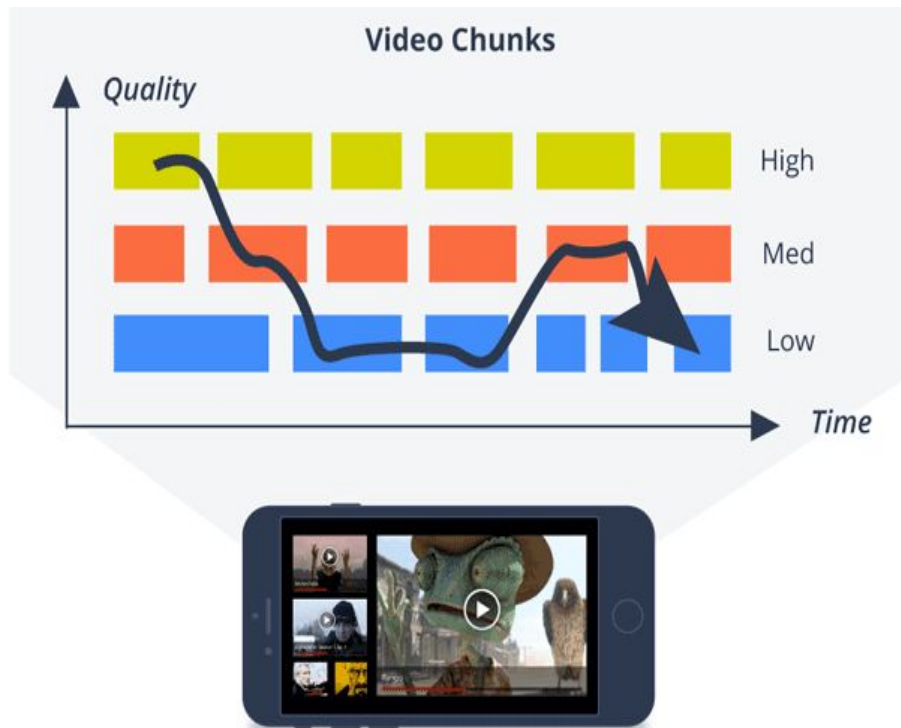
Start-up time  
Buffering (freeze) time



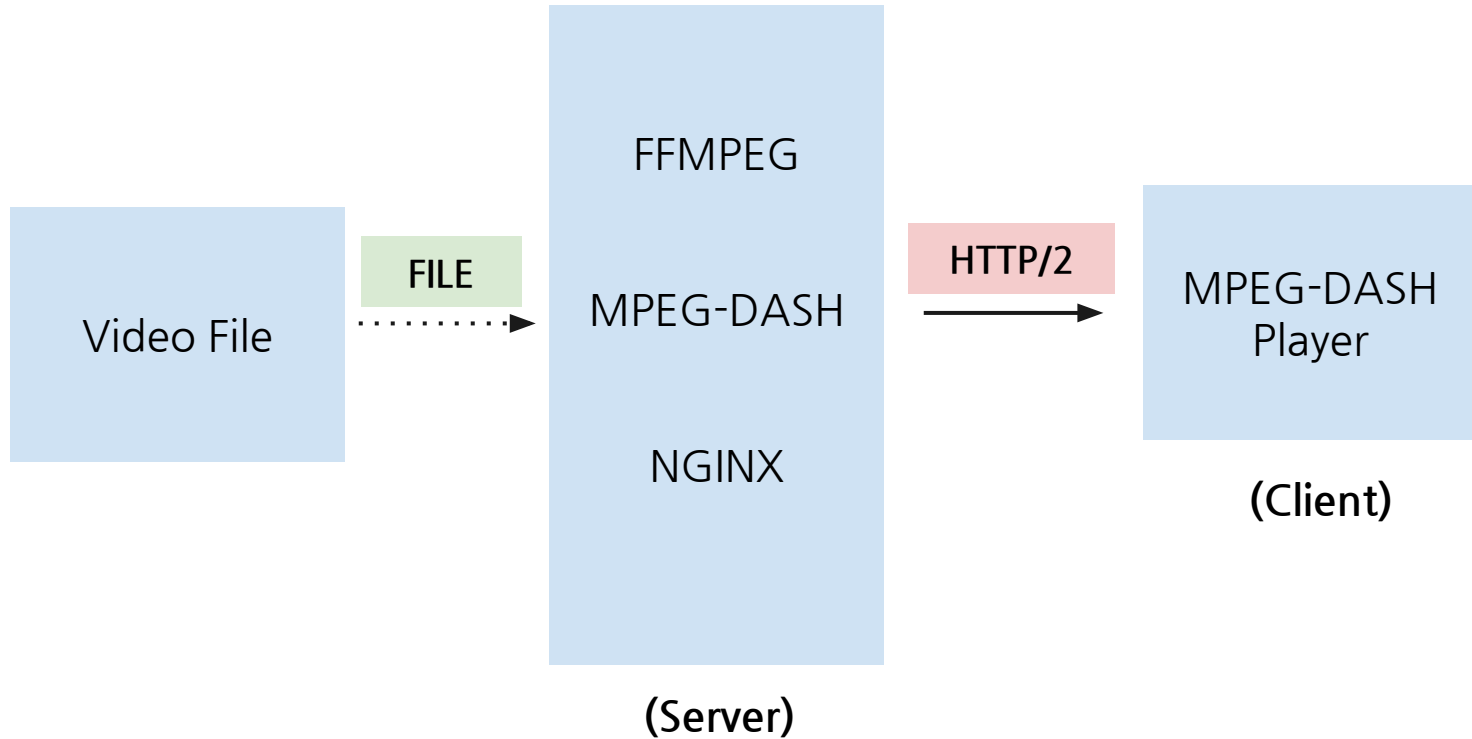
VOD의 RTT를 줄이자

# Requirement

## Adaptive Streaming



# Background

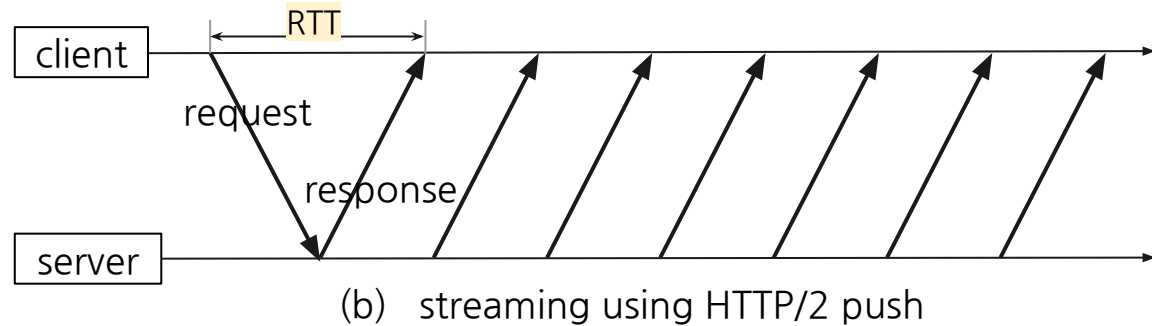
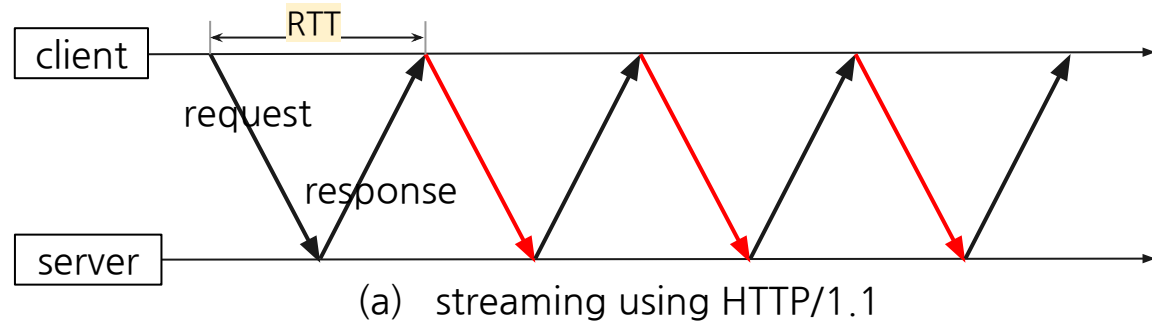


# Solution

HTTP/1.1



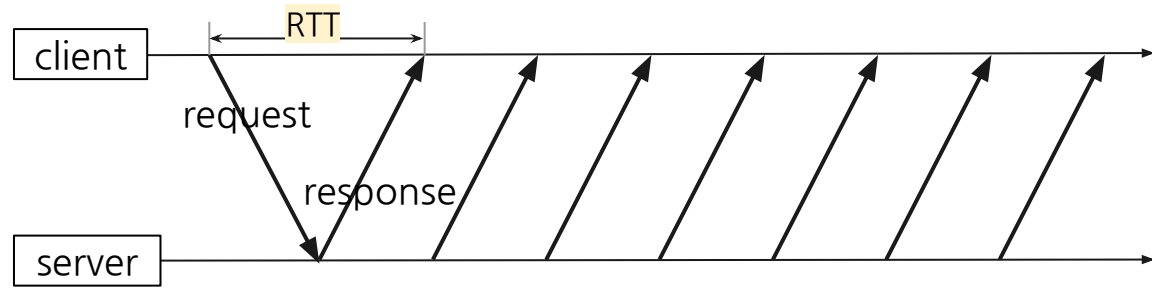
HTTP/2 PUSH



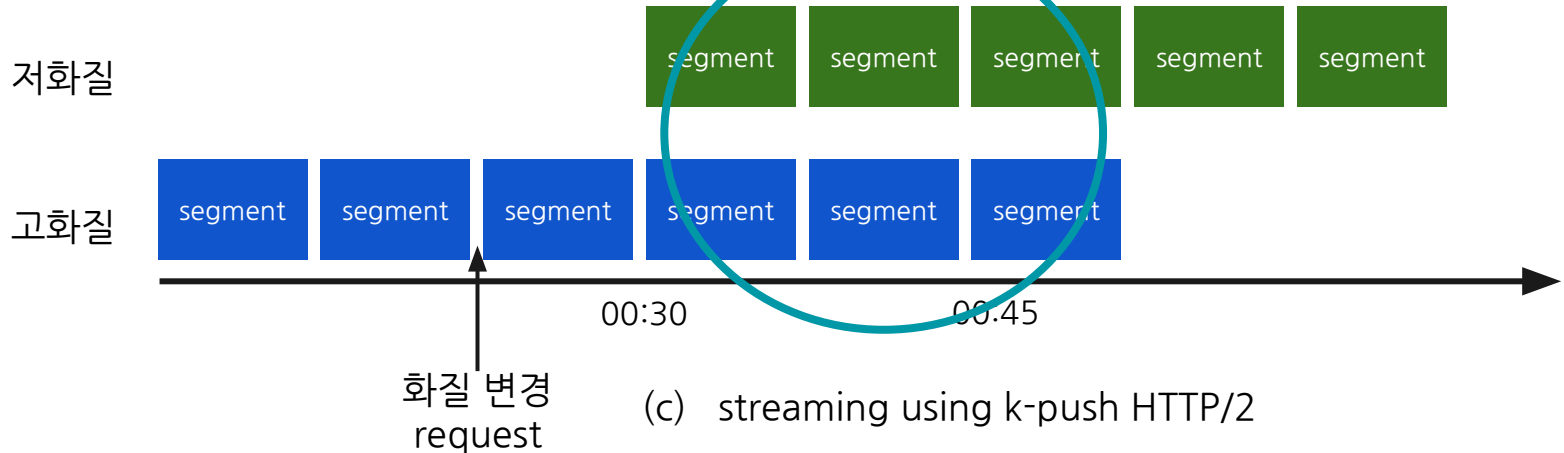


# Solution

## HTTP/2 PUSH



(b) streaming using HTTP/2 push



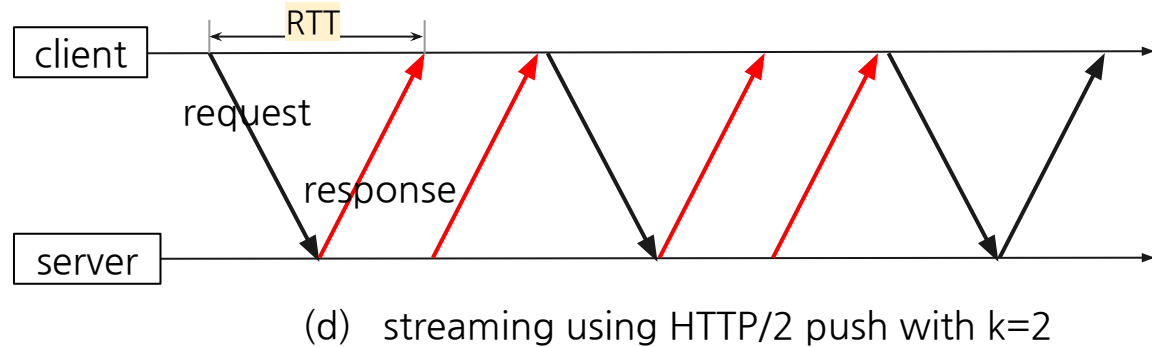
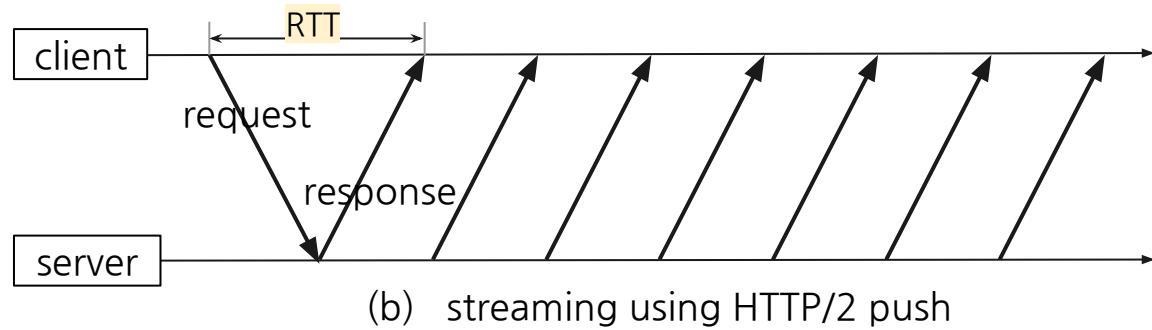
(c) streaming using k-push HTTP/2

# Solution

HTTP/2 PUSH



HTTP/2 PUSH  
with  $k=?$



## What is optimal k?

(Start-up time / Buffering time)

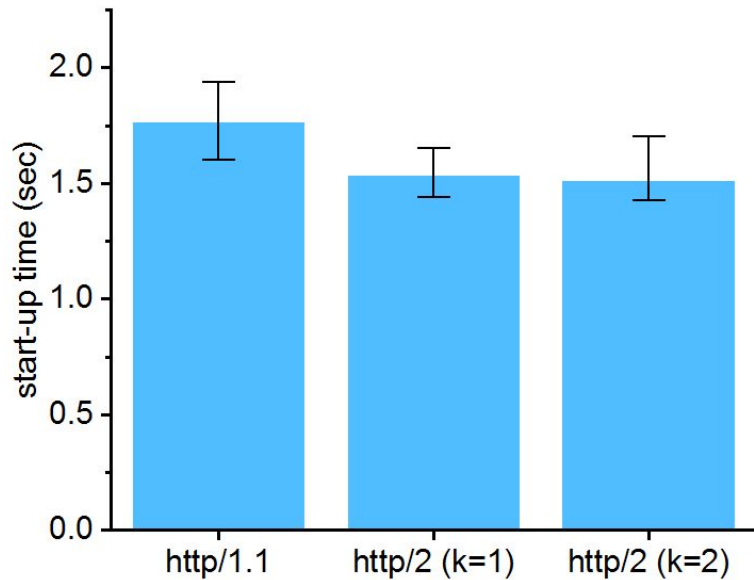
k	HTTP/1.1	HTTP/2 1	2	4	8
segment	5s				
RTT	20ms / 55ms				
count	10				



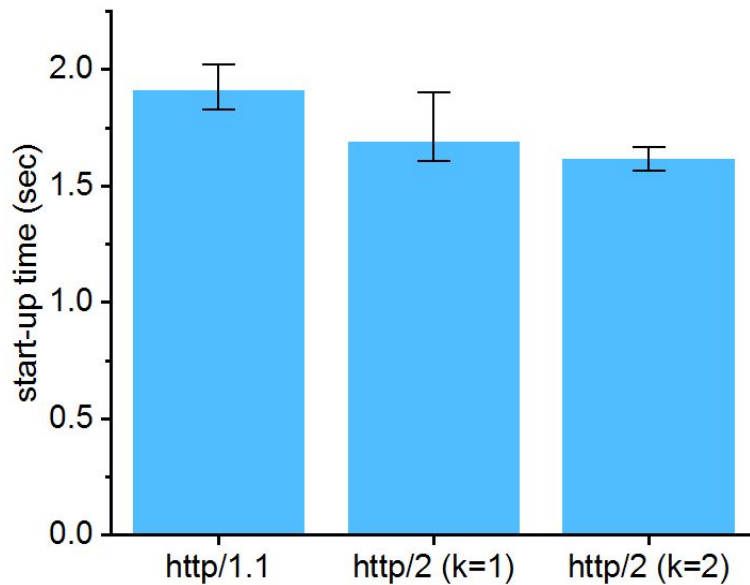
bandwidth: 3000kbps  
video length: 2min

## Results

# Start-up time



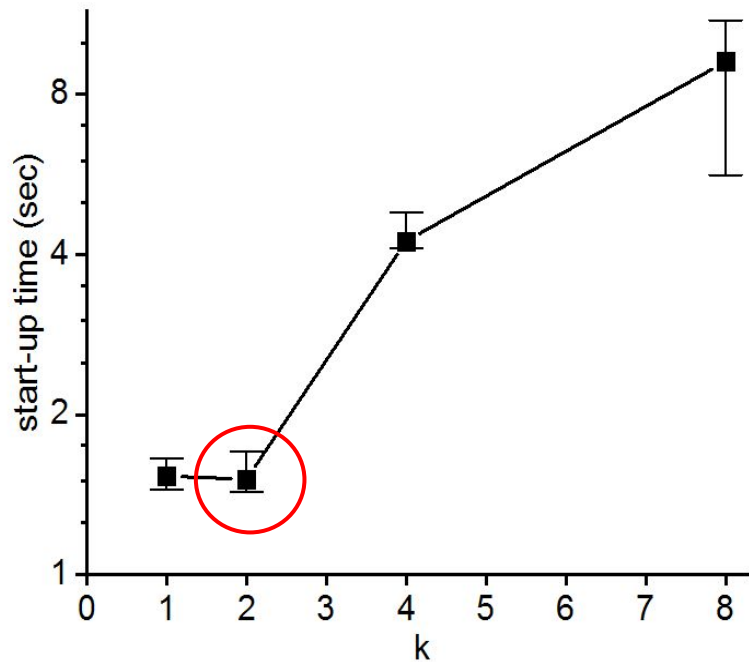
RTT = 20ms



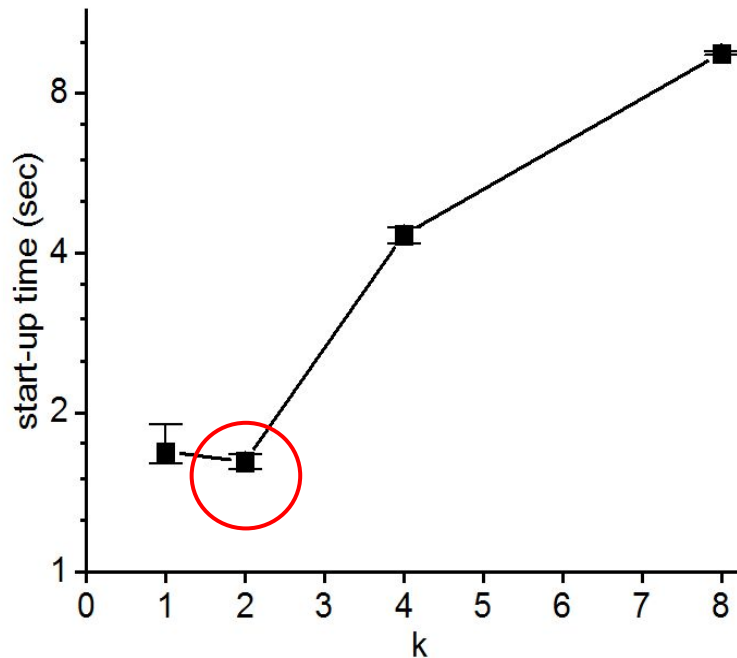
RTT = 55ms

## Results

## Start-up time



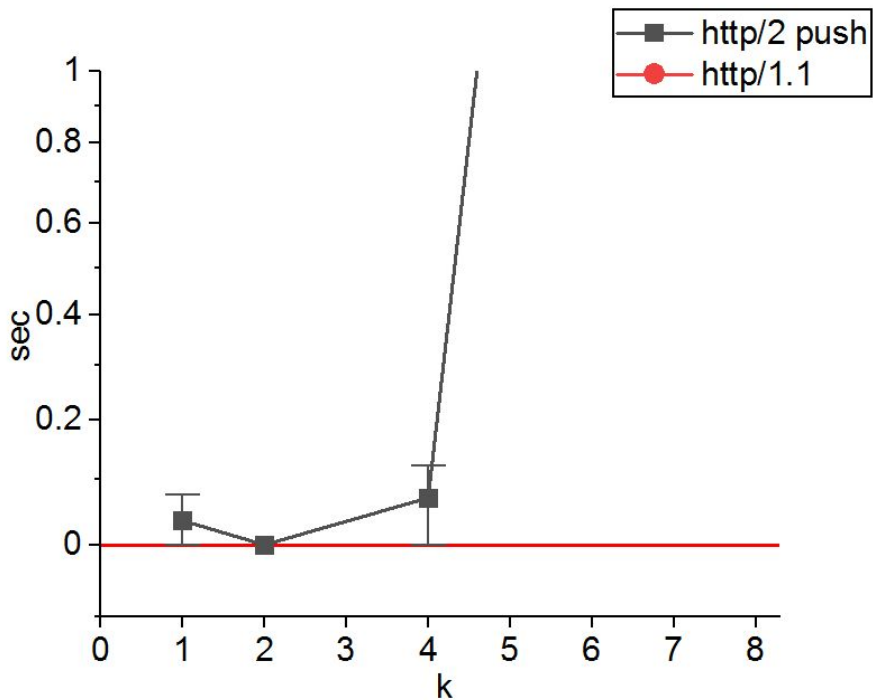
RTT = 20ms



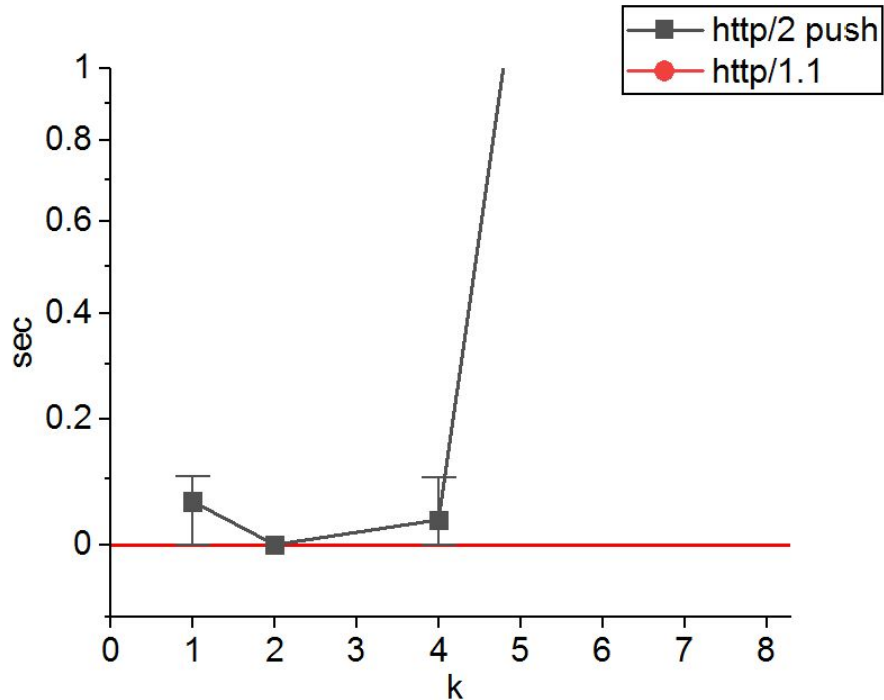
RTT = 55ms

## Results

# Buffering time



RTT = 20ms



RTT = 55ms

## Results

- **Start-up time**

- optimal  $k = 2$
- $k < 2$  : init (비디오 디코딩하는데 필요한 기본 정보) 요청 후 segment 1 요청
- $k > 2$  : segment들의 도착 순서 안 정해져있음 (역순으로 도착 시 기다려야함)

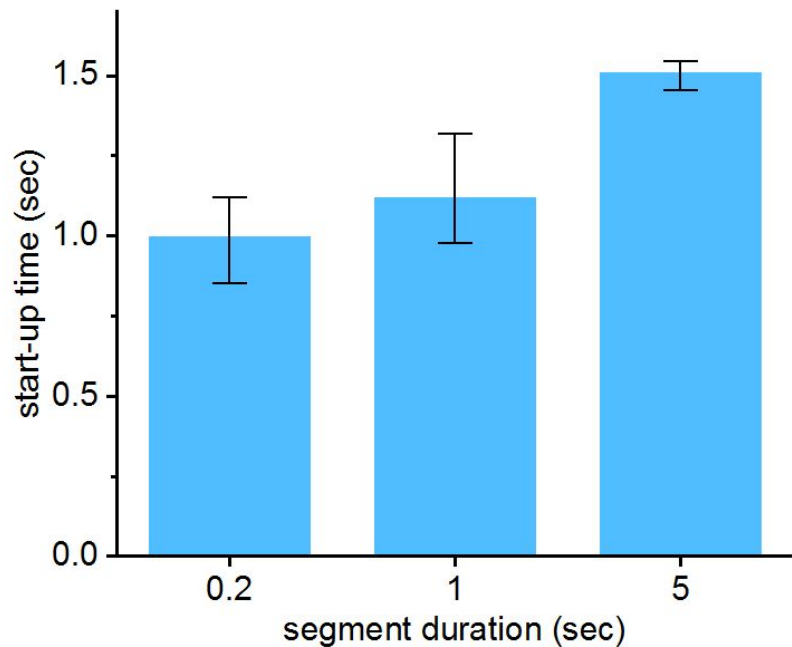
- **Buffering time**

- optimal  $k = 2$

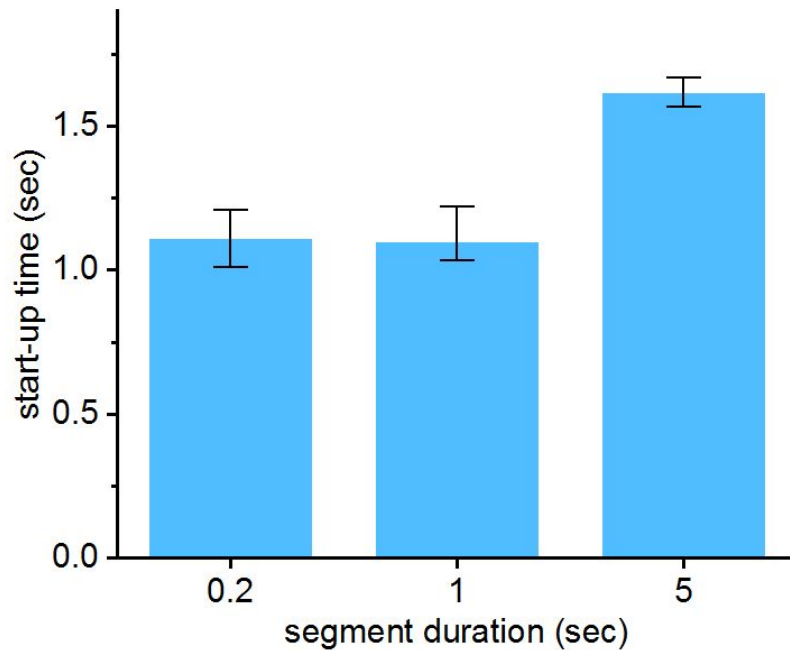
optimal  $k = 2$   
+ 여러 segment size

## Results

# Start-up time



RTT = 20ms



RTT = 55ms



## Results

# Buffering time

segment size = 1 s

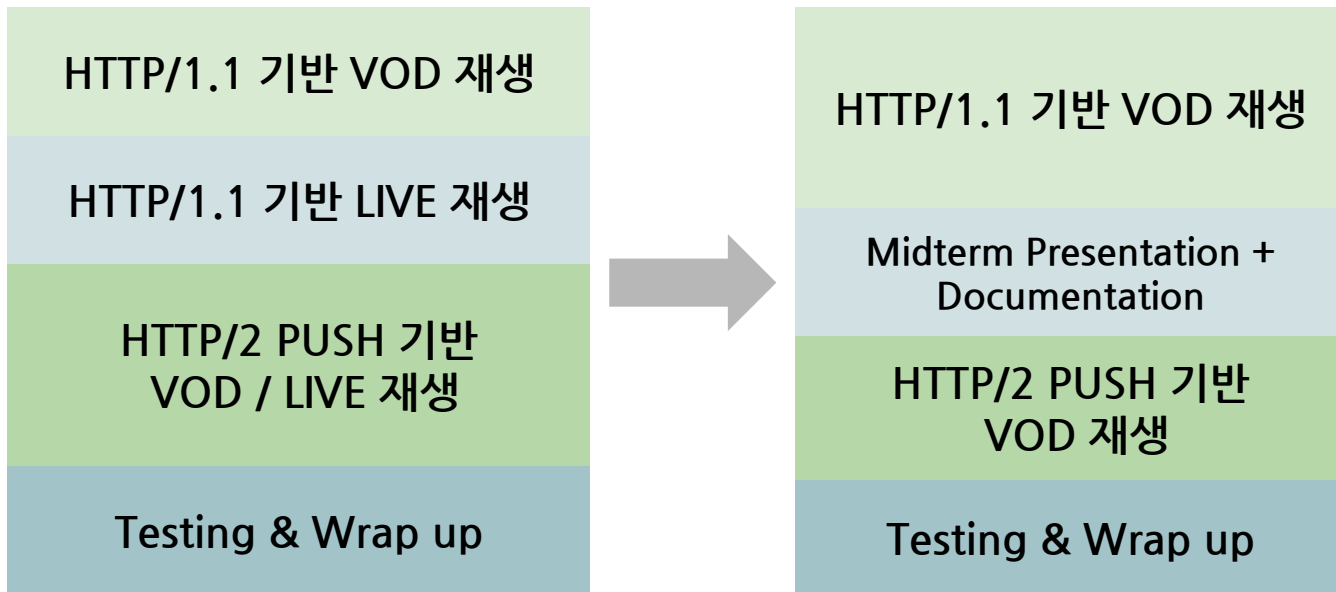
player buffer size  $\approx$  1 s

RTT / k	http/1.1	http/2 k=1	k=2	k=4	k=8
20ms	0	0	0	0	0.009
55ms	0	0	0	0	0

## Project Management

- Scope management

- 주어진 시간 내에서 sub-목표를 달성할 수 있도록



- Requirement management

- Adaptive Streaming: MPEG-DASH

# Project Management

- Risk management

예상하지 못한(하는) risk를 고려한 스케줄링 필요!

## 처음 예상했던 risk

- 1) 서버 오류
- 2) 안드로이드 탭 고장
- 3) 노트북 고장
- 4) 구성원 변경

HTTP/1.1 기반 VOD 재생

Midterm Presentation +  
Documentation

HTTP/2 PUSH 기반  
VOD 재생

Testing & Wrap up

## 발생한 risk

- 1) 사용한 라이브러리 (Exoplayer + Okhttp) 간의 오류
  - 앱->웹으로 진행
- 2) 모바일 웹 브라우저에서 캐쉬 disable 불가능
  - Webview로 진행
- 3) 영상의 영구적인 멈춤 현상
  - 실험의 scope 줄임

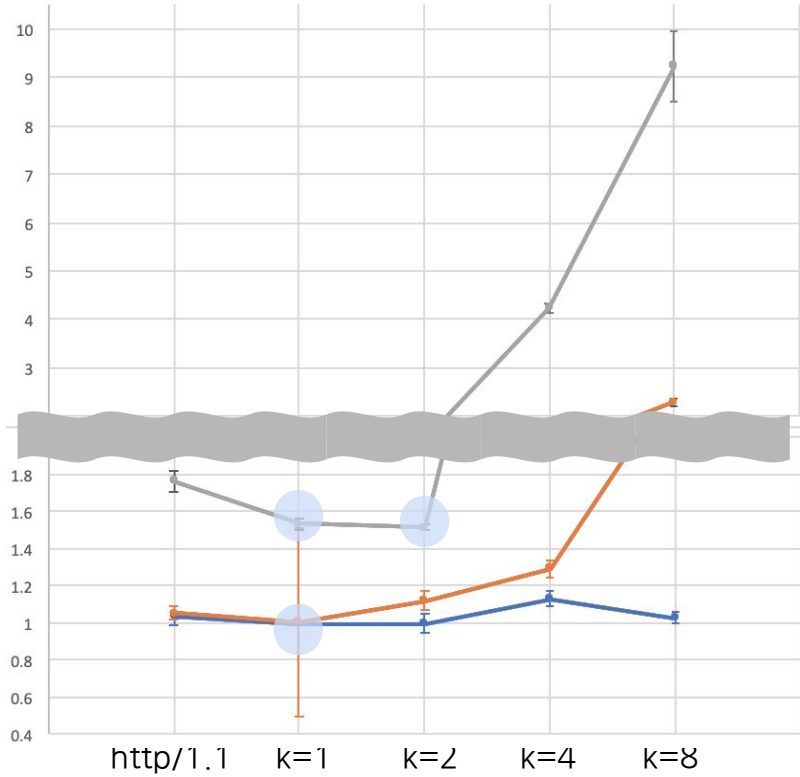


# Thank you

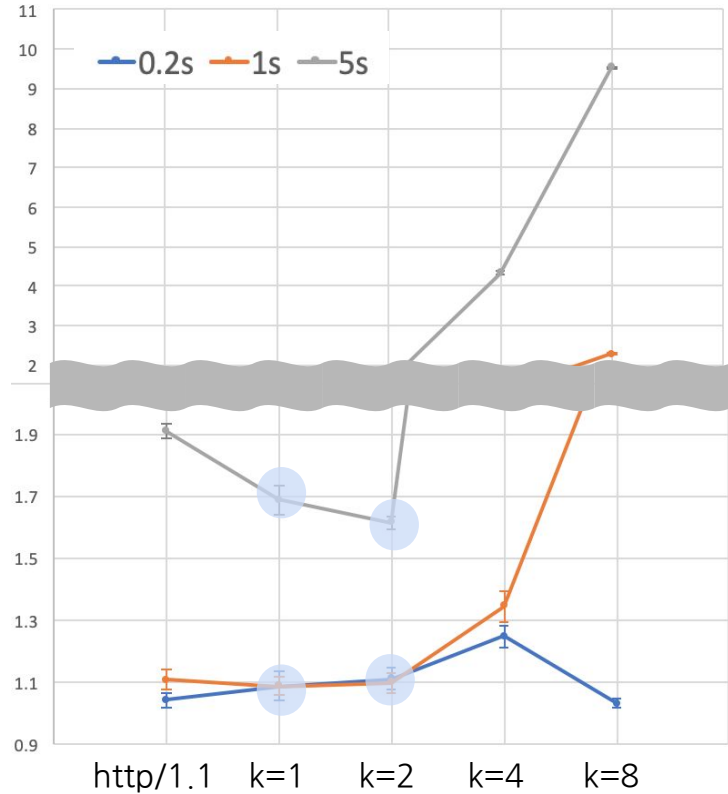
Let's see a demo!

# Appendix

## Start-up time



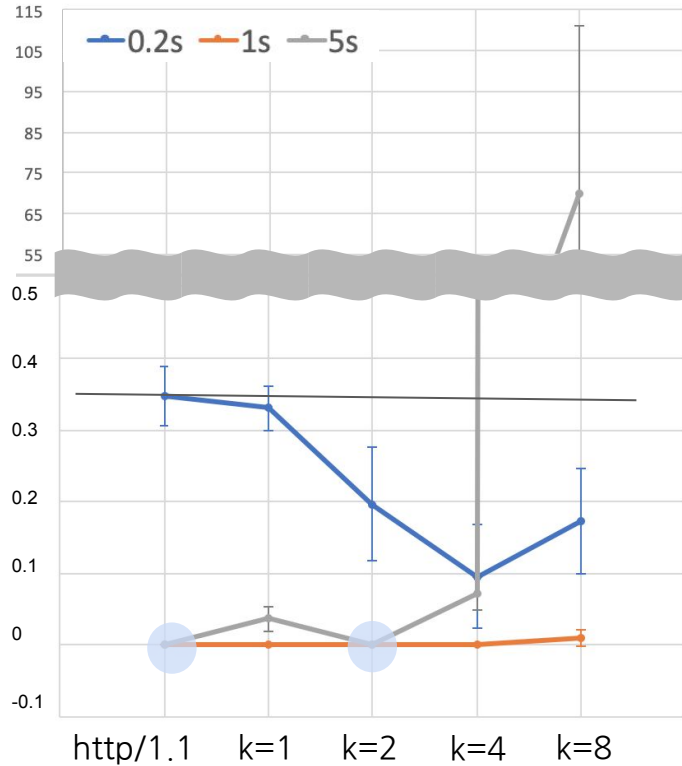
RTT = 20ms



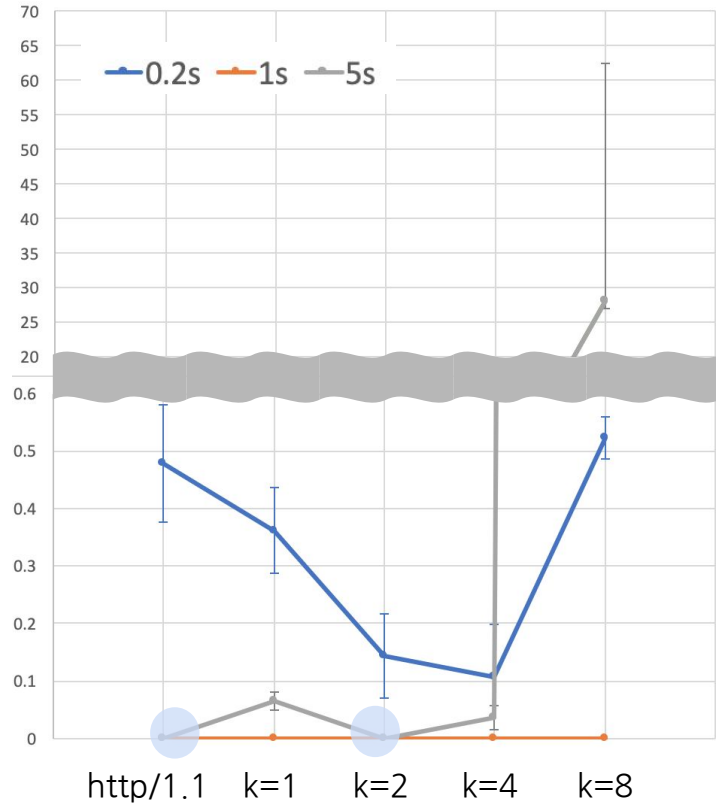
RTT = 55ms

## Appendix

# Buffering time



RTT = 20ms



RTT = 55ms