
MATROŠKA

Low Latency Streaming

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{ Origin Of MATROŠKA }

- Created in Open communities (IRC, mailing lists, Doom9)
- Mix of AVI, Ogg, XML, Unicode, Semantic Web (2002 buzzwords)
- W3C inspired (open, royalty free)
- Long term storage (designed for 10+ years)
- Low overhead
- Streaming Friendly (continuous stream, progressive download p2p)
- Adopted by Google/Mozilla for WebM
- A.K.A. .mkv files

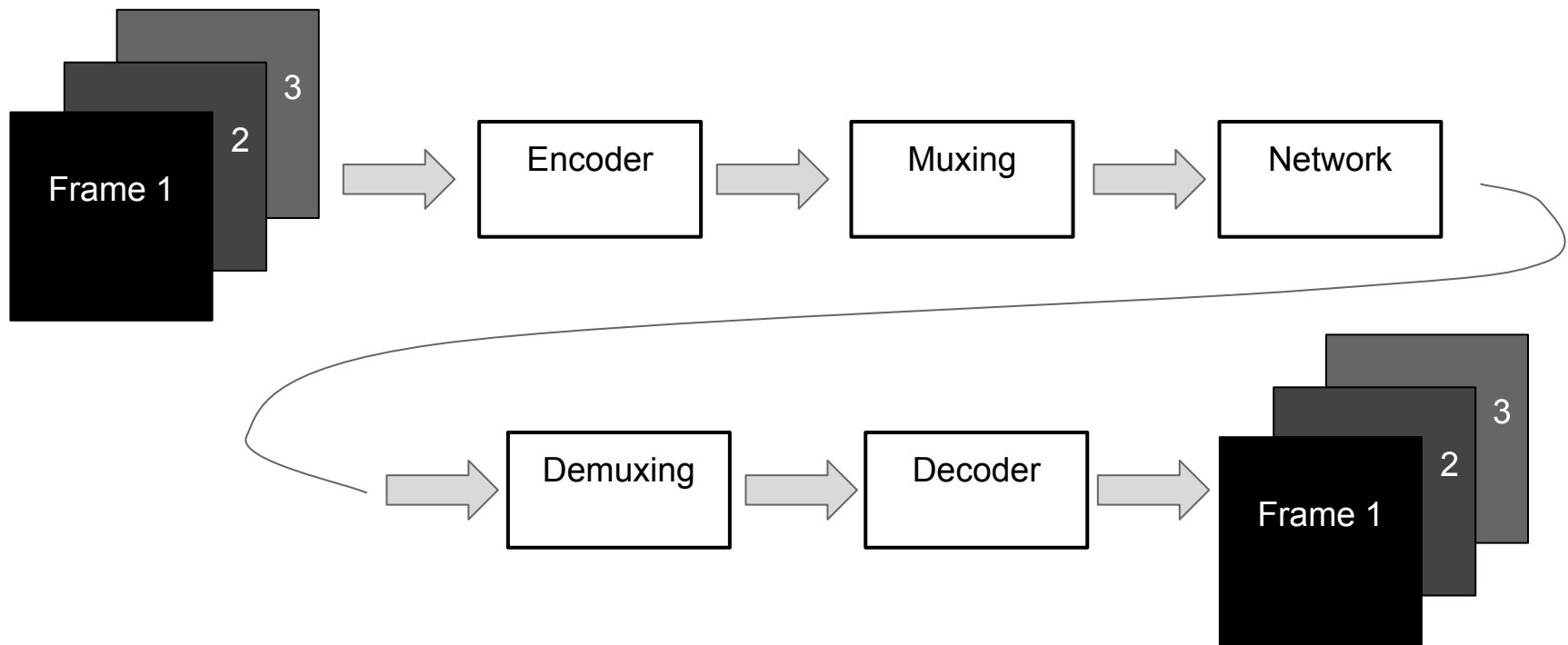
{ IETF CELLAR Group }

- Codec **E**ncoding for **L**oss**L**ess **A**rchiving and **R**eal-time transmission
- EBML and **MATROŠKA** documentations
- 13 contributors
- +300 commits for each
- Started in 2015
- Also handles FFV1 and FLAC standardization

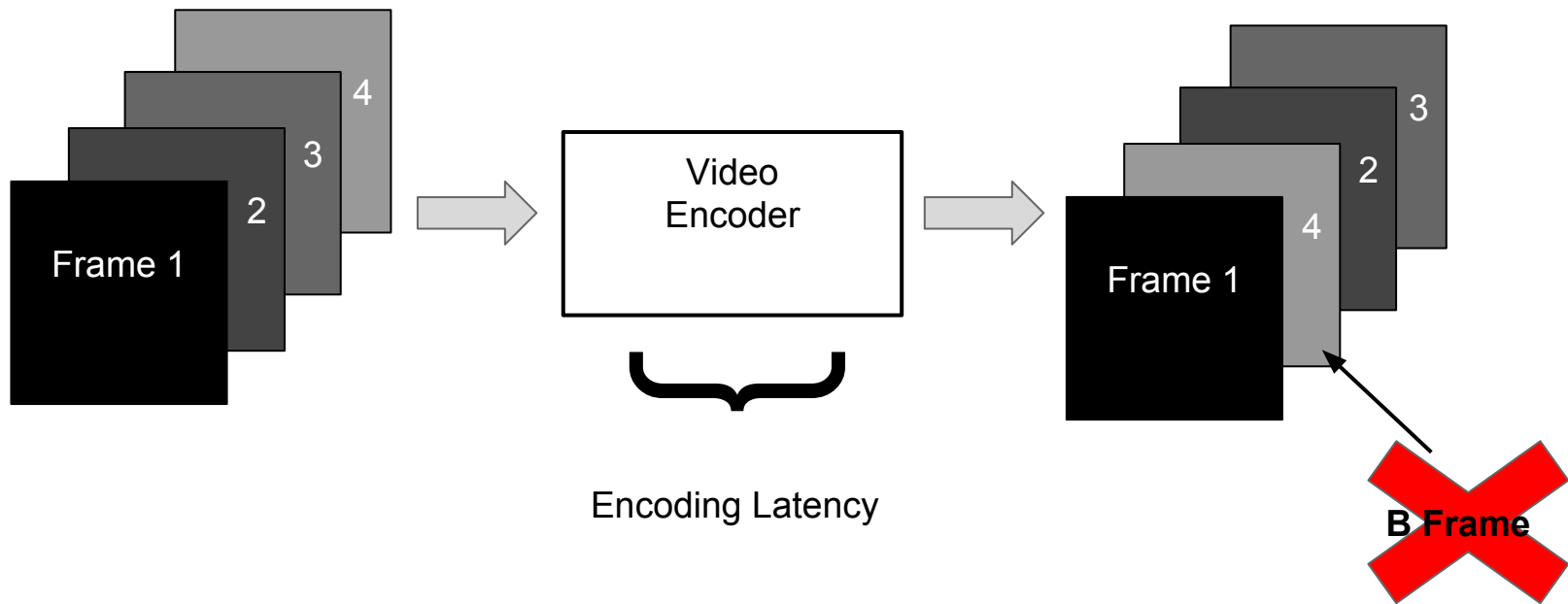
{ What is Latency ? }

Wikipedia:

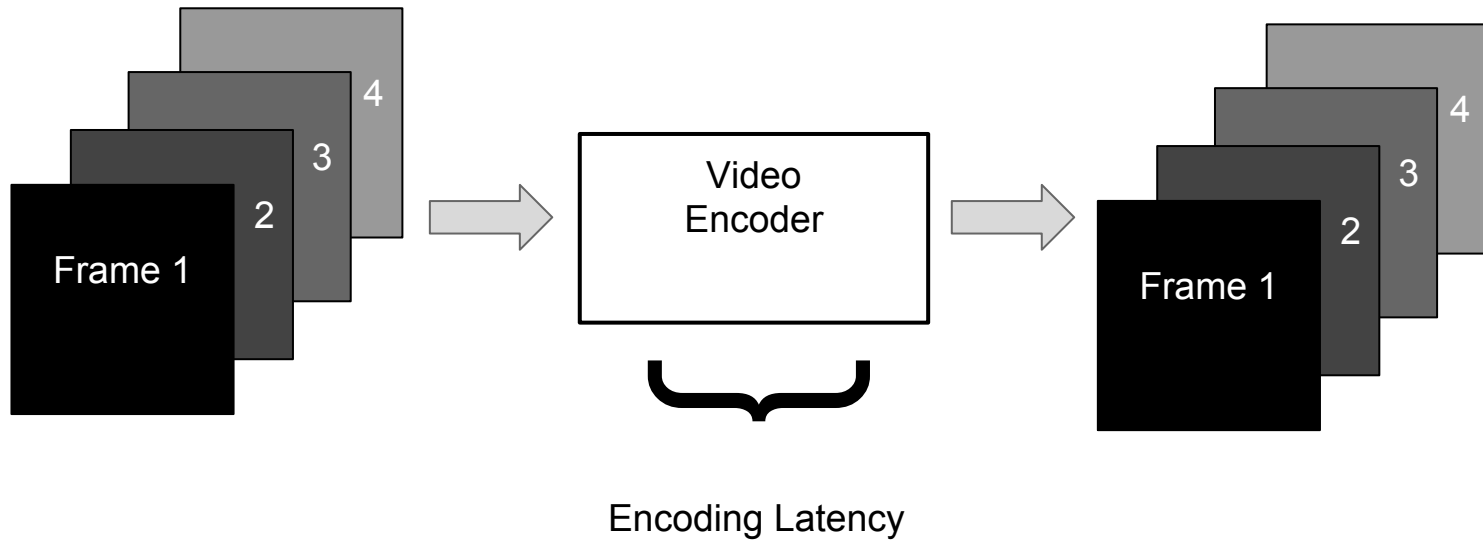
Latency is a time interval between the stimulation and response, or, from a more general point of view, a time delay between the cause and the effect of some physical change in the system being observed.



{ Video Encoding }

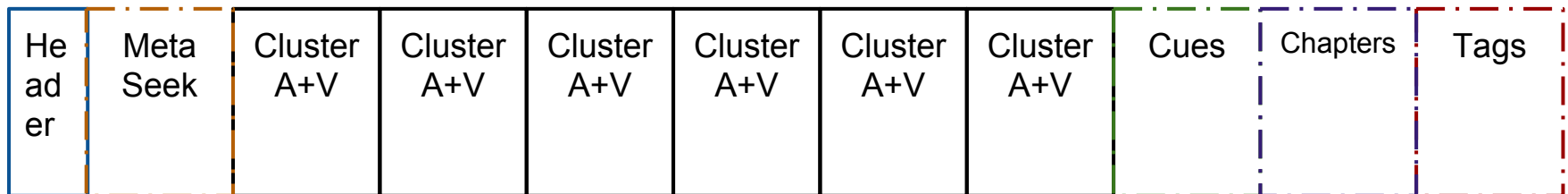


{ Video Encoding }

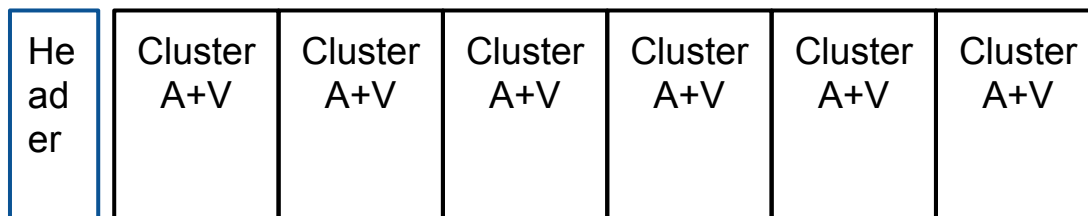


{ MATROŠKA File Structure }

File structure

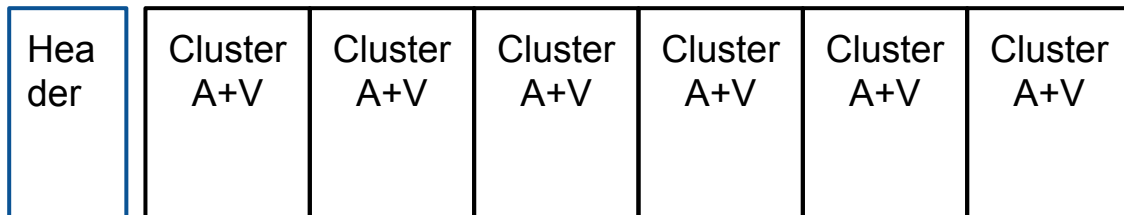


Live stream structure

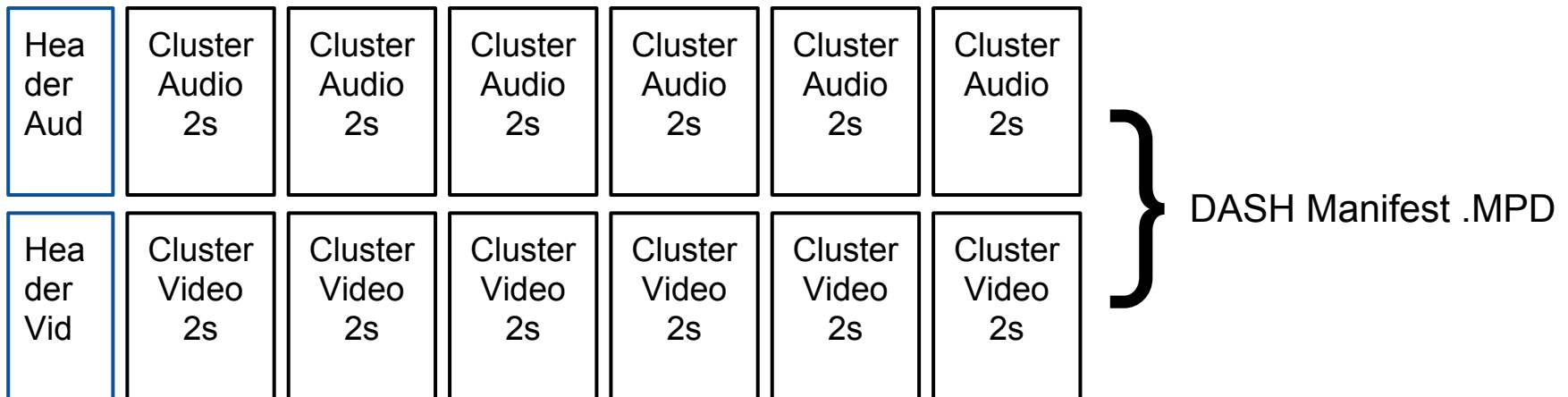


{ WebM DASH }

Live stream structure

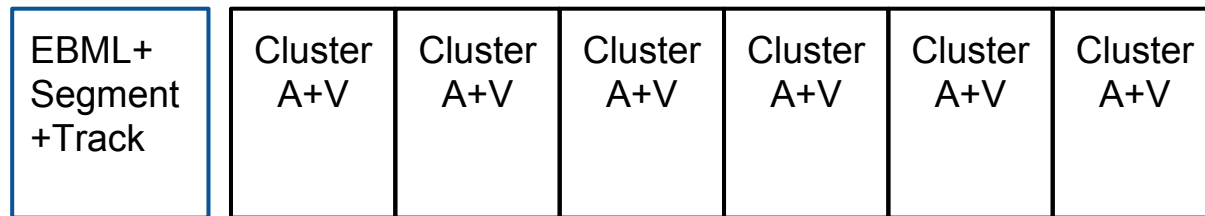


DASH live adaptive streaming structure



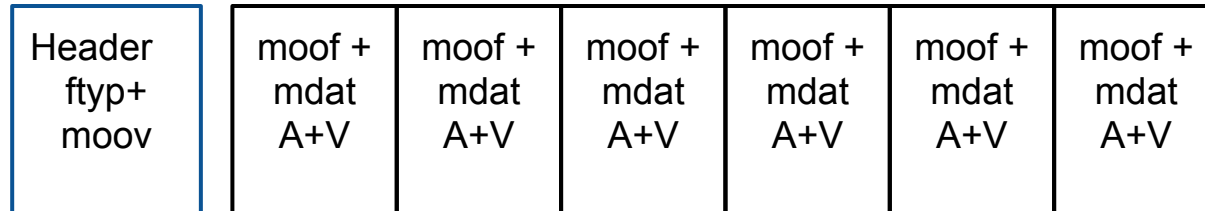
{ Comparison with fragmented MP4 }

Live stream structure



460 bytes 25+data', 25+data', ...

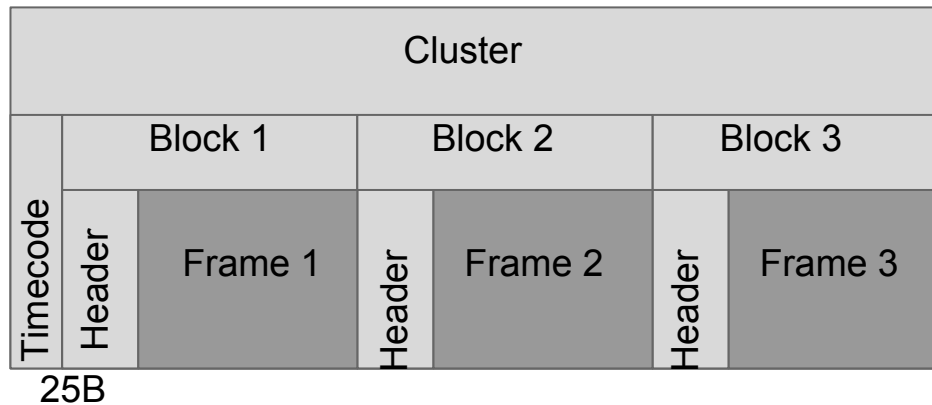
Fragmented MP4



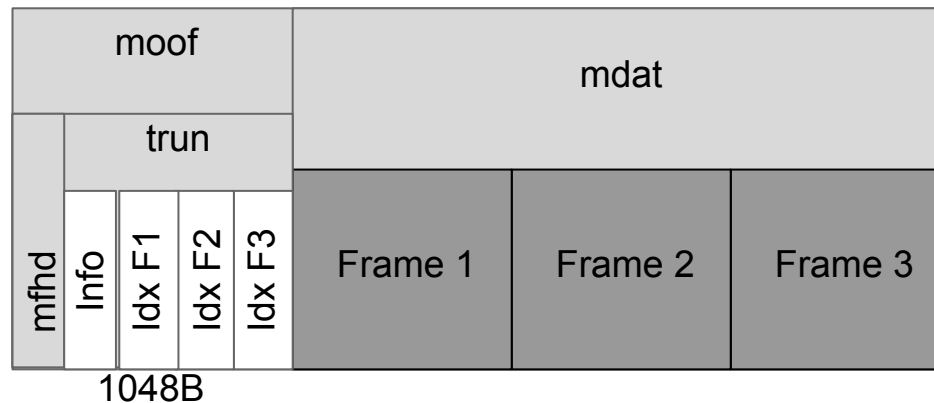
2100 bytes 850+data, 850+data, ...

{ Frames wrapping MKV vs fMP4 }

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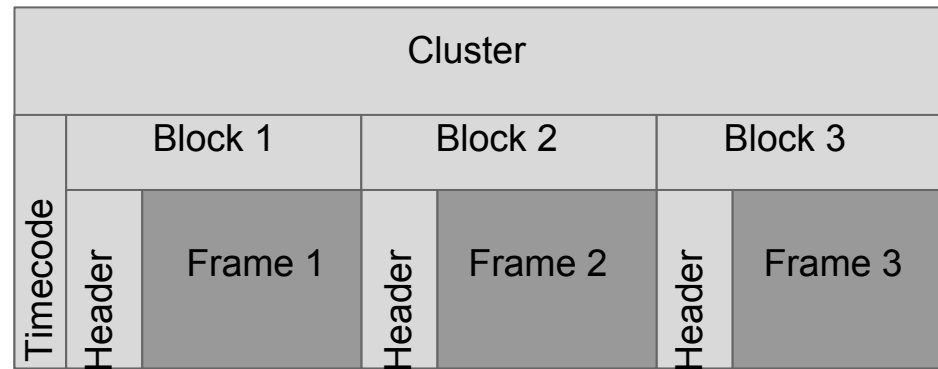


fMP4 (frame caching required)



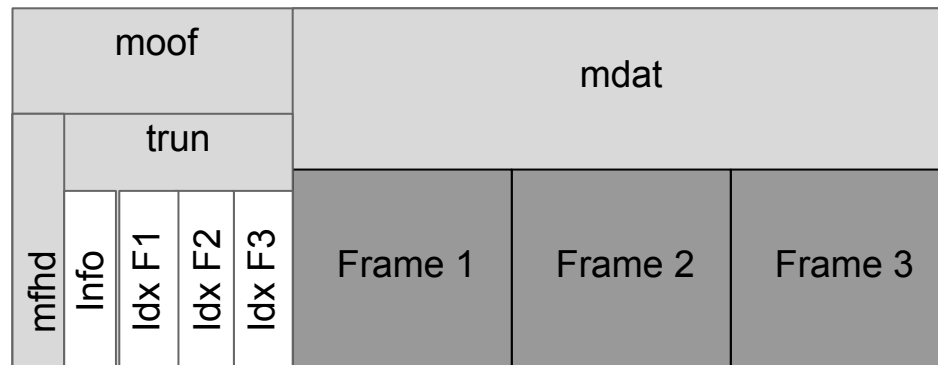
{ Frame Latency MKV vs fMP4 }

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1st Frame Latency = 40000+25

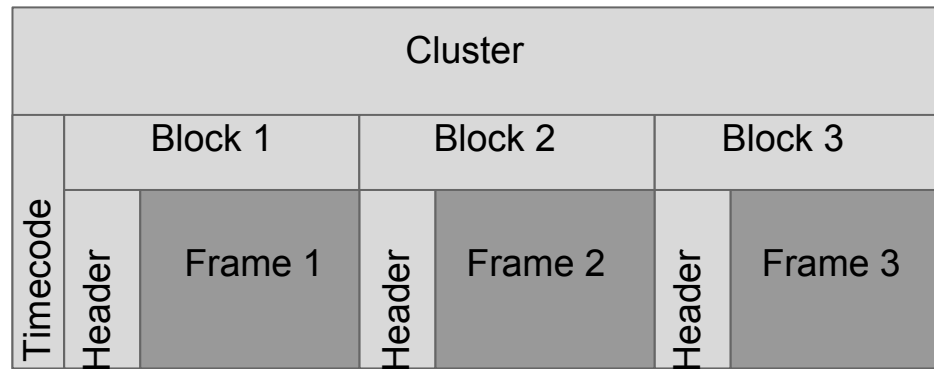
fMP4 (frame caching required)



1st Frame Latency = 40000+1048

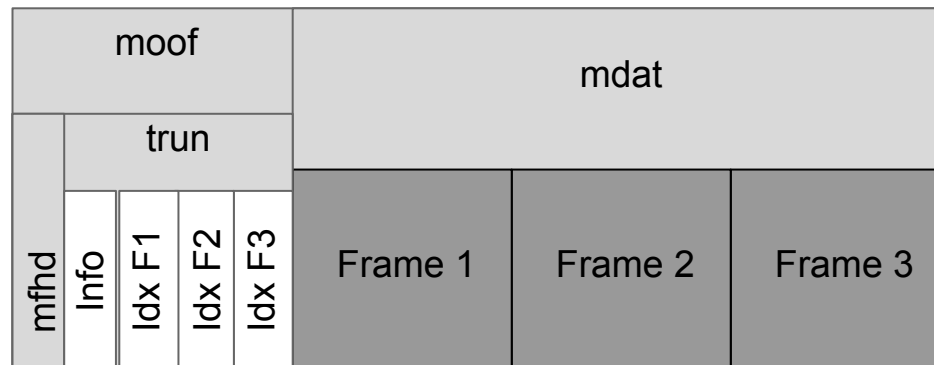
{ Buffer Latency MKV vs fMP4 }

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Buffer before sending

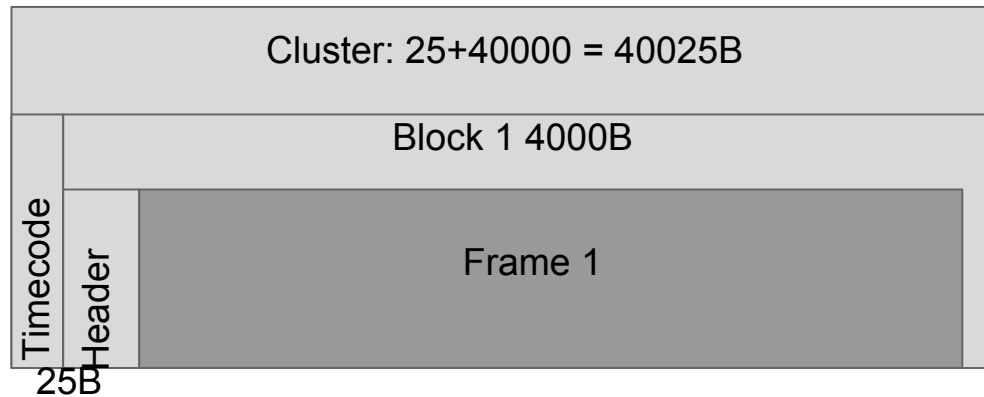
= 20ms fMP4 (frame caching required)



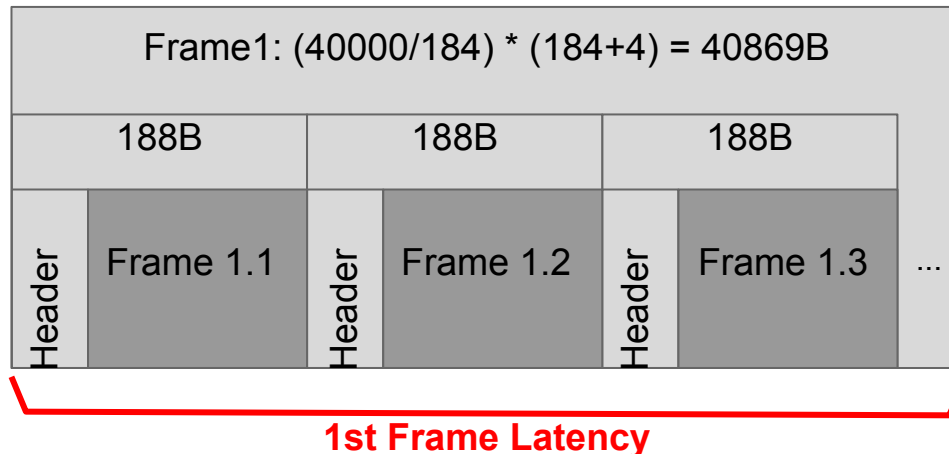
Buffer before sending = 2s

{ Frame latency MKV vs TS }

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Transport Stream



{ Latency Summary }

MKV/WebM vs fMP4/CMAF

- Slightly lower network latency
- MUCH lower buffering latency

MKV/WebM vs TS

- Lower network latency
- Similar buffer latency

{ FIN }

- Thank You
- Contribute (pretty please)
- Questions
- Stickers