

Simple video encoder model for congestion control algorithm evaluation

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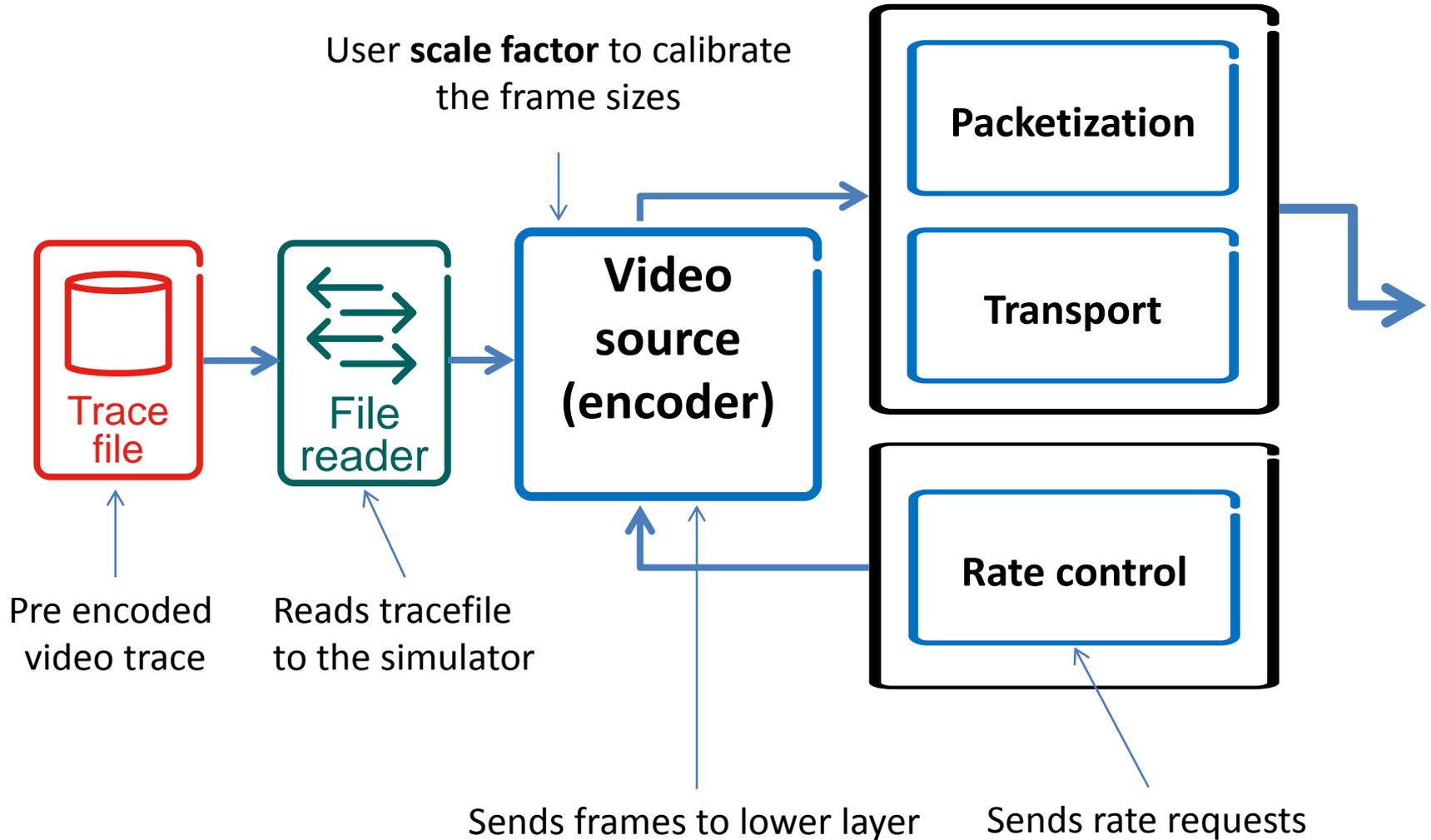
Background

- In RMCAT there has been discussion going on to design a traffic generator which takes into various encoder properties in to account.
- One way to facilitate the process is to reveal what everybody is using for evaluation of various adaptation solution
- This is attempt to describe what we use in our simulaton and eventually show a simple video encoder model for that task.

Important properties

- A real-time video source is periodic in nature
 - fps is a famous unit
- Video frame sizes depend on the content
 - Variation in bitrate
 - The used encoder rate control impacts the amount of variation
 - *bitrate variation* $\propto 1 / \textit{quality variation}$
- Given a specific codec compressing a specific sequence, at a certain bitrate the video quality depends on the used frame rate, resolution combination

The video source model



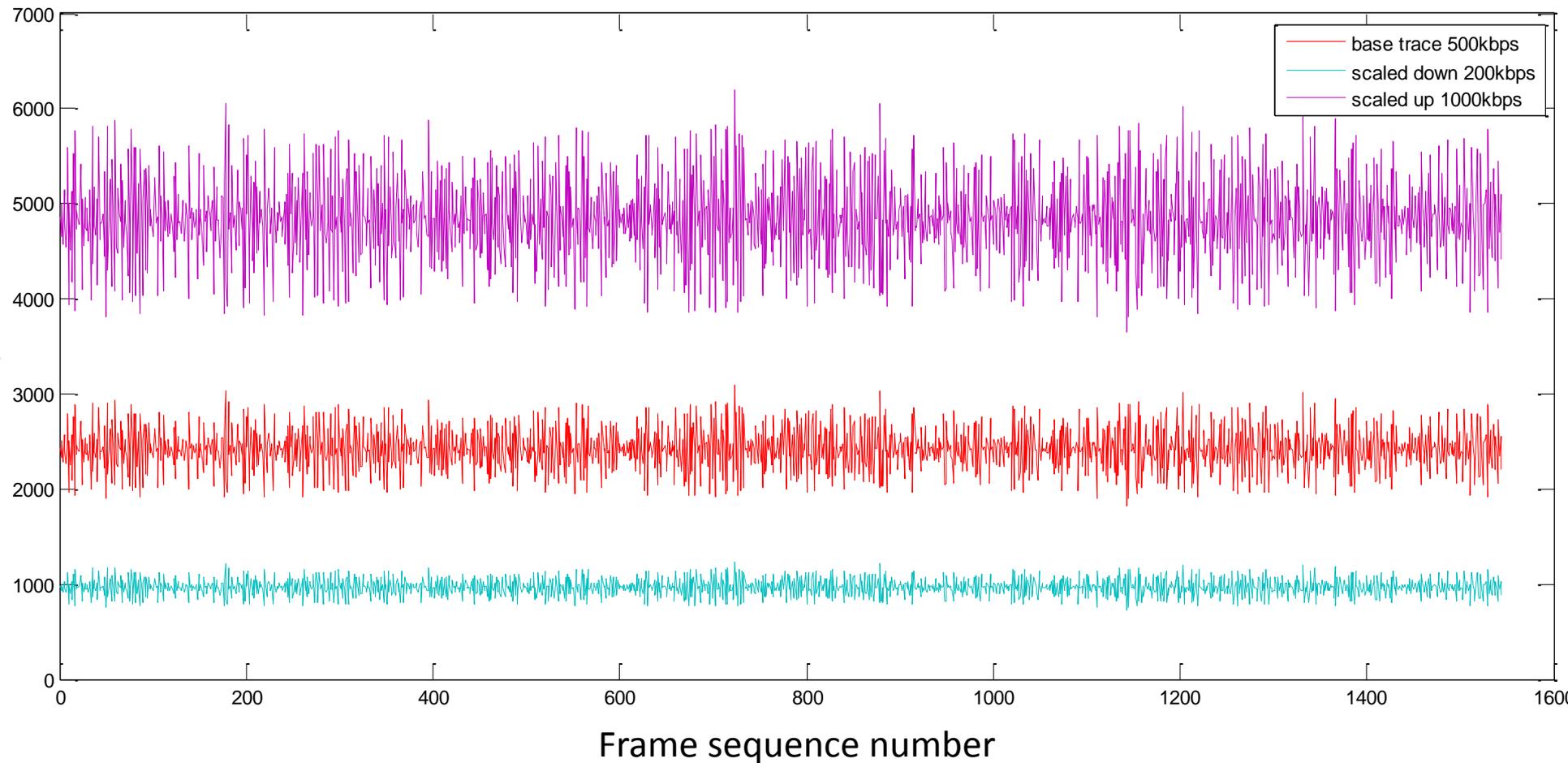
Theories behind the model

- Less number of trace files
 - One base trace file encoded for a particular target nominal bitrate with preferred framerate
- Scaling of framesize according to target bitrate
 - Unless framerate is changed
- Change tracefile when changing framerate
- From transport point of view it is the framesize that matters most

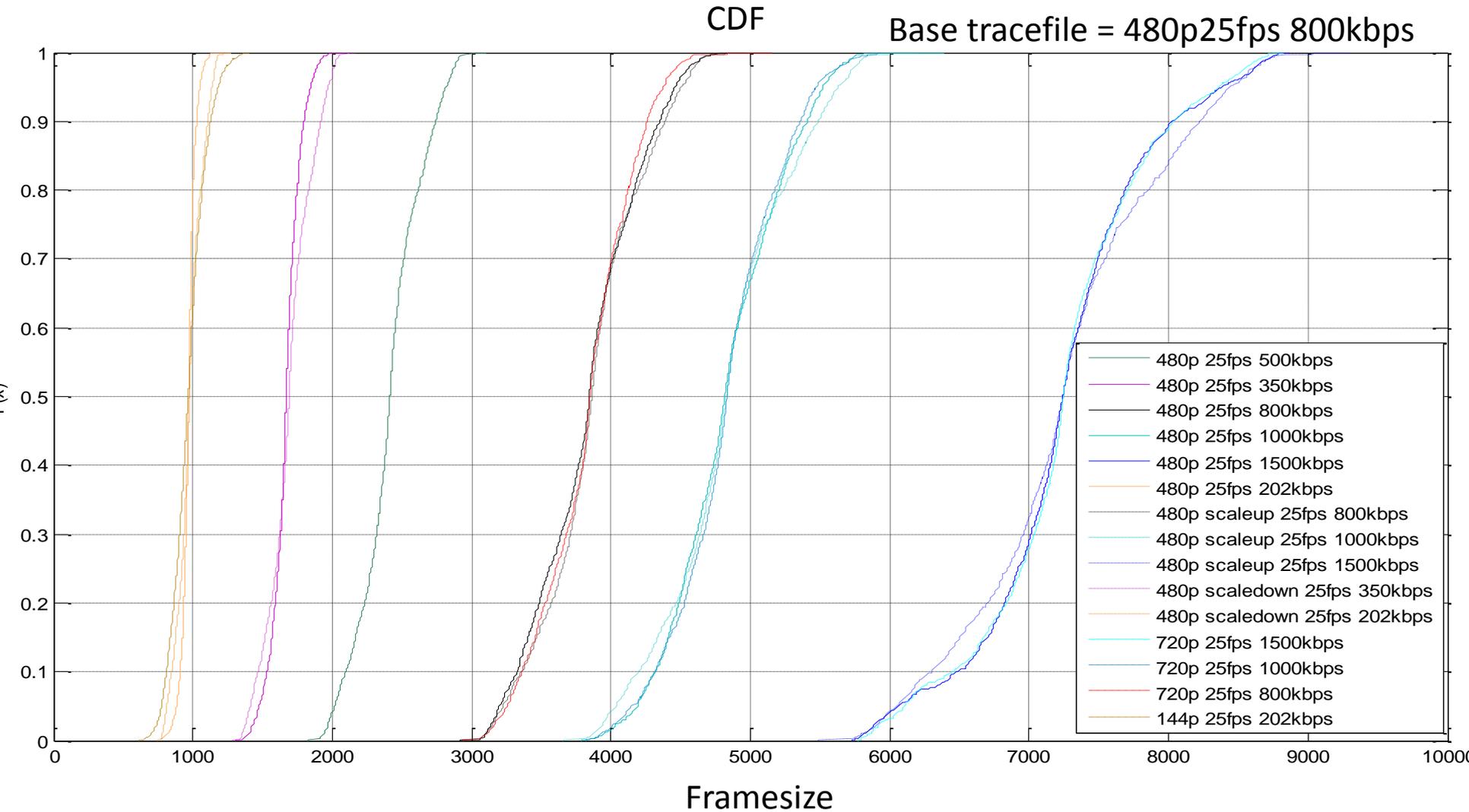
Scale factor

- If the framerate is kept same
 - Scaling of framesize to meet the target bitrate and resolution is OK.
 - Bump up or bump down all frames in the tracefile according to a scale factor
- $scalefactor = \frac{target\ bitrate}{base\ tracefiles\ bitrate}$
- $new\ framesize(i) = base\ framesize(i) * scale\ factor$

Scale factor (example)



Scale factor verification



Scaled up/down frame sizes almost matches with the preferred resolution frame sizes

Addressing the properties

- Periodicity
 - Frames are sent according to the encoded frequency
- Variability
 - According to trace
- Quality
 - Scale factor, when framerate is same

Issues

- How to select tracefile?
 - If we agree on video content then people can produce tracefiles using their favorite encoders
 - The final frame size in tracefile can be statistically generated from all the traces
- Responsiveness
 - Opt. 1: can use any stochastic process to decide which rate request to be delayed
 - Opt. 2: can depend on framesize

Questions / comments / suggestions?