Large-Scale Video Compression Research Work on Quality of Experience (QoE) Evaluation for VQEG JEG-Hybrid Project

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Introduction and Motivation

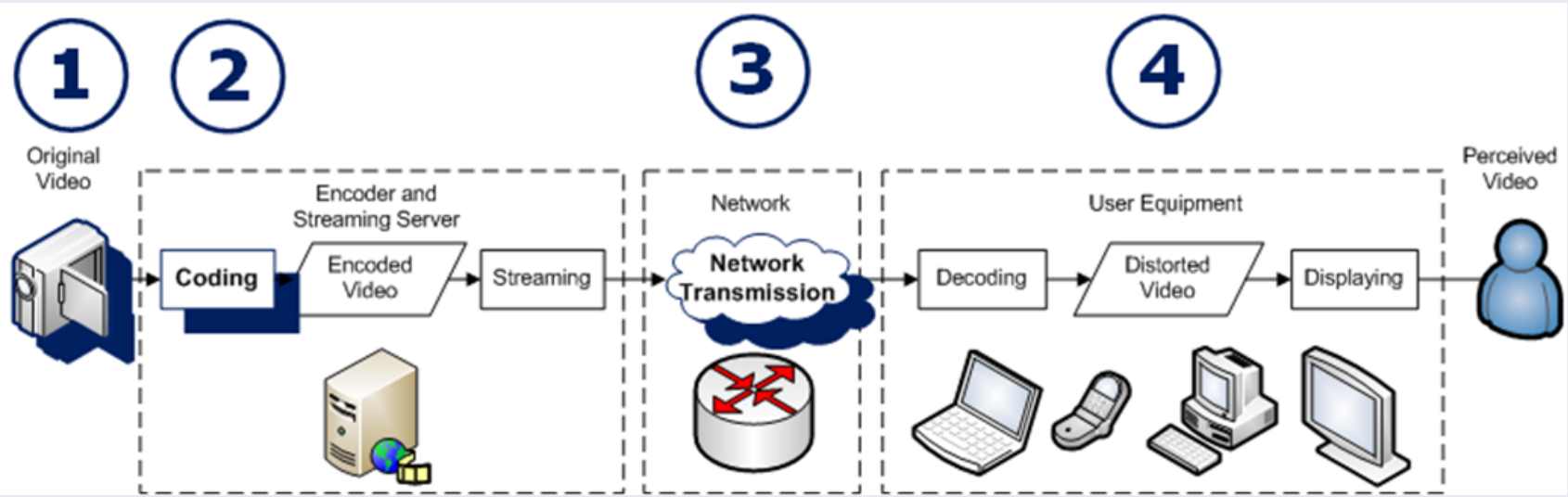

Figure: Transmission chain.

1. Original video acquisition
2. ***Encoder*** & streaming server
3. Network
4. User equipment

Hypothetical Reference Circuit (HRC) Parameter Sets

- Bit-rate/quantization factor, with at least 5+5 choices
- Different Group of Pictures (GoP) sizes and structures:
  - 2 choices of I frame frequency
  - 2 choices of B/P frames frequency
  - 2 different settings of Hierarchical coding
- Structure of slices – of at least 2 different lengths – does not work! :-(
- Number of frames per second – original and halved
- Resolution – original and halved

Experiment Scale

Each SRC needs to be:

- 10 seconds long
- With 30 FPS
- With resolution ranging from SD ($720 \times 480/576$) to HD (1920×1080)

- Each video frame needs to be encoded (1 second per video frame has been evaluated to be a good estimate for using JM Reference Software using a single CPU core)
- For each video frame, video quality metrics need to be calculated
- For each video frame, video content characteristics need to be calculated

Metrics

No Reference:

- Blockiness
- Blurriness
- Exposure
- Noisiness
- Flickering
- Spatial Activity (Intensity)
- Temporal Activity (Intensity)
- Spatial Correlation
- Energy
- Homogeneity
- Variance
- Contrast
- Colour Layout Descriptor
- Edge Histogram Descriptor

Full Reference:

- *Peak Signal-to-Noise Ratio* (PSNR)
- *Structural Similarity Index* (SSIM)
- *Video Quality Metric* (VQM)
- *SwissQual's Metric*
- *Tetra Video Quality Metric* (TetraVQM)
- *Visual Information Fidelity* (VQM)
- *MOtion-based Video Integrity Evaluation* (MOVIE)

Calculation Time using Single Core

Calculation time using a single core has been estimated as approx. 889 days

Assumption 1: $19,200,000$ video frames.

Assumption 2: compression of a single video frame in 1 s.

Assumption 3: three video quality metrics to be calculated for all video frames.

Assumption 4: calculation of a single video quality metric for one frame in approx. 1 s.

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