P.BBQCG study item overview
(generalities & passive tests)

VQEG meeting – June 8th, 2021

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Generalities

P.BBQCG
parametric Bitstream-Based Quality assessment of Cloud Gaming services

- Study item of ITU-T SG12 / Q14
- Reference documents:
  - Draft Terms of Reference: SG12-C0530
  - Passive tests: SG12-C0529
  - Interactive tests: SG12-C0542
- Active organizations: Ericsson, Dolby, Tencent, TU Berlin, TU Ilmenau
  P.BBQCG still open to new participants
  Access to the database restricted to participants
Model to monitor and predict the quality of cloud gaming services

Scope

Bitstream-based model, considering information from:

- Header and payload of packets
- Game
- Network
- Control
- Context

Passive part

Active part

No reference model

No access to decoded pixels
### Application area

<table>
<thead>
<tr>
<th><strong>Video standards</strong></th>
<th>H.264, H.265, AV1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Video encoders</strong></td>
<td>NVENC (H.264, H.265) – FFMPEG libaom (AV1)</td>
</tr>
<tr>
<td><strong>Encoder configuration</strong></td>
<td>Low delay P, infinite GoP</td>
</tr>
<tr>
<td><strong>Encoder rate-control</strong></td>
<td>CBR</td>
</tr>
<tr>
<td><strong>Resolutions</strong></td>
<td>540p, 720p, 1080p, 2160p</td>
</tr>
<tr>
<td><strong>Frame rates</strong></td>
<td>30fps, 60fps, 120fps</td>
</tr>
<tr>
<td><strong>Bitrates</strong></td>
<td>300 kbps to 100 Mbps</td>
</tr>
<tr>
<td><strong>Bit depth</strong></td>
<td>8 bits</td>
</tr>
<tr>
<td><strong>Display size and resolution</strong></td>
<td>27” screen size, up to 4K resolution</td>
</tr>
<tr>
<td><strong>Sequence length</strong></td>
<td>10s</td>
</tr>
<tr>
<td><strong>Pixel format</strong></td>
<td>YUV 4.2.0</td>
</tr>
</tbody>
</table>

*(passive tests)*
Description of the model

Building blocks:

2 main modules:

- **interaction** quality
- **video** quality
Description of the model

Model inputs:

- **Header information** (codec and profile, bitrate, coding resolution, frame-rate, size and type of frames, GoP size and structure, VPS, SPS, PPS, ...)

- **Payload information** (quantization parameters, frame type, any other information that can be parsed from the bitstream)

- **Game information** (information on the game as known by the service provider)

- **Network information** (packet loss, jitter and network delay)

- **Control information** (actions performed by a player on the client device)

- **Context information** (device and player information)
Description of the model

Model outputs:

- **0.31**: estimated **overall gaming QoE**
- **0.22**: estimated **video quality impairment factor due to video compression artifacts**
- **0.21**: estimated **interaction quality factor potentially degraded due to network latency and transmission errors**
- **0.11**: estimated interaction quality factor degraded due to network latency
- **0.12**: estimated transmission impairment on player interaction due to packet loss
## Operating modes and anchor models

<table>
<thead>
<tr>
<th>Mode</th>
<th>Inputs information</th>
<th>Anchor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Header, game, context, network</td>
<td>P.1203.1 mode 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>post-processed by linear mapping only [P.1401]</td>
</tr>
<tr>
<td>2</td>
<td>Header, game, payload, network, control, context</td>
<td>P.1204.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>post-processed by linear mapping only [P.1401]</td>
</tr>
</tbody>
</table>
Model development and timeline

Candidate model 1
Candidate model 2
... Candidate model n

Selection process

Reference model

Validation process

Adoption process

Proposal
Proposal
Proposal
Proposal
Proposal
Proposal
Proposal
Proposal
Proposal
Proposal
Proposal

Crowdsourcing MOS1
end 08/21
Crowdsourcing MOS2
mid 12/21

Content captured
end 06/21

end 11/21
end 01/22
end 01/23
end 06/21
## Timeline

<table>
<thead>
<tr>
<th>Date</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of June 21</td>
<td>Finalize crowd-sourcing document</td>
</tr>
<tr>
<td>End of June 21</td>
<td>Content captured (database 1 + 2) and shared among participants</td>
</tr>
<tr>
<td>End of July 21</td>
<td>Database processed (encoding, planning crowd-sourcing sessions, ...)</td>
</tr>
<tr>
<td>End of July 21</td>
<td>Crowdsourcing platform available</td>
</tr>
<tr>
<td>End of August 21</td>
<td>MOS available for database 1</td>
</tr>
<tr>
<td>End of Nov 21</td>
<td>Submission of candidate models</td>
</tr>
<tr>
<td>Mid of Dec 21</td>
<td>MOS available for database 2</td>
</tr>
<tr>
<td>End of Jan 22</td>
<td>Selection of reference model - start of collaborative approach</td>
</tr>
<tr>
<td>End of Jan 23</td>
<td>Final model available - Model verification</td>
</tr>
<tr>
<td></td>
<td>Validation database available -&gt; final performance</td>
</tr>
<tr>
<td>End of 23</td>
<td>End of the project</td>
</tr>
</tbody>
</table>
Crowd-sourcing approach

Inspired by
P.808
P.809
P.CROWDV
P.CROWDG

Adapted to P.BBQCG context

Using an Absolute Category Rating (ACR) method P.910 with an extended 7-point continuous scale
Topics under discussion

• Operating modes

• Details of the collaborative approach

• Details of the crowd-sourcing

• Selection of the evaluation criteria
  - RMSE, PLC
  - Complexity

Thinking about:
• Considering gaming content characteristics: sudden drops of quality (rotations, explosions)

• Adding a indicator in addition to classical RMSE and PLC, assessing only the ability of the model to reflect sudden quality drops/increases
To know more and get involved

• Contact Joel Jung (Tencent) and Saman Zadtootaghaj (Dolby)
  joeljung@tencent.com
  saman.zadtootaghaj@dolby.com

• Reference documents:
  Draft Terms of Reference: SG12-C0530
  Passive tests: SG12-C0529
  Interactive tests: SG12-C0542

• P.BBQCG meetings every 3 weeks, Thursday, 2pm UTC
  • Next meeting: June 16th