Test Report

Juphoon Multi-Media Engine Performance 2012.6
[confidence]
- Voice Engine Test
- Video Engine Test

Test result:
1. The voice module has excellent QoS performance including AEC, NS, PLC and very fast adaptive Jitter buffer.
2. The video module is good at codec performance and network control.

- Test engineer Carl Lee & Fiona Zhou
Voice Engine

- Acoustic Echo Cancellation
- Noise Suppression
- Packet Loss Concealment
- Veryfast Adaptive Jitter Buffer
AEC  Acoustic Echo Cancellation

ERL${}_{\text{max}} \geq 39\, db$  @ double talk

ERL: Echo Return Loss

Test comply ITU P.340, P.502
**NS**  Noise Suppression

**SNR**↑12db,  **MOS**↑1.13  @ average -30dBov white noise

**SNR**: Signal-to-Noise Ratio

**MOS**: Mean Opinion Score

**Bak**: Background noise rating scale

**Sig**: Speech signal rating scale

**Ovrl**: Overall quality rating scale

Test comply ITU P.835

Voice Engine
PLC  Packet Loss Concealment

Average MOS↑0.78  @ average 10% packet loss ratio

<table>
<thead>
<tr>
<th>Packet Loss</th>
<th>MOS Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>0.62</td>
</tr>
<tr>
<td>10%</td>
<td>0.78</td>
</tr>
<tr>
<td>20%</td>
<td>0.73</td>
</tr>
<tr>
<td>30%</td>
<td>0.81</td>
</tr>
<tr>
<td>Average</td>
<td>0.74</td>
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</tbody>
</table>

Test comply ITU P.830 (Reference P.862 PESQ)
VFAJB  Very Fast Adaptive Jitter Buffer

Average delay shorter  50~200ms
Video Engine

- H.264 codec performance
- video Sweet Point ctrl (SPo®)
  - Sweet bitrate
  - Best frame rate
  - Leverage of FPS & Resolution
- CPU load control
H.264 codec performance

Extreme higher performance

The H.264 encode module in Juphoon MME is more faster than x264, it roughly equal to x264 veryfast mode 200%~300% with same level PSNR. And the H.264 decode module performance is roughly equal to FFmpeg 130%.

The test sample is CIF_forman.avi, with the same CPU and other hardware.
**SPo Video Sweet Point Control**

The SPo is an advanced VBR tech that automatic set optimized parameters (bitrate, resolution, FPS) to get the best possible video quality under the dynamic changed IP network.

Like tennis sweet point

**SPo CONSISTED BY:**

- **SBr** (Sweet bitrate) – get best available bandwidth usage.
- **BFr** (Best frame rate) – optimized temporal spatial balance for fixed resolution.
- **ALs** (Auto Level select) – select sweet point level at available bitrate.
**SBr**  
**Sweet Bitrate**

The SBr is an adaptive VAR algorithm that is suitable for dynamic network with various bandwidth such as internet.
SBr  Sweet Bitrate test case

Test VGA video Br at dynamic network

The real bitrate is tracing the available bandwidth of the network.
And the max bitrate required by VGA(640 x 480) is around 1500kbps, it keeps at 1500kbps even when there is more bandwidth.
Detect available bandwidth with random delay, jitter and packet loss.
Input current **resolution** (as k pixels) and **bitrate** to find out best suitable **FPS** per relationship shown in the following figure.

**BFr** Best frame rate
**Case 1**

bitrate: 400kpbs; codec: h.264 HP; source: CIF_forman.avi, VGA_foortall.avi, 720p_office.avi

**Case 2**

bitrate: 800kpbs; codec: h.264 HP; Source: VGA_foortall.avi, 720p_office.avi, CIF_MobileCalendar_cif.avi, D1_flowergarden.avi

Note: the best frame rate is just the middle number of a best frame rate interval, it means in this range, the MOS will be very similar.

Test comply ITU P.910 - Degradation category rating (DCR)
**BFr** Best frame rate test result

The BFr is matched with subjective MOS test. Pearson correlation coefficient = 0.939

\[ r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2} \sqrt{\sum (y_i - \bar{y})^2}} \]
ALS Auto Level select

Per target resolution (Level), auto level select algorithm insure the best possible video perceptive effect under the current available bitrate.
SPo test case

Juphoon(SPo) vs Skype vs QQ

Note: the Skype use VP8 codec, and QQ video codec is unknown, but it is very similar to H264 codec performance. According to the VP8 and H.264 is at the same level performance codec, hence the comparison is reasonable. MOS score is scaled from 1 to 9.

Test comply ITU P.910 - Absolute category rating (ACR)

The Skype multiple-routing paths have been disabled, that is the reason why Skype has so poor score.
SPo test case

Juphoon(SPo) vs Skype, Juphoon(Spo) vs QQ

It is a more direct comparison. In the same and fair condition, we put Juphoon and another one together to have a subjective comparison. It can show people the popularity of two comparators clearly.

In the same bandwidth (kpbs), resolution, video
Test sequence: VGA_foortall.avi, CIF_MobileCalendar_cif.avi
CPU Load Control

Auto Learning  CPU load estimate

CPU load estimate is more accurate than general feedback model.
Auto learning algorithm can adapt various hardware platform without artificial tuning.

Video Engine

CPU load Case 1

Capture 24%
Encode 31%
Decode 11%
Render 15%
Other 19%

Capture/Encode/Decode
800 x 600 x 30fps

Total CPU load: 45.7%

CPU load Case 2

Capture 35%
Encode 21%
Decode 8%
Render 14%
Other 22%

Capture 800 x 600 x 30fps
Encode/Decode
800 x 600 x 15fps

Total CPU load: 32%
CPU Load estimate accurate test result

The CPU load estimate is matched with real test. The Pearson correlation coefficient = 0.982
Thank you!