Compte Rendu ITQoS TME1

Response 1:

$$R = Ro - Is - Id - Ie\_eff + A$$

The utility of each factor is the following:

- ***Ro*** represents the basic signal-to-noise ratio, accounting for noise from both circuit and room sources.
- ***Is*** is the simultaneous impairment factor, which includes impairments that occur concurrently with the voice signal.
- ***Id*** represents the delay impairment factor, representing impairments caused by delay in voice transmission.
- ***Ie_eff*** represents the effective equipment impairment factor, which accounts for impairments from low bit-rate codecs and packet loss.
- ***A*** The advantage factor, which compensates for impairments if the user gains other benefits (e.g., mobility).

Response 2:

Yes, **audio packet loss** is considered in the calculation of the R-factor. It is included in the **effective equipment impairment** factor (***Ie_eff***), which accounts for impairments caused by codecs and random packet loss. The formula for ***Ie_eff*** includes the packet-loss probability and a codec-specific factor for packet-loss robustness.

For **end-to-end network delay**, it is accounted for in the **delay impairment factor** (***Id***), which represents impairments due to transmission delays. This factor is broken down into further components that address different types of delay-related impairments

Response 3:

The values of the R-factor that correspond to different levels of conversation quality are:

- Très bonne (very good): **R ≥ 90**
- Acceptable (fair): **R ≥ 60**

Response 4:

Estimator	Significance	Utility
MOS-CQE (Mean Opinion Score - Conversational Quality Estimate)	Translates technical measurements into a user satisfaction score, showing how users perceive voice quality.	Helps assess overall conversation quality objectively, aiding in transmission planning and service evaluation.
GoB (Good or Better)	Indicates the proportion of satisfied users, highlighting the success of a telecommunication service.	Used to measure and maintain user satisfaction, helping to track service performance from the user's perspective.
PoW (Poor or Worse)	Reflects the level of dissatisfaction, highlighting issues that negatively impact user experience.	Identifies service problems and helps improve the quality of telecommunication services by minimizing poor ratings.

Response 5 :

MOS-CQE=1+0.035R+R(R−60)(100−R)×7×10−6

MOS-CQE=1+0.035×75+75×15×25×7×10^-6

MOS-CQE=3.7628125

Response 6:

With ***Ie_eff*** = 0 (because ***Ie*** = 0 and ***Ppl*** = 0% by default), we have the following equation to use:

R = 93.2 - ***Idd***

And since the default value is ***mT*** = 100***, sT*** = 1:

T = 50ms	Idd = 0	**R = 93.2**
T = 150ms	Idd = 0.16	**R = 93.04**
T = 300ms	Idd = 14.76	**R = 78.44**

T = 500ms	Idd = 30.64	**R = 62.56**

Response 7:

R = 93.2 - ***Idd*** - ***Ie_eff***

We have ***T*** = ***Ta*** = 150ms (so we have ***Idd*** = 0.16 from the previous question), ***BurstR*** = 1, ***Ie*** = 11 et ***Bpl*** = 19.

Using the formula to calculate ***Ie_eff*** based on the variations of ***Ppl***:

Ppl = 1%	Ie_eff = 11.04418726985797	**R = 81.99581273014203**
Ppl = 5%	Ie_eff = 11.220472440944881	**R = 81.81952755905513**
Ppl = 10%	Ie_eff = 11.43979057591623	**R = 81.60020942408377**

Response 8:

Subjective tests involve evaluating transmission quality by human users, often through Mean Opinion Scores (MOS). These tests are based on users' perception of sound or call quality where they give it a score from 1 (bad) to 5 (excellent).

Objective tests use algorithmic models to predict transmission quality based on measured technical parameters (such as signal-to-noise ratio, packet loss, equipment impairment factors, etc.) like the E-model.

In the graph, we notice the distribution of subjective and objective results done on different audio tracks, where the objective tests used 3 different algorithms. We notice that the algorithms MNB1 et MNB2 give results which are usually higher than the subjective results, while the results of the algorithm PESQ are usually lower than the subjective ones.

We deduce that for future objective tests, it’s better to use the PESQ algorithm in order to avoid giving a higher MOS score than the one actually experienced by users.

Response 9:

The maximum point attributed by the algorithm PESQ is 4.5.

Response 10:

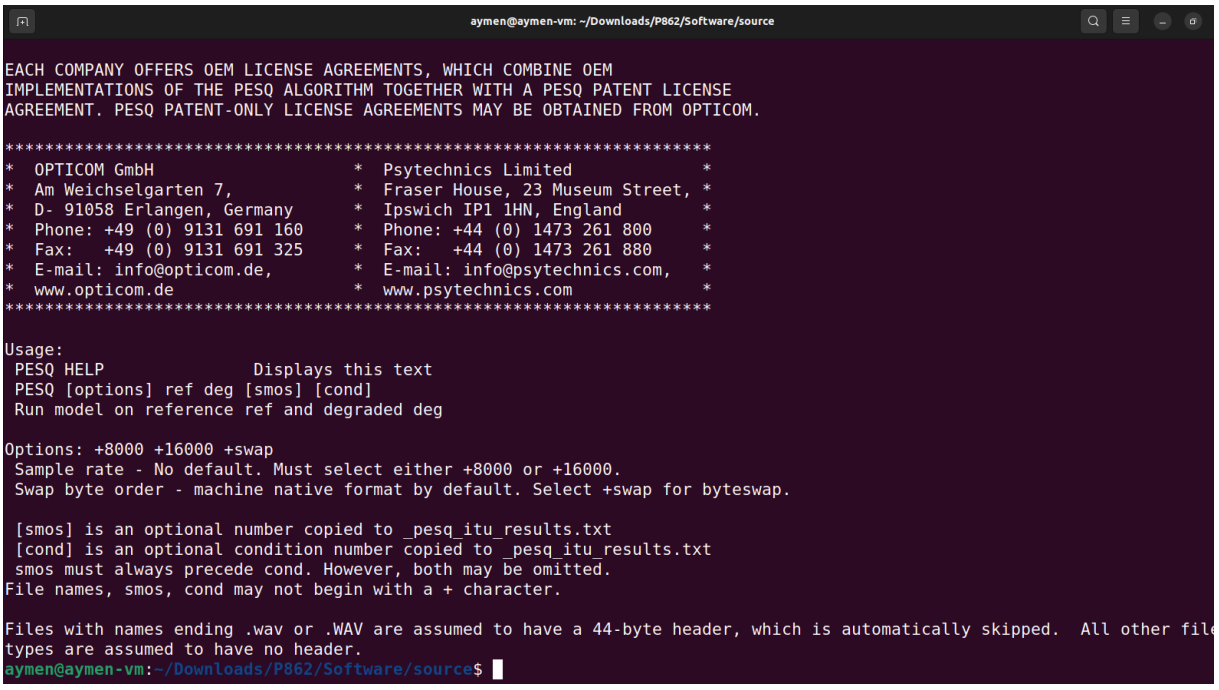
Fichier	Note 1	Note 2	Note moyenne
First audio	3.5	4	3.75
Second audio	3	3	3

Response 11:

Fichier	Note 1	Note 2	Note moyenne
First audio	3.5	4	3.75
Third audio	3	3.5	3.25

Response 12:

1. Compiling the program



2. The **8 kHz** sampling rate is commonly used for speech in telephony systems and is ideal for narrowband audio, where voice is the primary signal being tested. This is because 8 kHz is designed to capture the frequency range most important for intelligible speech. On the other hand, the **16 kHz** sampling rate is used for more advanced applications, such as wideband communication or music, where higher audio fidelity and a broader frequency range are needed. Therefore, for typical telephony and speech testing, **+8000** is the recommended choice, unless the files

specifically require higher quality or wideband analysis, in which case **+16000** would be more appropriate.

In the case of our audio files, they contain a speech so we'll use the **+8000** option as a sampling rate.

3.

4. Execution result of the program on the files:

```
aymen@aymen-vm:~/Downloads/P862/Software/source$ ./pesq +8000 ../Conform/u_am1s01.wav ../Conform/u_am1s01b2c8.wav

Reading reference file ../Conform/u_am1s01.wav...done.
Reading degraded file ../Conform/u_am1s01b2c8.wav...done.
 Level normalization...
 IRS filtering...
 Variable delay compensation...
 Acoustic model processing...

Prediction : PESQ_MOS = 2.198
aymen@aymen-vm:~/Downloads/P862/Software/source$
```

```
aymen@aymen-vm:~/Downloads/P862/Software/source$ ./pesq +8000 ../Conform/u_am1s01.wav ../Conform/u_am1s01b2c1.wav

Reading reference file ../Conform/u_am1s01.wav...done.
Reading degraded file ../Conform/u_am1s01b2c1.wav...done.
 Level normalization...
 IRS filtering...
 Variable delay compensation...
 Acoustic model processing...

Prediction : PESQ_MOS = 4.300
aymen@aymen-vm:~/Downloads/P862/Software/source$
```

5. The degradation between the file *conform/u_am1s01.wav* and *conform/u_am1s01b2c8.wav* is worse than the degradation in the *conform/u_am1s01b2c1.wav,* which is what we also concluded in our subjective tests.

Response 15:

No, we didn't respect the guidelines of the recommendation P.830 as it is recommended to have at least 2 men and 2 women do the testing, but we were only 2 men who performed the test.