CTF: Midnight CTF qualifs
Challenge: Tonalizer
Category: Steganography
Team: ForenSick

A file is provided by the staff: Tonalizer.wav
No information.

First of all we try to see which type of file is it:

```
└─$ file tonalizer.wav
tonalizer.wav: RIFF (little-endian) data, WAVE audio, Microsoft PCM, 16 bit, mono 44100 Hz
```

Which is recognize as a audio file.

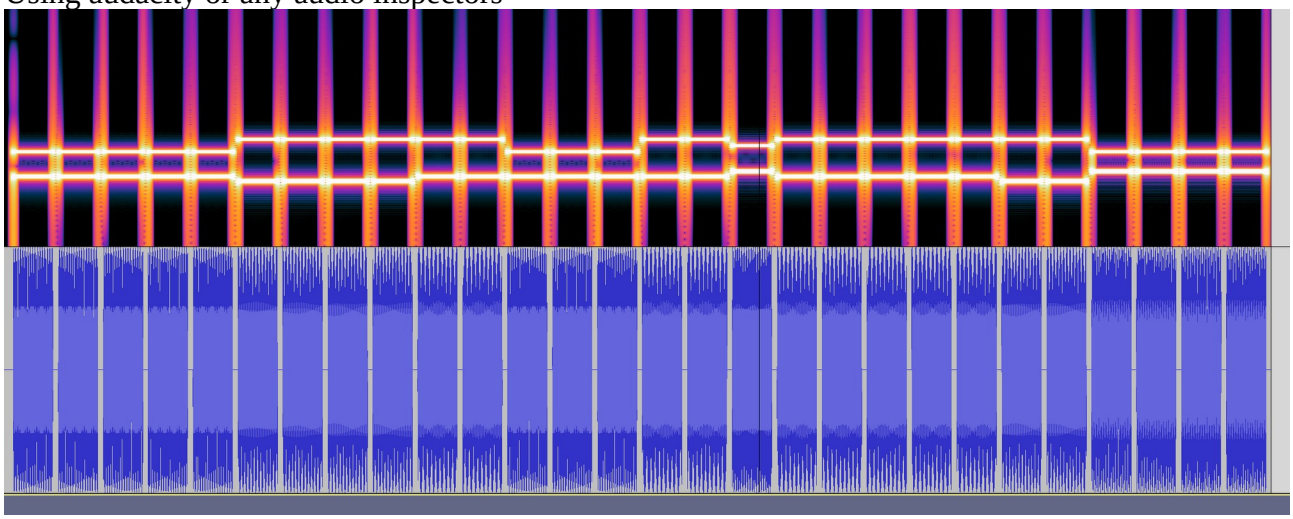
The first listening provides us a lot of information : it seems to be phone beeps' to communicate information through audio.

With some search we find this : DTMF Code.
It's the way to communicate numbers and basic symbols using audio canals.

Frequency	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

For example, the combination of 697 Hz and 1209 Hz will be translated as "1" taped.

Using audacity or any audio inspectors



We can clearly see lines and "tics" (can be interpreted as time unit).

Now we have to convert frequency of audio waves to numbers.

We got something like this:

1209 770 : 4
1477 697 : 3
1477 770 : 6
1209 770 : 4
1477 770 : 6
1336 852 : 8
1477 770 : 6
1477 697 : 3
1209 852 : 7

But, using this “time unit” we can repeat keys X times. For example the first one (4) will be repeated 5 times. We got something like this : 44444333366444668666666337777.

But now, if you already saw a phone keyboard, it doesn’t have this much letters on keys (like 5 times “6” for 3 letters). So we need to split it correctly.

But using bruteforce to check all possible combination with these keys :

44 444 3 3 33 66 : HIDDEN
444 66 8 666 66 33 7777 : INTONES

Flag : MCTF{HIDDENINTONES}