

# Cryptography - Attack Plan

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Version 2020.12.31

## 1 Attack Plan

This is my attack plan The weakness of ECB mode is that it lacks diffusion. Since it encrypts identical plaintext blocks into identical ciphertext blocks, it does not hide data patterns well. As such, global patterns across the plaintext are still kept in the ciphertext.

Something else that I can exploit here is the fact that the key is 8 bytes long, yet the outcome (and therefore the input) is 16 bytes long, so the ciphertext is generated by using the same key twice on each half of the plaintext. Therefore we can look at each half of the ciphertext individually in order to try to work out the 8 byte long plaintext behind each. we know that the input was more than 8 bytes if padding was used and exactly 16 bytes if padding was not used. Either way we know that the key is repeated for longer inputs, as such we know that the same key was used to encrypt the first half of the message "90 34 08 ec 4d 95 1a cf" as the second half "ae b4 7c a8 83 90 c4 75".

The encrypt.exe file does not use padding, therefore we can tell that the input is exactly 16 bytes long. There are 201 English words which only contain hexadecimal characters, e.g. 'abcdef'. The location is a combination of these, of length 14, since there are 2 '.' characters. Scrap that, what 3 words location included '.' separators, which are not hexadecimal, therefore must be converting string to hex.

Input is a 32 character hexadecimal string, which means 16 letter. We can break ciphertext in half to work out each half of the plaintext at a time, so if the first eight letters of a what 3 words address such as "heavy.br" produces the first half of the ciphertext "90 34 08 ec 4d 95 1a cf" then we have found part of the address which was encrypted. encrypt.exe "heavy.br" == 90 34 08 ec 4d 95 1a cf I could narrow it down the around 7 million possibilities for the first half of the plaintext, using this I would then test out all second half possibilities. However this would take a long time (60 days) due to the inbuilt delay in the encrypter.

Any attempt at running the executable file encrypt.exe multiple times will not work since the program has a built in 0.5 second delay in order to prevent brute force attacks.

Each word of the what 3 words address can only be 4,5, or 6 letters long, with the total length of the three words being no more than 14, possible combinations are: 4,4,4 4,4,5 4,4,6 \* 4,5,4 4,5,5 \* 4,6,4 \* 5,4,4 5,4,5 \* 5,5,4 \* 6,4,4 \*

If padding is not being used then only combinations marked with an \* are possible.

using blocks of 2047 \* 16 hexadecimal strings concatenated first half is 'tile.bil', in hexadecimal: '74696c652e62696c' first index is 6272674 second half is 'ls.print', in hexadecimal: '6c732e7072696e74' second index is 35093 therefore address if 'tiles.bills.print', in hexadecimal: '74696c652e62696c6c732e7072696e74' Location is in 7346 Melrose Street, Philadelphia, Pennsylvania, United States. Four Seasons

First half took around an hour Second half took around 30 seconds On a Dell Precision 5530 Laptop with an Intel Core i7-8850H 6 core 12 thread CPU @ 2.6GHz (Max Turbo 4.3GHz) with 64GB RAM, running Windows 10

Solution is something to do with cryptanalysis, linear or differential