Dear Sir/Ma'am

Greetings,
After trying to crack all the leaked hashes, I found several vulnerabilities in your password policy and this report concludes all the findings and suggestions to improve your password policy.

1) What type of hashing algorithm was used to protect passwords?
   All the passwords were hashed using the MD5 algorithm.

2) What level of protection does the mechanism offer for passwords?
   All the passwords which were compromised were using MD5 which is a weaker hash algorithm and is prone to collisions with low level of protection. Therefore, making it very easy to crack with Hashcat.com and rockyou.txt wordlist via terminal and web browsers which has been demonstrated below. Hence, MD5 is not recommended to be used in any application.

3) What controls could be implemented to make cracking much harder for the hacker in the event of a password database leaking again?
   It is suggested to use a very strong password encryption mechanism to create hashes for the password based on SHA. Secure Hash Algorithm (SHA) and Message Digest (MD5) are the standard cryptographic hash functions to provide data security for authentication. There are several versions of SHA such as SHA-3 and SHA-256, all of them highly suitable for providing a high level of protection.

4) What can you tell about the organization's password policy (e.g. password length, key space, etc.)?

   After cracking the passwords, the following conclusion about organization's password policy were found:

   • Minimum length for password is set to 6.

   • There is no specific requirement for password creation i.e. the users can use any combination of word and letters to create a password.

5) What would you change in the password policy to make breaking the passwords harder?

   To make a better and optimized password policy the following set of rules can be mandated. The recommendations are:

   • Avoid common words and character combinations in the password.

   • Longer passwords are better, 8 characters is a starting point.

• Disable the use of previously used passwords.

• Inclusion of special characters, spaces, uppercase and lowercase letters, and numbers in password, all being optional to include except for one special character.

• Disable users to use their username, actual name, date of birth and other personal information while creating a password

• Train users to follow these policies to keep their passwords safe.

• Concept of password salting must be used.

• An external Api based tool which checks for password strength should show that the used password is strong.

• It must contain between 7 and 12 characters. Use only characters from the following set: ! # $ % & ( ) * + , - . / 0123456789 : ; < = > ? @ ABCDEFGHIJKLMNOPQRSTUVWXYZ [\ ] _ ` abcdefghijklmnopqrstuvwxyz { | } ~

• It must contain at least 1 lowercase letter(s) (abcdefghijklmnopqrstuvwxyz).

• It must contain at least 1 capital letter(s) (ABCDEFGHIJKLMNOPQRSTUVWXYZ).

• It must contain at least 1 numeric character(s) (0123456789).

• It must contain at least 1 character(s) from the following set: ! # $ % & ( ) * + , - . / : ; < = > ? @ [\ ] _ ` { | } ~

• It must not contain more than 2 identical consecutive characters (AAA, iiii, $$$$$ ...).

• It must not contain your user name.

• It must not contain your e-mail address.

• It must not contain your first name.

• Concept of password salting must be used.

Thank you.

Regards,
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Security Algorithms used:

```
experthead:e10adc3949ba59abbe56e057f20f883e – MD5
interestec:25f9e794323b453885f5181f1b624d0b – MD5
ortspoon:d8578edf8458ce06fbc5bb76a58c5ca4 –MD5
reallychel:5f4dcc3b5aa765d61d8327deb882cf99 –MD5
simmson56:96e79218965eb72c92a549dd5a330112 – MD5
bookma:25d55ad283aa400af464c76d713c07ad – MD5
popularkiya7:e99a18c428cb38d5f260853678922e03 – MD5
eatingcake1994:fcea920f7412b5da7be0cf42b8c93759 – MD5
heroanhart:7c6a180b36896a0a8c02787eeafb0e4c – MD5
edi_tesla89:6c569aabbf7775ef8fc570e228c16b98 – MD5
liveltekah:3f230640b78d7e71ac5514e57935eb69 – MD5
blikimore:917eb5e9d6d6bca820922a0c6f7cc28b – MD5
johnwick007:f6a0cb102c62879d397b12b62c092c06 – MD5
flamesbria2001:9b3b269ad0a208090309f091b3aba9db – MD5
oranolio:16ced47d3fc931483e24933665cded6d - MD5
spuffyffet:1f5c5683982d7c3814d4d9e6d749b21e - MD5
moodie:8d763385e0476ae208f21bc63956f748 - MD5
nabox:defebde7b6ab6f24d5824682a16c3ae4 - MD5
bandalls:bdda5f03128bcbdfa78d8934529048cf - MD5
```

In the terminal, run the command:

```
$ sudo hashcat -a 0 -m 0 hashes.txt /usr/share/wordlists/rockyou.txt -o cracked.txt
```

Command reference:

(-a) Attack mode: 0 (for dictionary attack)

(-m) Hash type: 0 (for MD5)

(-o) File to store: cracked.txt (cracked passwords are stored here)

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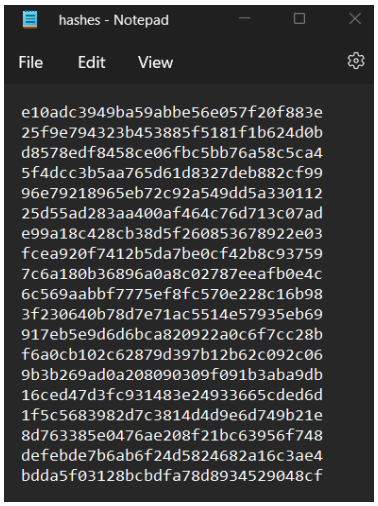
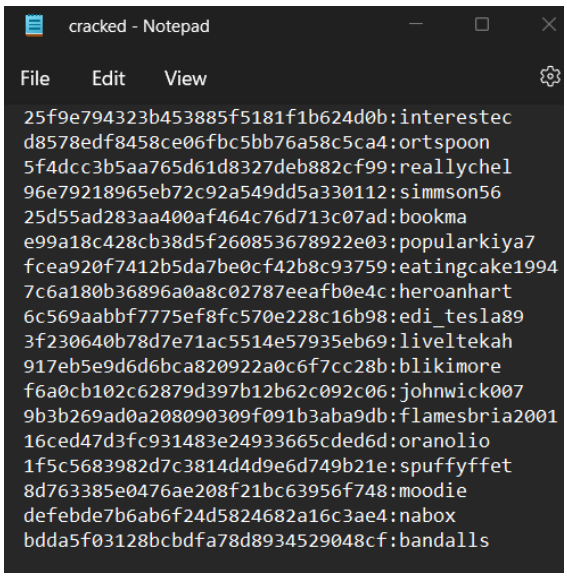
i) stored hash of passwords in `hashes.txt` file:



ii) ran the following hashcat command in the terminal:

iii) results stored in `cracked.txt` file as following:



References:

[1]*https://arstechnica.com/information-technology/2013/05/how-crackers-make-minced-meat-out-of-your-passwords/*
[2] *https://en.wikipedia.org/wiki/Salt_(cryptography)*
[3] *https://en.wikipedia.org/wiki/Cryptographic_hash_function*
[4] *https://en.wikipedia.org/wiki/Password_cracking#Software*
[5] *https://howsecureismypassword.net/*
[6] *https://hashcat.net/hashcat/*
[7] *https://md5decrypt.net/en/#answer*