REDEFINING PASSWORDS WITH UNICODE & EMOJIS 😇

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Abstract : *Passwords are required to protect the sensitive data on web as well as on desktop. Password general standards require minimum 8 character length password comprising combination of upper/lower case alphabets, digits and few special symbols. According to new password guidelines of NIST, NIST favors longer passwords and usage of even UNICODE characters. This paper describes a sample PHP-MYSQL Login system which allows users to frame passwords comprising of EMOJIS and other UNICODE characters.*

IndexTerms **– Password, NIST, Emojis, Emoji Picker, UNICODE, utf8mb4, Code Points, hash, salt**

I. INTRODUCTION

Passwords play an important role in accessing and securing our desktop computer, laptop, smart phone, ATMs, tablets. Password is string of characters for authenticating user's digital identity to gain approval for accessing sensitive computing and web resources and is a security mechanism to prevent unauthenticated users from accessing resources.

In this era of ever expanding web usage, be it you are doing some transaction on your banking web site, sending email through GMAIL, connecting with friends on Facebook, tweeting through Twitter, or logged on to your institution web site, all these have one thing in common- a need to register with the web application and then login using your UserName and a Password.

Password is required to secure our web resources. Along with good things come into practice the bad things also. Hackers are always inventing ways to hack your password and steal your resources. Passwords itself are susceptible to several weaknesses and drawbacks. The biggest responsibility of any web application designer is to ensure the security of the password itself.

II. STANDARD POLICIES REGARDING PASSWORDS:

Over years, most websites have followed the most fundamental password security standards which included certain guidelines suggested by NIST (National Institute of Standards and Technology) in its publication called NIST Special Publication 800-63:

i) Asking and even forcing users to change their passwords frequently.
ii) Recommending complex passwords with a mixture of upper and lower case alphabets, digits and some special symbols on keyboards and limited to ASCII character set.
iii) Regulating the minimum and maximum length of passwords
iv) Allowing a specific range of characters to be allowed in the password.
v) Not to repeat the old passwords.
vi) Passwords characters are hidden from user view and only special symbol like star or dot is shown.
vii) To ensure password correctness, user is asked to enter the password twice while registering or while changing the password.

No matter how long or complex we make our password in terms of numbers of characters or how frequently we change the password, the biggest weakness appears to be the limited character set from which we create passwords.

In GMAIL new account creation, the following emojis and UNICODE characters were entered but these characters were not accepted in password.

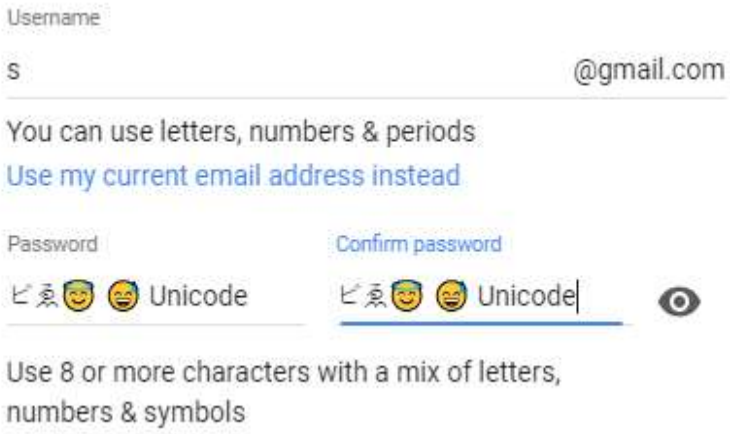

Figure 1: Gmail user account creation

But it gives following error.

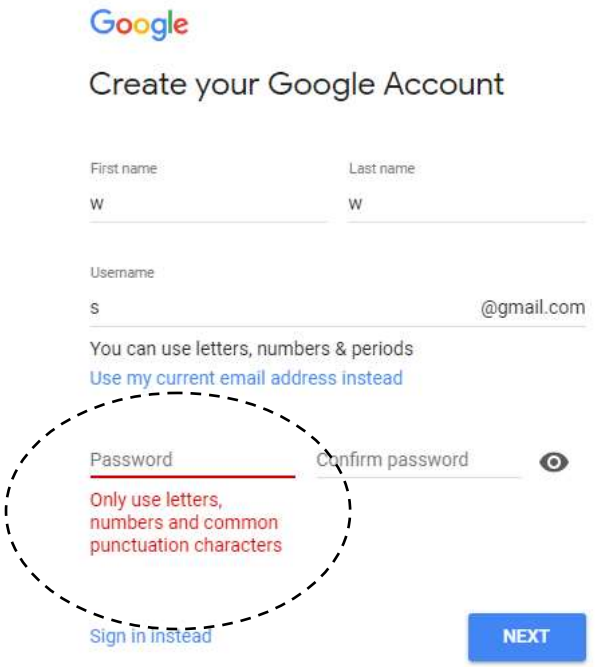

Figure 2: GMAIL Password error if we enter emojis

This snapshot of Gmail new account creation ask user to use only letters, number and common punctuation characters.

That makes for traditional 26 upper case English alphabets(A-Z) , 26 lower case English alphabets (a-z), 10 digits from 0-9, and few punctuation symbols. This is a set of even less than 100 symbols from which we frame our passwords. Given such a small set of symbols, hackers find it easy to crack passwords using brute force approach. This paper discuss upon the approach we can take to increase the character set from which we can frame passwords.

III. NIST's NEW PASSWORD GUIDELINES

In June 2017, National Institute for Standards and Technology (**NIST**), revised its stand on passwords and published new guidelines regarding password management. It recommended removing periodic password

change , drop the constraint of using mixture of upper and lower case letters and numbers in a specific composition pattern. The most interesting guideline which this paper focus upon is-

(i) Longer Passwords of even 64 characters long
(ii) Copy and paste functionality into user and password form fields
(iii) Ability to freely use all special characters, including all UNICODE characters and spaces and punctuation.
(iv) Using passphrases instead of complex passwords
(v) Secure storage of passwords in database, by salting and hashing them.

IV) Use of UNICODE characters

UNICODE is a international and multilingual text character and coding system which was introduced to represent characters from different languages in the world. ASCII code can represent only 127 or 255 characters and can encode only the characters of English language. UNICODE provides a unique number for every character to be used irrespective of language, platform or program. UNICODE code point is written by writing "U+" followed by a hexadecimal code. Apart from multi lingual characters ,UNICODE 11.0 also represent emoji with its codepoints

V) **EMOJI** 

Emoji are widely popular especially on mobiles and have widely changed the way we correspond and chat with one another on social media like whatsapp, facebook. Emoji are actual colorful picture file in form of .png which represent pictographs (picture symbols) of faces, animals and nature, smileys and people, food and drink, activity, travel and places, objects, symbols, flags and much more.

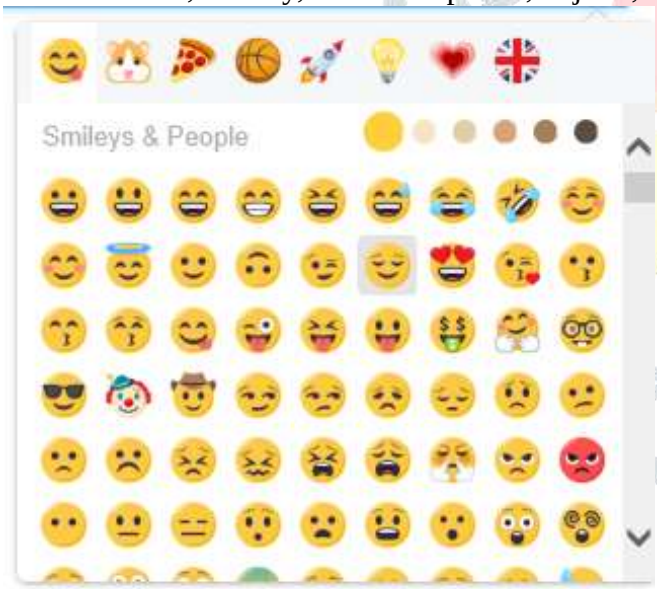

Figure 3: Emoji Picker

UNICODE (https://unicode.org/emoji/charts/full-emoji-list.html) provides long chart of approximately 1644 emoji characters from different vendors. Each Emoji is assigned a unique UNICODE character. One of the illustration taken from web page is


Smileys

face-positive

№	Code	Browser	Appl	Goog	Twtr	One	FB	Sams.	Wind.	GMail	SB	DCM	KDDI	CLDR Short Name
1	U+1F600													grinning face

Figure 4: Emojis

Emojis are extremely popular in representing feelings, emotions, sentiments, activities and other objects of interest especially in our communication on social media platforms like whatsapp.
Since NIST recommends using passphrases and UNICODE symbols , we can extend our password with emojis symbols in web applications. For e.g. we can have a passphrase as " It is Soccer Versus Football" as

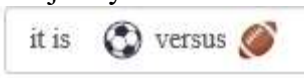

Figure 5: Passphrase

These emojis can also be copied and pasted. It also permits us to incorporate other UNICODE symbols representing characters from different languages.

VI) SAMPLE PHP & MYSQL LOGIN APPLICATION SYSTEM TO CREATE PASSWORDS WITH UNICODE CHARACTERS AND EMOJIS

One important aspect of any web application from any platform like PHP, ASP.NET, Java is the designing of registration form and a Login form. While registering we are required to specify a password and then login with that password. A PHP-MYSQL web application has been designed to enter passwords comprising the emojis and other UNICODE characters.

The keyboard do not provide the emoji characters or other UNICODE characters. But today there are many emoji Pickers software tools available for downloads. These are jQuery based emoji picker plugin which allows to select, parse, convert emojis inside a given textarea or DIV element or textbox.. They have associated .css (cascading style sheet) and ,js (javascript) files. These plugins can be downloaded from various internet sites like https://www.jqueryscript.net/, https://cdnjs.cloudflare.com/ajax/libs/emojionearea . Emoji pickers contain emojis and are represented with .css (cascading style sheet) files and .js (javascript) files. These files can be programmatically modified to include other Unicode characters also.

The following registration form ask to choose Login name, enter password and reenter password. A show password checkbox has been provided so that user can toggle the visibility of password. The password box has been designed using the <input type=password> control in HTML. The Emoji picker has been bound with this password box. The smiliey face at end of password box opens the emoji picker.

Figure 6: HTML password input with emoji picker

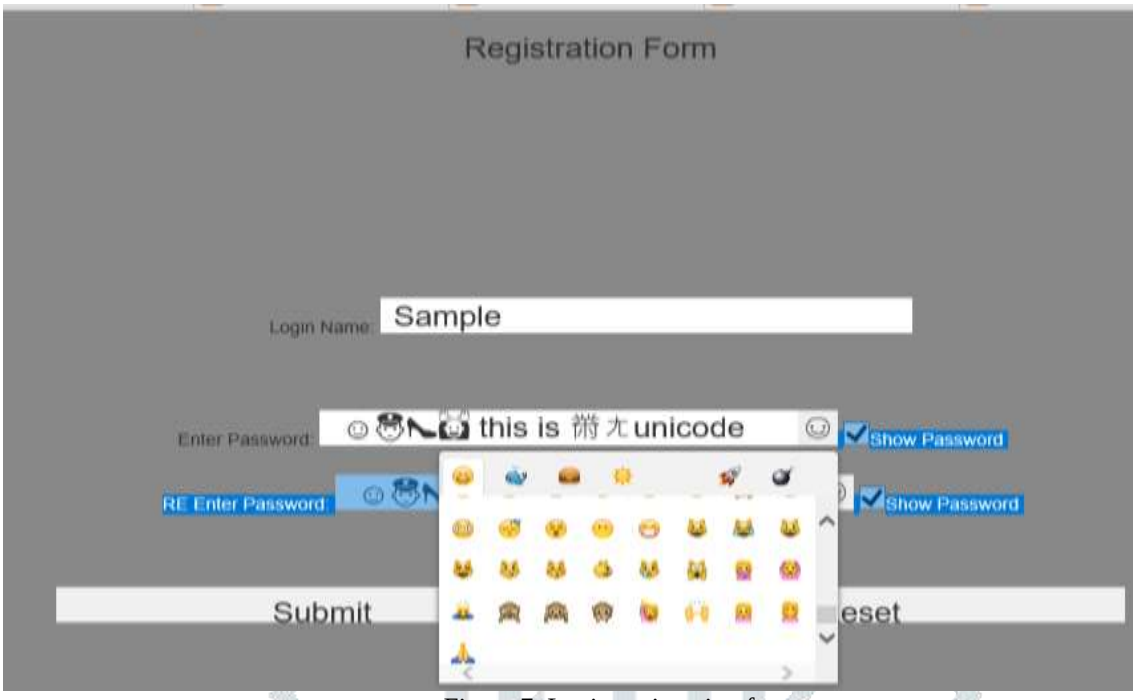

Figure 7: Login registration form

Any such passphrase can be made using English words, emojis present in the emoji picker, any other UNICODE symbol. Any UNICODE symbol can also be copied and pasted.

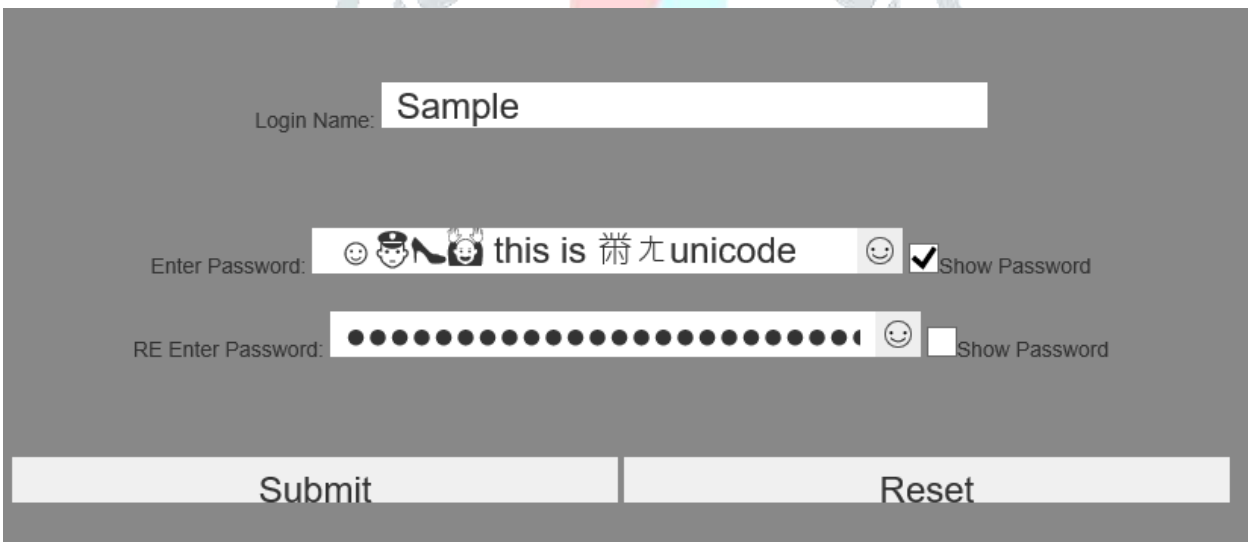

Figure 8: Login registration form with password made of emojis and UNICODE

Its features include:

I) Show/Hide Password
II) Choose emoji from Emoji Picker
III) Copy and paste any UNICODE symbol.
IV) Allow spaces.
V) On Submit these details along with password will be stored in MYSQL database.
VI) json_encode () generate the code points of UNICODE characters
VII) To further strengthen the password, we can use BCRYPT() , PBKD2F to encrypt it as salted hashed passwords.

VIII) In MYSQL, the command ` ALTER TABLE Tablename CONVERT TO CHARACTER SET utf8mb4 COLLATE utf8mb4_bin` help us to store UNICODE characters.

IX) In PHP program to handle database connectivity, set the character set of MY SQL as mysqli_set_charset($db,"utf8mb4");.

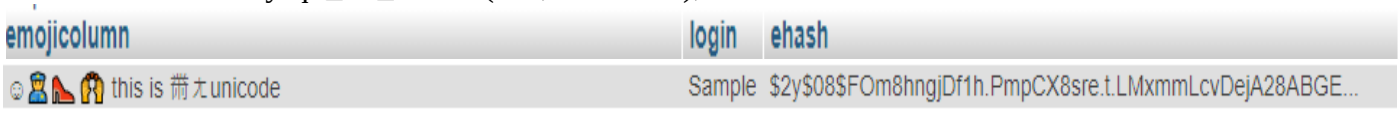

Figure 9: Password hash stored in MYSQL table

For illustration purpose the UNICODE based password has been displayed in column- emojicolumn. Column ehash displays the hashed password.

The Login form will have similar emojipicker for password field. Minimum and maximum password length can be checked through programming.

For demonstration, we have following user in Database

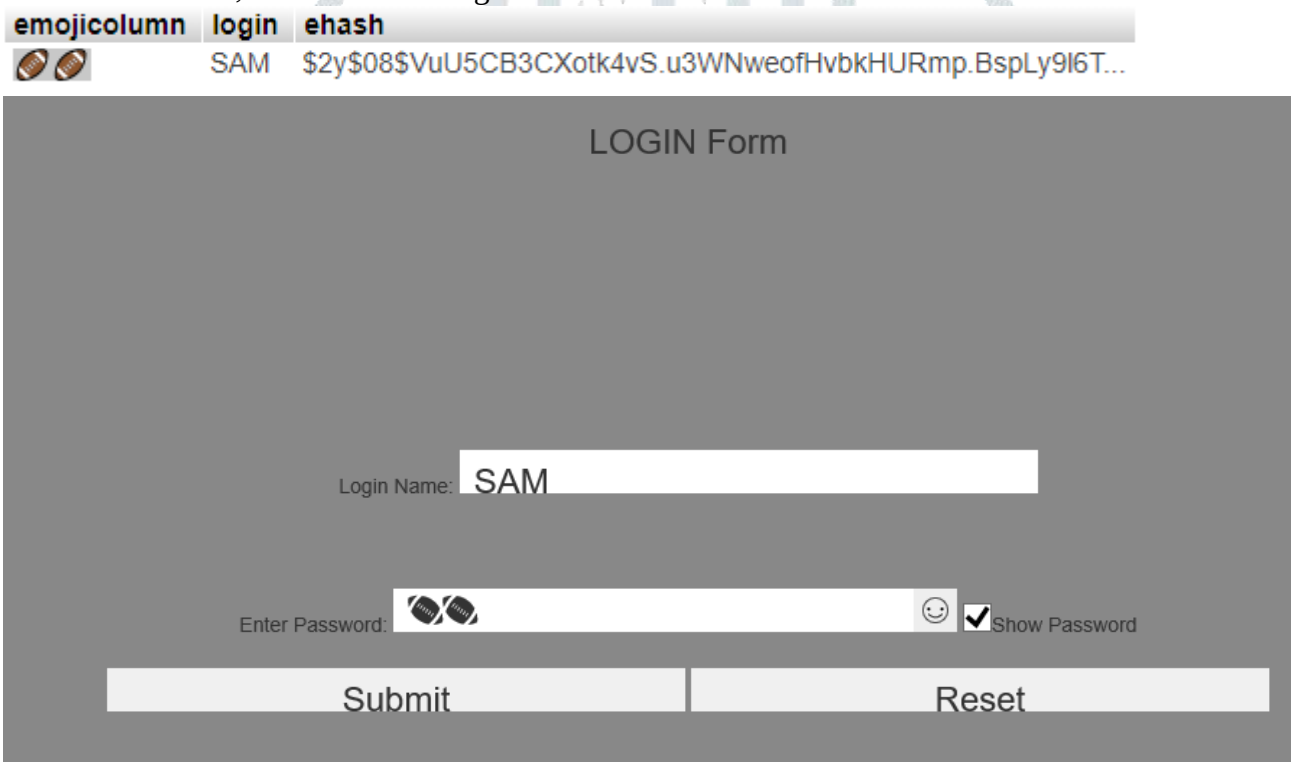

Figure 10: Login form

On verification of the hash value of given password, the password is reported as VALID.

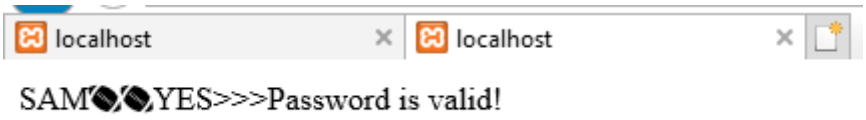

Figure 11:Authenticating password

VII) CONCLUSION

From the sample PHP-MYSQL application we can conclude that we can include emojis and other UNICODE characters in the passwords. This increase the total number of characters from which we can

construct our passwords. It help us to frame longer passwords comprising of English alphabets, numbers, punctuation , spaces, emojis and all UNICODE characters. It is very difficult to crack such passwords by brute force, as the hacker will have permute a exponentially large number of character combinations and is also harder to guess. This system can be easily extended to Android applications.

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