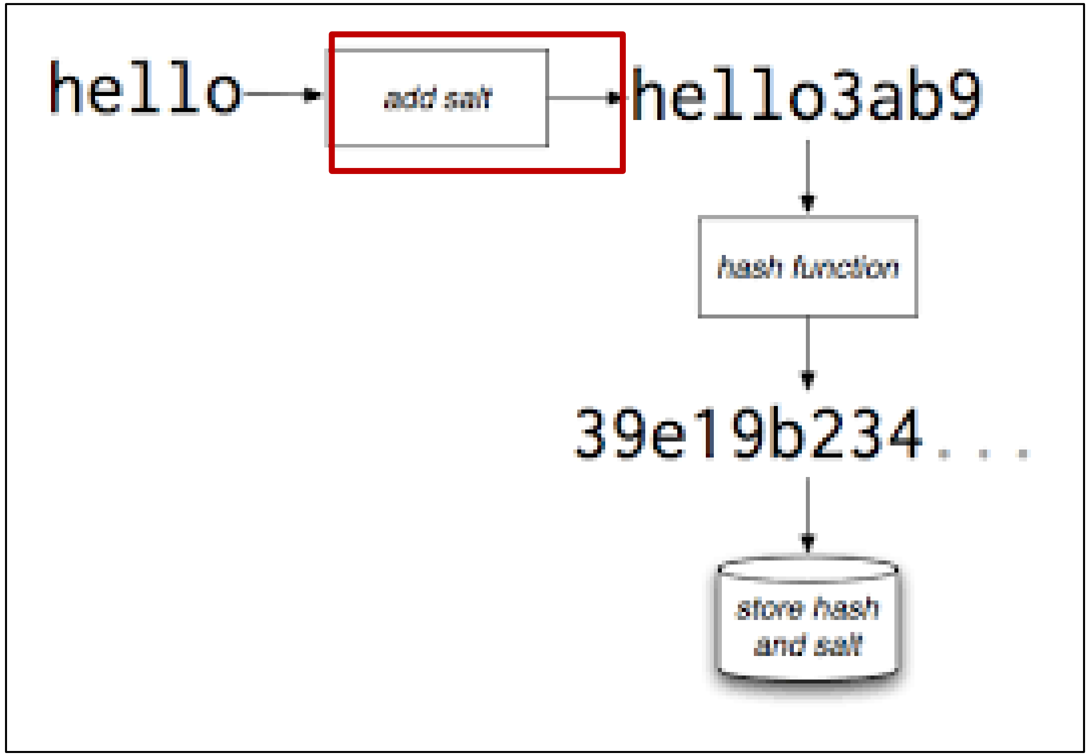
PASSWORD SALTING

Salting

Illustration



- To reduce the effectiveness of offline attacks using pre-computed hashes, a *salt* is added to a password before applying the hash function.
- A salt is just a random string.
- Each password has its own salt.
- The salt value is stored along with the hash of password+salt.
- For a salt of n-bit, the attacker needs to pre-compute 2^n of hashes for *the same password*.

Password Storage Cheat Sheet

Introduction¶

- It is essential to store passwords in a way that prevents them from being obtained by an attacker even if the application or database is compromised.
- After an attacker has acquired stored password hashes, they are always able to brute force hashes offline.
- As a defender, it is only possible to slow down offline attacks by selecting hash algorithms that are as resource intensive as possible.

Hashing vs Encryption

- Hashing and encryption both provide ways to keep sensitive data safe.
- **Passwords should be hashed, NOT encrypted.**
- **Hashing is a one-way function** (i.e., it is impossible to "decrypt" a hash and obtain the original plaintext value).
- Hashing is appropriate for password validation.
- Even if an attacker obtains the hashed password, they cannot enter it into an application's password field and log in as the victim.
- **Encryption is a two-way function**, meaning that the original plaintext password can be retrieved (if we have the key)

How Attackers Crack (unsalted) Password Hashes

- Although it is not possible to "decrypt" password hashes to obtain the original passwords, it is possible to "crack" the hashes in some circumstances. The basic steps are:
- Select a password you think the victim has chosen (e.g.password1!)
- Calculate the hash
- Compare the hash you calculated to the hash of the victim.
- If they match, you have correctly "cracked" the hash and now know the plaintext value of their password. (stop)

How Attackers Crack Password Hashes

- This process is repeated for a large number of potential candidate passwords.
- Different methods can be used to select candidate passwords, including:
  - Lists of passwords obtained from other compromised sites
  - Brute force (trying every possible candidate)
  - Dictionaries or wordlists of common passwords