

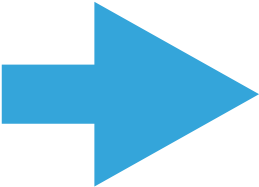


JENNER

+r1.id

+r1.ver







DERIVEREORDERKEYS



IV



IV



IV

MAKE SURE THE MASTER KEY HAS ENOUGH ENTROPY FOR DERIVED KEY AND DERIVED IV



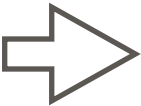
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Problem: Use different keys for different records, only store master key.

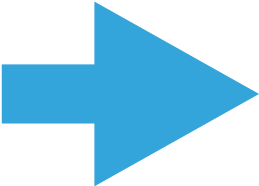
Solution: Use key derivation to derive per-record keys.

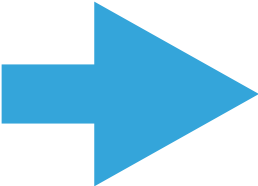












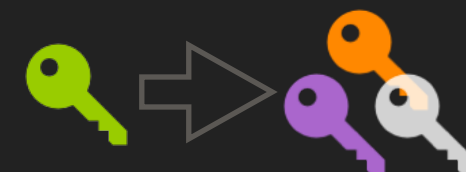




+r.n.id +r.n.ver

IMPORTANT: NEVER USE THE SAME KEY/IV TO ENCRYPT DIFFERENT DATA

SOLUTIONS FOR DERIVING KEY(S)



```
// Input:
//  Master_key and
//  (DB) record_id target record DB id
// Output:
//  AES-Key and
//  salt for encrypting target record

// AES-Key and salt for target record. "||" concatenates
// AES-CBC uses 128 bit IV. AES-GCM uses a 96 bit IV
byte[32] keyAndIV = derive_key( master_key ||
                                record_id || record_version, 256 bit)

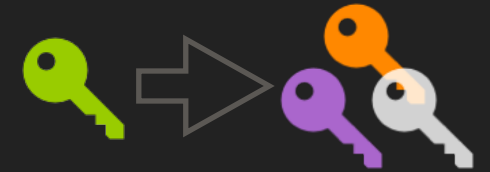
byte[16] derived_iv    = keyAndIV[0..15]
byte[16] derived_key   = keyAndIV[16..31]
```

- ▶ `derive_key` needs an additional *installation specific* salt of ≥ 128 bit. PBKDF2 with HMAC sha256 is an example of `derive_key`, as is `sCrypt` or [argon2](#).
- ▶ Use same process for decryption.
- ▶ No need to store the *generated* IV value.

IMPORTANT: NEVER USE THE SAME KEY/IV TO ENCRYPT DIFFERENT DATA

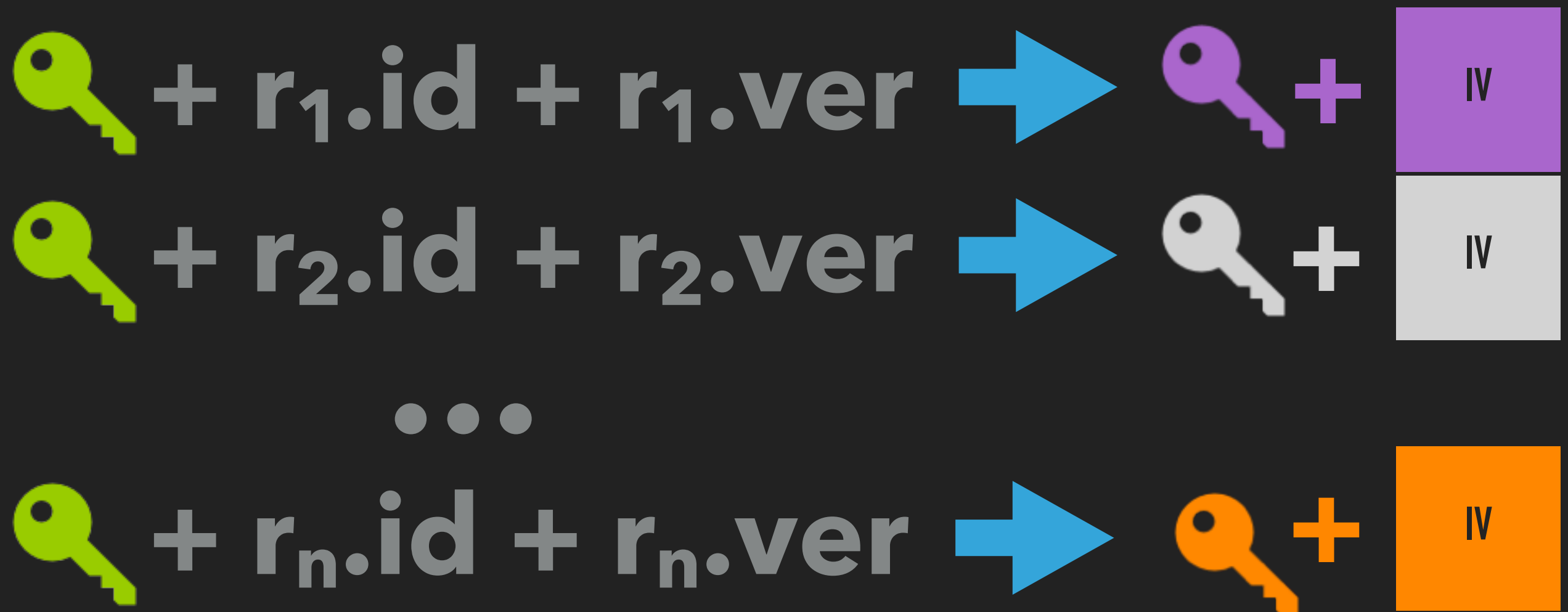
MAKE SURE THAT THE MASTER KEY HAS ENOUGH ENTROPY FOR DERIVED KEY AND DERIVED SALT

DERIVE PER RECORD KEYS



Problem: Use different keys for different records, only store master key.

Solution: Use key derivation to derive per-record keys.



IMPORTANT: NEVER USE THE SAME KEY/IV TO ENCRYPT DIFFERENT DATA

MAKE SURE THAT THE MASTER KEY HAS ENOUGH ENTROPY FOR DERIVED KEY AND DERIVED IV