draft-ietf-6tisch-minimal-security

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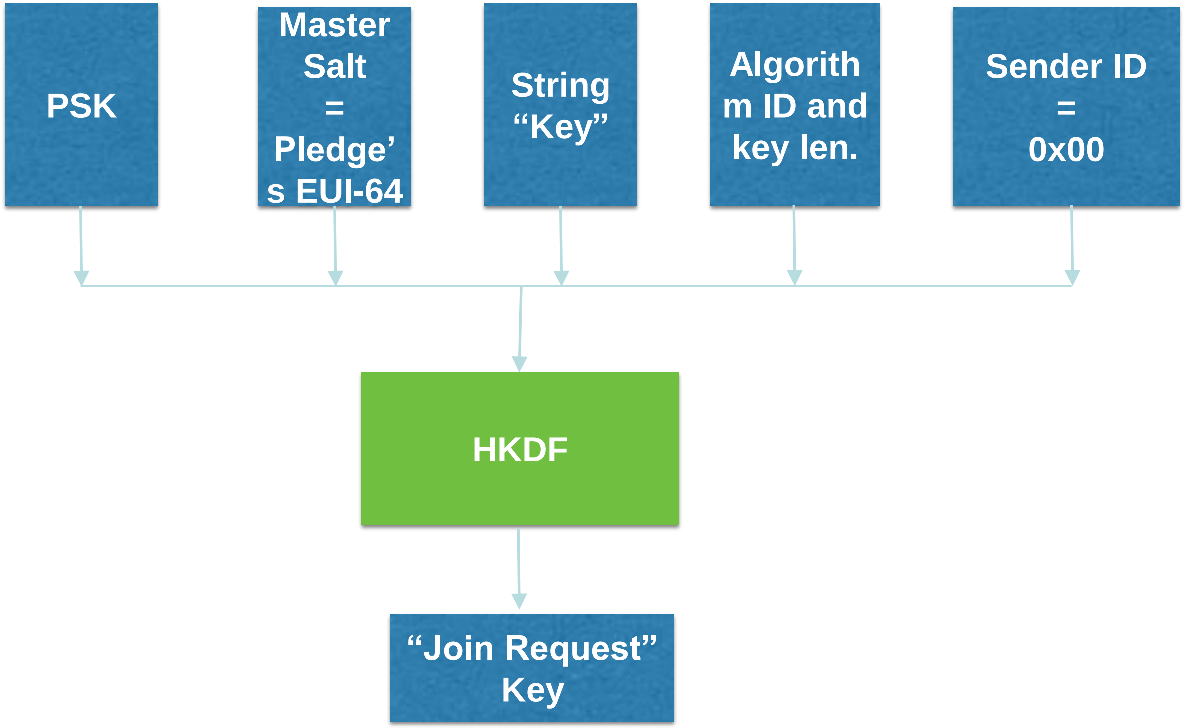
Status

- News
  - draft-ietf-6tisch-minimal-security-04
  - Published on 30 Oct 2017
- Relies completely on PSKs
- Summary of updates in -04

Update #1: Key/Nonce Derivation

- OSCORE-06 (formerly known as OSCOAP) updated the key/nonce derivation process
  - Same nonce used for both request and response but under a different key
- We could no longer use “EUI-64 | 0x00” and “EUI-64 | 0x01” as identifiers for the pledge and the JRC
- We now use EUI-64 of the pledge as Master Salt during key derivation and transport it as Context Hint
  - Sender ID of each pledge is 0x00; ID of the JRC is 0x01

Derivation of Key Used to Protect Join Request



PSK

Master Salt = Pledge's EUI-64

String "Key"

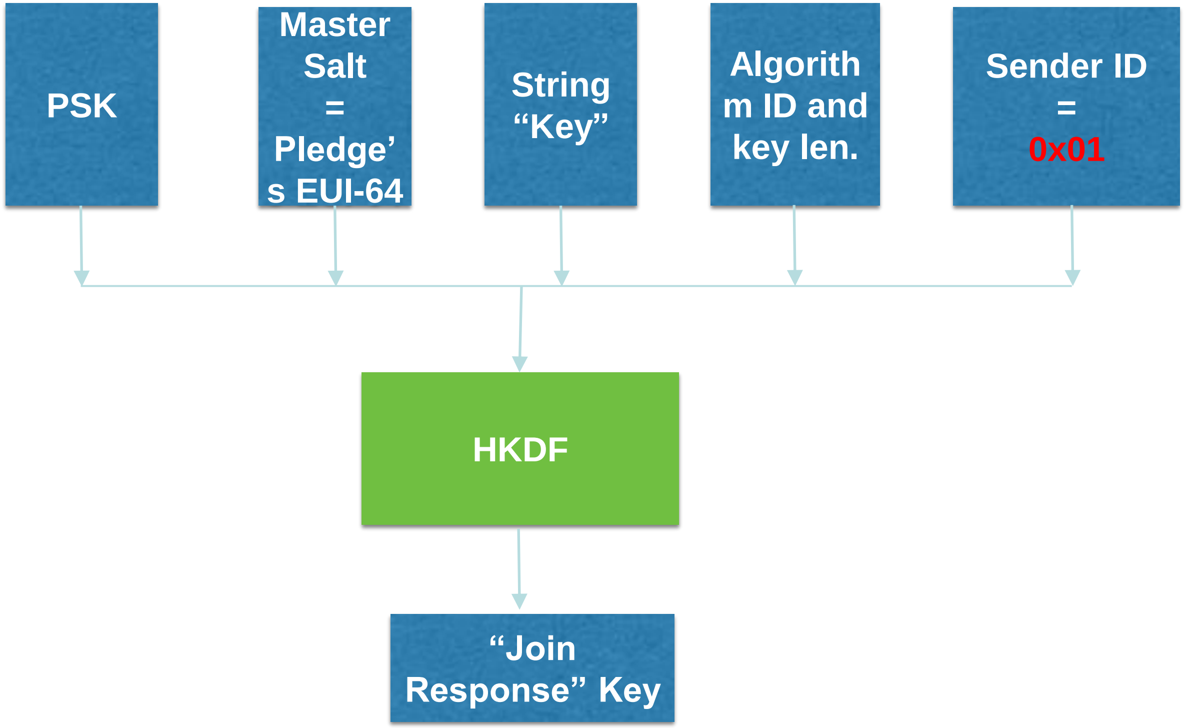
Algorithm ID and key len.

Sender ID = 0x00

HKDF

"Join Request" Key

Derivation of Key Used to Protect Join Response


PSK

Master Salt = Pledge's EUI-64

String "Key"

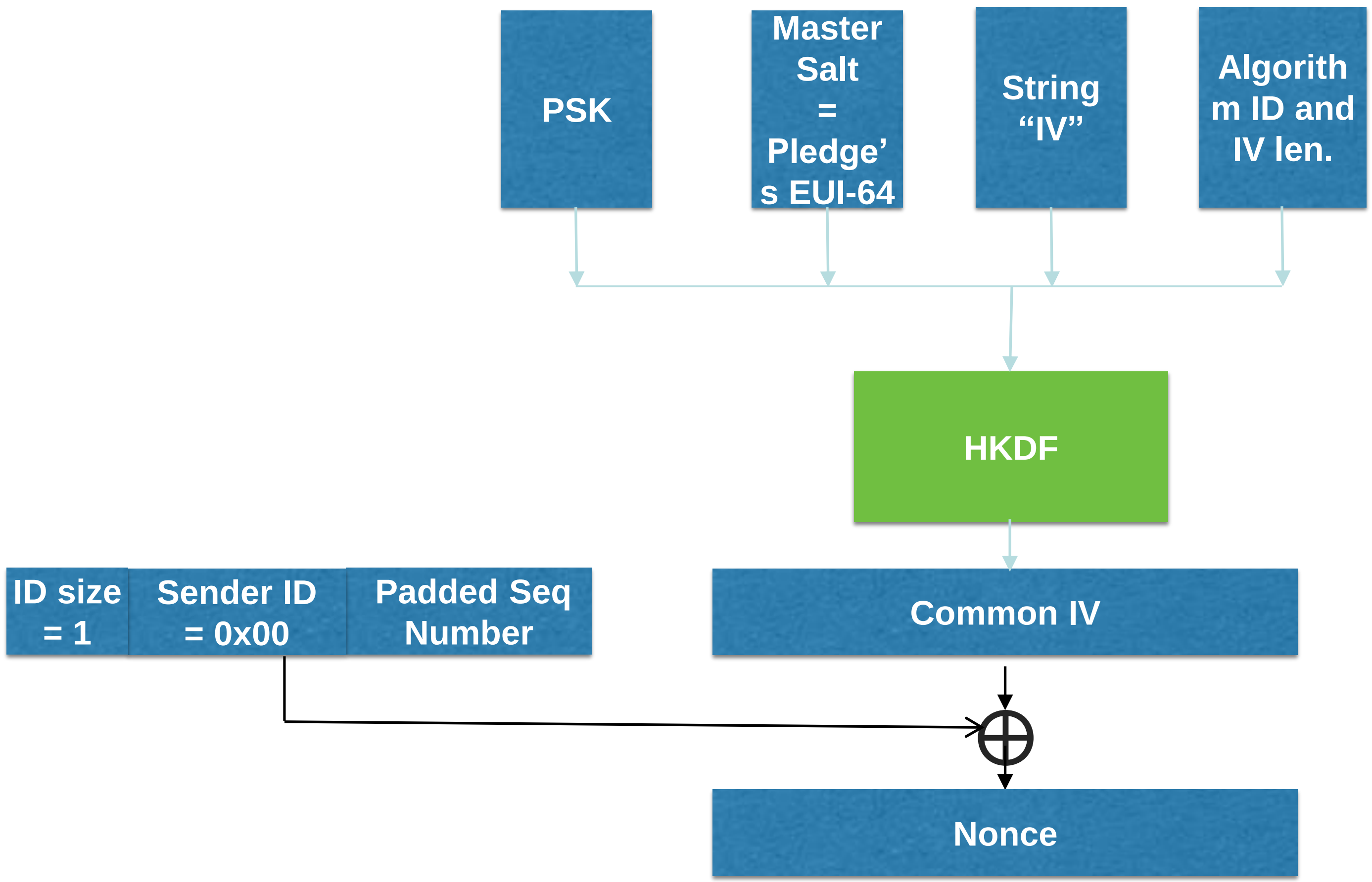
Algorithm ID and key len.

Sender ID = 0x01

HKDF

"Join Response" Key

Nonce Derivation
(used both for Join Request and Response)

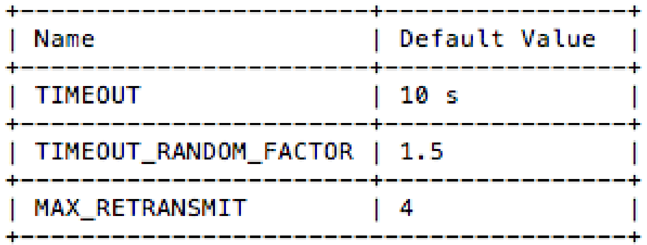


Update #2: Error Handling

- Error handling in -03 opens the pledge to a DoS attack
    - Attacker could send (unprotected) error messages and force the pledge to attempt joining the next advertised network
- Solution in -04:
    - Using **Non-Confirmable** CoAP msg for Join Request will make OSCORE at JRC silently drop the request in case of failure (decryption, replay, unauthorized)
    - *The pledge MUST silently discard any response not protected with OSCORE, including error codes.*
    - Forces the pledge to implement a retransmission mechanism at the APP layer duplicating CoAP Confirmable msg functionality

Update #3: Join Request Retransmissions

- Binary exponential back-off mechanism to be implemented by the pledge at the APP layer specified in -04:
  - Super simple, inspired by the one in RFC7252 (CoAP)
  - Pledge keeps track of *timeout* and *retransmission_counter*
  - Parameters: TIMEOUT, TIMEOUT_RANDOM_FACTOR, MAX_RETRANSMIT
  - *If the retransmission counter reaches MAX_RETRANSMIT on a timeout, the pledge SHOULD attempt to join the next advertised 6TiSCH network.*



Name	Default Value
TIMEOUT	10 s
TIMEOUT_RANDOM_FACTOR	1.5
MAX_RETRANSMIT	4

1st attempt: timeout in [10s, 15s]
2nd attempt: timeout in [20s, 30s]
3rd attempt: timeout in [40s, 60s]
4th attempt: timeout in [80s, 120s]

Misc updates

- Recommendation to store untrusted neighbor entries in a separate cache
- Join Request switched from GET -> POST to be more flexible with payload
- Added requirement on persistency of mutable OSCORE context parameters
    - Prevents nonce reuse and replay attacks across reboots
- Extensive editorial pass
    - Rewrote intro, clarifications on the PSK, etc…

Conclusion

- minimal-security-04 relies completely on PSKs
- Tracking of OSCORE, updates to error handling, editorial
- Open issue:
  - Join traffic, potentially controlled by the attacker, can influence SF to trigger 6P commands
  - In minimal-security, we recommend bandwidth cap at Join Proxy but this does not completely solve the problem
  - Should each SF specify how it handles the join traffic?
  - Proposed Resolution: Tag join packets at JP by using ToS bits in IPv6
- Reviews welcome!