OSCORE Profile of ACE

https://tools.ietf.org/html/draft-ietf-ace-oscore-profile-05

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Status

- Update -05 according to review
- WGLC review comments from Jim - PR #9 included in -05 fixes most of them:
  - Take out EDHOC appendix
  - Change term "MitM" with "on-path attacker”
  - Add section on discarding the sec ctx
  - Change uniqueness requirement on IDs
  - Define structure to transport OSCORE sec ctx input parameters
  - Remove uri path from the document
  - Motivate use of nonce in Protocol overview
- One open point discussed here

Add section on discarding the sec ctx

- The client MUST discard the current security context associated with an RS when:
  - the Sequence Number space ends.
  - the access token associated with the context expires.
  - the client receives a number of 4.01 Unauthorized responses to OSCORE requests. The exact number needs to be specified by the application.
  - creating a new security context from an old non-expired token
- The RS MUST discard the current security context associated with a client when:
  - Sequence Number space ends.
  - Access token associated with the context expires.

Define structure to transport OSCORE sec ctx input parameters

- Example of OSCORE_Security_Context using JSON:

```
"OSCORE_Security_Context" : {
 "alg" : "AES-CCM-16-64-128",
 "clientId" : b64'qA',
 "serverId" : b64'Qg',
 "ms" : b64'+a+Dg2jjU+eIiOFCa9lObw'
}
```

- CDDL definition for OSCORE_Security_Context (CBOR):

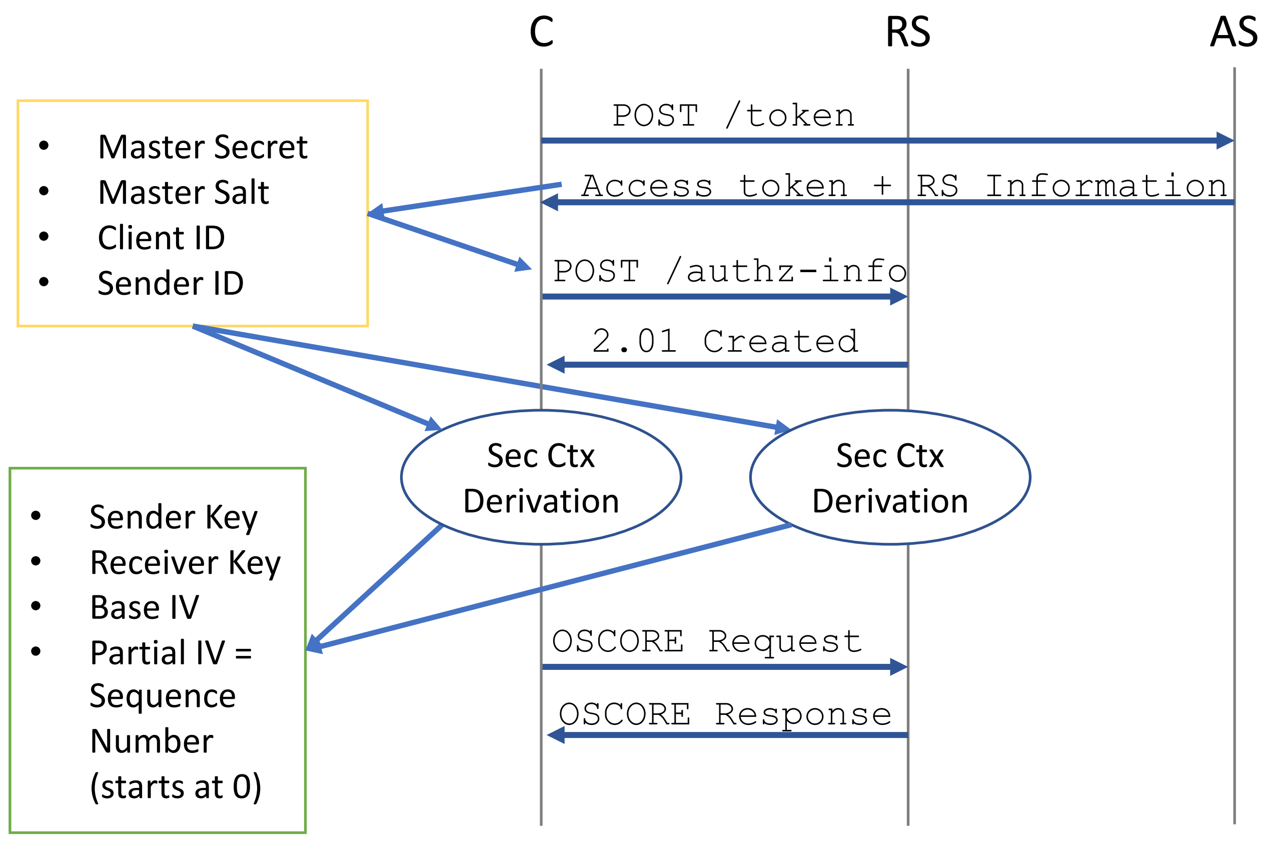
```
OSCORE_Security_Context = {
 ? 1 => bstr, ; ms
 ? 2 => bstr, ; clientId
 ? 3 => bstr, ; serverId
 ? 4 => tstr / int, ; hkdf
 ? 5 => tstr / int, ; alg
 ? 6 => bstr, ; salt
 ? 7 => bstr / tstr ; rpl }
```

- IANA considerations: registry creation (Expert Review Required), parameters registration, CWT and JWT registration, expert review guidelines

The one issue left

- Assumptions:
  - Client and RS can forget security contexts and do not keep track of all the tokens received.
  - Client can get an old non-expired token from AS.

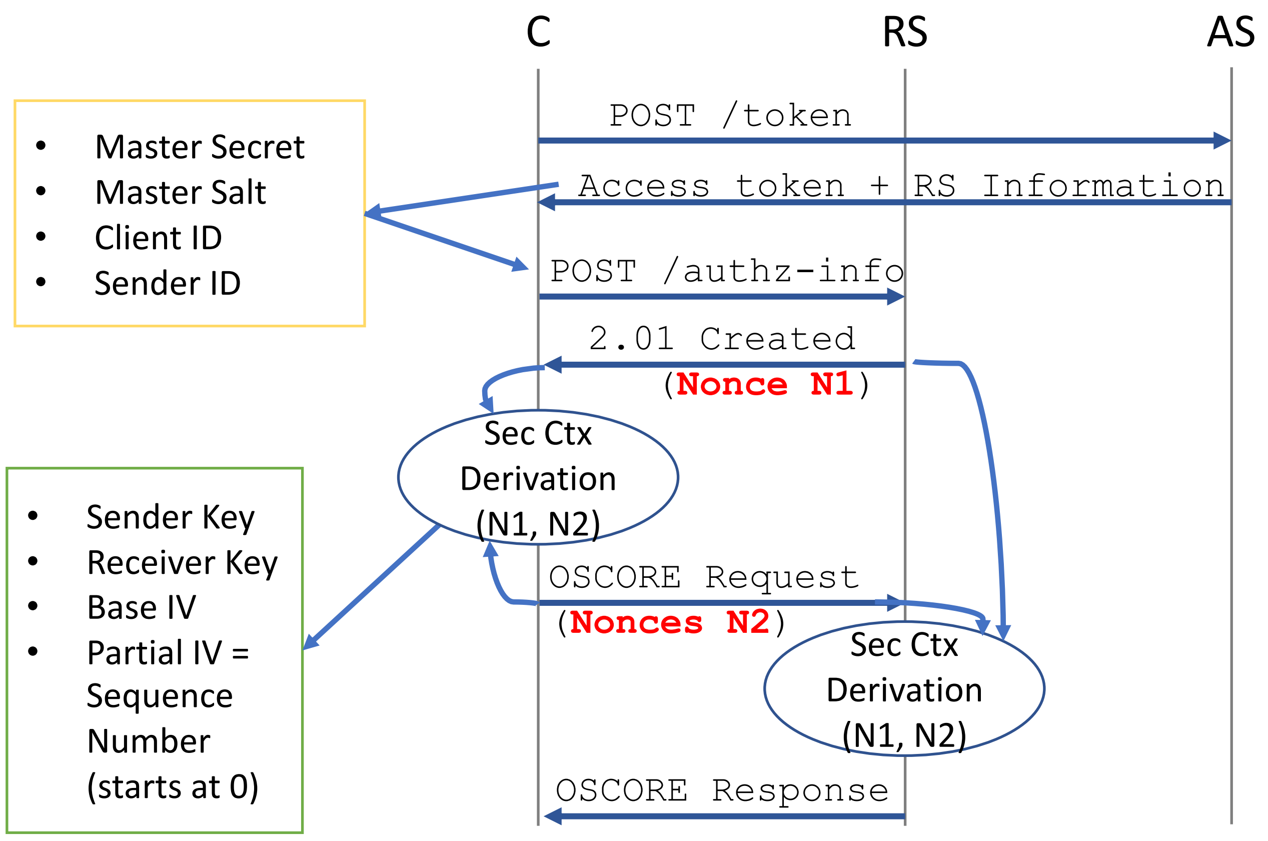
Background



Protocol Overview from v-02 (June 2018)

Proposal

Adding random Nonces N1 and N2 in Sec Ctx derivation (Created by RS and C resp)

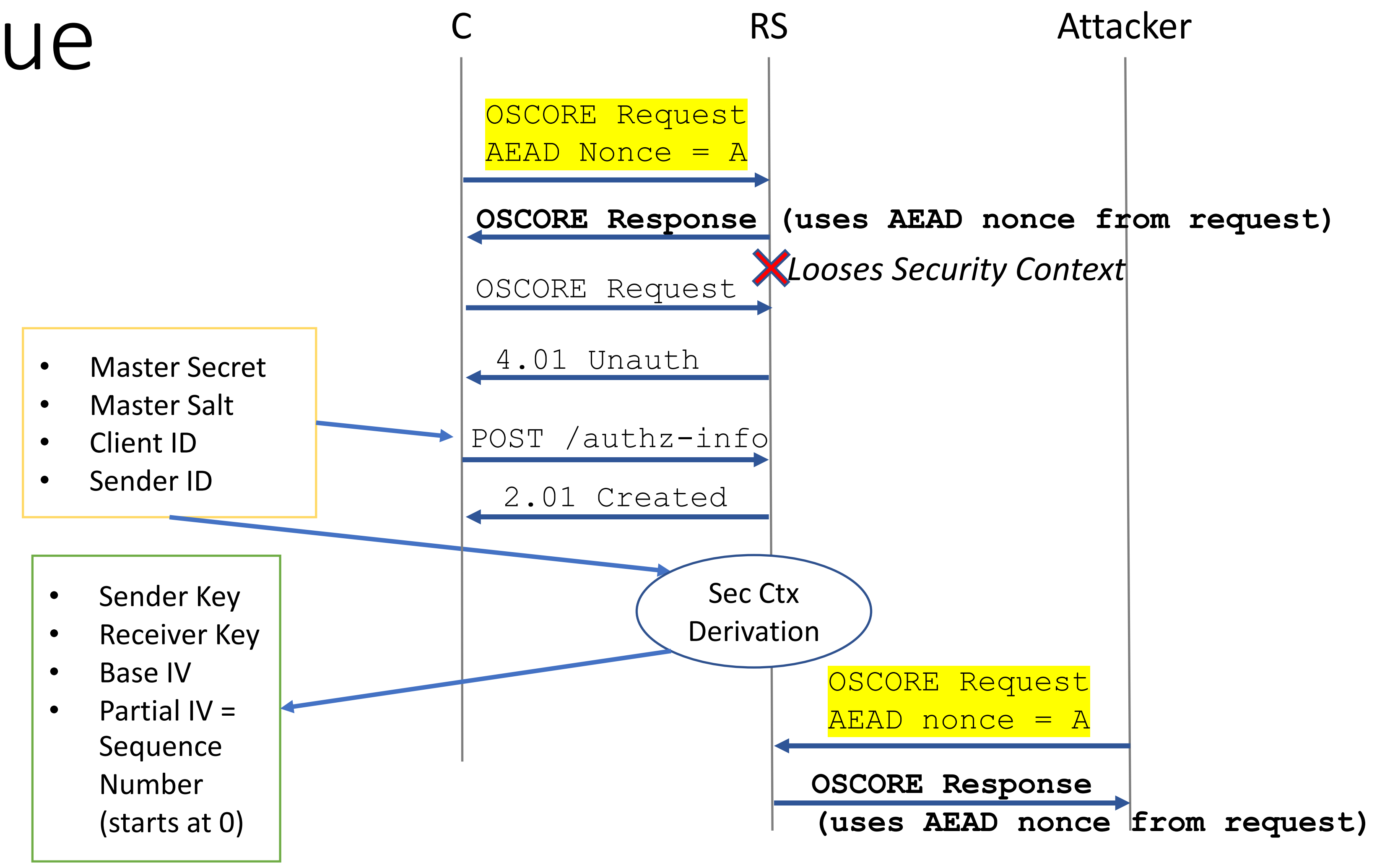


This will avoid reuse of nonces and keys on RS and C for a security context derived from the same input parameter

Motivation: N1 (RS nonce)

- Issue:
  - RS looses security context and token
  - C reposts the same token, triggering security context derivation
  - Attacker replays an old OSCORE Request from C to RS
- This leads to reuse of nonces on the server side
- RS sends a random nonce N1 to avoid this.

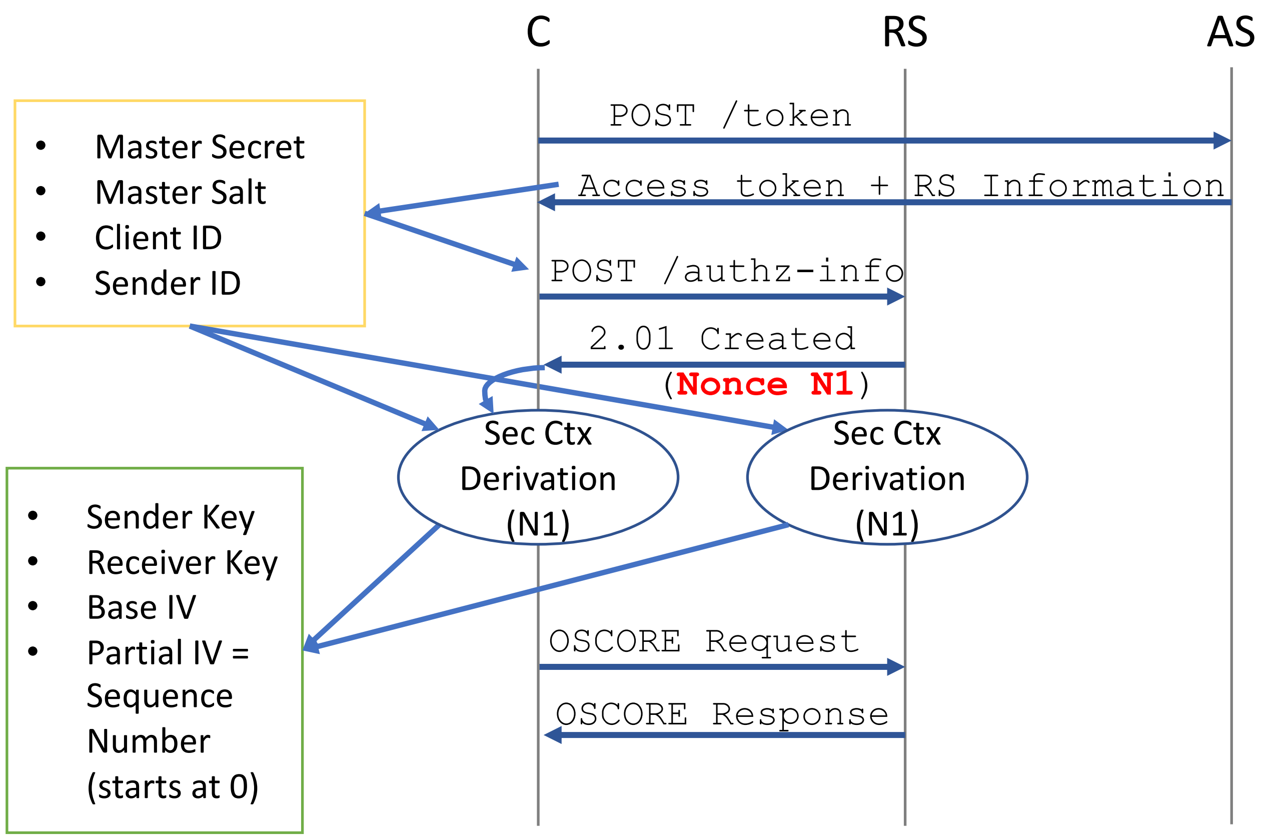
Issue



This will cause reuse of AEAD nonces and keys on the RS for a different message for a security context derived from the same input parameter

Solution

Adding a random Nonce N1 in Sec Ctx derivation (Created by RS)



- Master Secret
- Master Salt
- Client ID
- Sender ID

- Sender Key
- Receiver Key
- Base IV
- Partial IV = Sequence Number (starts at 0)

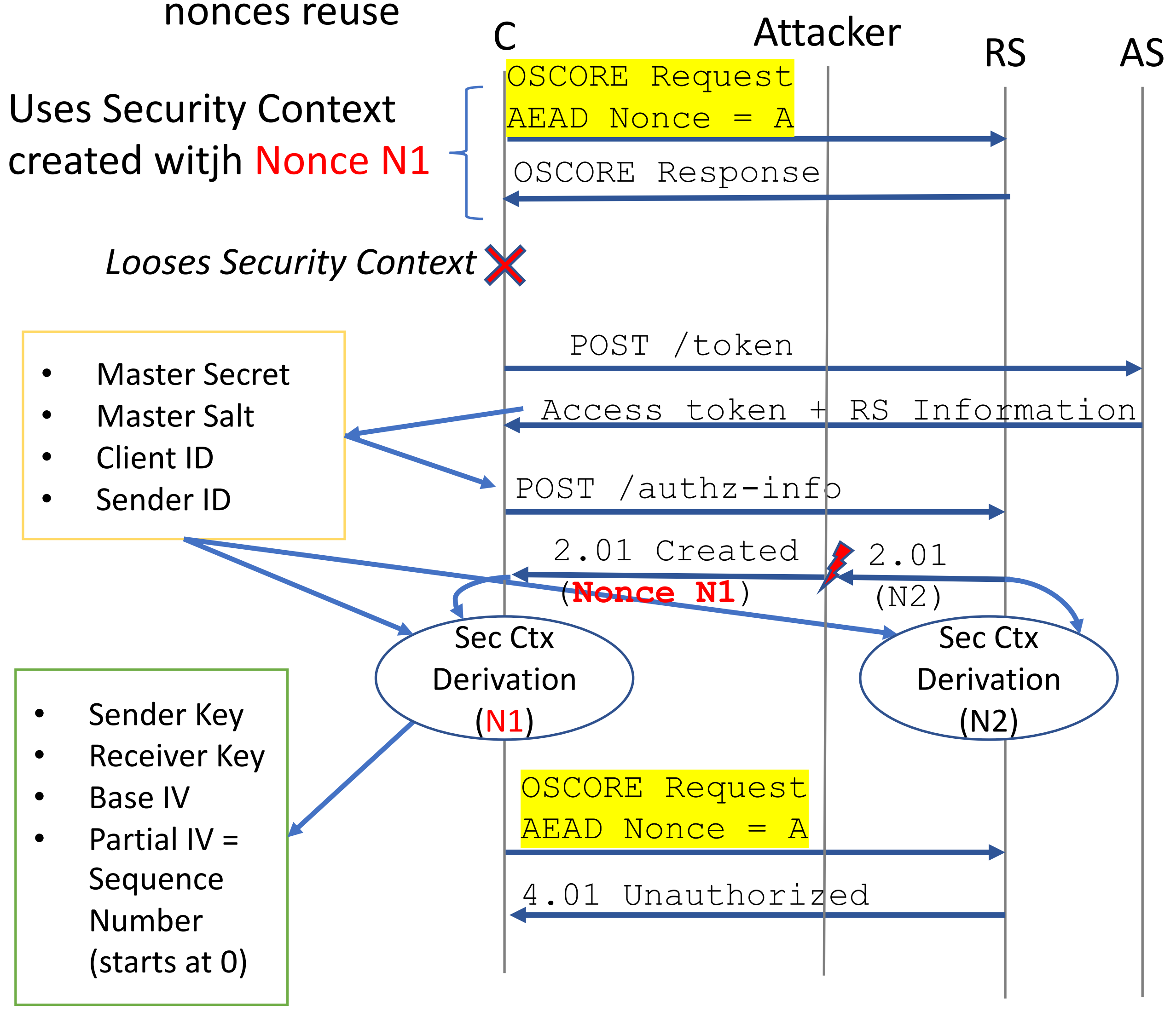
This will avoid reuse of nonces and keys on RS for a security context derived from the same input parameter

Motivation: N2 (C nonce)

- Issue:
    - C looses security context and token
    - C gets a token, and posts it to RS
    - An on-path attacker replays an old message from RS to C, containing an old nonce N1 for security context derivation
- This leads to reuse of nonces on the client side

Issue

Nonce N1 is not protected so an on-path attacker can replace it, provoking an old security context to be created on the Client, and nonces reuse

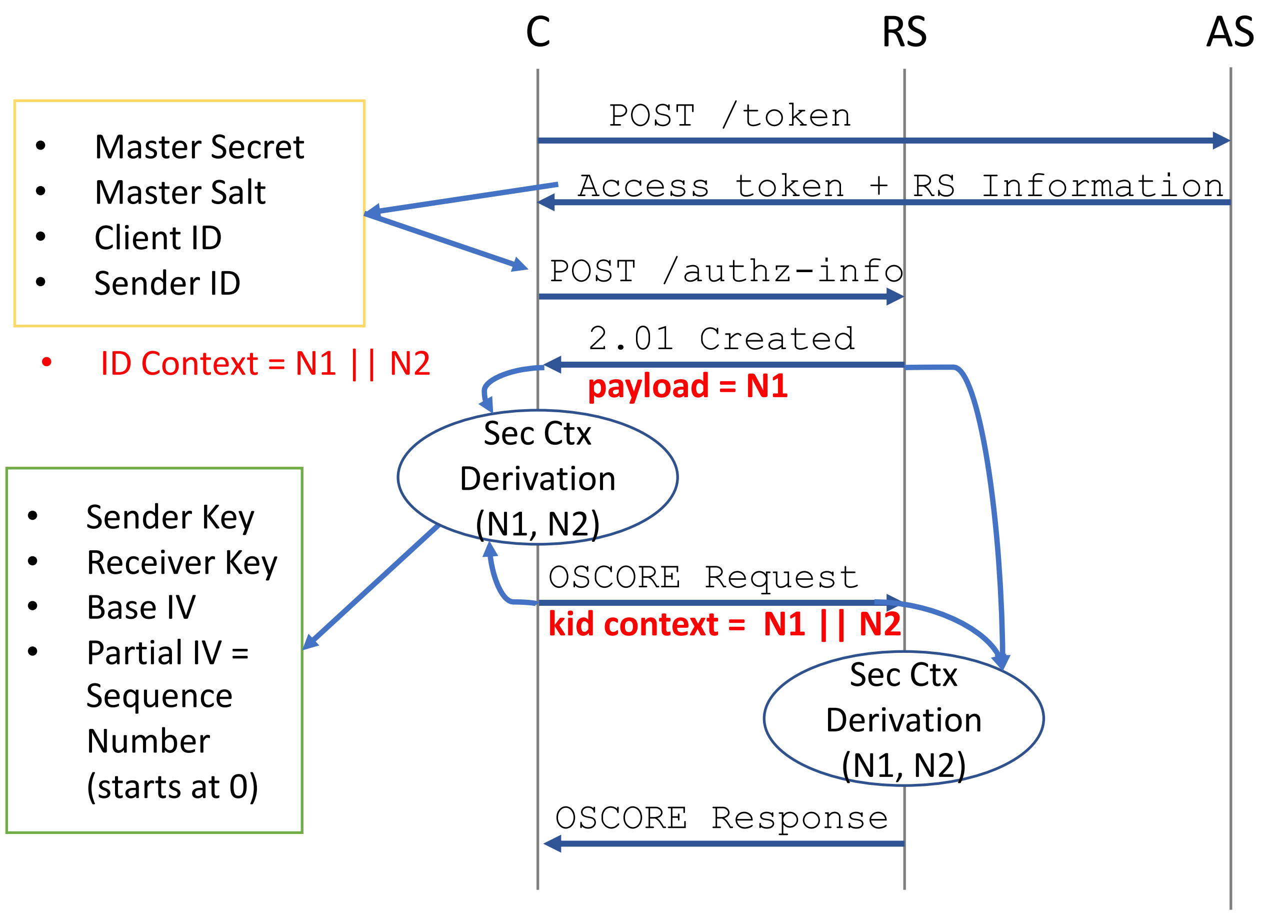


Conclusion

- Because of these security issues, we consider that using nonces can not be optional.

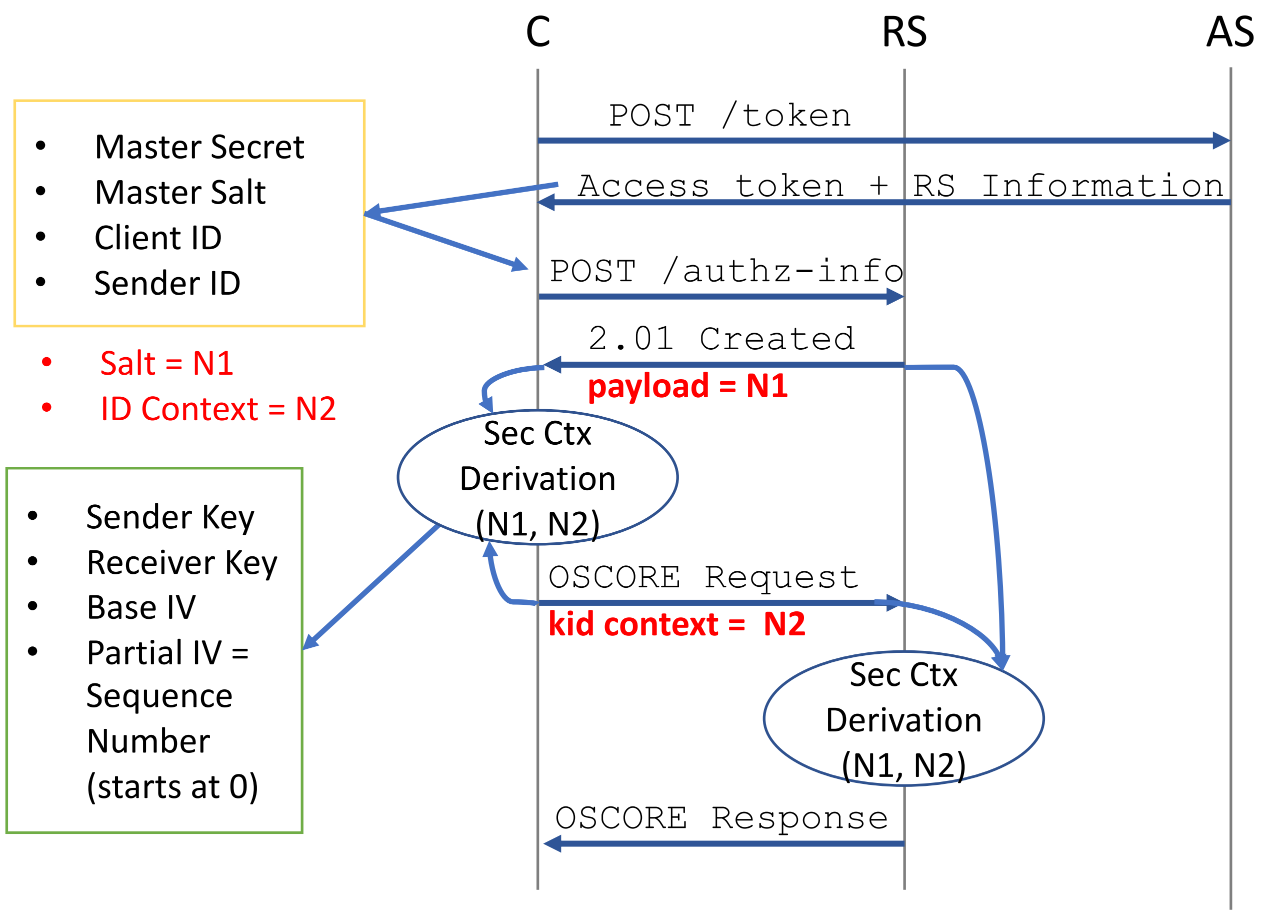
- Question to the WG: how do we transport N1 and N2 and include them in OSCORE Security Context derivation?
  - N1 || N2 as ID Context; transported as kid context (currently in the draft)
  - N1 as salt, N2 as ID Context; N1 transported as payload of 2.01 Created, N2 as kid context
  - N1 || N2 as ID Context; N2 transported at the same time of the token in the POST /authz-info (new content-format), N1 transported as payload of 2.01 Created

Proposal 1: N1 || N2 as kid context



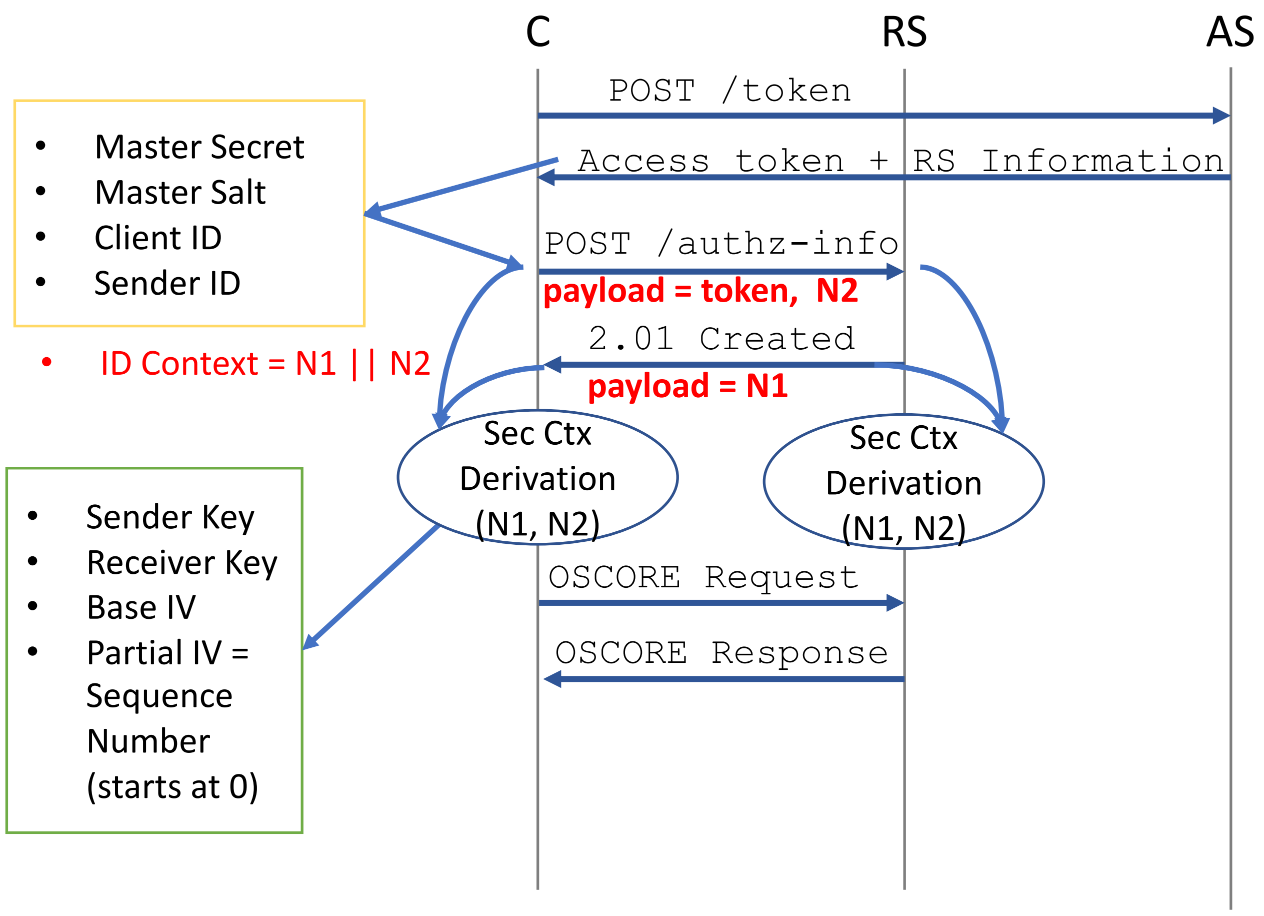
- ID Context = N1 || N2 is used in Security Context derivation
- kid context to transport ID Context in the first OSCORE request
- kid context can be omitted in further OSCORE requests
- Con: RS derives a sec context when receiving an unknown kid context; we send N1 when only N2 is needed.
- Pro: we don’t use salt, leaving it to the application

Proposal 2: N1 as salt, N2 as ID Context



- Salt = N1 is used in Security Context derivation
- ID Context = N2 is used in Security Context derivation
- kid context to transport ID Context in the first OSCORE request, salt is transported as payload of 2.01 Created
- kid context can be omitted in further OSCORE requests
- Pro: we send N2 only
- Con: we use salt

Proposal 3: N1 || N2 as ID Context



- ID Context = N1 || N2 is used in Security Context derivation
- N1 transported as payload of 2.01 Created
- N2 transported together with the token

```
Header: POST (T=CON, Code=0.02)
   Uri-Path: "authz-info"
   Content-Format:
"application/ace+cbor"
   Payload: {
"access_token" : Token,
"nonce": N2 }
```

- Pro: cleaner, don't send nonces in OSCORE message
- Con: Changes in Ace for POST /authz-info:
  - Allow use of Content-Format: application/ace+cbor together with CBOR map as payload (which MUST contain token)

Last Question

- Should we use Content-Format: “application/ace+cbor” for 2.01 Created and use the registered parameter “nonce” to send N1?