Group OSCORE Profile of the Authentication and Authorization for Constrained Environments Framework

draft-tiloca-ace-group-oscore-profile-00

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Motivation (1/2)

- Application scenarios with group communication
  - Group OSCORE provides security also over multicast
  - What about access control for resources at group members ?

- For very simple use cases
  - Straightforward and plain access control may be just fine
  - Joining the security group is enough to access resources
  - Any group member can do anything at any other group members' resource

- For more complicated use cases
  - Different clients can have different access rights
  - Creating (many) more groups poorly scales and is hard to manage
  - Instead, use ACE to enforce fine-grained access control. However …

Motivation (2/2)

- Every current profile of ACE
  - Does not cover secure group communication between C and RSs
  - Relies on a single security protocol between C and RS

- OSCORE profile
  - C and RS must use OSCORE
  - The Token is bound to the OSCORE Security Context
  - Group OSCORE is simply not admitted

- We cannot use Group OSCORE and ACE-based access control of resources

Contribution

- New Group OSCORE profile of ACE
  - Builds on the OSCORE profile
  - Admits two security protocols: OSCORE and Group OSCORE
  - Assumes that C and RS have already joined a same OSCORE group

- Outcomes
  - Pairwise OSCORE Security Context ***ctx***
  - Token bound to both ***ctx*** and the Group OSCORE Security Context ***g_ctx***
  - ***ctx*** is bound to ***g_ctx*** , i.e. ***ctx*** derivation relies also on ***g_ctx*** parameters

- Properties
  - Proof-of-Possession of the OSCORE Master Secret in the Token
  - Server Authentication (through OSCORE or Group OSCORE)
  - Proof-of-Group-Membership for that exact Client (Token bound also to ***g_ctx***)

Overview – Δs from OSCORE profile

- The C-to-AS Access Token Request includes also:
  - The Sender ID ('kid') of the Client in the OSCORE group
  - The Group ID ('kid_context') of the OSCORE group
  - New request parameters: 'salt' and 'context_id'

- The AS-to-C Access Token Response includes also:
  - Namesake parameters of the OSCORE Sec Ctx Object
  - Same OSCORE Sec Ctx Object in the Access Token

- Token POST and response
  - Exchanges of nonces N1 and N2 as in the OSCORE profile
  - RS stores the Access Token with {Sender ID; Group ID}

```
Header: POST (Code=0.02)
Uri-Host: "as.example.com"
Uri-Path: "token"
Content-Format: "application/ace+cbor"
Payload:
{
   "audience" : "tempSensor4711",
   "scope" : "read",
   "salt" : h'00',
   "context_id" : h'abcd0000'
}
```

Access Token Request

```
Header: Created (Code=2.01)
Content-Type: "application/ace+cbor"
Payload:
{
  "access_token" : h'a5037674656d7053656e73 ...'
   (remainder of access token omitted for brevity),
  "profile" : "coap_group_oscore",
  "expires_in" : 3600,
  "cnf" : {
    "OSCORE_Security_Context" : {
      "alg" : "AES-CCM-16-64-128",
      "clientId" : b64'qA',
      "serverId" : b64'Qg',
      "ms" : h'f9af838368e353e78888e1426bd94e6f',
      "salt" : h'00',
      "context_id" : h'abcd0000'
    }
  }
}
```

Access Token Response

Overview – Δs from OSCORE profile

- Derivation of the pairwise OSCORE Security Context ***ctx***
  - Extended parameters, through more concatenations
  - Use also information related to the OSCORE Group

Aligned with v -07 of the OSCORE profile

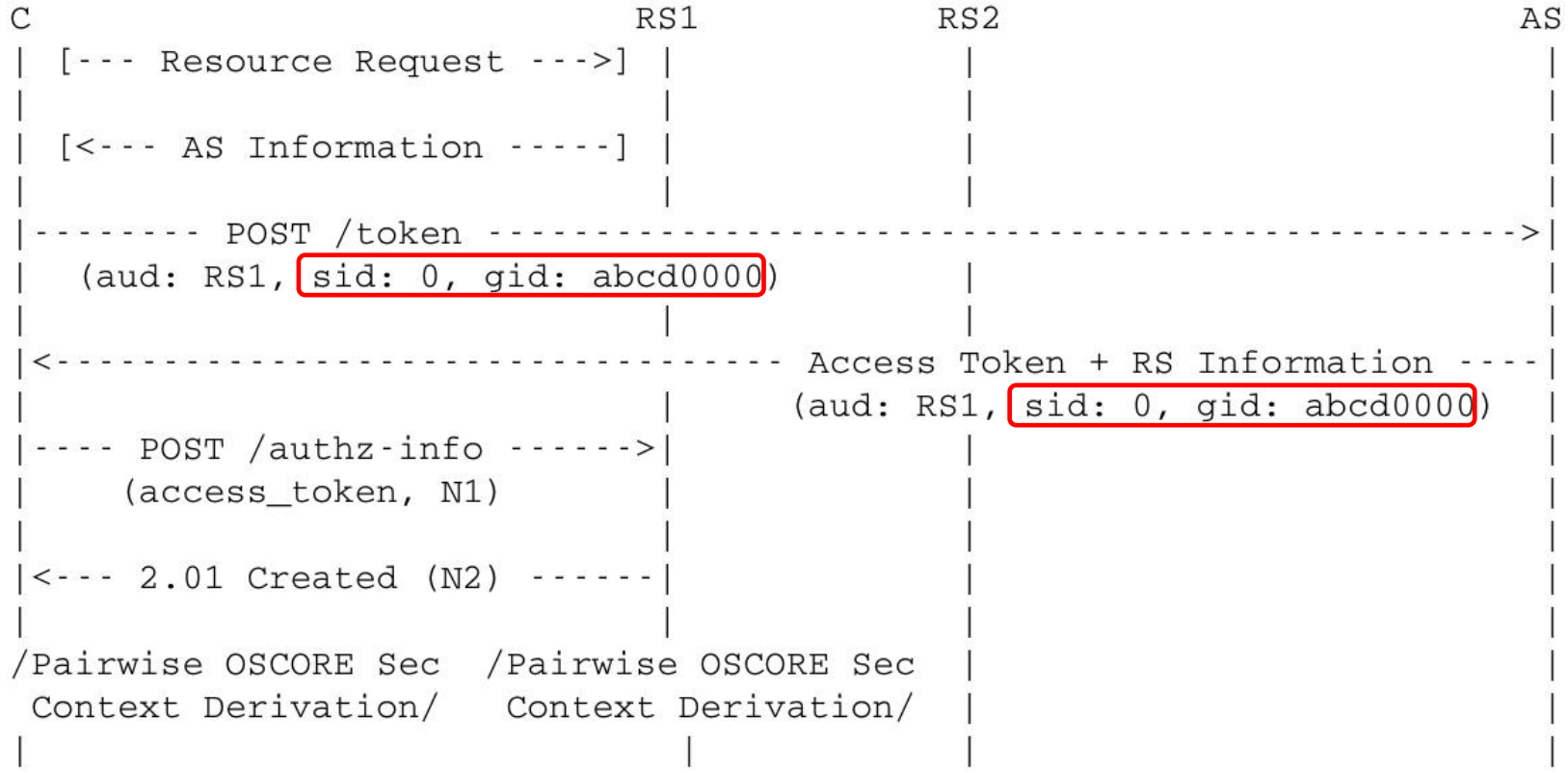
- **Context ID** = N1 | N2 | <Group ID of the OSCORE group>
  - The Group ID of the OSCORE group is also in the Access Token, as 'context_id'

- **Salt** = <Sender ID of C in the OSCORE group> | <Master Salt in the OSCORE group>
  - The Sender ID of C in the OSCORE group is also in the Access Token, as 'salt'
  - The Master Salt in the OSCORE group is known to C and RS as group members

- **Master Secret** = <OSCORE Master Secret> | <Master Secret of the OSCORE group>
  - The OSCORE Master Secret is in the Access Token, as 'ms' like in the OSCORE profile
  - The Master Secret of the OSCORE group is known to C and RS as group members

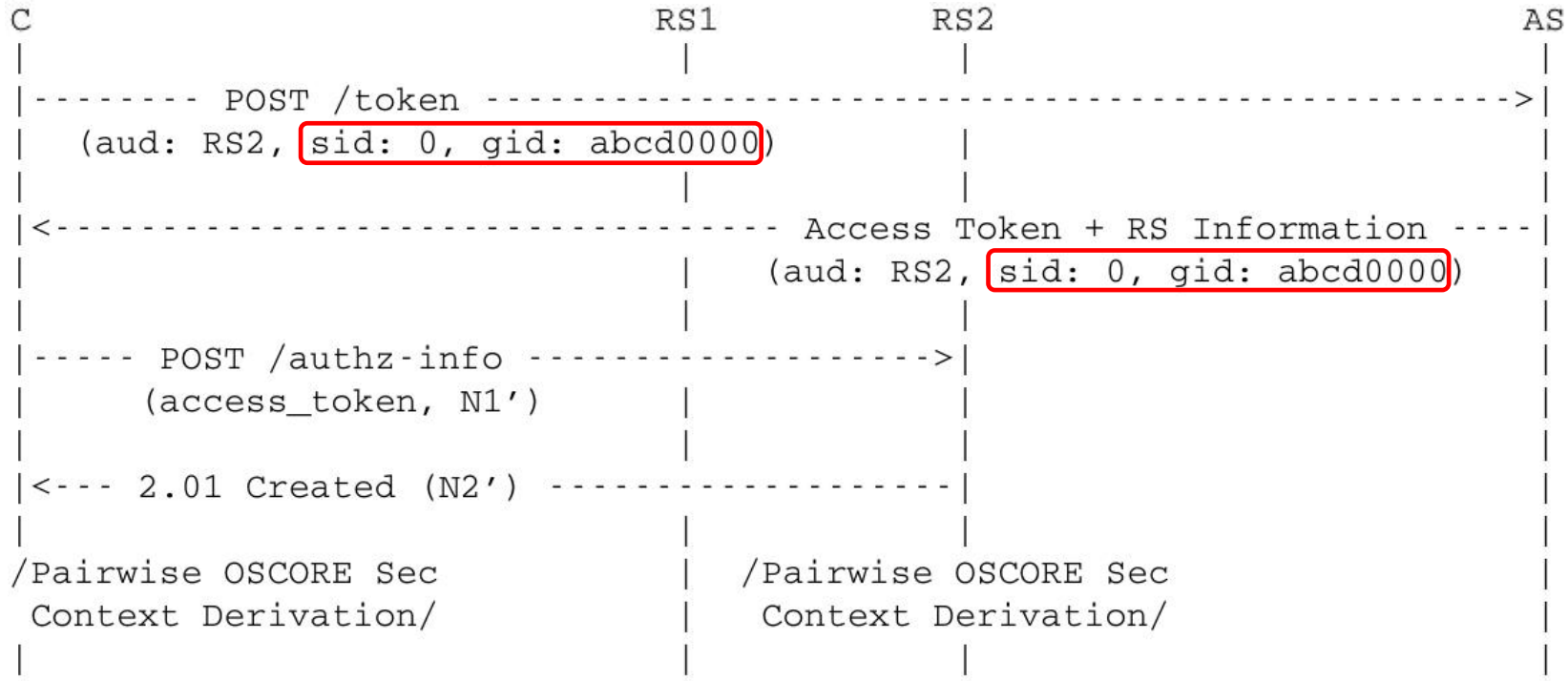
C – RS1 pairing

0: Sender ID ('kid') of C in the OSCORE group
abcd0000: Group ID ('kid_context) of the OSCORE group



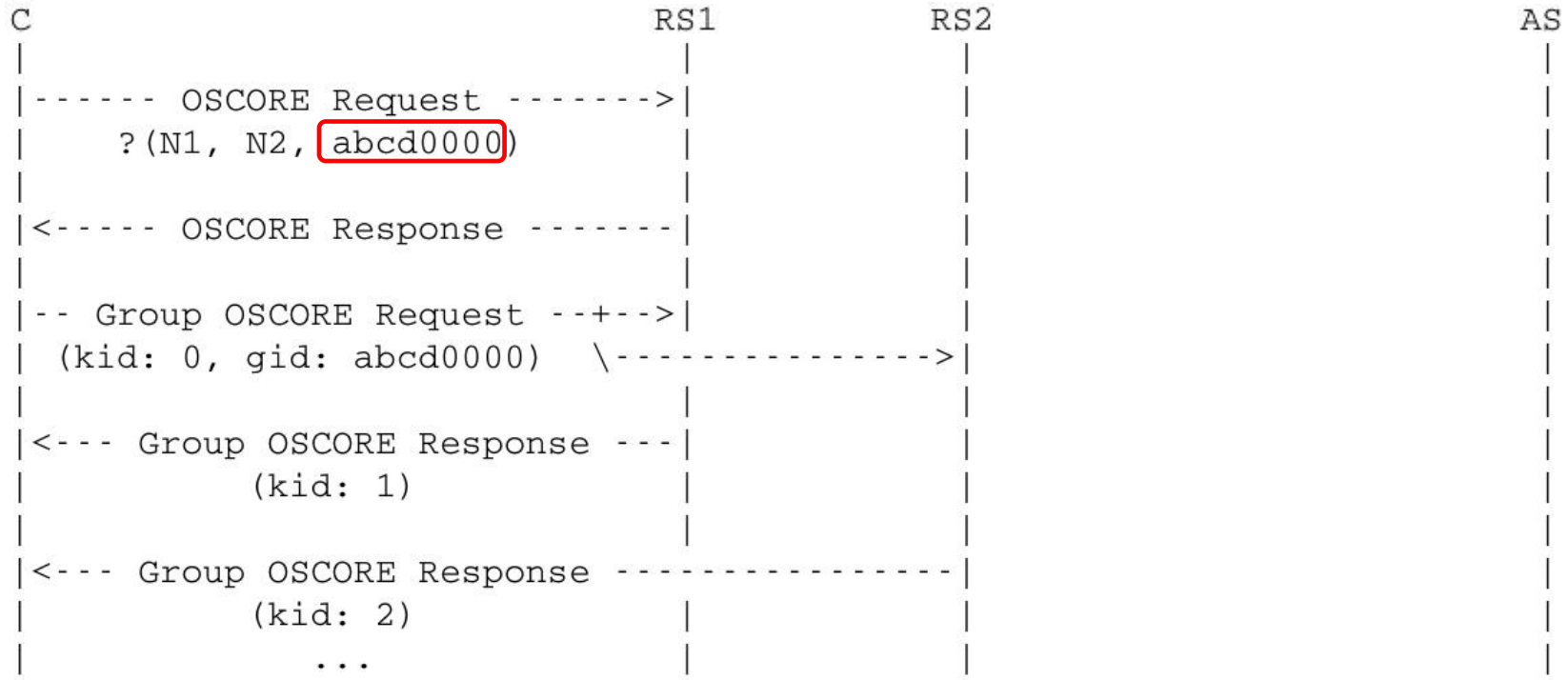
C – RS2 pairing

0: Sender ID (‘kid’) of C in the OSCORE group
abcd0000: Group ID (‘kid_context) of the OSCORE group



C – {RS1,RS2}

0: Sender ID ('kid') of C in the OSCORE group
abcd0000: Group ID ('kid_context) of the OSCORE group



C can access RS1 and RS2 resources, as per the posted Access Token, using OSCORE or Group OSCORE

Open point

- Risk for impersonation among group members
  - A node n1 asks for a Token, but using the Sender ID of a node n2
  - Then n1 performs authorized actions, yet “blaming” n2 for them

- Solution
  - Bind also the public key used in the group to the Access Token
  - Include the public key and a PoP signature in the Token Request
  - The AS includes also the public key in the Access Token

- Thanks to Jim for this discussion!

Summary

- New ACE profile for secure group communication
  - Two security protocols: OSCORE and Group OSCORE
  - The pairwise context and group context are bound to each other
  - The Access Token is bound also to the group context

- Benefits
  - Enables Group OSCORE together with ACE-based access control
  - Builds on the OSCORE profile and its context derivation

- Need for document reviews

Thank you!

Comments/questions?

https://gitlab.com/crimson84/draft-tiloca-ace-group-oscore-profile