Alternative Approach for Postquantum Preshared Keys in IKEv2

draft-smyslov-ipsecme-ikev2-qr-alt

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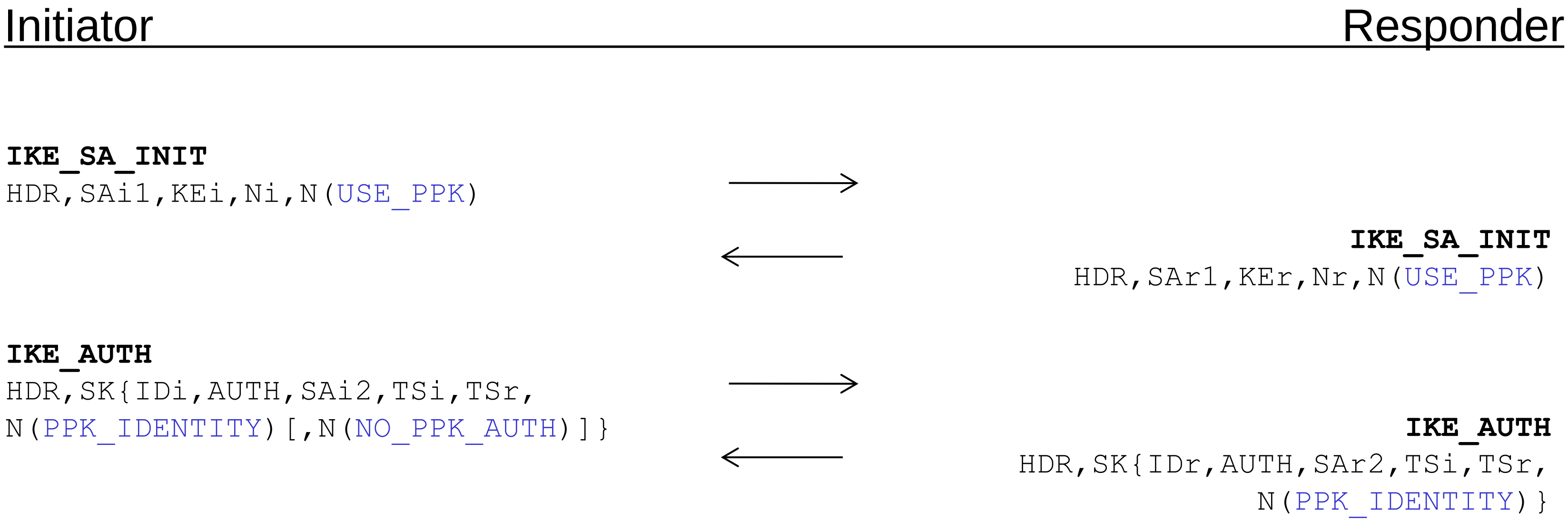
IETF 106

PPK for IKEv2

Defined in draft-ietf-ipsecme-qr-ikev2:



Initiator Responder

IKE_SA_INIT
HDR,SAi1,KEi,Ni,N(USE_PPK) →

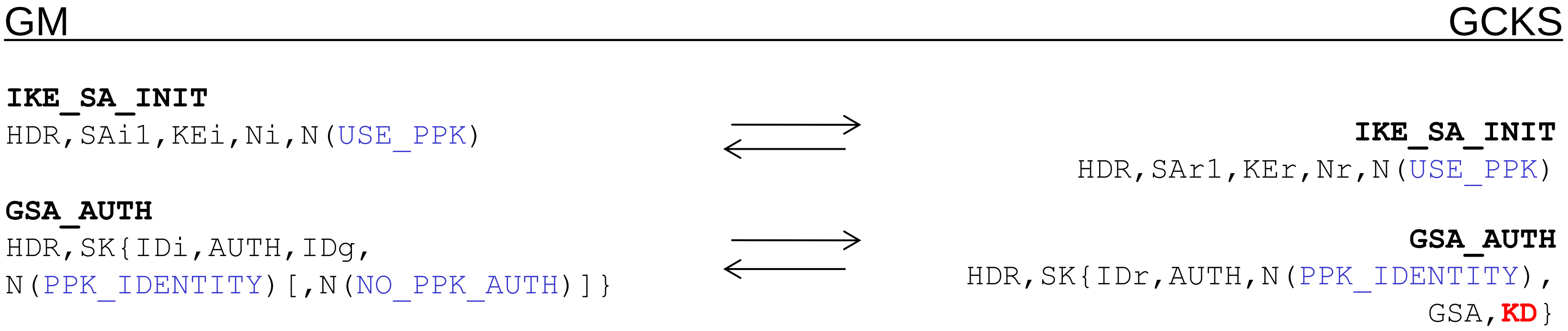
← **IKE_SA_INIT**
HDR,SAr1,KEr,Nr,N(USE_PPK)

IKE_AUTH
HDR,SK{IDi,AUTH,SAi2,TSi,TSr,
N(PPK_IDENTITY)[,N(NO_PPK_AUTH)]} →

← **IKE_AUTH**
HDR,SK{IDr,AUTH,SAr2,TSi,TSr,
N(PPK_IDENTITY)}

The Problem

- Initial IKE SA is not protected by PPK (WG decision)
  - it was assumed that no sensitive information was transferred over initial SA, and one could immediately rekey it to get protection
- G-IKEv2 (draft-yeung-g-ikev2) uses initial IKE SA to immediately transfer session keys from Group Controller/Key Server (GCKS) to Group Member (GM)
  - the keys **are not protected** by PPK



GM

GCKS

IKE_SA_INIT
HDR,SAi1,KEi,Ni,N(USE_PPK)

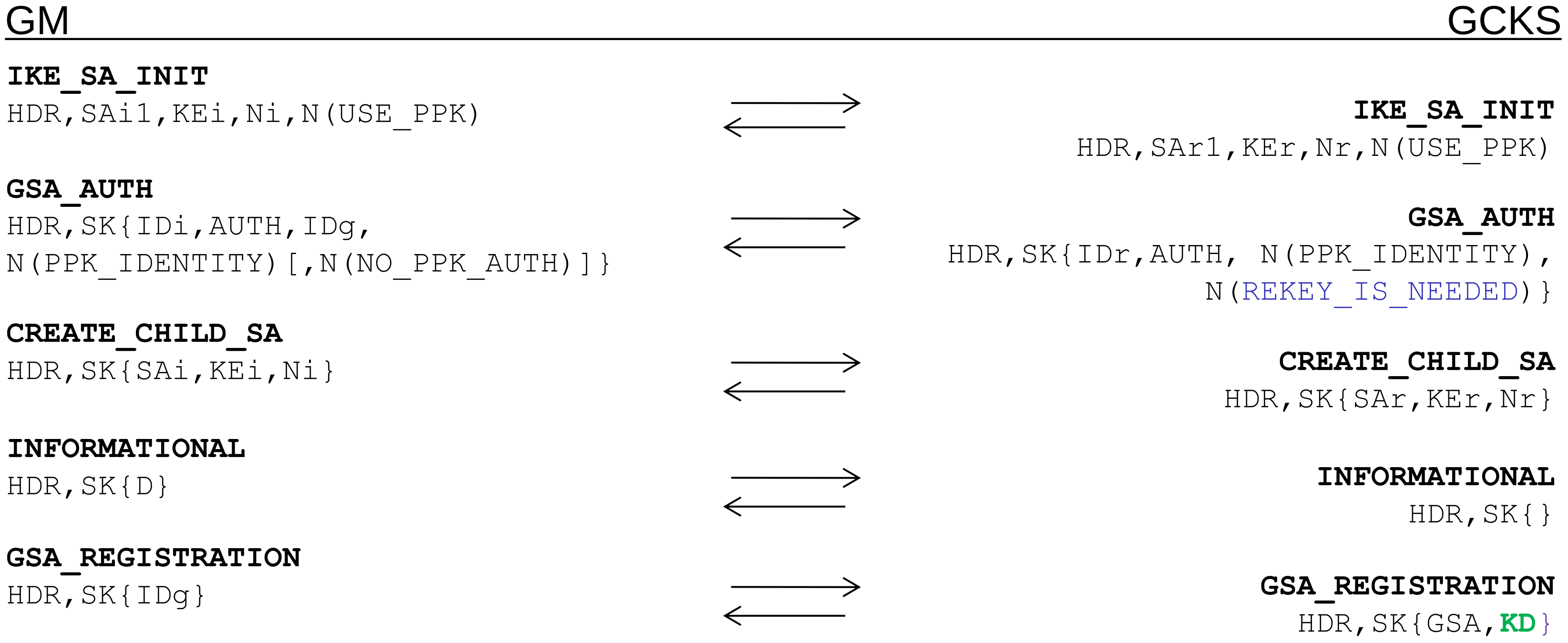
IKE_SA_INIT
HDR,SAr1,KEr,Nr,N(USE_PPK)

GSA_AUTH
HDR,SK{IDi,AUTH,IDg,
N(PPK_IDENTITY)[,N(NO_PPK_AUTH)]}

GSA_AUTH
HDR,SK{IDr,AUTH,N(PPK_IDENTITY),
GSA,**KD**}

Current Use of PPK with G-IKEv2

Currently G-IKEv2 draft suggests the following sequence of exchanges to get the protection with PPK:



GM | GCKS

IKE_SA_INIT
HDR,SAi1,KEi,Ni,N(USE_PPK)

IKE_SA_INIT
HDR,SAr1,KEr,Nr,N(USE_PPK)

GSA_AUTH
HDR,SK{IDi,AUTH,IDg,
N(PPK_IDENTITY)[,N(NO_PPK_AUTH)]}

GSA_AUTH
HDR,SK{IDr,AUTH, N(PPK_IDENTITY),
N(REKEY_IS_NEEDED)}

CREATE_CHILD_SA
HDR,SK{SAi,KEi,Ni}

CREATE_CHILD_SA
HDR,SK{SAr,KEr,Nr}

INFORMATIONAL
HDR,SK{D}

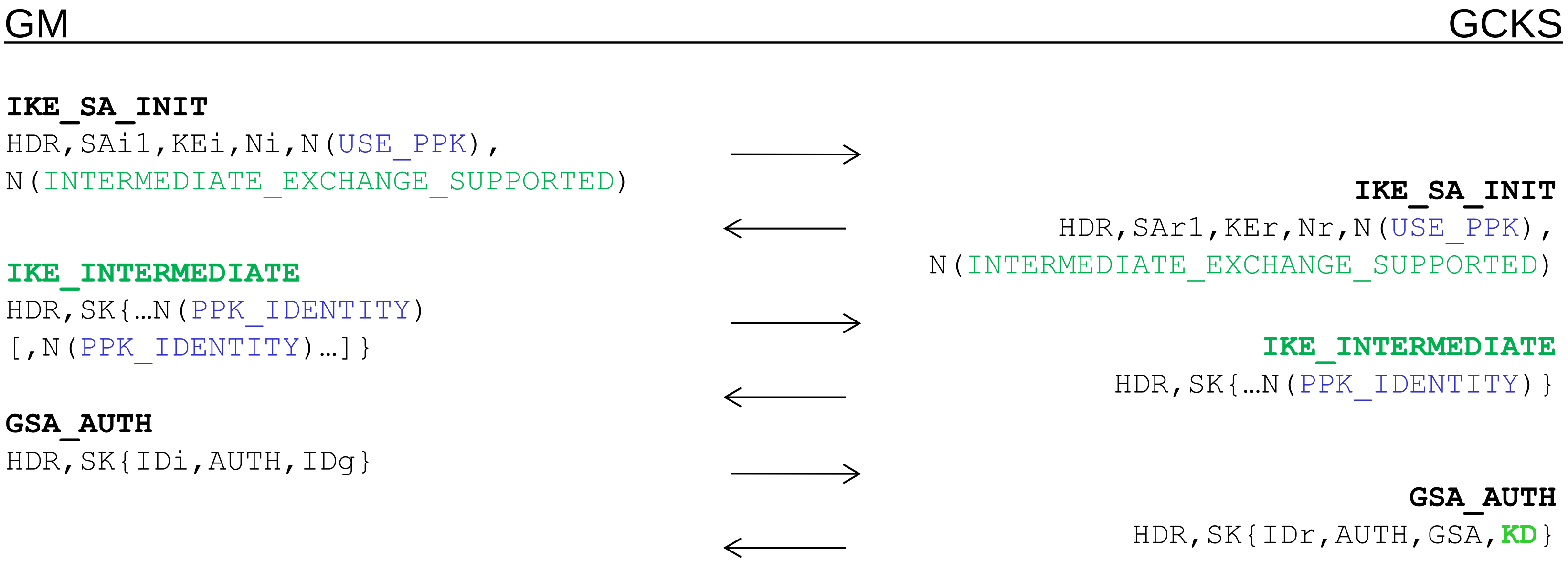
INFORMATIONAL
HDR,SK{}

GSA_REGISTRATION
HDR,SK{IDg}

GSA_REGISTRATION
HDR,SK{GSA,**KD**}

Alternative Approach

Proposed in draft-smyslov-ipsecme-ikev2-qr-alt:



GM GCKS

IKE_SA_INIT
HDR,SAi1,KEi,Ni,N(USE_PPK),
N(INTERMEDIATE_EXCHANGE_SUPPORTED)

IKE_SA_INIT
HDR,SAr1,KEr,Nr,N(USE_PPK),
N(INTERMEDIATE_EXCHANGE_SUPPORTED)

IKE_INTERMEDIATE
HDR,SK{…N(PPK_IDENTITY)
[,N(PPK_IDENTITY)…]}

IKE_INTERMEDIATE
HDR,SK{…N(PPK_IDENTITY)}

GSA_AUTH
HDR,SK{IDi,AUTH,IDg}

GSA_AUTH
HDR,SK{IDr,AUTH,GSA,**KD**}

Comparison

- For G-IKEv2:
  - 3 exchanges instead of 5 (4 round trips)
  - 1 DH shared key computation instead of 2
  - 1 computation of AUTH in case of optional PPK instead of 2
  - initiator can propose several PPK_ID
- Can also be used in IKEv2:
  - 3 exchanges instead of 2
    - but PPK_ID can be piggybacked if IKE_INTERMEDIATE is also used for other purposes
  - 1 computation of AUTH in case of optional PPK instead of 2
  - initiator can propose several PPK_ID

Coexistence

- The proposed approach is **not intended to replace** the existing one, both can co-exist:
  - for G-IKEv2 the proposed approach can be a primary one (or the only one?)
  - for IKEv2 the proposed approach can be an alternative one (e.g. if IKE identities need to be protected)

Thanks

- Comments? Questions?
- More details in the draft
- WG adoption?