AAA based Keying for Wireless Handovers: Problem Statement

draft-nakhjiri-aaa-hokey-ps-03

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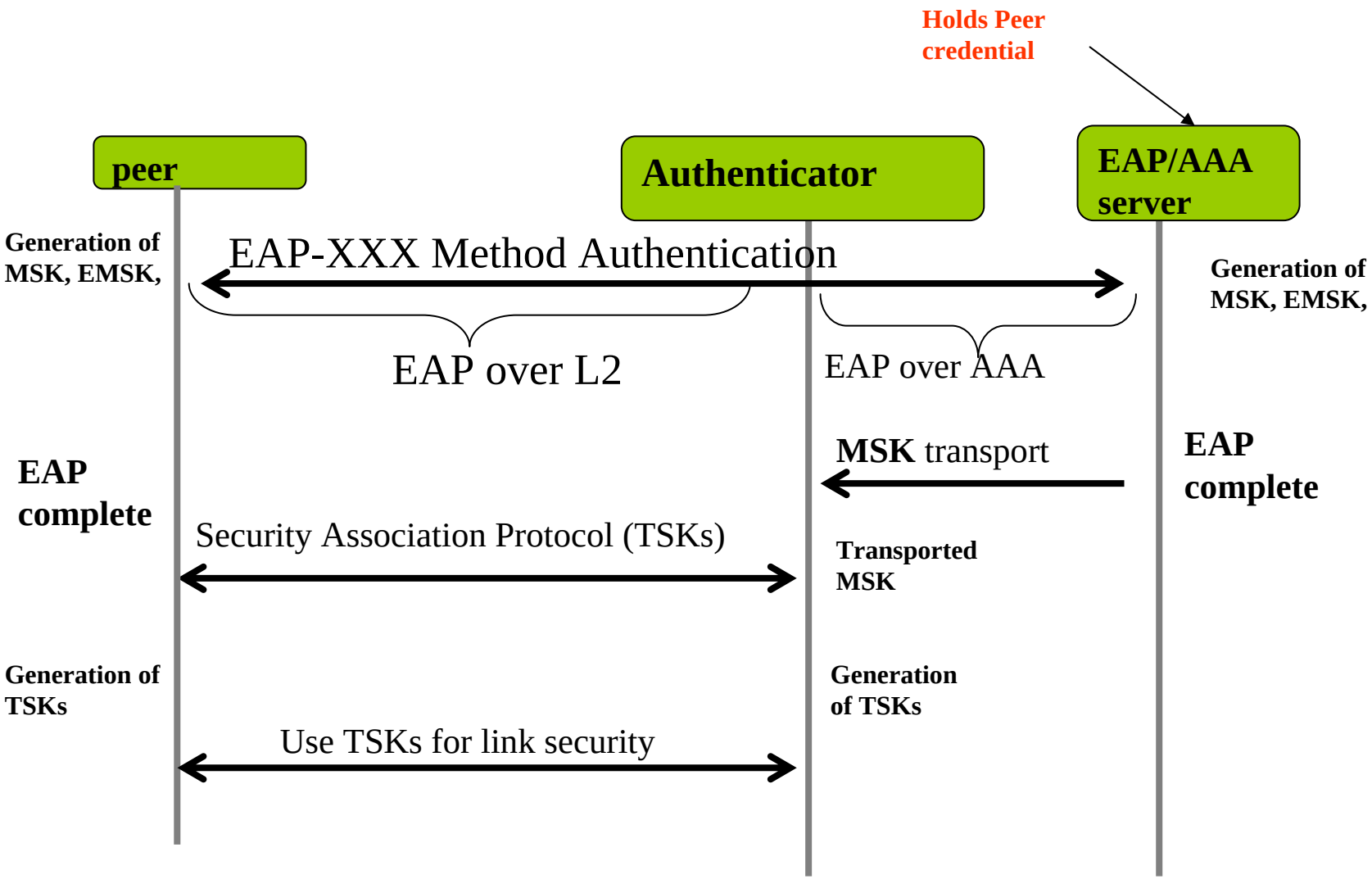
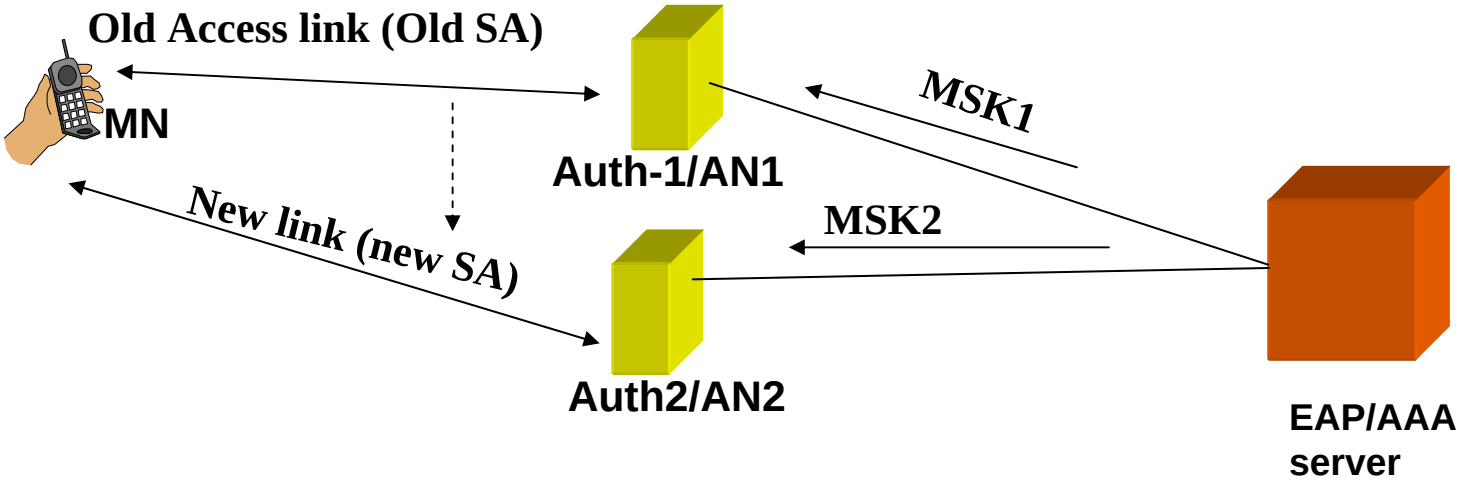
Slide from IETF 65: EAP Keying for fixed peers

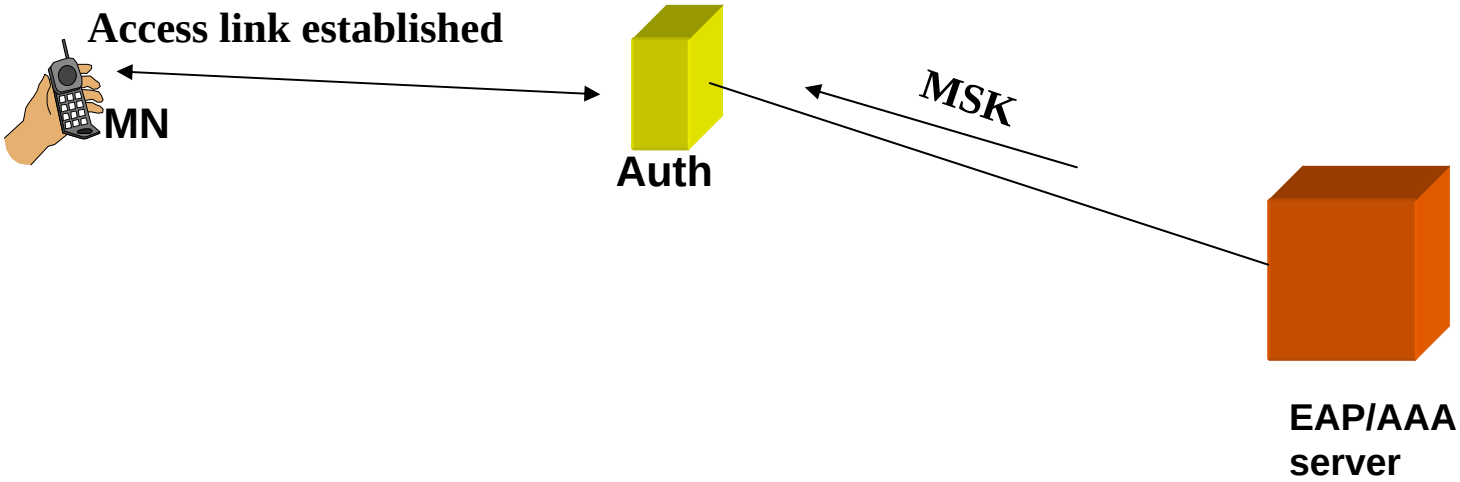


Mobility



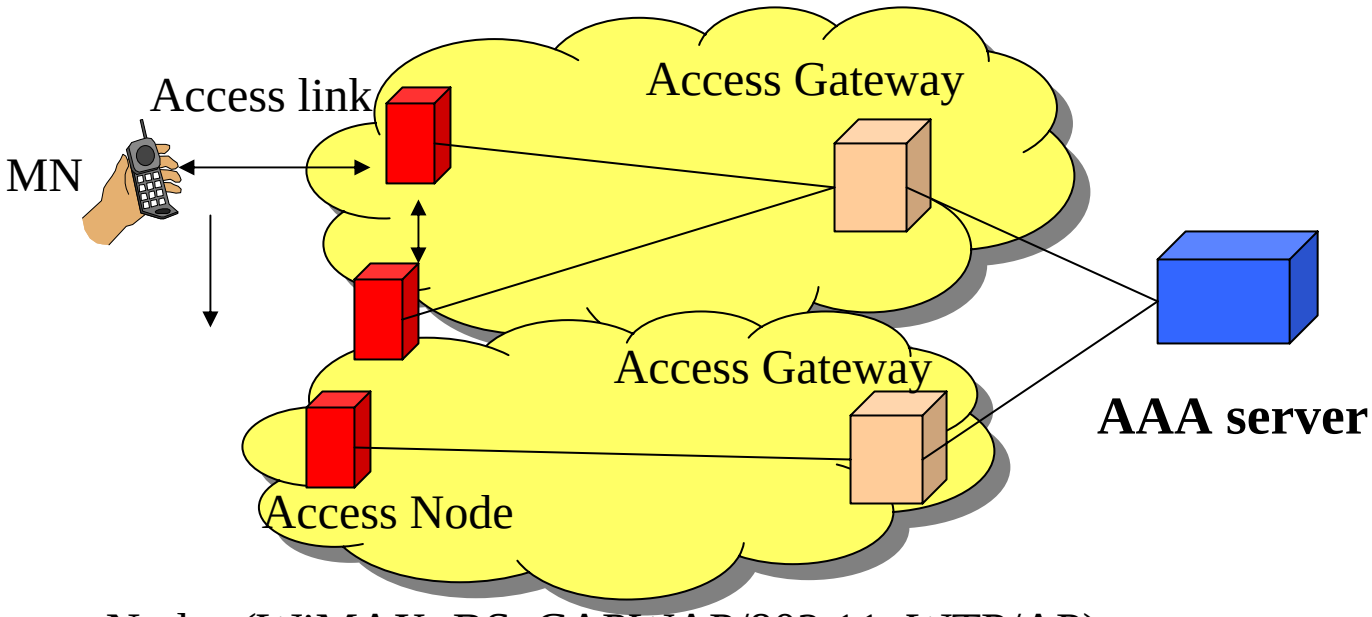
- Secure Access link: MN-AN SA
- Access link Handover: create MN-AN2 SA
- If Authenticator=AN:
  - MSK goes to AN1
  - MN-AN2 SA: requires new MSK at AN2?
- Run EAP again?? Handover performance suffers
- Don't send MSK to Authenticator,
  - Extend key hierarchy, create a per-authenticator key derived from previous EAP

Session Longevity



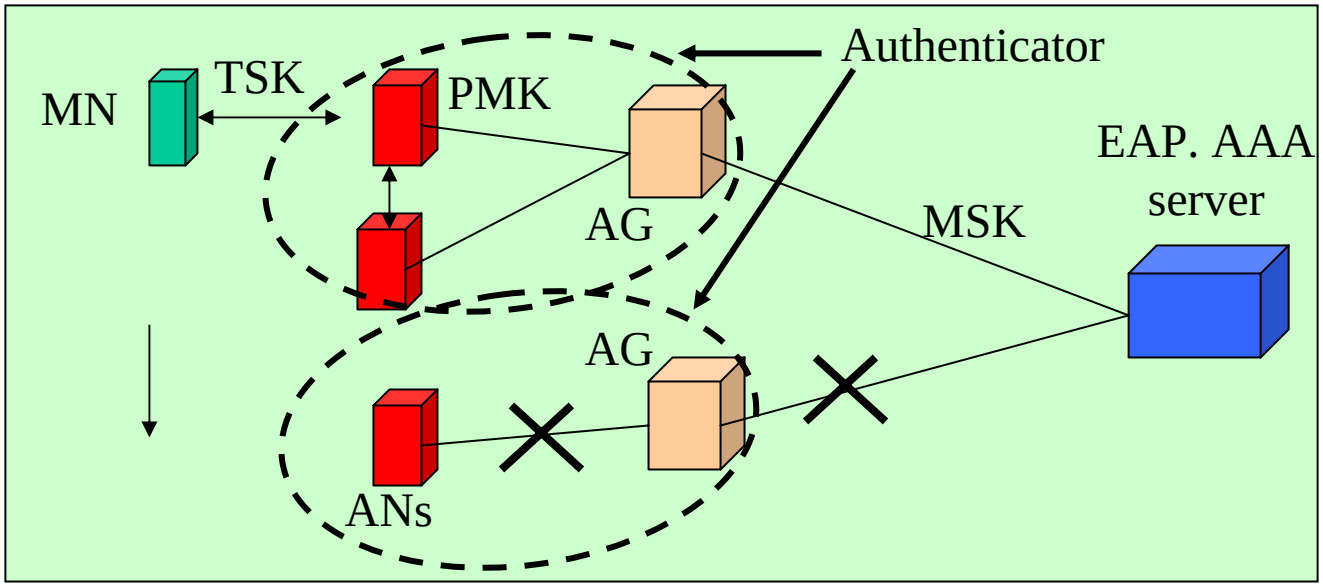
- Secure session established: previous lengthy EAP-XXX
- Session and keys about to expire
- Run EAP-XXX again?
- No, perform a “fast re-authentication”
  - Use state/keys from previous EAP
  - Design specific signaling for re-authentication

Network Management scalability
Wireless Access Network Architecture/CAPWAP



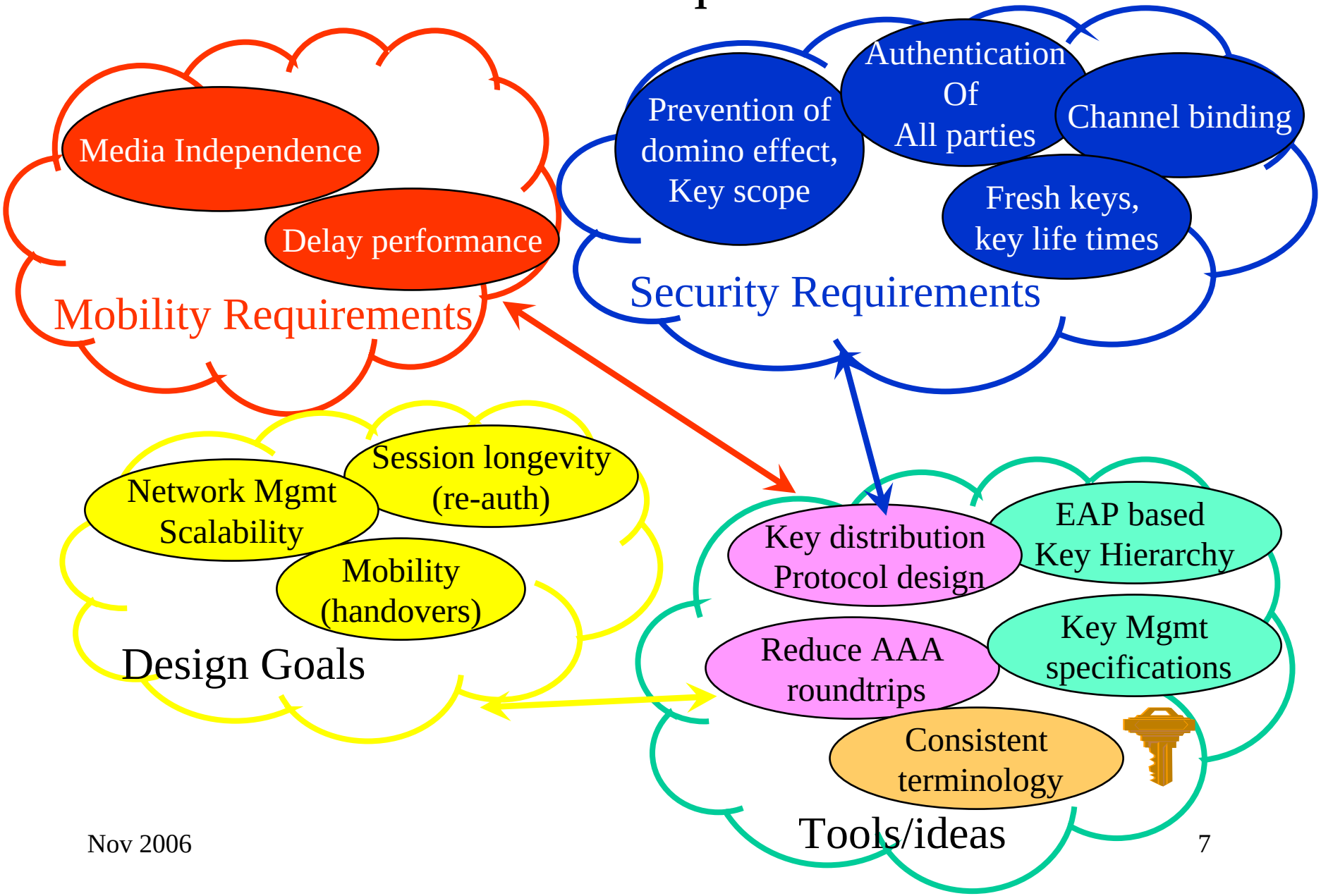
- Access Nodes (WiMAX: BS, CAPWAP/802.11: WTP/AP)
  - providing access links (wireless termination)
  - Lightweight/ less security-AAA functions/ less need for upgrades
- Access Gateways (WiMAX: ASN-GW, CAPWAP AC)
  - Management functions, backend communications
  - More trusted, AAA server interaction
  - Manages mobility across ANs (handovers) without interaction with AAA server
  - Typically manages one access technology.

EAP authenticator split to Manage scalability and AN-handover performance



- Splitting the EAP authenticator into 2 solves the intra-authenticator handover performance problem (SDOs)
  1. ASN_GW, R0KH, AC:
     - holds key from AAA server, creates per AN keys:
  2. AN, WTP, Auth port
     - receives Per AN keys, creates SA with peer (MN)
- It does not solve Inter-authenticator problem
- Authenticator a logical function, AN/AG physical entities (channel binding)
- Solutions varies between SDOs: media-independent handover difficult

Goals and Requirements



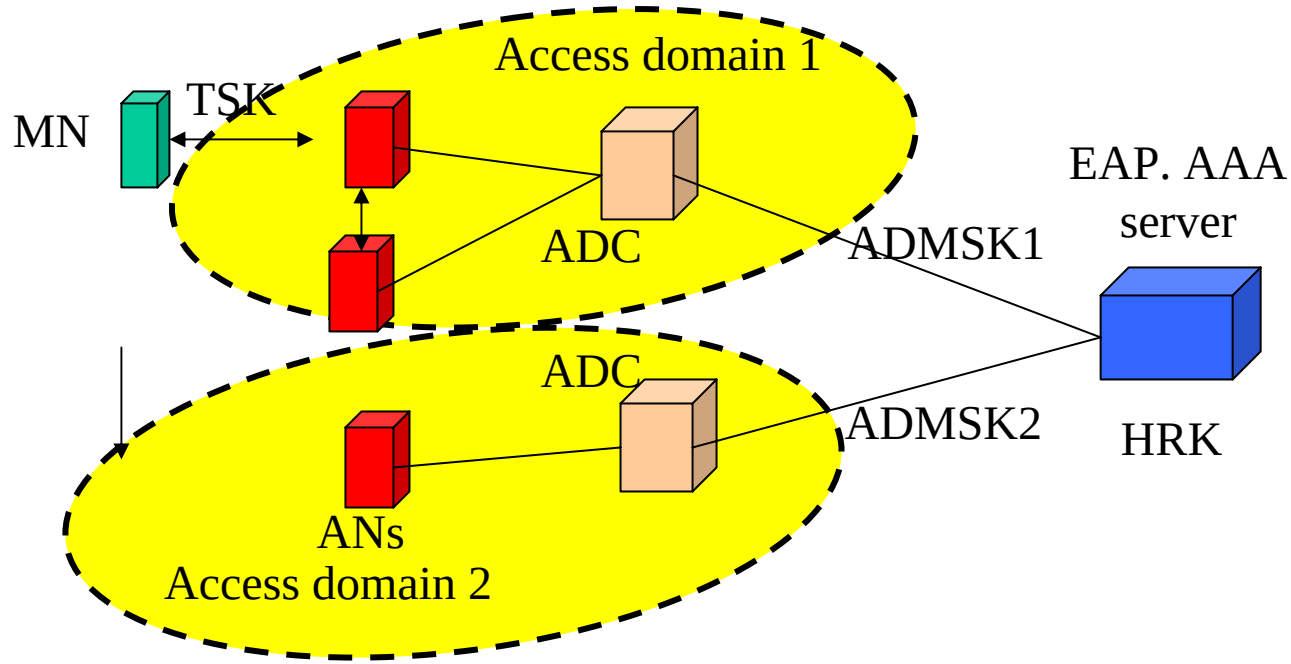
Problem statement/ To Dos

- Create consistent terminology
- Specify security, mobility, management goals
- Decide levels of key hierarchy
  - Map hierarchy levels to key holders
  - Define key derivation function and parameters
  - Define messaging to exchange the parameters
  - Define key management rules
- How far down the key hierarchy can IETF go?
- Do the needed protocols exist?

New Terminology/ Concepts

- Handover Root Key (HRK)
  - Used as the root of key hierarchy for handover (and re-auth)
  - AAA server is HRK holder
  - HRK is used to create per-ADC keys (ADMSKs)
- Access Domain Controller (ADC)
  - Top level key holder in an access domain (holds ADMSK)
  - Responsible for keying needs within an Access Domain (reduce the need to AAA interactions).
  - 802.11r calls this Mobility domain controller (MDC):
    - MDC or ADC?

Access Domain controllers



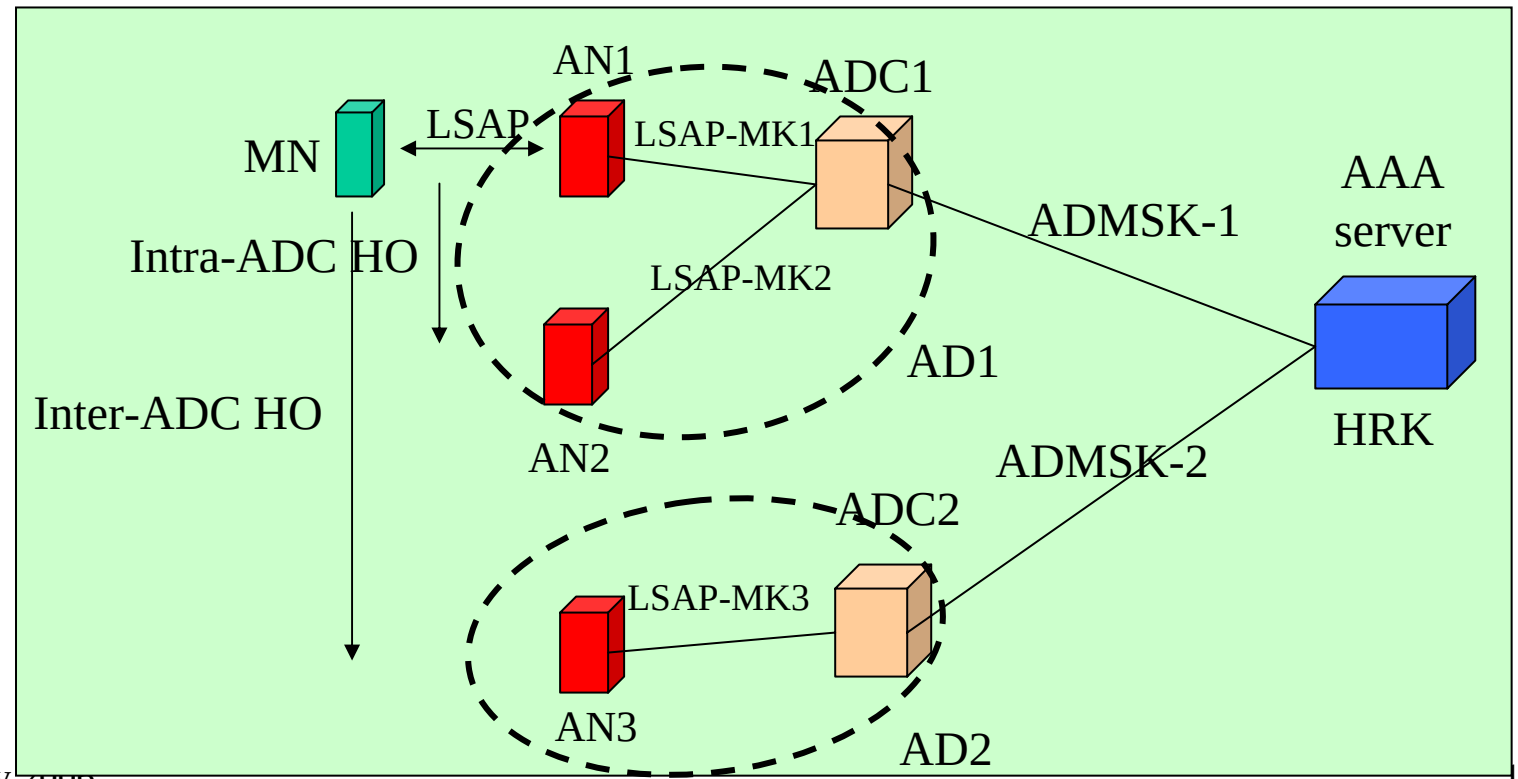
- ADC is a key holder and a AAA client
  - It can be the authenticator, but does not have to be
  - ADC is a AAA client (it receives ADMSK from AAA server)
  - Both authenticator-split and flat architectures can be supported.
  - ADC provisions the access domain ANs with keys
  - Access domain can be mapped to an access technology region, if needed

Tough problems

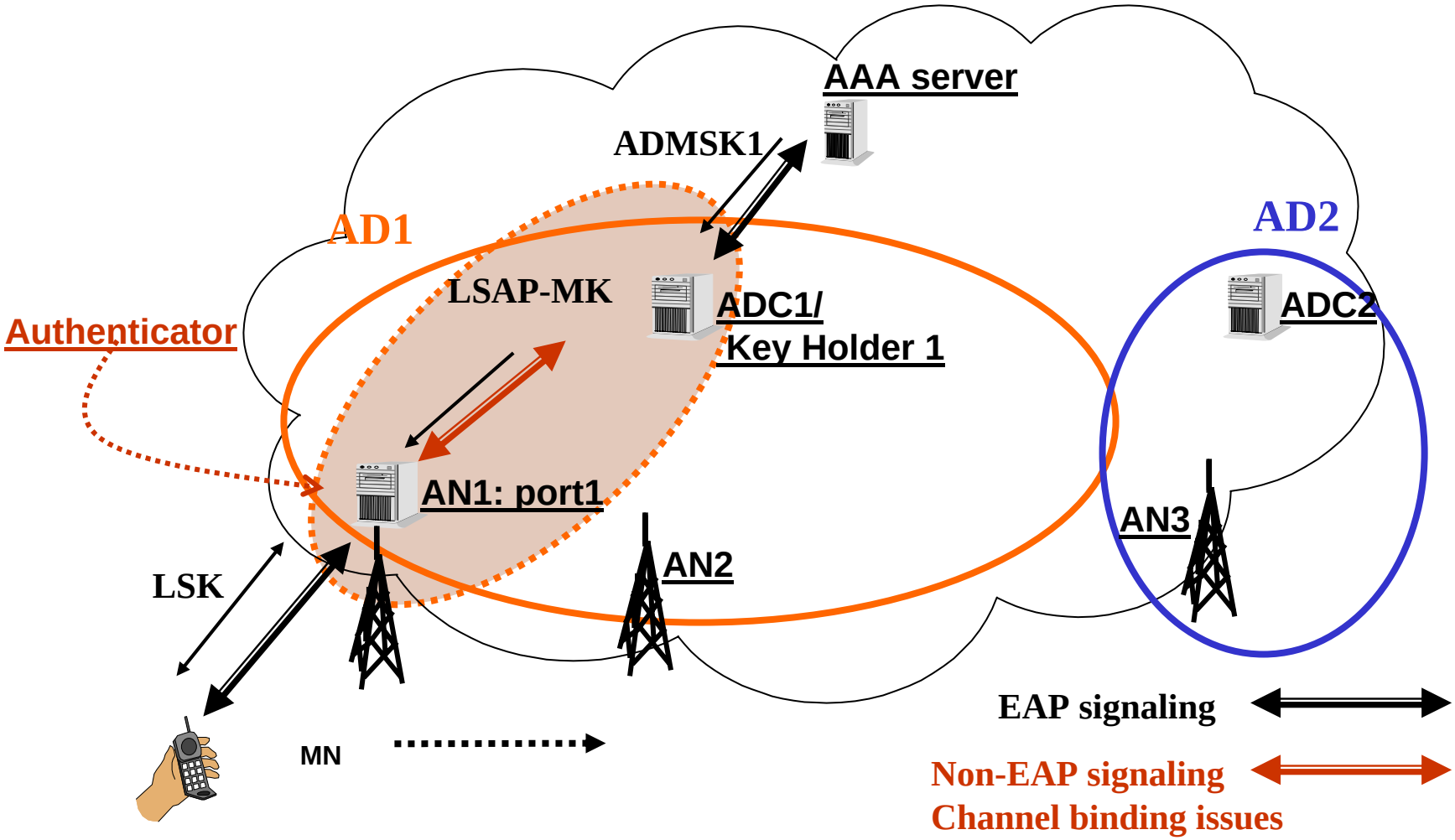
- Terminology, Terminology, terminology
- What key to use to derive handover root key?
  - MSK or as USRK from EMSK? (created at EAP server?)
    - Compatibility with other SDOs? Backward compatibility?
- Architecture:
  - ADC part of the authenticator? Positioning ADC vs Authenticator?
  - Access technology mapping
  - To accomodate physically separate ADC and AN?
    - Channel binding/ key derivation parameters/ Messaging
      - ADC and AN collocated (EAP keying) or not (SDO)
- Messaging
  - Exchange parameters for key derivation (e.g. ADC-ID)
- Channel binding
  - EAP keying item: ADC and AN are both part of Authenticator
  - Handover keying with deeper hierarchy?

Problem: IETF scope?
LSAP-MK should be defined in Info RFCs, IMHO

- Intra ADC handover: Key management and key derivation inside same ADC (Is this within IETF scope? Info RFCs?)
- Inter ADC handover: Key Management and key derivation through different ADCs but same AAA, without running EAP again.



Positioning of EAP authenticator wrt ADC (alternative 1)



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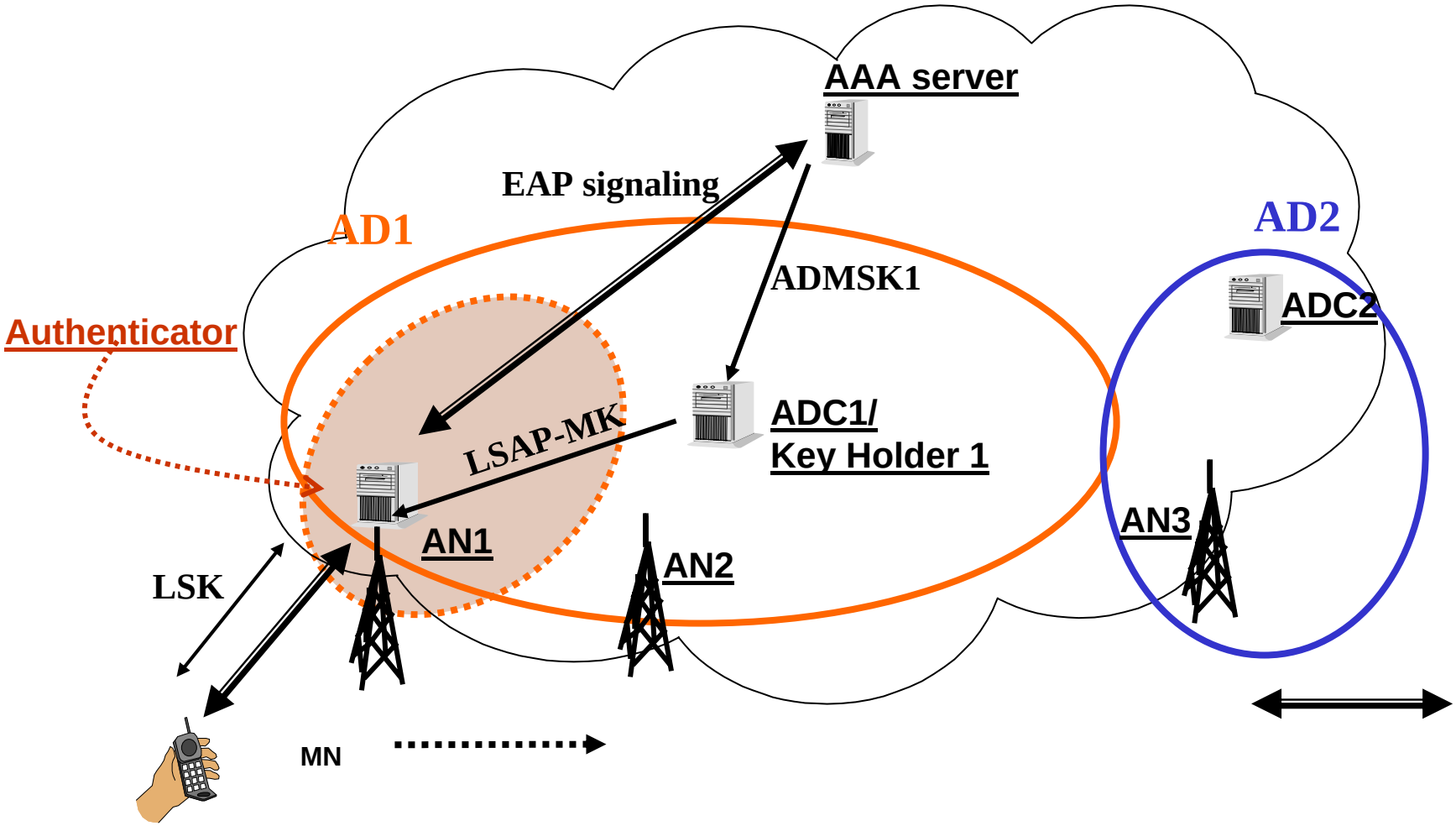

Backup:Related charter deliverables

- Re-authentication (including handover) and key management problem statement
  - Security and performance goals.
- Choice of MSK or EMSK in HRK (not a deliverable, but important)
- Handover Root Key (HRK) and key hierarchy derivation and management specification
- Handover/re-authentication protocol specification
- Key distribution protocol specifications

Backup: Why ADC instead of Authenticator

- Allows for easier management of heterogeneous roaming/ handovers (e.g. per-domain technology)
  - Combine key mgmt with mobility mgmt
- Handover root key transport/caching behavior
  - HRK (e.g. MSK) is kept at AAA server, not sent to authenticator
  - A per ADC master keys (ADMSK) are sent to ADC
- Separation of EAP auth. and handover keying signaling
  - Key mgmt and mobility mgmt can be inside an ADC, independent of entity that acts as pass-thru Auth,
  - Pass-thru auth either in AN or ADC
- More crisp key usage guidelines
  - Authenticator master key<->Authenticator port master key?
  - Use ADC master key (ADMSK) and AN master key (LSAP_MK) instead