AAA Extensions for Mobile IP

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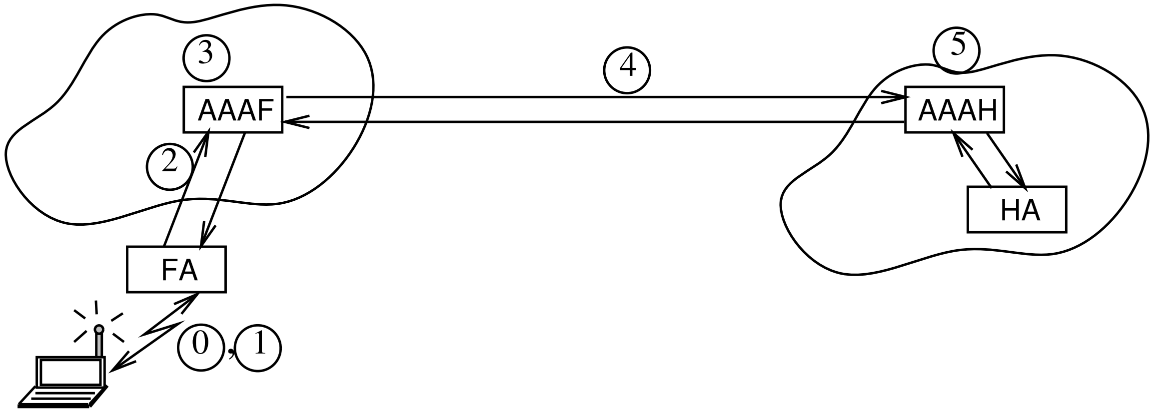
AAA - Authentication, Authorization, and Accounting

DIAMETER (a follow-on to RADIUS) is used by Mobile IP agents to handle

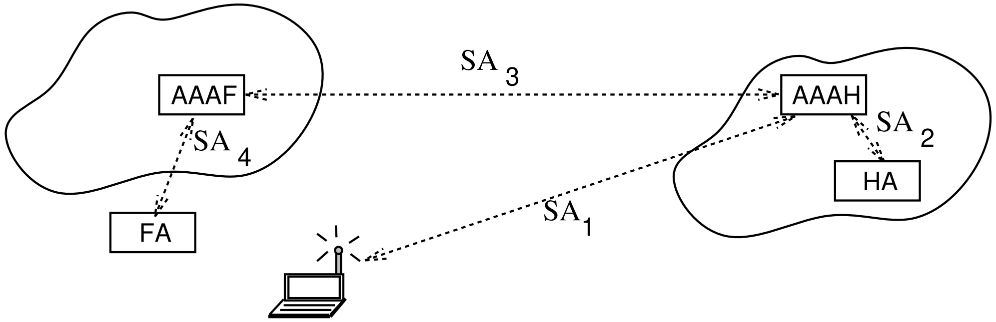
- Mobile Nodes authenticated by trusted agents in their home domain
- Connectivity authorized by administrative agents in the foreign domain
- Accounting initiated by foreign agents, which are trusted by the administrative agents in the foreign domain

Protocol Overview



0. Foreign agent (FA) advertises challenge
1. Mobile node (MN) adds NAI, Challenge Response etc., to Mobile IP registration request
2. FA sends DIAMETER AVPs with registration request to Foreign AAA (AAAF)
3. AAAF ("proxy") looks up NAI, finds MN's home server address (AAAH)
4. AAAF sends DIAMETER request, awaits approval by AAAH
5. AAAH authenticates request; it *may* allocate a HA and IP address for MN

Step 6: Key Generation



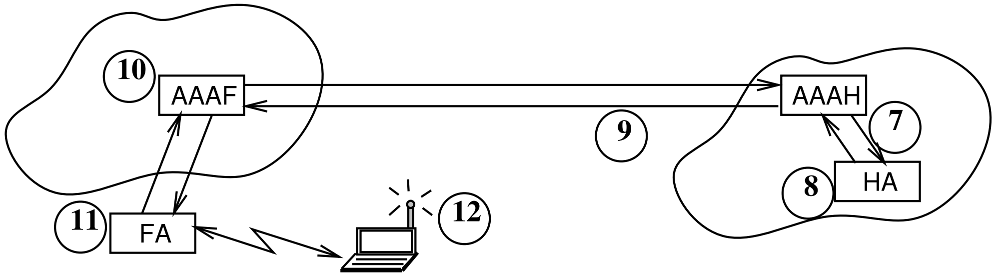
AAAH generates:

- K_1: MN $\leftrightarrow$ FA
- K_2: MN $\leftrightarrow$ HA
- K_3: FA $\leftrightarrow$ HA

AAAH encrypts:

- K_1 & K_2 using $SA_1 \rightarrow$ MN
- K_1 & K_3 using $SA_3 \rightarrow$ FA
- K_2 & K_3 using $SA_2 \rightarrow$ HA

Protocol Overview, continued



7. AAAH issues DIAMETER request to HA with K_2, K_3
8. HA creates registration reply using K_2, and K_3 for FA.
9. HA sends results to AAAH, which proxies request to AAAF
10. AAAF decrypts K_1 & K_3 using SA_3, re-encrypts using K_1 & K_3
11. FA decrypts K_1 & K_3 using SA_4, checks registration reply and FA↔HA authentication, adds MN↔FA using K_1
12. MN decrypts K_1 & K_2 using SA_1, checks registration reply, and MN↔FA authentication

Router Advertisement Extensions

- Foreign Agent Challenge
- Foreign Agent NAI

Mobile Node Registration Request Extensions for AAA

- Mobile Node Challenge
- Mobile Node Response
- Mobile Node NAI
- Previous-Foreign-Agent-NAI Extension
- possibly, Previous Foreign Agent Notification Extension

Foreign Agent DIAMETER Request AVPs

- AA-Mobile-Node-Request Command AVP
- Session-Id AVP
- User-Name AVP
- MIP-Registration-Request AVP
- MN-FA-Challenge AVP
- MN-FA-Response AVP
- Optionally, Previous-FA-NAI AVP
- Optionally, Mobile-Foreign-SPI AVP
- Timestamp AVP
- Initialization-Vector AVP
- Integrity-Check-Vector AVP, or Digital-Signature AVP

AAAH Mobile IP Registration Request AVPs

- DIAMETER Header
- Home-Agent-MIP-Request Command AVP
- Session-Id AVP
- User-Name AVP
- MIP-Registration-Request AVP
- MN-HA-SPI AVP
- HA-to-MN-Key AVP
- MN-to-HA-Key AVP
- FA-HA-SPI AVP
- HA-to-FA-Key AVP
- MN-FA-SPI AVP
- MN-to-FA-Key AVP
- Optionally, Mobile-Node-Address AVP
- Session-Timeout AVP
- Timestamp AVP
- Initialization-Vector AVP
- Integrity-Check-Vector AVP, or Digital-Signature AVP

Home Agent AAA Registration Reply Extensions

- Mobile-Foreign SPI Extension
- Mobile-Home SPI Extension
- Mobile-Foreign-Key Extension
- Mobile-Home-Key Extension
- Mobile-Node-Home-Address Extension
- Home-Agent-Address Extension

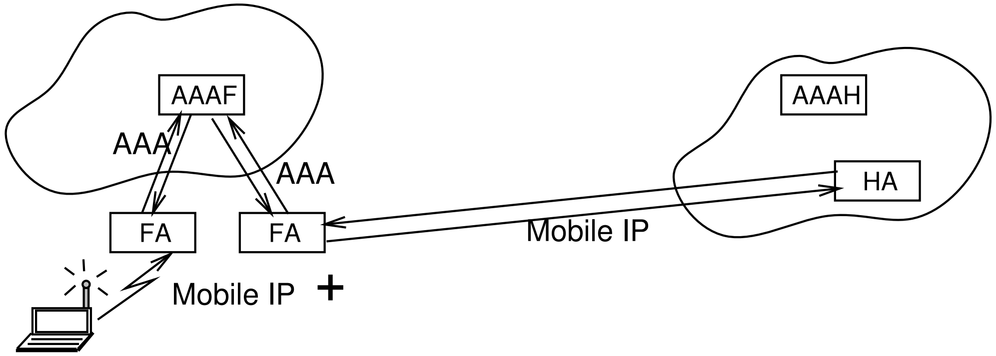
Home Agent DIAMETER Reply AVPs

- DIAMETER Header
- Home-Agent-MIP-Answer Command AVP
- Session-Id AVP
- Result-Code AVP
- Optionally, Error-Code AVP
- MIP-Registration-Reply AVP
- Optionally, Mobile-Node-Address AVP
- Timestamp AVP
- Initialization-Vector AVP
- Integrity-Check-Vector AVP, or Digital-Signature AVP

AAAF DIAMETER Reply AVPs

- DIAMETER Header
- AA-Mobile-Node-Answer Command AVP
- Session-Id AVP
- Result-Code AVP
- Optionally, Error-Code AVP
- MIP-Registration-Reply AVP
- MN-FA-SPI AVP
- FA-to-MN-Key AVP
- FA-HA-SPI AVP
- FA-to-HA-Key AVP
- Optionally, Home-Agent-Address AVP
- Optionally, Mobile-Node-Address AVP
- Session-Timeout AVP
- Timestamp AVP
- Initialization-Vector AVP
- Integrity-Check-Vector AVP, or Digital-Signature AVP

Local Handoff



FA advertises NAI as well as challenge

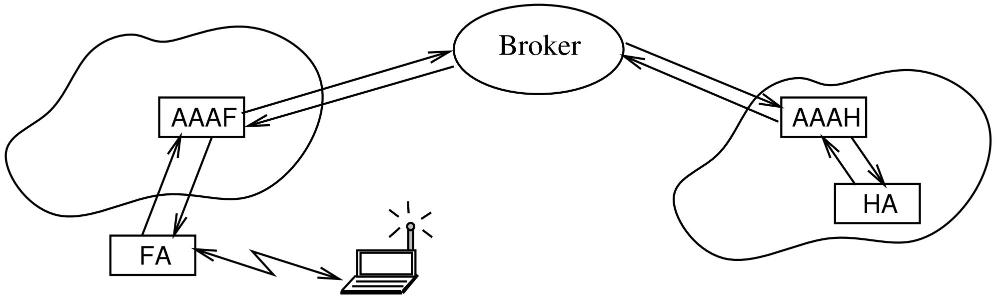
Mobile Node checks whether new NAI is in same domain as old NAI

Mobile Node supplies previous FA as well as unforgeable response

FA sends request to AAAF

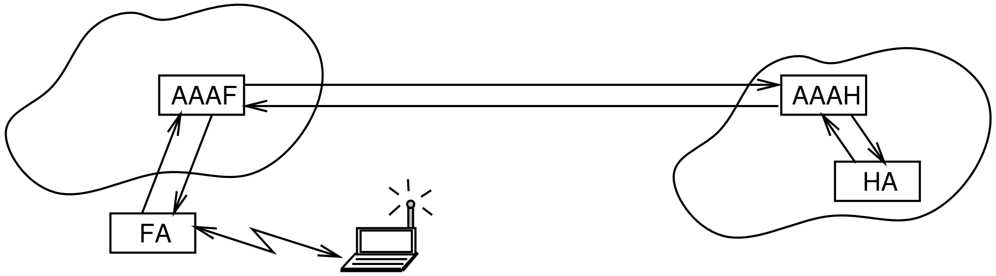
AAAF *may* re-encrypt previous registration key and send it to new FA, without contacting AAAH

Using Brokers



It is possible to use a broker, if the AAAF and AAAH do not already share a security association SA_3

AAAF↔AAAH Accounting



- After successful registration reply, FA sends Accounting Start Record to AAAF
- AAAF proxies Start Record to AAAH.
- Foreign Agent MAY send interim Accounting Records (perhaps every 5 minutes) containing cumulative information.
- Foreign Agent sends Accounting Stop Record upon receipt of notification from new FA.

Features

Generates session keys for Mobile Node and Mobility Agents

Eliminates unnecessary Internet traversals

Challenge/Response integrated with Registration Request

Centralizes AAA functions in administrated services

Broker certification (e.g., IPASS, GRIC), to eliminate need for so many bilateral service agreements (see DIAMETER Proxy draft)