IEEE P802.11

Wireless Access Method and Physical Layer Specification

Authentication Letter Ballot comments

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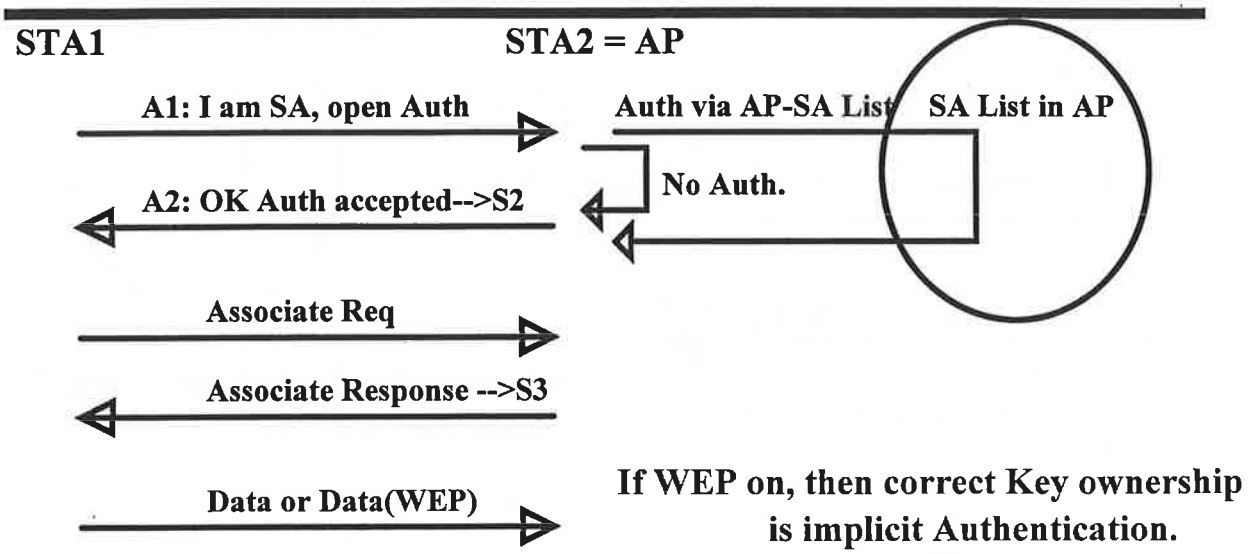
Authentication discussion

- This document intends to analyse the functionality of the different authentication schemes that are currently defined in D2 draft, and tries to identify the differences in their characteristics
- There are 3 authentication mechanisms defined:
  - Open Authentication
  - Shared Key authentication
  - Propriatary authentication
- Basic assumptions.
  - The objective for the 802.11 authentication is simply used to bring the wireless link up to the assumed physical standard of a wired link (section 2.4.3.1 par 5)
    - » So "Open Authentication" that compares the STA address against a "Allowed List" does achieve this basic function.
    - » But a station could fraud to be another station by using its SA address.
  - More sophisticated Authentication does only make sense when Privacy is used on all data traffic, so when WEP is on.
    - » otherwise stations can always fake to be an other station to send its information anyway.
  - If WEP is not used, then a more sophisticated Authentication scheme does not prevent stations to fake identity.
  - If a station does know the WEP key, then that is equivalent to a station being physically connected to the wired medium.
    - » So then we have achieved the spirit of the "Wired Equivelancy".
- So when WEP=on then knowledge of the WEP key does accomplish the "Wired Equivelancy", and provide a level of implicit authentication.

Authentication examples:

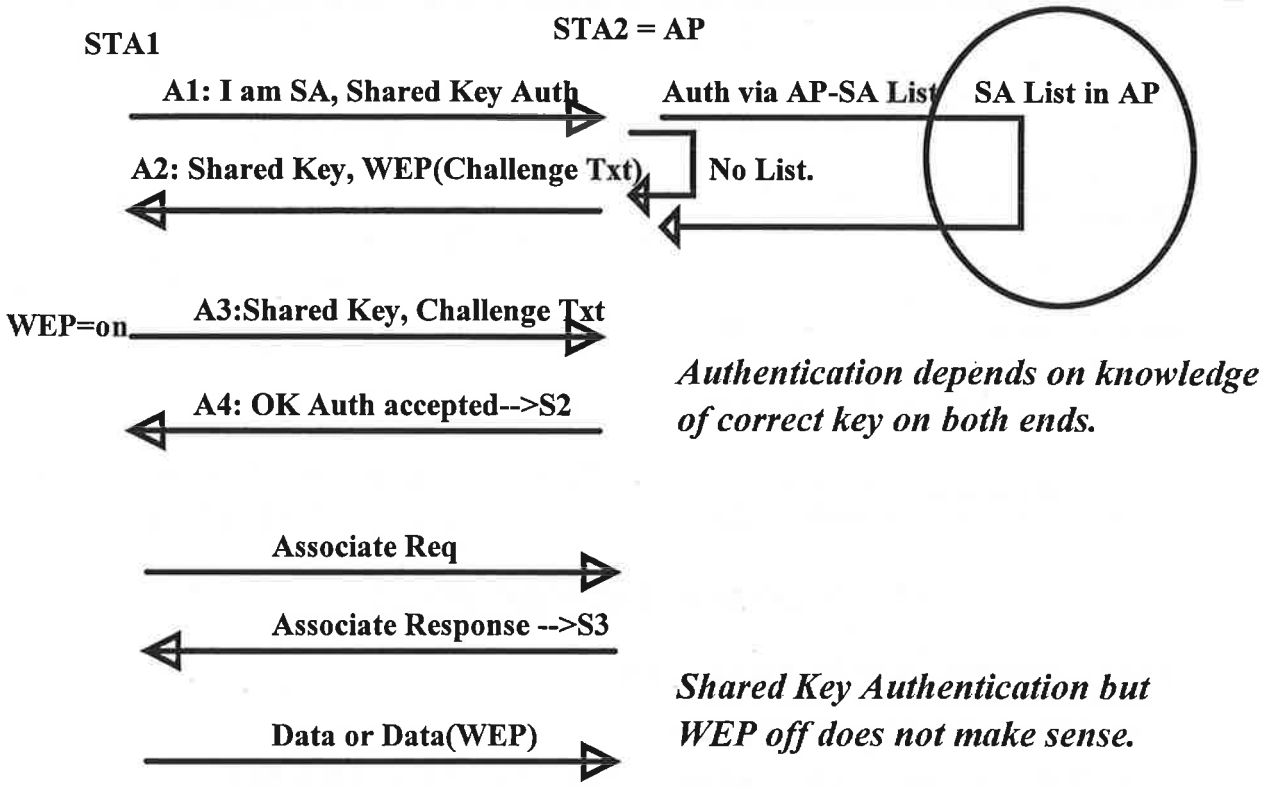


Open System Authentication

- Open Sytem Authentication:
  - Either no Authentication or
  - AP can verify allowed membership against SA list.
  - This makes sense with WEP = off.
  - but does not protect against fake identity.
- When WEP=on then knowledge of same key on both end is required to allow communication.
  - So this is implicit authentication.
  - If Station is not who he claims to be does not make any difference for privacy, because it has the key, so it can see all traffic.
- So Implicit authentication makes a lot of sense from a privacy point of view.
  - It does accomplish the "Wired Equivelancy" goal.

Shared Key Authentication:

Slide 4



Authentication depends on knowledge of correct key on both ends.

Shared Key Authentication but WEP off does not make sense.

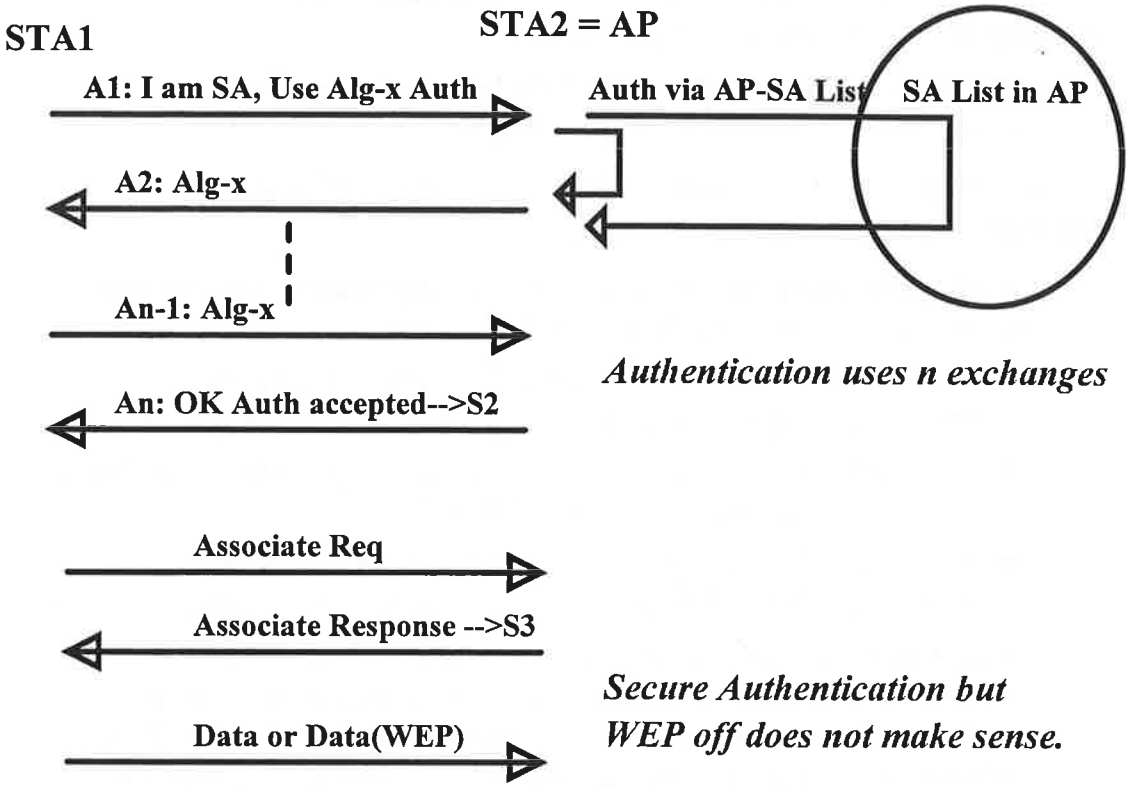
Shared Key Authentication

- Shared Key Authentication:
  - Needs WEP algorithm + Shared Key in Authentication phase.
    - » The same key is used for Privacy and Authentication (no separate key provisions in MIB).
  - AP can do an additional membership check against SA list.
  - Using Shared Key Authentication, without using WEP for data privacy does not make sense from privacy point of view. (We are not doing security but privacy).
- So Shared Key Authentication does also rely on knowledge of the same key on both ends.
- What is the value of Shared Key versus Open System Authentication when WEP is on???????
  - So why bother?

Conclusion: Shared Key authentication is equivalent to Open System authentication, because they both depend on the knowledge of the same key on both ends.

Recommendation: Delete Shared Key Authentication method.

Propriatary Authentication:



Propriatary Authentication algorithm

- Propriatary algorithm possible.
  - Can take relative long time depending on algorithm.
  - Therefore desire for pre-authentication possibility.
  - Station can be authenticated with multiple APs and Stations at the same time according to current scheme.
    - » This is basic requirement to allow pre-authentication.
- There is a desire for support of other authentication methods.
  - This is provided by the mechanism as currently defined.
  - Although from a privacy point of view it does not provide additional protection when the WEP key is known.

Maintaining Authentication State:

- Stations need to be able to be authenticated with multiple stations at same time.
  - Basicly to allow pre-authentication to prevent long propriatary authentication delays.
- Currently each TA/RA pair must maintain a authentication state variable.
  - Authentication is needed before any traffic can occur between a given station (TA/RA) pair.
  - For an AP this is no problem, because it needs to maintain per station knowledge for all kind of purposes.
  - For a Station in an IS this is default no problem, as long as all traffic is going via the AP (DS).
  - In Ad-Hoc a Station does need to maintain State information for all stations it wants to communicate with.
  - The same is true for a Station in an IS that wants to do direct S-to-S traffic, then it needs to maintain extra Authentication State information for each station that wants to communicate directly, in addition to the AP.
- Effect of Authentication requirement for S-to-S.
  - First transmission to a given station should be a Authentication handshake.
  - If there is a mismatch between state information on both ends then traffic is dropped (although Acked), and there is no feedback about this occuring.
  - Similar to suggested changes in AP, rules could be changed such that if such is detected, then a station has to do a deAuthenticate, to get state information on both ends in line.
  - However do we need/want this complexity??
- Authentication and WEP was there primarily to protect the DS, and to prevent to compromise the privacy of the existing wired network.
  - For Ad-Hoc implicit authentication is achieved when WEP is used.
  - This is more then sufficient for Ad-Hoc.

Implicit Authentication in Ad-Hoc

- **Conclusion:**
  - **Implicit Authentication is enough for Ad-Hoc.**
  - **So no explicit authentication is needed.**
  - **So no S-to-S state information needs to be maintained.**
    - » **which is an N to N problem.**
  - **Complexity reduction for Stations.**
  - **This is accomplished by allowing S-to-S traffic in State 1 of Figure 2-8. (To_DS = off).**
- **This can also simplify the Association:**
  - **Define an Authentication field in the (Re)Association frames.**
    - » **This can have the value:**
      - **Pre-authenticate**
      - **Open System**
      - **Or "Shared Key" if not deleted.**
    - » **If value is Pre-Authenticate, then an explicit Authentication cycle is needed.**
    - » **If value is open Sytem, then Association can proceed as normal.**
      - **Only returning status should show separate authentication failure code.**
  - **Association is reduced to two frames.**
  - **pre-authentication is still possible.**

Conclusion:

- **Using implicit "authentication only" for Ad-Hoc allows combined Association/Authentication frames without any loss of capability / flexibility.**
- **Also applies to any traffic with To_DS and From_DS both false**

Recommendation: Authentication is not needed for Ad-Hoc. So allow direct data frames (To_DS and From_DS both false) also as Class-1 frame.