# Password Authentication

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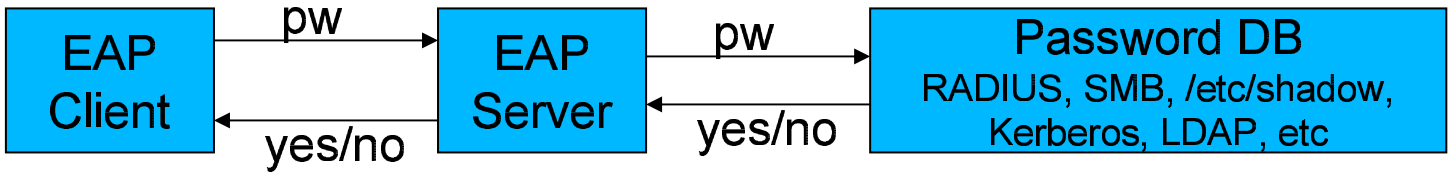
# Design Goals

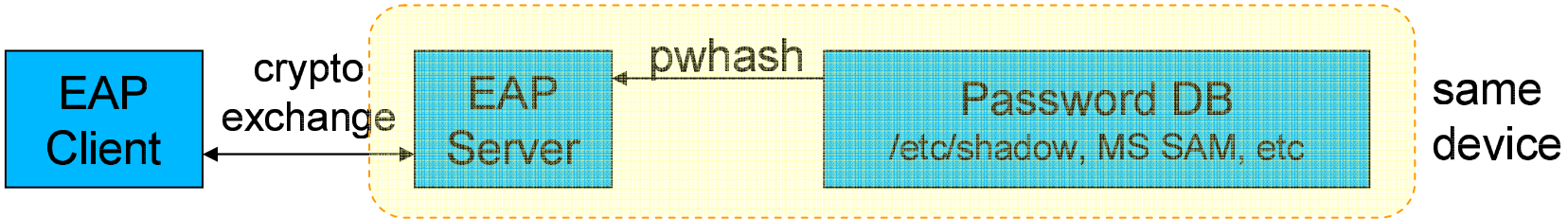
- **Simplicity:** easy to implement
- **Wide Applicability:** secure (dictionary attacks), works with multiple password databases
- **Efficiency:** minimize PK ops, round trips
- **Flexibility:** multiple ciphersuites
- **Extensibility:** secure data exchange with many applications

# Approaches

- Client sends plaintext password to Server
- Wide compatibility (i.e. use PAM)




- Client and Server confirm knowledge of same password without exchanging it
- More secure, but fewer applications



# Security Concern: Dictionary Attacks

- Online dictionary attacks
  - Adversary repeatedly authenticates to the server with guessed passwords
  - Prevent by locking accounts after too many invalid attempts
- Offline dictionary attacks
  - Using passively captured packets, repeatedly guess passwords
  - Full prevention requires use of public-key crypto

# Offline Dictionary Attack Prevention

- EKE/SPEKE/SRP approaches
  - Basically perform Diffie-Hellman using password hash as the base
  - Exchange $(pw)^x$ and $(pw)^y$, compute $(pw)^{(xy)}$
  - All suffer from IPR issues
  - Limited compatibility with backend databases

# Offline Dictionary Attack Prevention

- PKI-based approach:
  - Pre-authenticate the server (i.e. certificate)
  - encrypt exchange using server's public key
  - TLS?
  - Could also support username confidentiality
  - Works for both authentication scenarios
- Dictionary Attack *Mitigation*
  - Salt password and hash it ***a lot***
  - Increases time and complexity of dictionary attack
  - What 11i's PSK authentication does

# Feature Matrix

| | Plaintext Passwords | Hashed Passwords |
|---|---|---|
| EKE | | √ |
| PKI | √ | √ |
| Salt | | √ |

# PKI-based Approach

- Custom PKI-based protocol
  - Light weight, could be 2 RT (+ fragmentation)
  - Similar to what EAP-PAX does for provisioning
- Use TLS-based approach
  - Much of the hard work is already done
  - Minimum of 3 RT required, assuming 2 RT TLS handshake
  - Could use a tunneled method
    - PEAP, TTLS
    - Inner method could be PAP, CHAP, etc
    - Protected data exchange already built-in

# Choices

- Write our own PKI-based protocol
- Write our own TLS-based protocol
- Use tunneled method and write our own inner method
- Use tunneled method and use existing inner method

- PEAP & MSCHAPv2?
- EAP-FAST?