EAP-PPT

Privacy Preserving Network Access

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Problem Statement

Industry has embraced network privacy as important fundamental right

- **Device Identity:** MAC randomization - MADINAS - https://datatracker.ietf.org/wg/madinas/about/
- **Application Identity:** Application proxy - MASQUE - https://datatracker.ietf.org/wg/masque/about/

User Identity: Extensible Authentication protocol (EAP)

- Identity can be used by networks or AAA (identity providers) to track location and monitor activities
  - Sharing personal information for marketing and monetization
  - Surveilling employees, students and visitors
- Intentional and unintentional privacy compromise in RADIUS and Diameter
  - Chargeable-User-Identity
  - Location Information specific attributes
  - User-Name in Access-Accept
  - NAS-IP-Address, NAS-Identifier, Operator-ID in Access-Request (Proxy to Physical Location)
- Effectiveness limitations of existing identity protections
  - Applicable to passive and active attacks
  - Limit protection against service providers and identity providers

Example: OpenRoaming

- Includes a privacy framework
- Leverages EAP methods such as EAP-AKA, EAP-TLS, EAP-TTLS
- IETF 118 hackathon exposed (unintentional) privacy leakage (https://datatracker.ietf.org/meeting/118/materials/slides-118-madinas-hackathon-openroaming-update-00)
  - Chargeable-User-ID in some cases allows for correlation between sessions
  - Identity leakage in class attributes with an IDP
  - Identity providers may be able to infer user location

Conclusion: Even with a privacy framework, implementers may unintentionally leak personal data

Objectives

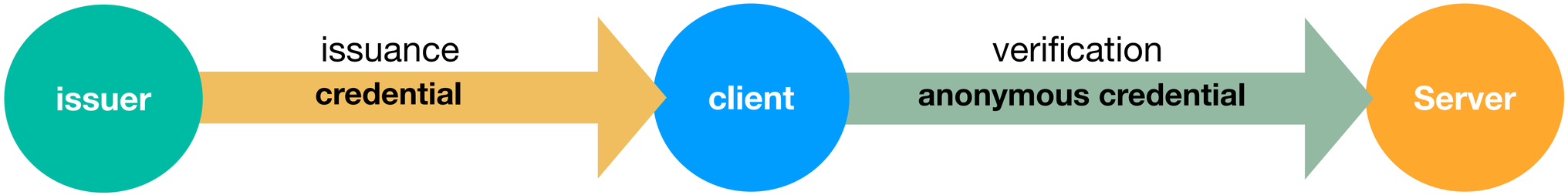
- Anonymous access to public and private networks
- Privacy protection against
  - Active and passive attackers
  - Network service providers
  - Venue owners, enterprises, educational institutions
  - Identity providers

Core Principles

- Carry attestation vs identity in EAP
  - Public: *Identity:* bob@icloud.com vs *Attestation:* This is an iCloud user logged into the Apple device that is authenticating to this network
  - Private: *Identity:* alice@cisco.com vs *Attestation:* This is a cisco employee, who's devices meets the corporate security policy
- Unlinkable authenticator
  - Unlinkable to user
  - No collusion possible between actors

What we need?

- An identity free credential
- Unlinkability between credential issuance and verification



Solution - Privacy Pass Token

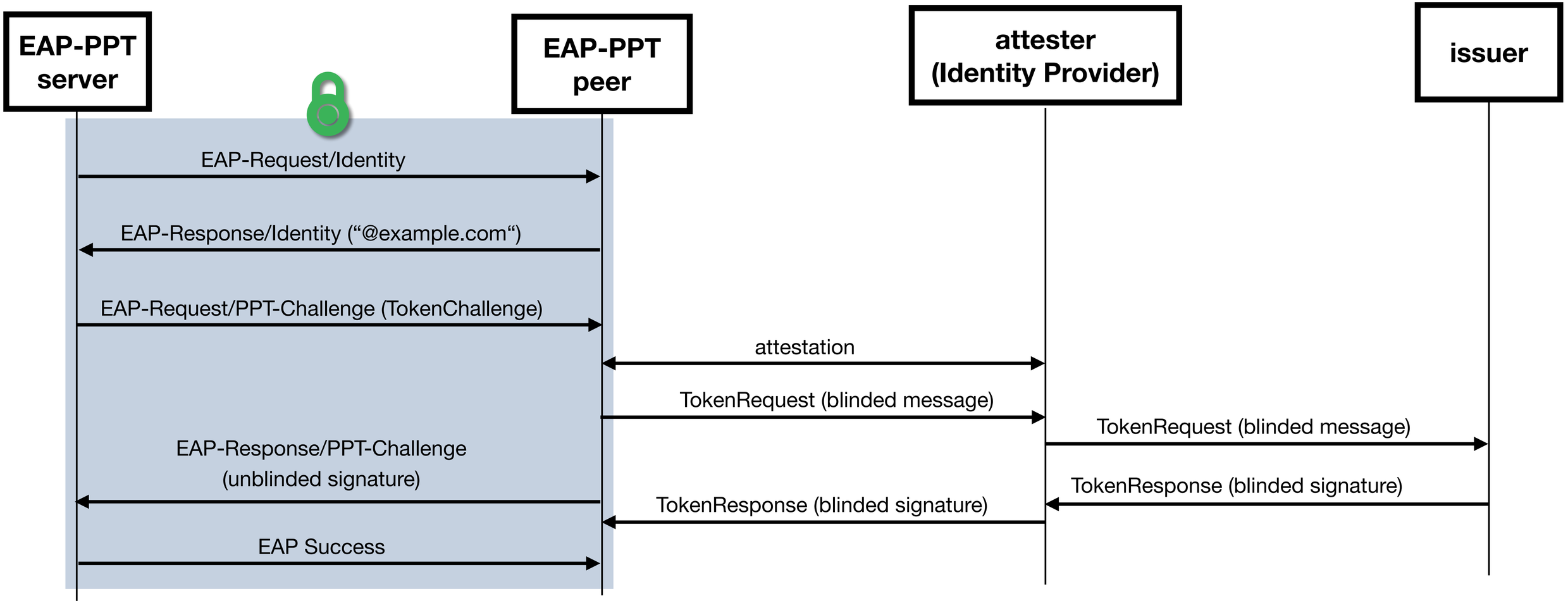
- Cryptographically generated unforgeable and unlinkable proof of attestation

  - Oblivious Pseudorandom Functions Using Prime-Order Groups

  - RSA Blind Signatures

- Server-Client, Issuer-Client, Attester-Server unlinkability guarantee

EAP-PPT


EAP-PPT server
EAP-PPT peer
attester (Identity Provider)
issuer
EAP-Request/Identity
EAP-Response/Identity (“@example.com“)
EAP-Request/PPT-Challenge (TokenChallenge)
attestation
TokenRequest (blinded message)
TokenRequest (blinded message)
EAP-Response/PPT-Challenge (unblinded signature)
TokenResponse (blinded signature)
TokenResponse (blinded signature)
EAP Success

Q&A