Federated Identity and Single-Sign On

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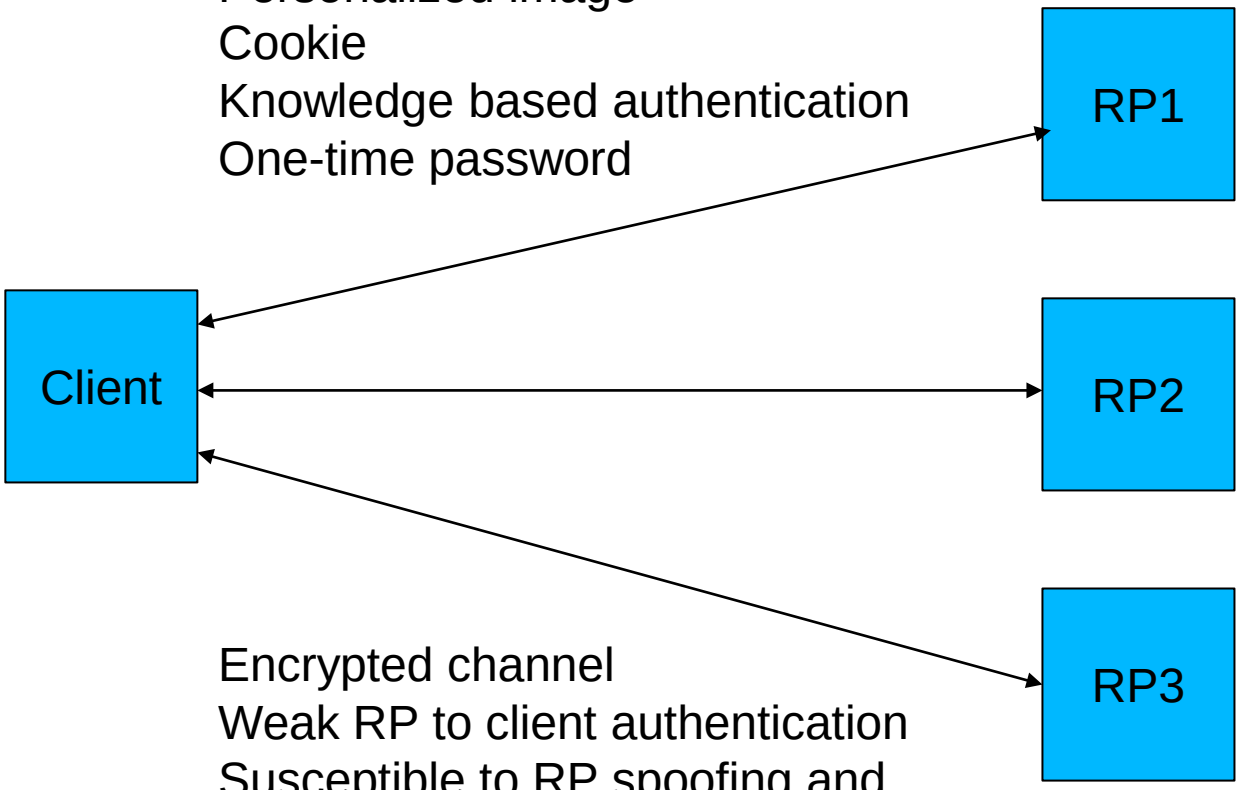
The Web Today

User ID, Password
+ maybe:
Personalized image
Cookie
Knowledge based authentication
One-time password



Relying Parties
(Service Providers)

Encrypted channel
Weak RP to client authentication
Susceptible to RP spoofing and
man-in-the-middle

The Web Today

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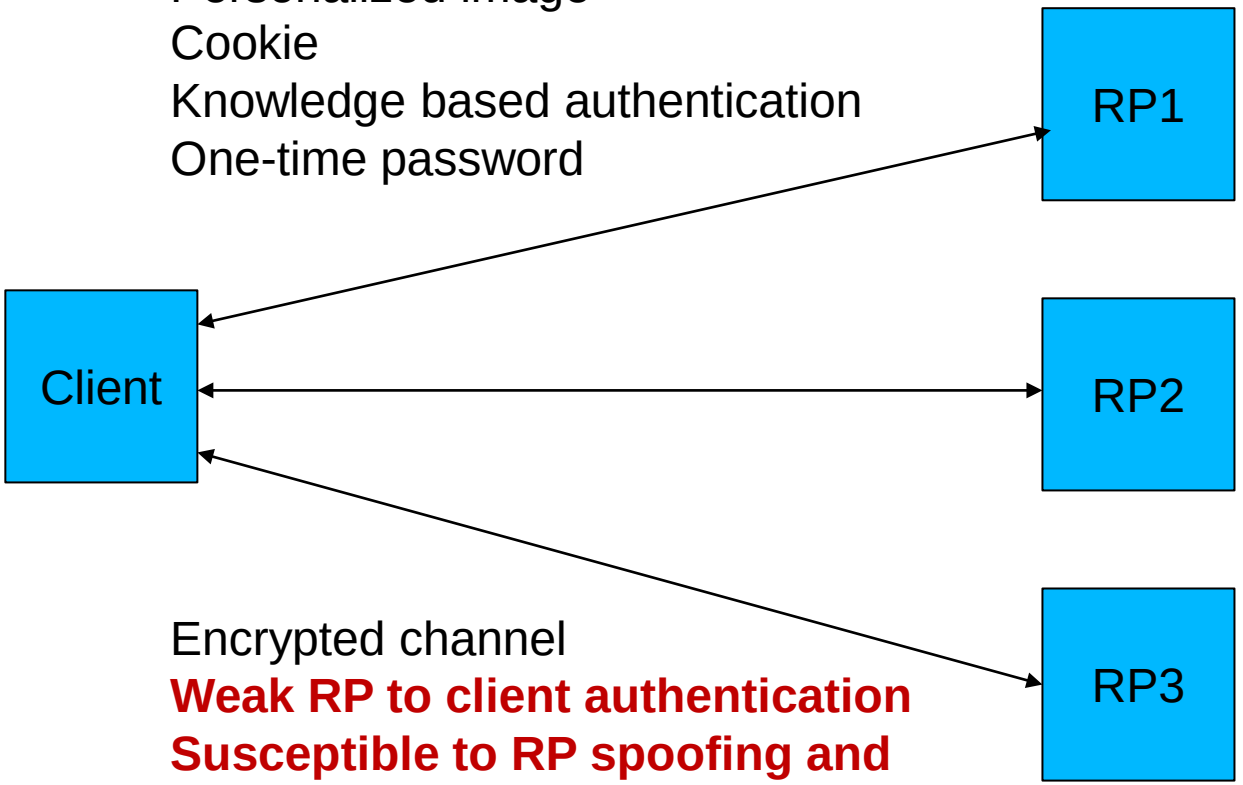


Private Key
Public Key

Private Key
Public Key

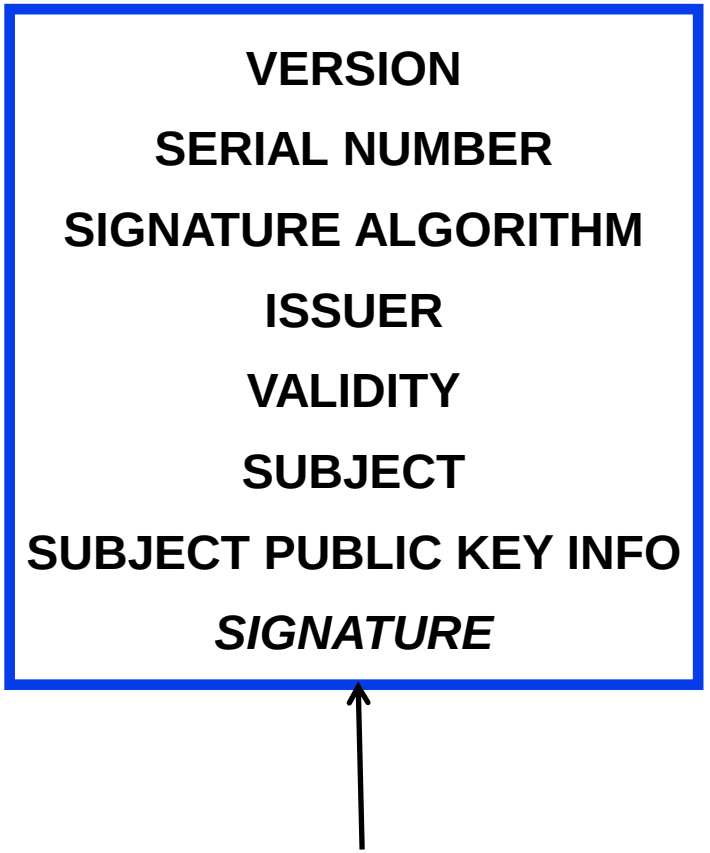
Private Key
Public Key

Encrypted channel
Weak RP to client authentication
Susceptible to RP spoofing and man-in-the-middle

Signature: done by Private Key, Verified by Public Key
Encryption: done by Public Key, Decrypted by Private Key

The Web Today

How to get a public key?
Digital Certificates

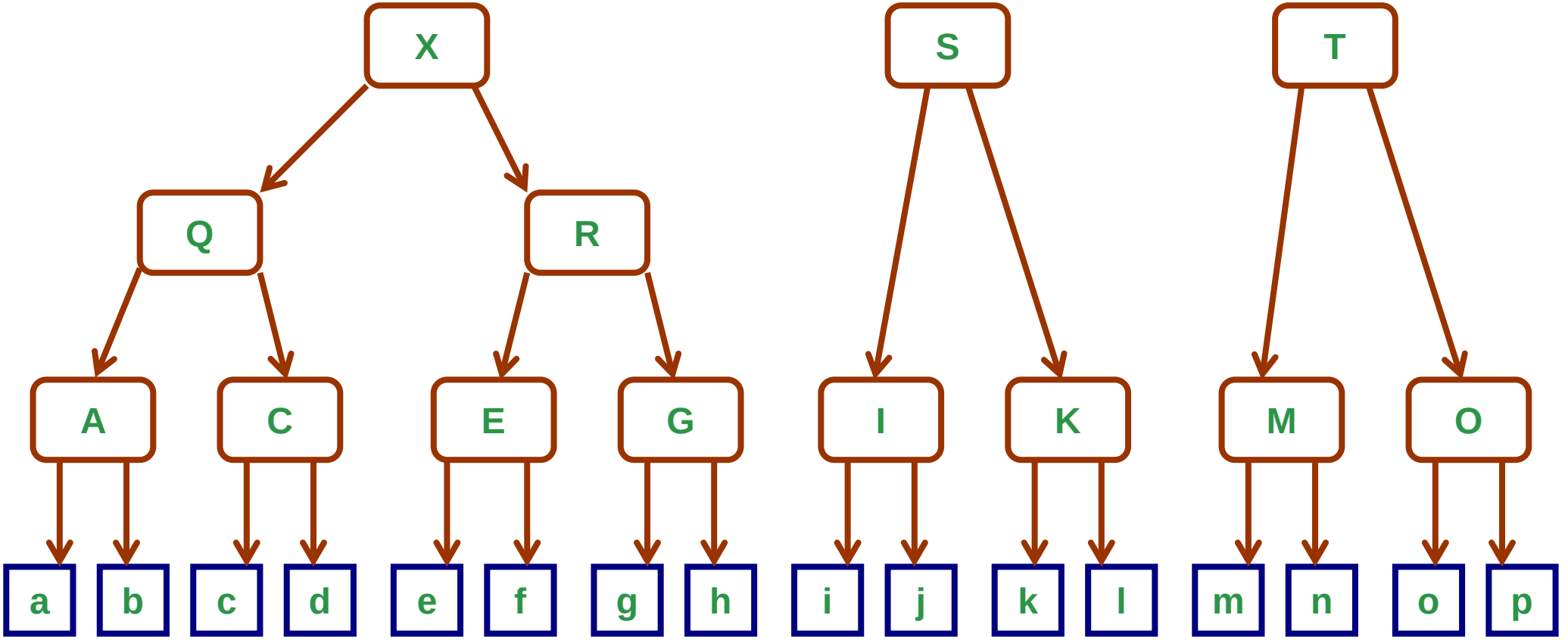


PKI: Public Key Infrastructure

Guarantees authentication and integrity
But how does one verify this signature
Need another Public Key

The Web Today

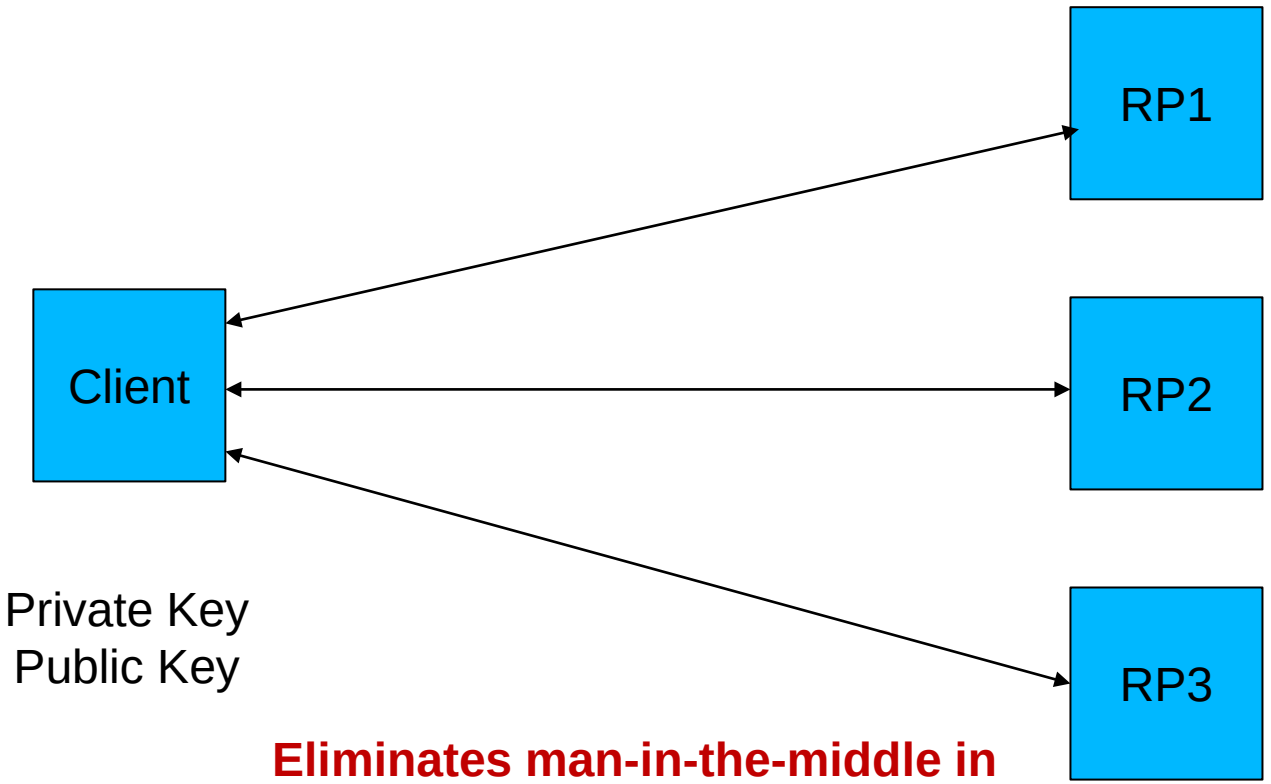
Root certificates are weakly protected in today's browsers



Multi-rooted Certificate Hierarchy

The PKI Vision (1980s Onwards)

Relying Parties
(Service Providers)



Private Key
Public Key

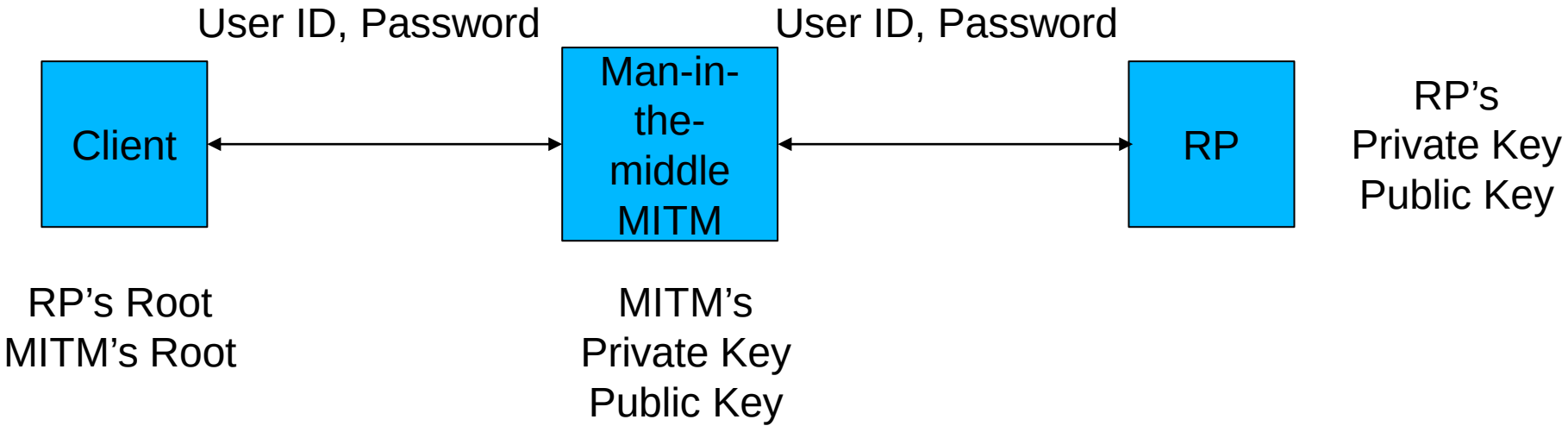
Private Key
Public Key

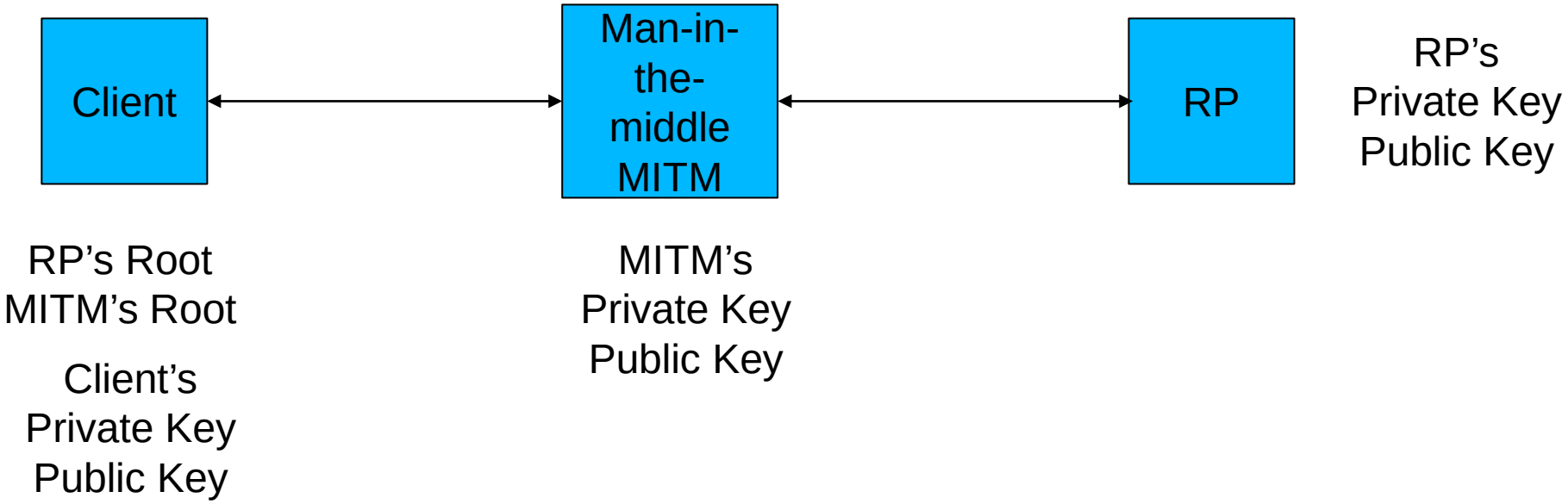
Private Key
Public Key

Private Key
Public Key

Eliminates man-in-the-middle in the network. Remains vulnerable to man-in-the-browser and man-in-the-PC

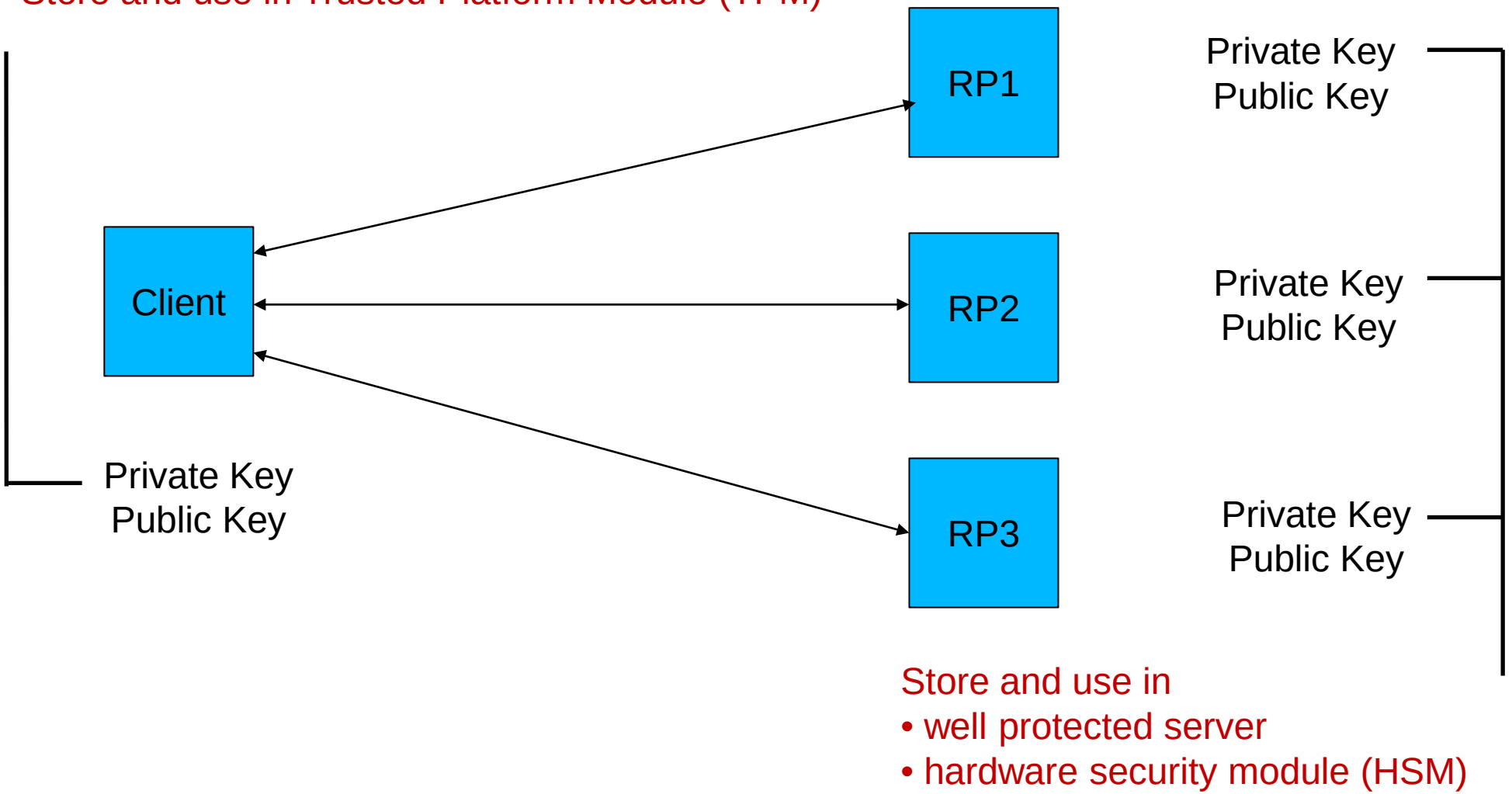
The PKI Vision (1980s Onwards)





The PKI Vision (1980s Onwards)

- Store as password protected and use in insecure PC
- Store and use in smartcard
- Store and use in Trusted Platform Module (TPM)



Store and use in
- well protected server
- hardware security module (HSM)

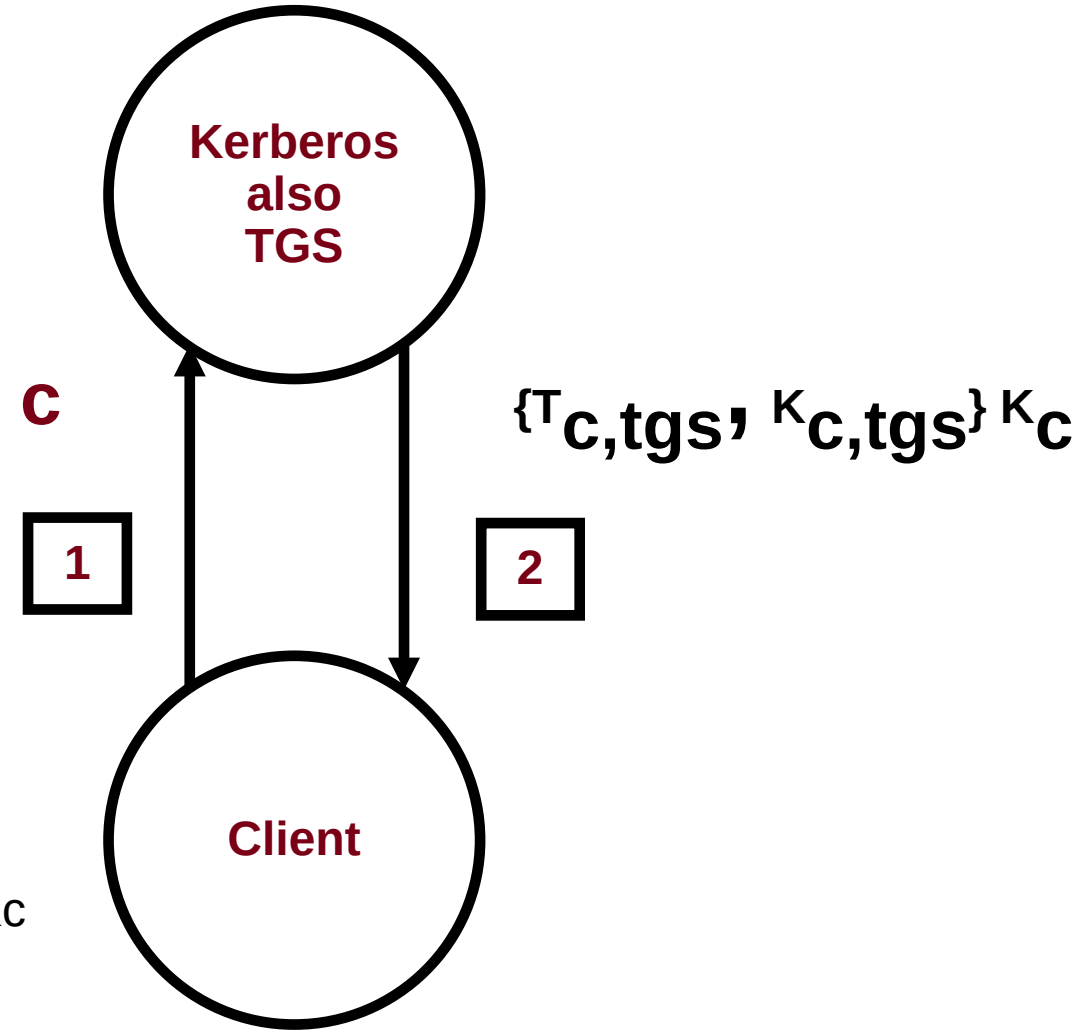
The PKI Vision (1980s Onwards)

- One authenticator for each client
  - Protected by one or more additional factors
- Usable by every RP who trusts the client's root
- Built-in out-of-the box Single Sign-On (SSO)
- Massive expense by US DoD on Common Access Card

Kerberos SSO (1980's onward)

Symmetric Key Technology

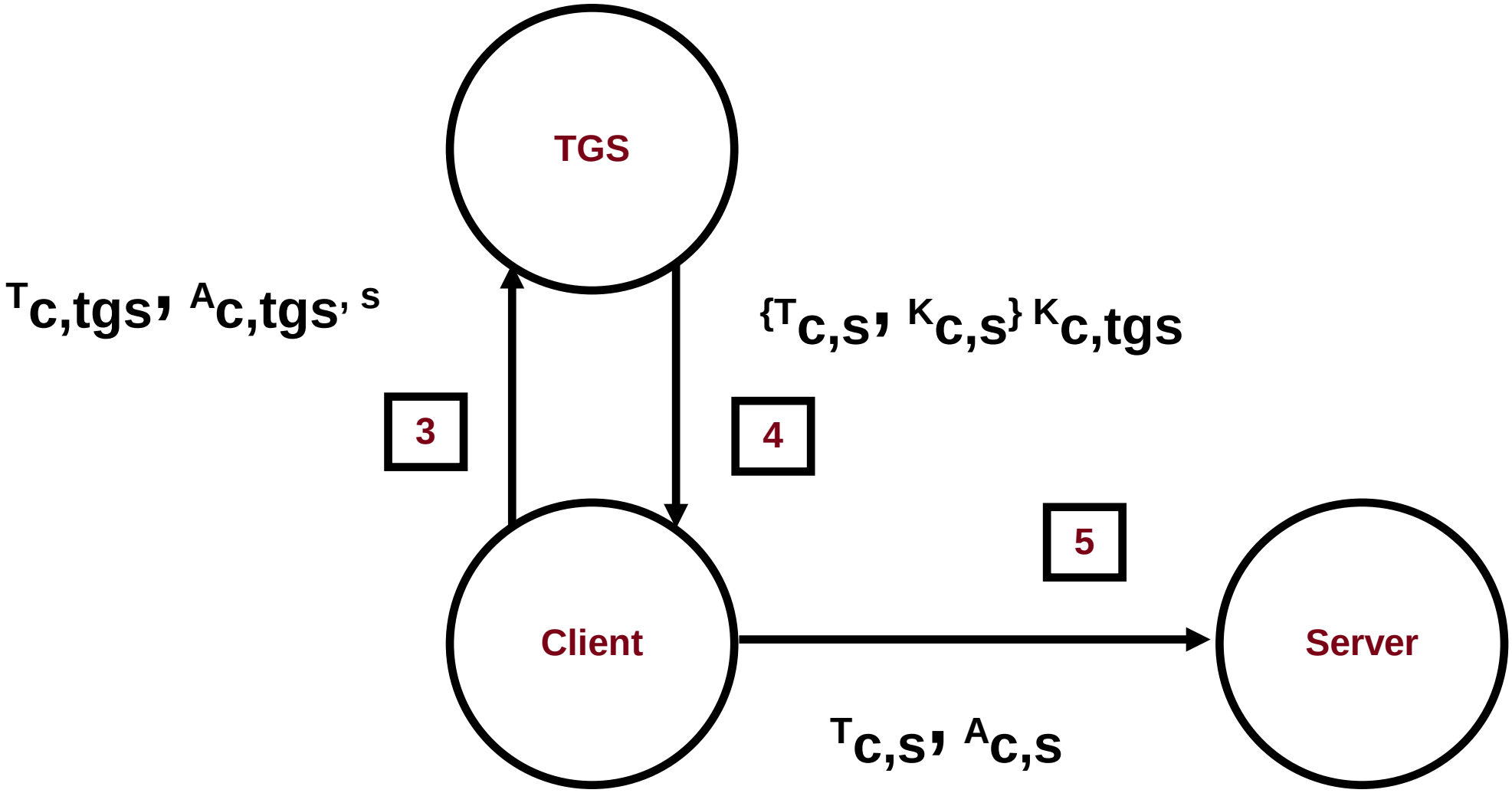
Stored client symmetric key Kc



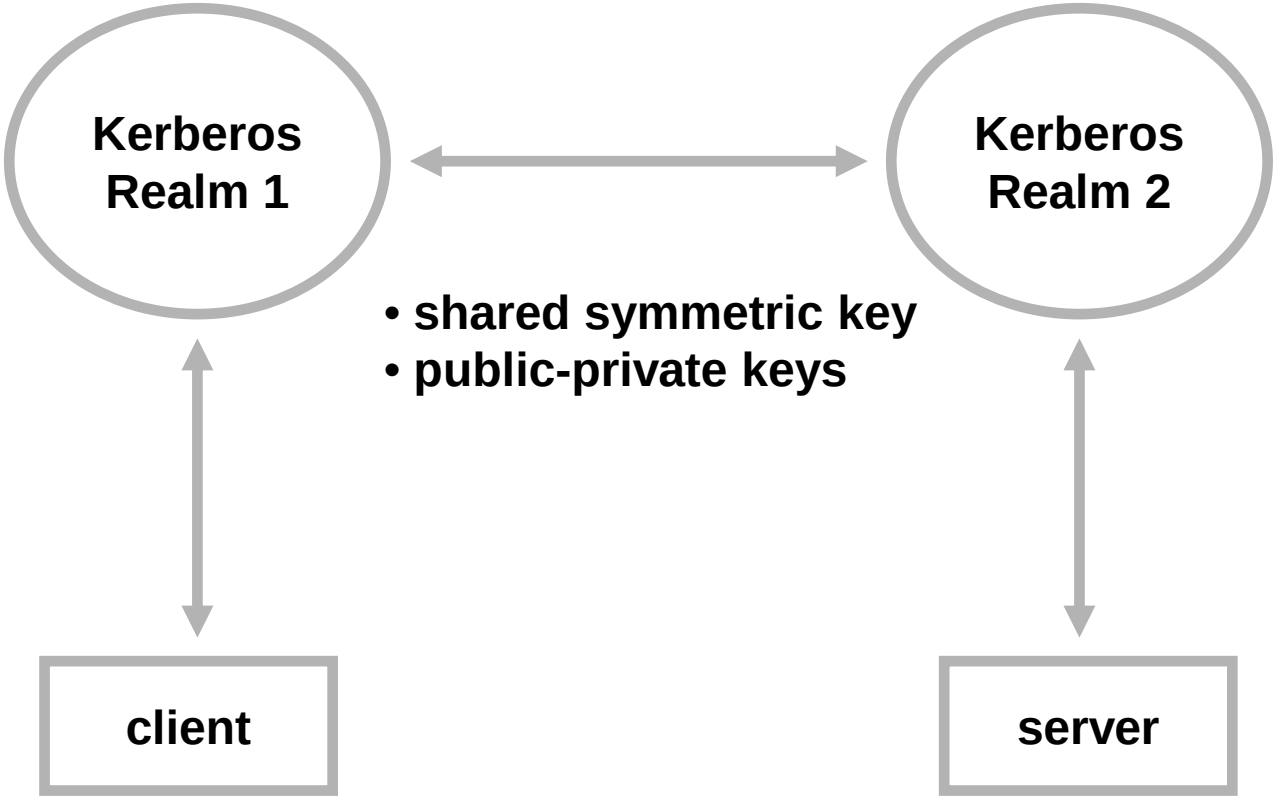
Client password -> client symmetric key Kc

Kerberos SSO (1980's onward)

Symmetric Key Technology



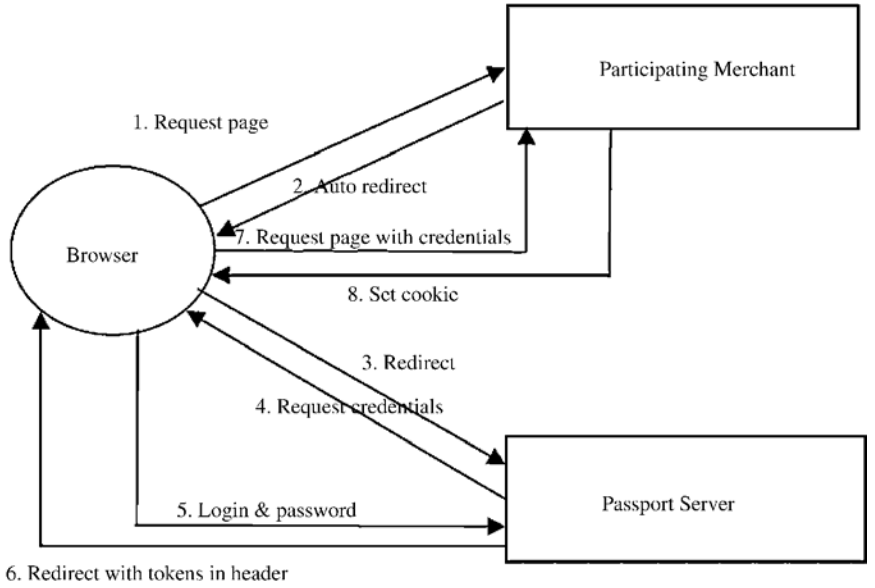
Kerberos SSO (1980's onward)



Kerberos SSO (1980's onward)

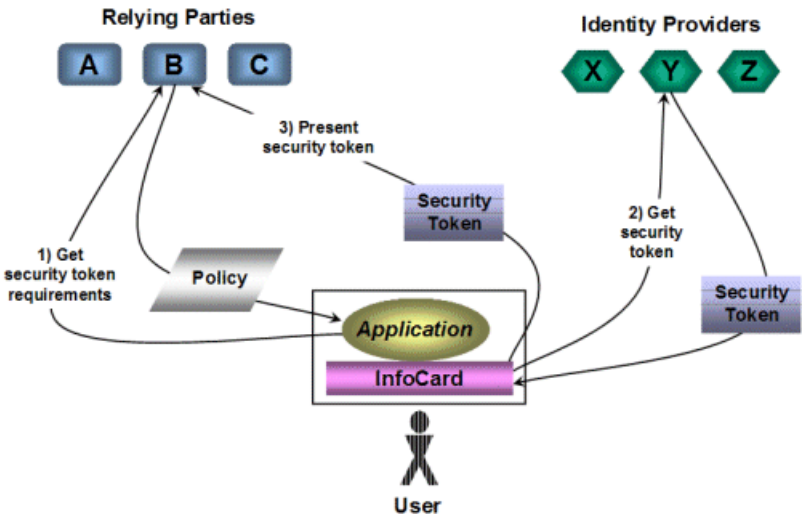
- Successful in Enterprise SSO
  - Scales to 10's or 100's of thousands of users
- Microsoft Active Directory login is based on Kerberos
- Inter-realm rarely deployed

Microsoft SSO (1990's)



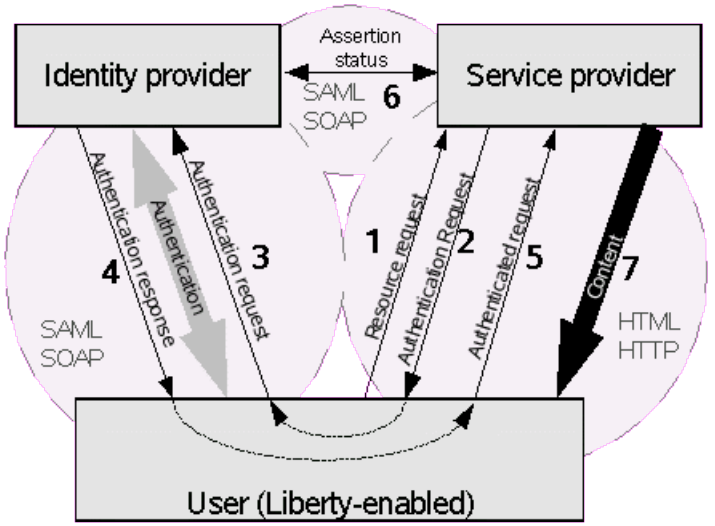
Failed

Microsoft Infocard Identity Ecosystem (2000's)



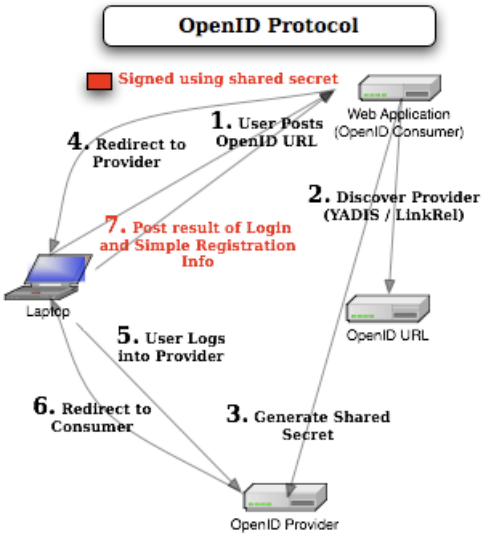
Failed

Liberty Alliance (2000's)

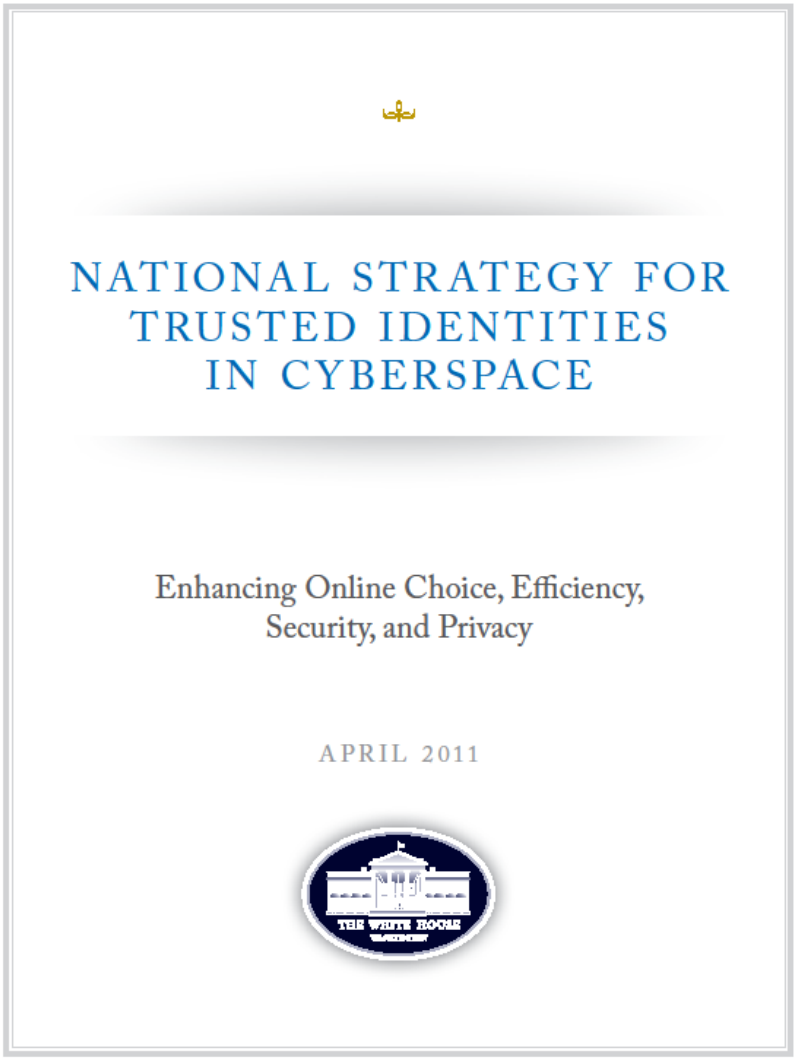


Failed

OpenID (2000's)



Failing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