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Multifactor Identity Verification without Prior Relationship

Five Techniques for Remote Identity Proofing

Francisco Corella
fcorella@pomcor.com
Karen Lewison
kplewison@pomcor.com

In-Person vs. Remote Identity Proofing

- Typically in-person identity proofing relies on
  - Primary evidence: picture ID
    - Driver's license, passport
  - Secondary evidence from other identity sources:
    - Ownership of utility, financial, mobile, or social network accounts
    - Address verification
- No problem with remote presentation of secondary evidence
- **Goal: replace picture ID with primary evidence that can be presented remotely**
- **We can do that with higher identity assurance than provided by a picture ID**

Multifactor Identity Verification without Prior Relationship

- Identity proofing is harder than authentication
  - No prior relationship between subject and verifier
- Authentication gold standard: provide 3 verification factors
  - Something you have: device containing private key
  - Something you know: password
  - Something you are: one or more biometric features
- But in identity proofing, without prior relationship:
  - The subject cannot have previously registered a password, nor enrolled a biometric sample with the verifier

Rich Credential

- **Achieves the gold standard** without prior relationship by certifying biometric and password verification data under a signature by the issuer
- **Allows multiple biometric modalities**
  - Both revocable and non-revocable
- And it provides **selective disclosure of attributes** and **selective presentation of verification factors**
  - … using a **typed hash tree** that provides **omission-tolerant integrity protection**

Remote biometrics

- A rich credential supports:
  - **Remote biometric presentation to a verifier**
    - Rather than to a device owned by the subject that may be compromised
  - **With spoofing detection by the verifier**

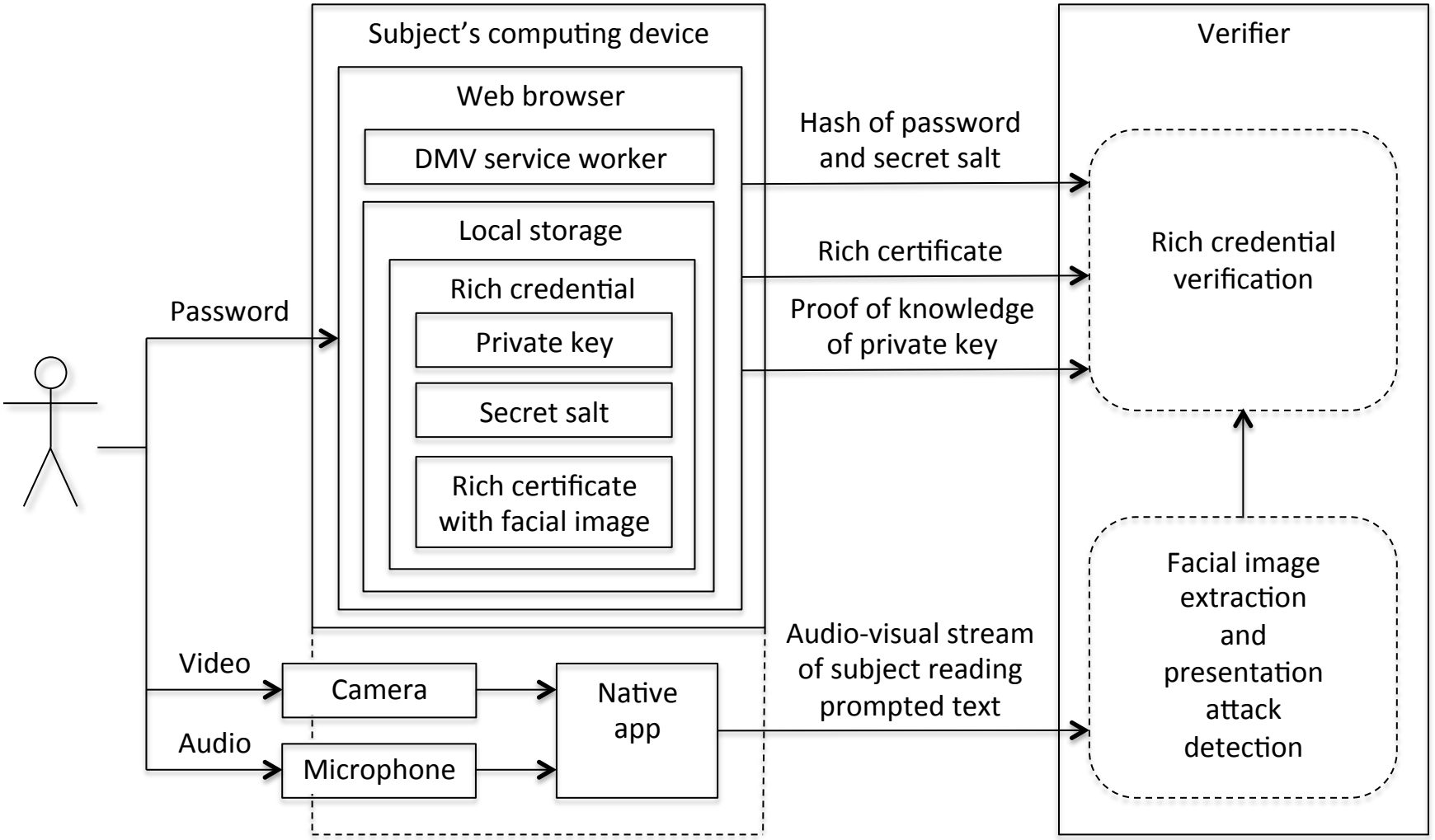
Remote spoofing detection with a rich credential

- Verifier receives an **audio-visual stream** of the subject reading prompted text selected at random with high entropy
- **Uses face recognition** to match a face in the stream to a facial image in the rich credential
- **Uses speech recognition** to verify that the subject is reading the prompted text
- **Verifies audio-visual synchrony** by tracking lip movement and matching distinguishable visemes to phonemes
- **Optionally uses speaker recognition** against a voiceprint in the rich credential
  - Possible because a rich credential supports multiple biometric modalities

Overview of the Five Solutions

	Solution 1	Solution 2	Solution 3	Solution 4	Solution 5
Identity Source	DMV	Bank	Credit card issuer	Medicare or medical insurance provider	State Department
Credential	Rich credential with facial image	Rich certificate asserted on a blockchain	Contactless EMV chip card	Medical ID smart card with signed facial image	Passport with signed facial image in RFID chip

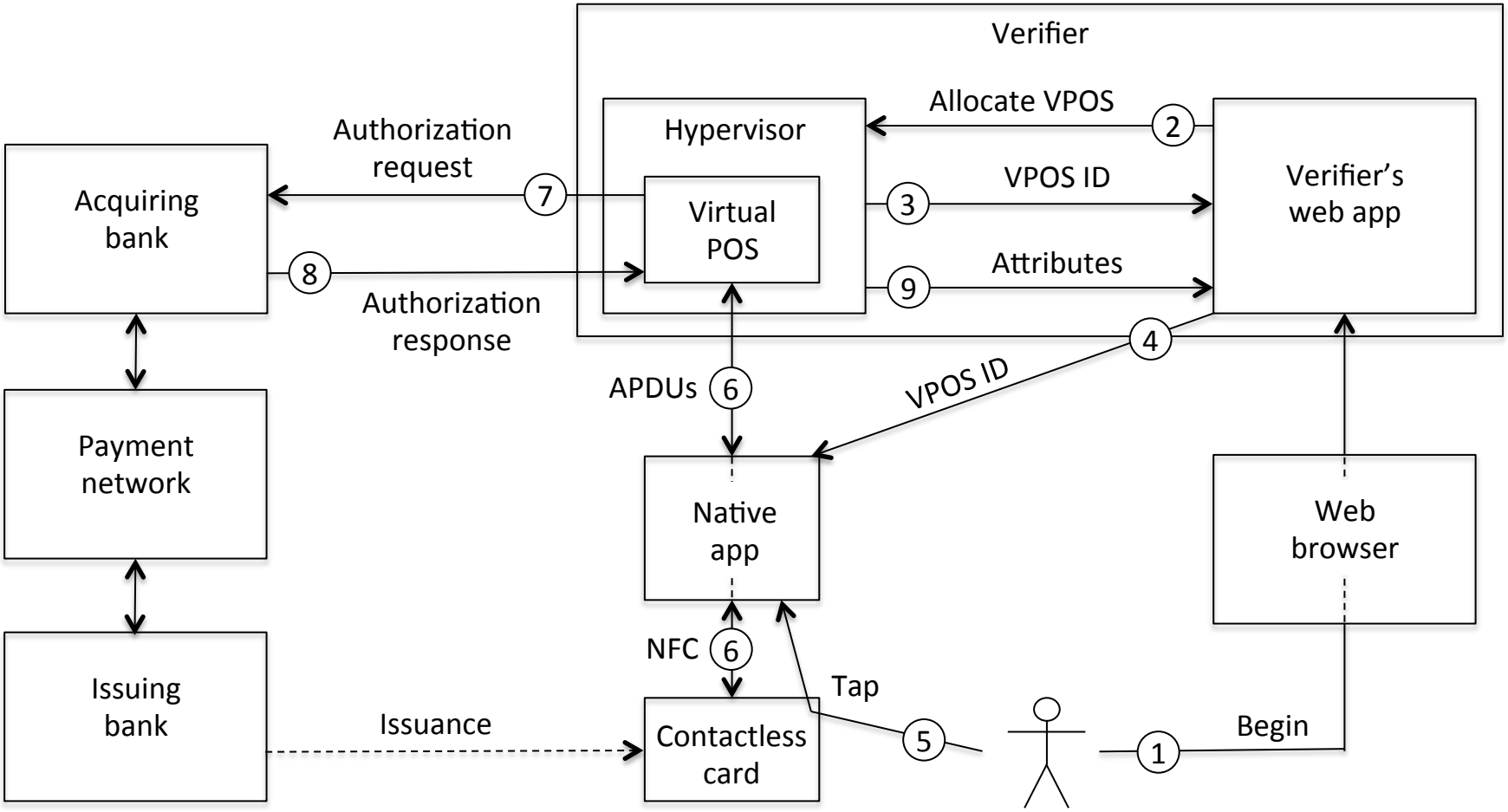
Solution 1: Rich Credential Issued by a DMV



Solution 2: Unsigned Rich Certificate Asserted by a Bank on a Blockchain

- Bank asserts certificate by placing hash of certificate in a storage location that it controls within the blockchain
- Bank revokes certificate by placing hash in another storage location
  - **Big improvement over CRLs and OCSP**
- Three-factor verification as in Solution 1
- Biometrics:
  - Speaker recognition, leveraging voiceprint used for customer authentication
  - Optional: face recognition as in Solution 1, to defeat voice morphing

Solution 3: Remote Proof of Possession of a Contactless EMV Chip Card



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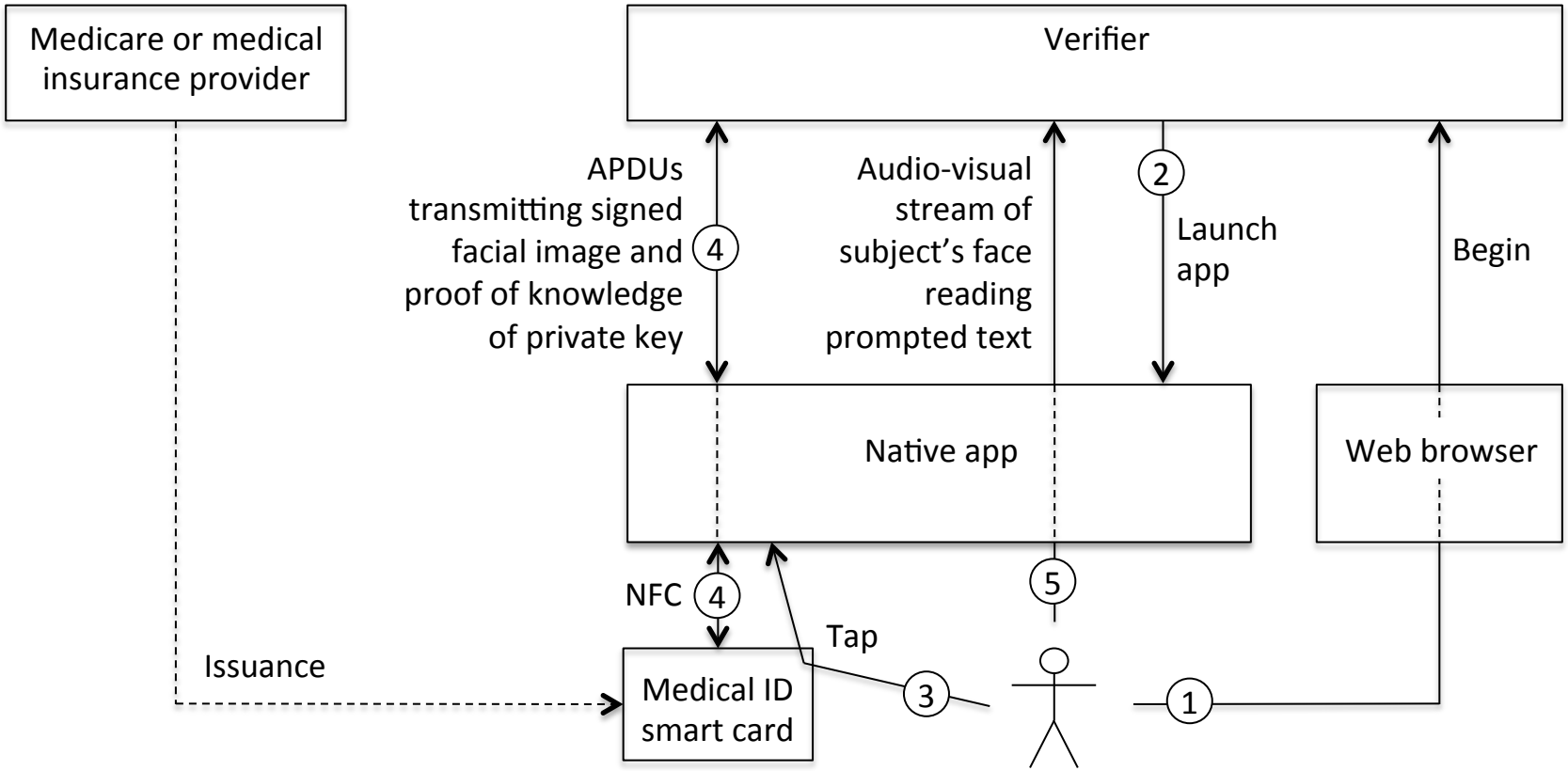
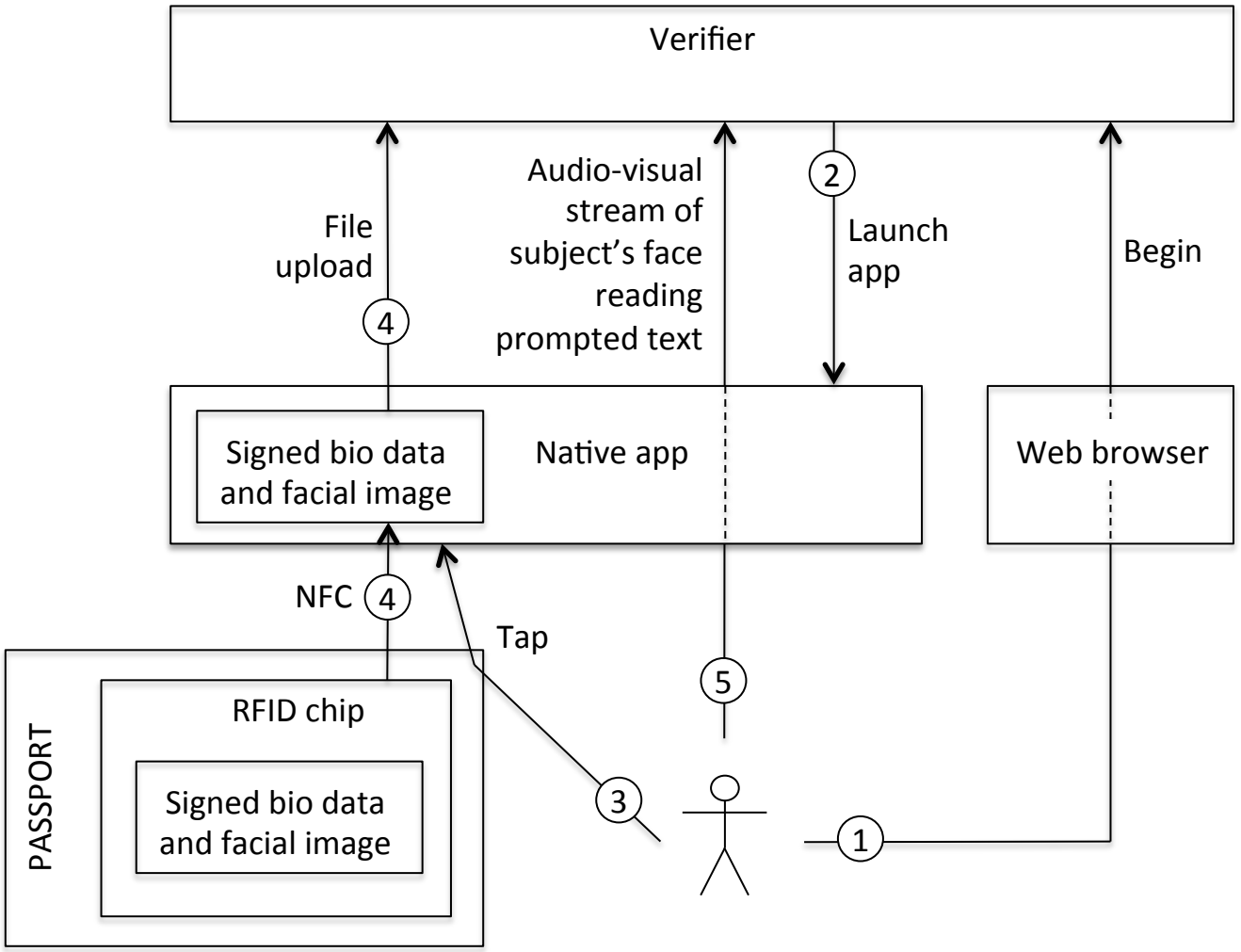
Solution 3 Enhancements

- As described above, Solution 3 provides only one verification factor:
  - Possession of contactless EMV card
- An "indirect" factor can be added
  - By asking the subject to demonstrate ownership of the account by reporting the amounts of the transactions
- The issuing bank could add a face recognition factor by placing a signed facial image in the card

Solution 4: Medical ID Smart Card with Signed Facial Image



Solution 5: Passport with Signed Facial Image in RFID chip



Solution 5 Enhancements

- As described above, Solution 5 provides only one verification factor:
  - Face recognition
- A strong proof of possession could be added by storing a key pair in the RFID
  - As specified by ICAO Doc 9303 Part 11, but not implemented in US passports
- A weaker proof of possession can be added by asking subject to show passport data page in audio-visual stream
  - Next generation passports will add more physical security features (but no private key?!)

Recap of Verification Factors Provided by the Five Solutions

	Solution 1	Solution 2	Solution 3	Solution 4	Solution 5
Identity source	DMV	Bank	Credit card issuer	Medicare or medical insurance provider	State Department
Credential	Rich credential with facial image	Rich certificate asserted on a blockchain	Contactless EMV chip card	Medical ID smart card with signed facial image	Passport with signed facial image in RFID chip
Verification factors	3 strong	3 strong	1 strong + 1 indirect	2 strong	1 strong + 1 weak

Thank you for your attention!

For more information:
Web site: pomcor.com
Blog: pomcor.com/blog/
Paper: https://pomcor.com/techreports/RichCredentials.pdf

Francisco Corella
fcorella@pomcor.com
Karen Lewison
kplewison@pomcor.com

Any questions?