Enforcement of Privacy-compliant Delegation of Personal Data

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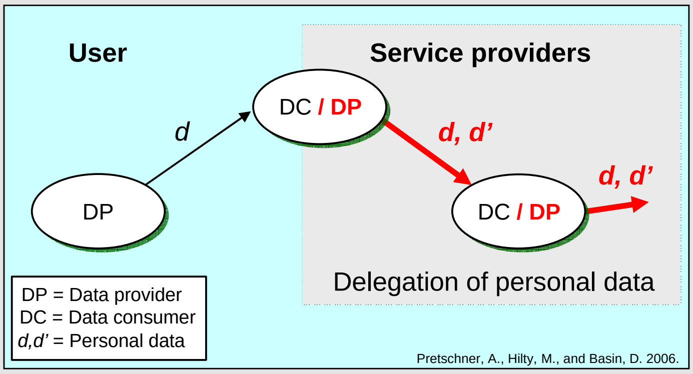
Personalized Services and Business Processes

Service providers act as data consumers and data providers

- Data consumers collect, use, and store the user's personal data
- Data providers disclose / delegate personal data to service providers
- Privacy promise: Service providers handle personal data according to the agreed upon privacy policy between users and service providers
- Examples: Customer relationship management and medical services with electronic health record



DP = Data provider
DC = Data consumer
d,d' = Personal data

Pretschner, A., Hilty, M., and Basin, D. 2006.

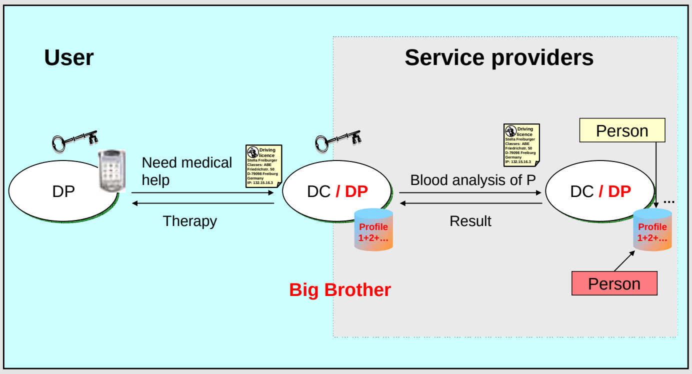
No Control on the Delegation of Personal Data

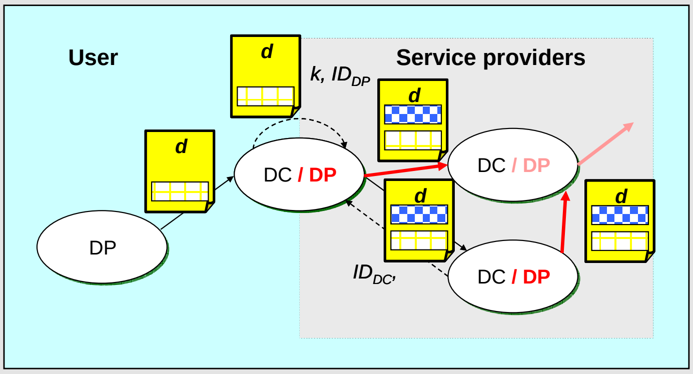
Identity Management and Delegation

- Privacy by non-linkable credentials
- All credentials and pseudonyms are based on secret key
- All-or-nothing delegation ➡ **Loss of control**

Digital Watermarking and Delegation

- Copyright protection by labeling digital content
- Symmetric watermarking scheme: Both service providers get the same watermark ➡ **Non-distinction of last data provider**





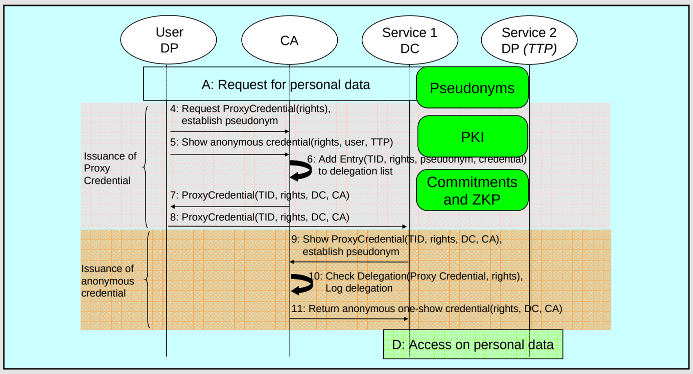
Controllable Delegation of Personal Data by DREISAM & DETECTIVE

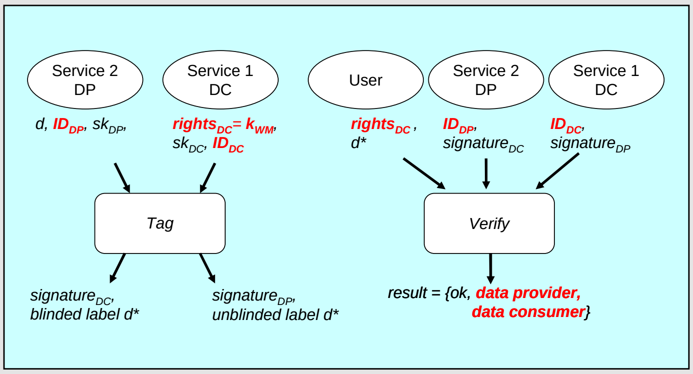
DREISAM: Non-linkable Delegation of Rights

- Authorization: Delegation of access rights to user's data
- PKI-based protocols with cryptographic commitments and zero-knowledge proof for non-linkability
- Proxy credentials instead of sharing secret key

DETECTIVE: Documenting Delegations of Personal Data

- Ex-post enforcement by identifying last data provider
- Linking the identities of data provider and consumer by cryptographic commitments and digital watermarking
- Verification by user due to delegated rights as watermarking key


User DP
CA
Service 1 DC
Service 2 DP (TTP)
A: Request for personal data
Pseudonyms
PKI
Commitments and ZKP
Issuance of Proxy Credential
4: Request ProxyCredential(rights), establish pseudonym
5: Show anonymous credential(rights, user, TTP)
6: Add Entry(TID, rights, pseudonym, credential) to delegation list
7: ProxyCredential(TID, rights, DC, CA)
8: ProxyCredential(TID, rights, DC, CA)
Issuance of anonymous credential
9: Show ProxyCredential(TID, rights, DC, CA), establish pseudonym
10: Check Delegation(Proxy Credential, rights), Log delegation
11: Return anonymous one-show credential(rights, DC, CA)
D: Access on personal data


Service 2 DP
Service 1 DC
User
Service 2 DP
Service 1 DC
d, ID_DP, sk_DP,
rights_DC = k_WM, sk_DC, ID_DC
rights_DC, d*
ID_DP, signature_DC
ID_DC, signature_DP
Tag
Verify
signature_DC, blinded label d*
signature_DP, unblinded label d*
result = {ok, data provider, data consumer}

Evaluation: Proof-of-concept implementation for medical services with electronic health records

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