Protecting Users’ Privacy in Electronic Prescribing Systems with Active Privacy Bundles

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Introduction

- Electronic prescribing (e-Rx) systems — record and transmit electronic prescriptions among prescribers, pharmacy benefit managers, and pharmacies
  - Prescriber — the subject (e.g., a physician) who writes prescriptions (Rx) for a patient
  - Pharmacy benefit manager (PBM) — a third-party administrator responsible for developing and maintaining the formulary, contracting with pharmacies, and negotiating discounts and rebates with drug manufacturers
- Also responsible for processing and paying prescription drug claims

The current e-prescribing workflow

- User privacy — a user’s right to control what information she reveals about herself, and who can access that information
  - Patient privacy (a special subcase of user privacy) — deals with data that are or include a patient’s healthcare-related data (incl. Rx data)

An active privacy bundle (APB)

- A software construct

Motivation and Problem Statement

- Data privacy in an e-Rx system — a critical challenge
  - Users must be sure that the e-Rx system does not disseminate or share their private data (e.g., name, home address, names of mental illness medications) to unauthorized entities
  - Users do not know who/what controls their data physically
  - Do not know where data are sent in an e-Rx network, and who manages them
  - Some companies profit from selling physician’s prescribing routines to pharmaceutical companies

Security = confidentiality + integrity + availability (CIA)

- This is a classical definition of security

Problem Statement

- Assure that an e-Rx system provides all 3 components of security
- Assure that private data are not disclosed to unauthorized parties by an e-Rx system

The Proposed Solution

Modifications of the Active Privacy Bundle

1) APB creation: APB constructed in user space with APB creator software (either automatically or interactively)
   - The APB creation steps
     - Darker color indicates modified steps

2) APB enabling: APB automatically enabled on the visited host
   - The APB enabling steps
     - Darker color indicates modified steps

Requirements for APB creation

- Using domain names, addresses & associated certificates
- Key derivation
- Key stretching
- Detached signatures

Requirements for APB enabling

- Message disposition notification (MDN)
  - Provides indications of message delivery (read or discarded) to the sender
- Using certificate authority (e.g., X509)
- Certificate discovery
- Through DNS and LDAP
- Trust verification

Salient Solution Features

- Attribute-based access control (ABAC)
- No need for trusted third party (TTP)

Work Status and Future Work

- Status
  - Nearing completion of a pilot APB implementation
  - Developing active privacy bundles with multi-agent system (APB-MAS)

- Future work
  - Adding to APB privacy policy inclusion
  - Adding to APB privacy policy verification
  - Adding to APB automatic negotiation of privacy policies
  - Using APB-MA for protecting patients' privacy in e-Rx systems