Big Health Care Data
(MedVault: Ensuring Security and Privacy for Electronic Medical Records)

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Georgia Institute of Technology
Children’s Healthcare of Atlanta

Primary Sponsor: National Science Foundation
Additional Sponsors: I3P, Nortel
MedVault Technical Overview

- Organizational VPN
- Secure EMR Storage
- Wireless Access Point
- Secure Virtualized End Devices

- Personal Health Record
  - Verifiable and Selective Information Disclosure

- Internet-based EMR Sharing
  - Attribute-based Access Control
  - Federated Cross-Layer Identity and Access Management

- Other External Users (patients, patient surrogates, community physicians, emergency responders, etc)

- Other EMR Provider
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Trends in Medical Data

• Wide-spread sharing of health care organizations’ EMR data with external entities, e.g. patients, community physicians, EMT personnel, other health care organizations, public health officials, medical researchers
  – Cross domain data search/analysis

• Third-party services for users’ maintenance and control of their medical data, e.g. Google Health, Microsoft Health Vault

• Generation of large volumes of medical data from non-traditional sources, e.g. home-based health care and portable medical devices
Challenges and Selected Approaches

- Authorization and access control in federated environments
  - Credential-based (attribute-based) systems
- Privacy: cross-correlation attacks mean stripping obvious personally identifiable information is not sufficient
  - Data obfuscation to group data into sets of a minimum size
  - Privacy vs. usability
- Identity
  - Uniquely identifying patients without use of globally unique identifiers such as SSNs
    - Attribute similarity metrics
  - Identification of individuals accessing medical data
    - Auditing + secure binding of credentials to credential owners
- PHR services with data verifiability and selective disclosure
  - Novel types/uses of redactable signatures
Challenge: Dealing with Real-Time Sensor Data