Usage Management of Electronic Medical Records

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***Abstract*—Electronic medical record management is under new scruitiny as private companies move into the market and government agencies actively address percieved health care distribution inequalities and inefficiencies. Current systems are coarse-grained and provide consumers very little actual control over their data. Herein, we propose an alternative system for managing the use of healthcare infomormation. This system is more granular, allows for data mining and repackaging, and gives users more control over data while allowing said data to be distributed as much as needed. In this paper, we outline the characteristics of such a system, present relavant background information and research leading to the system design, and cover two specific use scenarios supported by this system that are difficult to control using simpler access control strategies.**

***Keywords*-usage management; electronic medical records**

I. Introduction

New healthcare legislation has spurred previously unknown levels of public and private investment into technologies supporting more efficient healthcare delivery [10]. An active area of examination is electronic health records. Current systems, like Microsoft HealthVault and Google Health are a start in this area, but provide rudimentary control over health information, provide consumers with very little actual control of their information, and essentially demand proprietary lockin to these products because of the amount of effort involved with data transfer [22].

We propose an open, consumer-centric approach to health information storage and consumption centered around flexible and granular usage management policies. User empowering systems in this area are needed to allow users control over the information that represents them, and would be in high demand if appropriately designed [7]. We propose to address this need by bundling health information (either entire records or subsets of records) with traceable and aggregateable usage policies controlled by the users themselves. Users would have the ability to make aspects of their records available to everyone from research institutions looking for historical information for studies, to specific healthcare providers who need specific information to support diagnoses. Furthermore, institutions would be able to combine information from groups of users and determine dynamically via policy evaluation how that new set of data can be used in a way that complies with all included user policies. If the combined dataset cannot be used, policies can be analyzed to determine the cause of the policy conflict.

We will propose, design, and demonstrate a system that supports granular management of the data elements of an electronic medical record. This management will allow users to specify policies over the data itself rather than the entire record in question, providing control over information dissemination. We will demonstrate this control in three distinct scenarios. The first will include two distinct parties negotiating over access to specific information contained in a medical record. If the parties can reach an agreement, the information consumer will be granted access to specific medical data, for an agreed-upon price. The second demostrates a data broker combining a set of previously acquired medical record data into an aggregate set for research, if the licensure is in fact compliant between all selelected data elements. Finally, the aggregated data set will be placed back into the market.

This kind of system, allowing users control over their data in ways fostering ease of dissemination, use and reuse, helps users receive better, more targed care, helps providers easly access required information, and allows this kind of data to be more easily examined and mined. We use established system design principles, used in the develoment of internet-scale networks to create a open flexible system [3], [6], [9]. We will standardize certain features, such as operational semantics and ontological domains, but otherwise limit the impact of the policy system on data dissemination as much as possible.

A. Previous Work

Past research applicable to this area includes usage management, digital rights management (DRM), and access control. Most of the research applicable to the combination of previous arfifacts into a single aggregate artifact comes from the DRM world in particular. Generally, these expressive languages have been fundamentally based on different types of mathematical logic or formalisms with reasoning capabilities [4], [5], [8], [11], [12], [19], [24]. This approach, while useful in closed systems, tends to not work as usefully in more open dynamic environments. This has led to the development of translation mechanisms to address interoperability needs [13], [18], [21]. This translation process is

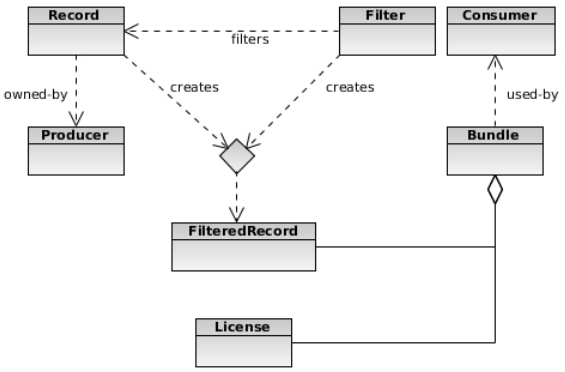

Figure 1. Simulation Results

difficult for most policy languages, and in fact infeasible as a result [17], [20]. Alternative approaches have required the use of sophiticated and powerful languages that must be adopted as a universal standard [1], [2], [23], [25]. This approach inherently limits innovation and flexibility [13], [14], [15], [16].

II. Underpinnings

Describe details of technology including ontologies; need to discuss static v. dynamic term evaluation and why we require dynamic in this system

A. Marketplace

describe how the market works, how it incentivises desired behaviour

B. Usage Management

describe how the usage management system works

III. System

A. Cases and Scenarios

Outline the use cases, describe them, map them to specific scenarios

B. Scenario 1: Negotiation

Demonstrate and present results; negotiation over specific information contained in a EMR

C. Scenario 2: Aggregate Assembly

Demonstrate and present results; assemble data elements into a single data set; show both usage term compliance and non-compliance

D. Scenario 3: Aggregate Submission

Demonstrate and present results; insert new set into marketplace; demonstrate acquisition of set and traceability back to individual elements

IV. Conclusion

Evaluate results and outline future work

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